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Medical-Surgical Nursing

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SENIOR CONTRIBUTING AUTHORS

Christy Bowen, Chamberlain University

Bridget Carey, Holy Family University

Jessica Palozie, University of Connecticut

Maren Reinholdt, University of Rochester School of Nursing

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OpenStax
Rice University
6100 Main Street MS-375
Houston, Texas 77005

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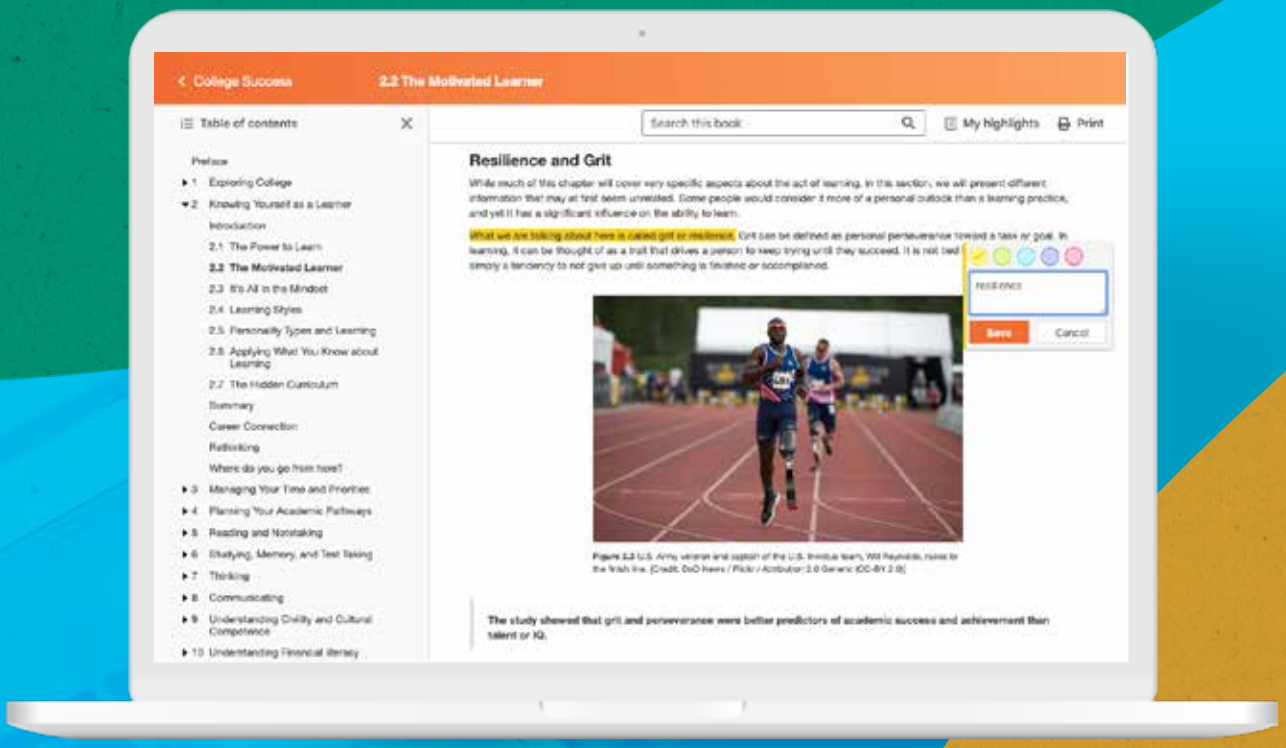

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Contents

UNIT 2 CRITICAL THINKING IN NURSING PRACTICE

UNIT 3 GENERAL ASSESSMENT CONSIDERATIONS

UNIT 5 CARE OF THE SURGICAL PATIENT

PREFACE

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About *Medical-Surgical Nursing*

Summary

With more than half of all nursing students eventually working in medical and surgical environments, it is imperative that students build a solid foundation of knowledge, critical thinking skills, and patient-centered care practices to excel in these diverse settings. *Medical-Surgical Nursing* is designed to be a comprehensive guide for nursing students, equipping them with the essential knowledge and skills required to provide high-quality care. The ever-evolving field of health care demands that nurses be well-versed in both the science and art of nursing, capable of critical thinking, clinical judgment, and compassionate care.

Medical-Surgical Nursing encompasses a broad range of patient care situations, from managing chronic conditions

to providing post-operative care. The text balances concise explanations to facilitate understanding with rich reviews of pathophysiology, ensuring students grasp essential concepts without becoming overwhelmed. As a result, students come away with a deep understanding of the underlying mechanisms of diseases. *Medical-Surgical Nursing* integrates current best practices into each chapter. By staying informed about the latest advancements in medical-surgical nursing, students can deliver the highest quality care to patients. Beyond theoretical knowledge, the text emphasizes the development of practical skills and competencies. After reading *Medical-Surgical Nursing,* students will be better prepared to use their clinical judgment and critical thinking skills in a fast-paced environment.

Pedagogical Foundation

Medical-Surgical Nursing utilizes a blend of constructivism and experiential learning as its pedagogical framework. The text incorporates visual tools such as diagrams, flowcharts, and infographics to help students internalize complex information and create long-term understanding. Building on the foundational knowledge and skills acquired in previous nursing courses, this textbook expands students' learning with advanced concepts in medical-surgical nursing.

By encouraging students to apply their knowledge through real-world scenarios, case studies, and hands-on exercises, the textbook fosters experiential learning that enhances critical thinking and clinical decision-making skills. This approach not only prepares students for the complexities of medical-surgical nursing but also empowers them to provide high-quality, evidence-based care to their patients.

Organizational Framework

The table of contents for *Medical-Surgical Nursing* presents content in 38 chapters, organized into 7 thematic units.

- **Unit 1** establishes the foundational principles of medical-surgical nursing, covering professional practice, inter-collaborative care, health policy, evidence-based practice, and the integration of technology in health care. It also addresses culturally competent care and health promotion strategies.
- **Unit 2** focuses on the critical thinking skills essential for nursing by exploring the nursing process, clinical judgment, and ethical decision-making. It provides frameworks for recognizing, analyzing, and prioritizing patient care needs.
- **Unit 3** covers comprehensive health assessments and the management of pain, stress, and chronic illness. It emphasizes holistic patient evaluations and the development of effective communication skills.
- **Unit 4** details the management of various physiological conditions, such as fluid and electrolyte balance, respiratory and cardiovascular care, musculoskeletal and integumentary health, and more. It provides practical guidelines for patient care management.
- **Unit 5** guides students through the surgical experience, from preoperative to postoperative care. It highlights critical roles in ensuring patient safety, managing pain, and promoting healing and recovery.
- **Unit 6** addresses specialized topics such as genetics, oncology, palliative care, emergency care, and disaster response. It prepares nurses to handle specific conditions and scenarios with confidence and competence.
- **Unit 7** offers practical applications through unfolding case studies and NCLEX preparation. These sections enable students to integrate their knowledge and apply it in real-world clinical situations, fostering the transition from student to professional nurse.

Nursing Features

To further enhance learning, *Medical-Surgical Nursing* includes the following features:

- **Clinical Judgment Measurement Model** boxes guide students through the application of the Clinical Judgment Measurement Model. The content explores the critical thinking and decision-making processes necessary to navigate patient care at different points in the process, from recognizing cues to evaluating outcomes.
- **Clinical Safety and Procedures (QSEN)** align with the Quality and Safety Education for Nursing competencies by providing detailed explanations of safety protocols and procedures specific to medical-surgical nursing. This feature emphasizes the importance of patient safety and quality care and offers checklists, step-by-step, or tips on various safety practices.
- **Cultural Context** boxes explore the impact of cultural factors on nursing procedures and practices. Some features describe care provided in other countries, while other features discuss cultural considerations for

patients in the United States. Cultural Context boxes encourage students to approach each patient individually, respecting their culture and values.

- **Life-Stage Context** features describe topics that are affected by a patient's age. Age-related topics allow the students to critically think about what influences certain conditions and the specific considerations needed for patients at different life stages.
- **Link to Learning** features provide a very brief introduction to online resources—videos, interactives, collections, maps, and other engaging resources that are pertinent to students' exploration of the topic at hand.
- **Interdisciplinary Point of Care** features highlight the collaborative nature of modern health care by identifying the plan of care from various disciplines, including physical therapy, occupational therapy, social work, nutrition, pharmacy, case management, and respiratory therapy. These features help students appreciate the interdisciplinary approach to patient care, emphasizing the importance of teamwork in achieving optimal patient outcomes.
- **Read the EHR boxes** present students with real electronic health record (EHR) data, such as lab results, progress notes, or vital signs, for a specific patient. Each feature includes critical-thinking questions that challenge students to analyze the data, identify concerning information, determine expected findings, and question any anomalies. This exercise helps students develop the skills necessary for effective EHR utilization in clinical practice.
- **Real RN Stories** feature firsthand accounts from registered nurses in the field. These stories help students make connections to topics on a deeper level.
- **Unfolding Case Studies** present a hypothetical client scenario that unfolds in three parts across chapters, with each subsequent part presenting new information on the same client, to help foster clinical judgment. In each part of an unfolding case feature, the scenario is followed by two questions that require students to apply their knowledge of evidence-based care and allow them to practice with questions that mimic the style of Next-Gen NCLEX. The answers to these questions, with explanations, are included in the Answer Key for students at the end of the book.

Pedagogical Features

To support student learning, *Medical-Surgical Nursing* includes the following standard elements:

- **Learning Outcomes:** Every chapter section begins with a set of clear and concise student learning outcomes. These outcomes are designed to help the instructor decide what content to include or assign and can guide students on what they can expect to learn and be assessed on.
- **Assessments:** A variety of assessments allow instructors to confirm core conceptual learning, elicit brief explanations that demonstrate student understanding, and offer more in-depth assignments that enable learners to dive more deeply into a topic or history-study skill.
  - **Review Questions** test for conceptual apprehension of key concepts.
  - **Check Your Understanding Questions** require students to explain concepts in their own words.
  - **Reflection Questions** and **Competency-Based Assessment Questions** dive deeply into the material to support longer reflection, group discussion, or written assignments.
  - **What Should the Nurse Do?** and **Critical Thinking About Case Study Questions** assess students' clinical judgment skills using case-based scenarios. Students review either a single case or an unfolding case that reveals information gradually. In response to their observations of the patient, students must decide how to navigate the Clinical Judgment Measurement Model process. This approach challenges them to apply theoretical knowledge to practical situations, determining the most appropriate interventions based on the patient's specific circumstances.
- **Answers to Questions in the Book:** The assessments are intended for homework assignments or classroom discussion; thus, student-facing answers are not provided in the book. Answers and sample answers are provided in the Instructor Answer Guide for instructors to share with students at their discretion, as is standard for such resources.
- **Chapter Summary:** Chapter summaries assist both students and instructors by outlining the primary subtopics addressed within the chapter.
- **Key Terms:** Key terms are presented in bold text and are followed by an explanation in context. Definitions of key terms are also listed in the end-of-chapter glossary.

- **References:** References are listed at the end of each chapter.

About the Authors

Senior Contributing Authors

Senior contributing authors (left to right): Christy Bowen, Bridget Carey, Jessica Palozie, Maren M. Reinholdt

Christy Bowen, Chamberlain University. Dr. Christy Bowen DNP, RN serves as the Dean of Academic Affairs for Chamberlain University's BSN-Online. Dr. Bowen holds an ASN from Excelsior University, a BSN in Nursing and MSN in Nursing Education with a focus in Curriculum Development and Revision from Western Governor's University, and a Doctor in Nursing Practice in Nursing Leadership and Management from Capella University. Dr. Bowen has been a nurse for more than 20 years and is certified in the specialty of Critical Care nursing, and Wound Care. In her clinical practice she held roles such as Department Chair, Unit Educator, and Lead Nurse. In her Academia role, she has served as Lead Instructor, Curriculum Chair, Program Coordinator, Program Director, and Associate Dean of Faculty. Dr. Bowen has taught courses throughout all levels of nursing education such as associate, bachelor, master, and doctoral level programs. She enjoys teaching both clinical and didactic learning for nursing students. Dr. Bowen served as a key member of the curriculum team to develop a Concept-Based Curricula as part of the Texas Nursing Concept-Based Curriculum (TxNCBC) project; develop a standardized concept-based curriculum for the state of Texas. She has led over 50 Workshops as part of the Implementation and Customization service for schools across the US transitioning to Concept-based Nursing. She developed over 20 Board of Nursing Continuing Education (CE) Certified Workshops and presented as Keynote speaker for all workshops to Universities and Colleges across the US. Throughout Dr Bowens career she has received many prestigious awards including Nurse of the Year, Clinical Nurse Leader of the Year, Employee of the Year, Top Requested Nursing Education Consultant (NEC), Phi Theta Kapa Faculty Member of the Year, and Presidential Award Outstanding Faculty Service.

Bridget Carey MSN, RN, CWCN, LNC is an esteemed nurse leader and educator with over 15 years of clinical and academic experience. She holds a Bachelor of Science in Nursing (BSN) from Gwynedd Mercy University, a Master of Science in Nursing (MSN) with a focus on Nursing Education and Curriculum Development from Western Governor's University, and is a Board Certified Wound Care Nurse via graduate of the Rutgers School of Nursing's Wound Ostomy and Continence program. Bridget served as didactic and clinical adjunct faculty for the BSN-Express program at Holy Family University. Bridget is a published Medical Writer and Legal Nurse Consultant with a passion for advancing the field through evidence-based practice, innovative teaching methods, and elevating patient stories to foster systemic improvements. With experience as an active clinician and working across the continuum of health care, Bridget continues to weld the art and science of nursing by serving patients and providers from the classroom to bedside and boardrooms. She has reviewed and authored nursing curricula and clinical practice support with Wolters Kluwer/Lippincott, EBSCO and Dynamic Health, The Journal of Visualized Experiments (JOVE), HealthStream and Relias. She has authored, reviewed, and published several Continued Education courses for health-care providers, including a Wound Care 101 course with Texas Tech University.

Jessica Palozie, University of Connecticut. Dr. Jessica Palozie DNP, APRN, ACNP-BC, CNE has been an educator and practicing clinician for over a decade, specializing in acute care nursing with a focus on BSN and APRN students. As an Assistant Clinical Professor, she is deeply committed to the teaching philosophies of Benner and Bandura, tailoring education to meet the unique learning needs of her students. Dr. Palozie emphasizes the importance of leading by example and instilling confidence in student nurses, fostering both skills and knowledge essential for navigating today's complex health-care environment. A graduate of the University of Connecticut's Doctor of Nursing Practice (DNP) program, Dr. Palozie's academic journey also includes a Master of Science in Nursing (MSN) from UConn, a Post Master's Certificate in Nursing Education from the University of Hartford, and a Bachelor of Science in

Nursing (BSN) from Hartwick College. Her clinical interests include cardiology, women's health with a focus on infertility, and the integration of evidence-based practice (EBP) into clinical thinking. Dr. Palozie's research explores the adoption of EBP beliefs and attitudes among associate-prepared nurses, with a vision to increase the utilization of EBP guidelines in clinical practice. Dr. Palozie's dedication to education and research has been recognized through several prestigious awards, including the April 2018 Merit Faculty Award for her innovative integration of historical Hartford landmarks into nursing education and the October 2018 21st Century Grant for curriculum development. Her contributions continue to shape the future of nursing education and practice.

Maren M. Reinholdt, University of Rochester School of Nursing. Maren M. Reinholdt PhD, MSN, RN, CNE is an experienced educator of traditional, second degree/accelerated, and masters pre-licensure nursing students. She holds a BSN from Johns Hopkins University, a MSN in Nursing Education from Gonzaga University, a PhD in Nursing from Indiana University of Pennsylvania, and a BA in English, Theatre, and Secondary Education from Albright College. She has spent most of her time in clinical care in adult inpatient neurology and neurosurgery. She has coordinated and taught in-person and online in the didactic, laboratory, simulation, and clinical settings for Adult Health/Medical-Surgical Nursing, Child Health, Pathophysiology and Pharmacology, and Writing for Nursing courses. Dr. Reinholdt is a member of NLN, is a Certified Nurse Educator®, and a member of Sigma, International. Heather Moore, Xavier University.

Contributing Authors

Valerie Baker, Gannon University
Mary Anne Bera
Beverly Brown, Professional Consultants Without Walls
Catherine Cantrell, Higher Learning Technologies
Lindsay L. Draper, University of North Carolina Greensboro
Alissa Hershberger, University of Central Missouri
Stefanie Hoffman, Chamberlain University
Lori Greenhill, Christ Community Health Services
Tracey Long, Roseman University
Amanda Marten
Brandy McGhee, Marshall University
Taylor Mullin, The Ohio State University
Kate Roche, Dartmouth Hitchcock Medical Center

Reviewers

Taranee Albert, Northwestern Medicine
Kelly Coloff
Barbara Dewhirst, UPMC Passavant
Diane Glowacki, Clinical Nurse Specialist
Leigh Goldstein, The University of Texas at Austin
Susan Griffitts
Victoria Haynes, MidAmerica Nazarene University
Melissa Hollis, Baylor University
Veronica Hughes, Concordia University Texas
Christopher Jackson, South College
Monica Johnson, University of Holy Cross
Melissa Massey, Chamberlain University
Jenna Mendoza
Alexandra Patten, Columbia University
Jenna Reyes, Azusa Pacific University
Ansu Sebastian, Chamberlain University
Julie Thomison, Baylor University
Leigh A. Waldron, Western Governors University
Natasha Wylie, Boehringer Ingelheim
Joan Yankalunas, Lehigh Valley Health Network

Additional Resources

Student and Instructor Resources

We have compiled additional resources for both students and instructors, including Getting Started Guides, an instructor's answer guide, test bank, and image slides. Instructor resources require a verified instructor account, which you can apply for when you log in or create your account on OpenStax.org. Take advantage of these resources to supplement your OpenStax book.

Instructor's answer guide. Each component of the instructor's guide is designed to provide maximum guidance for delivering the content in an interesting and dynamic manner.

Test bank. With more than 1,100 assessments, instructors can customize tests to support a variety of course objectives. The test bank includes review questions (multiple-choice, identification, fill-in-the-blank, true/false), short answer questions, and long answer questions to assess students on a variety of levels. The test bank is available in Word format.

PowerPoint lecture slides. The PowerPoint slides provide learning objectives, images and descriptions, feature focuses, and discussion questions as a starting place for instructors to build their lectures.

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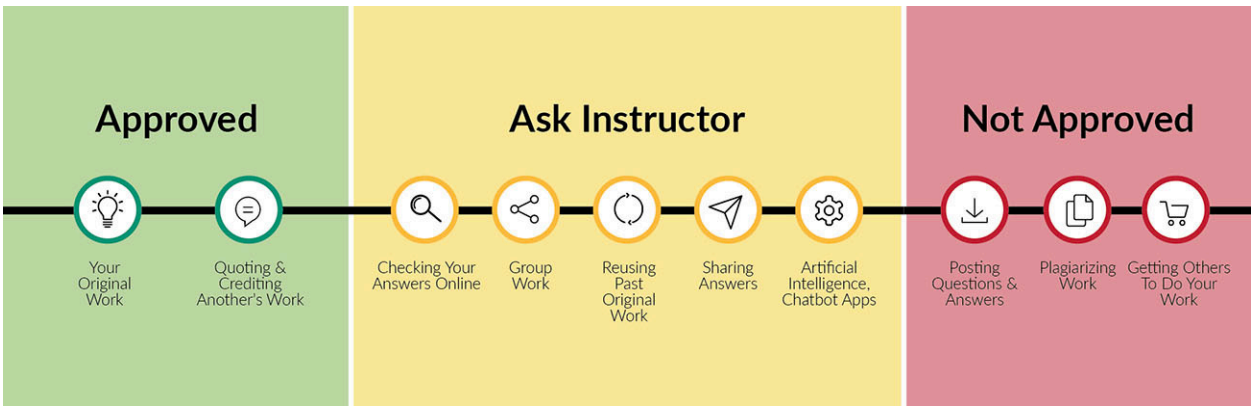
Academic integrity builds trust, understanding, equity, and genuine learning. While students may encounter significant challenges in their courses and their lives, doing their own work and maintaining a high degree of authenticity will result in meaningful outcomes that will extend far beyond their college career. Faculty, administrators, resource providers, and students should work together to maintain a fair and positive experience.

We realize that students benefit when academic integrity ground rules are established early in the course. To that end, OpenStax has created an interactive to aid with academic integrity discussions in your course.



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At OpenStax we are also developing resources supporting authentic learning experiences and assessment. Please visit this book's page for updates. For an in-depth review of academic integrity strategies, we highly recommend visiting the International Center of Academic Integrity (ICAI) website at https://academicintegrity.org/ (https://academicintegrity.org/).

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CHAPTER 1
Professional Medical-Surgical Nursing

FIGURE 1.1 Medical-surgical nurses care for a variety of patients in many different settings. (credit: modification of work "All of Us Participant" by NIH Image Gallery/Flickr, Public Domain)

CHAPTER OUTLINE

INTRODUCTION Medical-surgical nursing has become one of the largest nursing specialties. Medical-surgical nurses provide care for adult patients of all ages who are preparing for or recovering from surgery, as well as for patients with complications related to a variety of long-term illnesses. Nursing care incorporates a diverse patient population and a variety of disease processes, enabling medical-surgical nurses to apply a broad knowledge base and become experts in their field. Medical-surgical nurses also develop advanced organizational and prioritization skills, as well as strong assessment and communication skills. They are the leaders who coordinate patient care among the interdisciplinary team.

Medical-surgical nursing is practiced in a variety of settings within the health-care industry. Inpatient settings include hospitals, skilled nursing facilities, and long-term care facilities. Outpatient settings include clinics, same-day surgery centers, other nontraditional settings, and patients' homes. For this reason, the medical-surgical field offers many options where nurses can choose to practice.

1.1 Professional Nursing Practice

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Review key concepts of professional nursing
- Describe the competencies for the Quality and Safety Education for Nurses and role of The Joint Commission
- Define the nurse's role in providing patient-centered care

Nurses are an asset to their communities. The nursing profession is a calling for many, and it is an essential component of quality health care. Nurses take on many roles, from patient advocates to wellness educators, while also providing direct patient care. The nursing profession has evolved in recent decades so that evidence-based practice (EBP) is now the focus of patient care. Nurses also provide holistic care in a variety of specialized roles.

Professional Nursing Concepts

In the 1800s, hospitals typically comprised three primary units: medical, surgical, and obstetrics. In the mid-20th century, little distinction was made between surgical and medical nurses. However, by the 1960s, surgical nursing had become its own specialty; medical-surgical nursing became a more distinguished specialty around 1991, and the profession has continued to evolve. Today, medical-surgical nursing is one of the largest nursing specialties (Joseph, 2019; American Medical-Surgical Nurses Association, n.d.-b).

The Nurse's Role

Nurses work on the front lines of health care. They assess patients' symptoms and vital signs, document changes in condition, and evaluate the response to treatment. They also administer medications and operate medical equipment. The nurse is typically the first health-care worker to recognize when a patient is having a medical issue. It is their responsibility to immediately report the issue to the relevant provider to avoid adverse outcomes. The nurse remains with their patient during the patient's course of treatment. The nurse follows the progress of each of their assigned patients and keeps their best interest at heart. Nurses may also serve as a patient's case manager, taking the lead in coordinating medical care and advocating for the patient's physical, emotional, mental, cultural, and spiritual needs.

Because nurses have many roles, they acquire deep knowledge in a wide range of fields. An individual nurse has many specific roles to choose from, including bedside nurse, health coach, nurse navigator, case manager, nursing supervisor, home health nurse, hospice nurse, health writer, and nurse consultant. Nurse leaders, or those who enjoy management, may choose a role such as unit manager, clinical manager, or director of health services. Roles for advanced practice registered nurses include nurse practitioner, clinical nurse specialist, nurse midwife, and nurse anesthetist; these nurses have advanced training from a higher-level degree program such as a master's or doctorate. Regardless of one's focus, being a nurse opens the door to many opportunities in a variety of settings, including entrepreneurship beyond the health care industry.

The nursing **scope of practice**—the range of activities a licensed nurse is permitted to perform—is determined at the state level by a two-step process: (1) the state legislature passes a law, known as the **Nurse Practice Act** (American Nurses Association n.d.); and (2) regulatory bodies, such as the state nursing board, then create and implement rules and regulations intended to protect the public. Each state has its own rules and regulations. It is imperative as a licensed professional to be aware of the limitations of your practice in the state in which you work and where to find this information.

LINK TO LEARNING

The American Nurses Association articulates the nursing scope of practice (https://openstax.org/r/77scopepractice) explaining the areas in which each type of nurse can act. It is critical that a nurse understands their scope and role in the profession.

Professional Organizations

Nurses can choose to belong to a number of professional organizations. One of the most significant ones, with which

most nurses are likely familiar, is the American Nurses Association (ANA). The ANA was founded in 1896 as the Nurses Associated Alumnae; it changed to its present name in 1911. Its goal is to advance and protect the profession of nursing. According to the ANA, "patients' interests are best served by a health-care system in which many different types of qualified health professionals are available, accessible, and working together—collaboratively" (American Nurses Association, n.d.). Formal membership in any nursing organization generally requires membership fees that help fund the organization's political lobbying activities to support the causes of nurses, expand research, collect and disseminate resources, and provide networking, and educational and specialty certification opportunities for its members.

Another important organization for medical-surgical nurses is the Academy of Medical-Surgical Nurses (AMSN), which was founded in 1990. The AMSN's commitment is to "quality patient care through professional development, certification, scholarship, and advocacy" (American Medical-Surgical Nurses Association, n.d.).

LINK TO LEARNING

Specialties within the nursing profession have professional associations and organizations that support education and provide a subset scope of standards of practice. For example, the Academy of Medical-Surgical Nurses (https://openstax.org/r/77amsn) is the only professional association specifically for medical-surgical nurses. The role and mission of the organization is to support medical-surgical nurses throughout their professional careers.

Quality and Safety Education for Nurses

The **Quality and Safety Education for Nurses (QSEN)** project focuses on preparing future nurses to promote the quality of care and safety of patients in health-care systems (QSEN Institute, n.d.-a). The QSEN is a framework that weaves best practices from the Joint Commission Accreditation Standards and the Magnet model. The QSEN aims to redesign the "what and how" of nurses' delivery of care to ensure high-quality, safe patient care. QSEN's vision is "to inspire health care professionals to put quality and safety as core values to guide their work," with a focus on the following six main competencies:

- EBP
- informatics
- patient-centered care
- quality improvement
- safety
- teamwork and collaboration (QSEN Institute, n.d.-b)

LINK TO LEARNING

To learn more about the QSEN project and access their resources, visit the QSEN website that describes knowledge, skills, and attitudes (https://openstax.org/r/77qsen) for nurses.

Joint Commission Best Practices

The Joint Commission, formerly Joint Commission on Accreditation of Healthcare Organizations, is an independent, not-for-profit, peer-review organization that sets standards for quality care, quality improvement (QI), and patient safety for any organization and workers in the health-care industry. The standards set forth from the commission become the foundation for best practices in the health-care industry, including nursing standards of care. The Joint Commission has the power to accredit health-care facilities, ensuring their compliance with guidelines set by the Centers for Medicare and Medicaid Services and enabling them to receive federal reimbursement for services.

The Joint Commission believes nurses play an important role in health care and should be involved in developing safety and improvement initiatives. This belief led to The Joint Commission's support and integration of the QSEN. Ongoing priorities of the nursing profession include, but are not limited to, improving standards and recommendations for infection prevention, workplace violence, suicide prevention, emergency management,

environmental sustainability, and health-care equity for all, which are tied to the QSEN. Furthermore, each year, The Joint Commission gathers information related to emerging patient-safety issues. This information is used to create specific programs for the organization's National Patient Safety Goals (NPSGs). NPSGs are critical organizational elements to reduce negative patient outcomes and improve delivery of overall quality of care. Examples of NPSGs include improving the accuracy of patient identification and improving the effectiveness of communication among caregivers.

LINK TO LEARNING

Read The Joint Commission's National Patient Safety Goals (https://openstax.org/r/77jointcomm) on their website.

Patient-Centered Care

One model known as **patient-centered care** (PCC) is designed to promote optimal individual outcomes. The model requires listening to patients to understand what they value most, then using the information as the catalyst for health-care decisions. PCC encourages the patient and family to be a part of the health-care team, actively collaborating in the decisions that will formulate a customized plan of care and guide treatment decisions for the patient.

Scope and Attributes of PCC

PCC is essentially personalized care; providers work with each patient to develop and deliver a customized plan of care. Common elements of PCC include:

- collaboratively coordinating care by including the patient and family as essential team members
- encouraging the patient's family, as defined by the patient, to be present in the care setting
- ensuring the organization's mission and values are driven by patient-centered goals
- equally valuing the patient's emotional well-being and physical comfort
- incorporating the patient's emotional, mental, spiritual, social, and financial perspectives into their care
- promoting compassionate, quality care, and patient safety
- providing the right care at the right time in the right place
- respecting the patient's and family's values, culture, and socioeconomic status
- sharing information in a timely manner so the patient and their family can make well-informed decisions

PCC benefits patients as well as health-care providers and organizations. Overall, it improves patient satisfaction scores and enhances the reputation of health-care organizations, which, in turn, influences reimbursement rates. PCC boosts morale and productivity among providers because they share in their patients' experiences and improves the efficient use of hospital resources, which subsequently provides improved, individualized patient outcomes ("What is patient-centered care," 2017).

Examples of PCC in Nursing

Of all members of the health-care team, the nurse spends the most time with a patient; thus, they play the biggest role in PCC. The nurse's role in PCC includes responsibilities such as

- ensuring the patient's needs and concerns are at the center of health-care decisions and treatment plans
- inviting family members to become part of the care team by participating during rounds or shift changes
- including the patient and family in discussions and treatment decisions
- knowing what is most important to the patient and honoring their directives
- providing timely updates for the patient and their family

REAL RN STORIES

Nurse: Lisa
Years in Practice: Ten
Clinical Setting: Medical-surgical unit

Geographic Location: South Carolina

Lisa, a nurse in South Carolina, is providing care for Mr. Marshall, who has diabetes and is noncompliant with his physician's treatment plan, resulting in frequent hospitalizations. Lisa has been a nurse on the medical-surgical floor for 10 years and has developed a trusting relationship with Mr. Marshall and his family. Lisa remains mindful of the importance of providing PCC for Mr. Marshall, despite his noncompliance.

Knowing it is important to her patient, Lisa confirms during each hospitalization that Mr. Marshall does not want to receive heroic measures if his heart should stop beating or he should stop breathing. Upon confirmation, Lisa ensures that a do-not-resuscitate order is signed by the patient and then filed in his medical record. Lisa goes the extra mile to ensure Mr. Marshall and his family are informed of the latest test results and includes them in the decisions for Mr. Marshall's plan of care during his hospitalization; they also participate in designing his discharge plans. Mr. Marshall isn't always easy to get along with, but because he trusts Lisa; they share a special rapport that contributes to his overall satisfaction while in the hospital.

Lisa is well respected at the hospital and among her team members because of her diligence in ensuring Mr. Marshall's interdisciplinary team functions in a cohesive manner. Working as a case manager, she updates the team regularly to ensure there are no delays in care. Lisa has found that her initiatives to promote PCC in conjunction with improved outcomes and patient safety have inspired her peers to implement similar processes with their patients. Not only have Lisa and her team's efforts become greatly appreciated by their patients, the hospital has given a special award to the medical-surgical unit for their continued efforts to promote patient satisfaction and ensure positive outcomes.

1.2 Intercollaborative Care

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Describe the roles of members of an interdisciplinary health-care team
- Identify best practices for effective communication methods
- Define critical thinking and clinical judgment

A team-based approach called **intercollaborative care** is designed to promote person-centered care to improve patient and health system outcomes. This is achieved through shared responsibilities, interactive planning, and collaborative decision-making. When a team of health-care providers works closely with the patient and their loved ones to make quality health decisions, it is possible to provide holistic, **whole-person care** that focuses on all the patient's needs (National Center for Complementary and Integrative Health, n.d.).

There are many different generally, however, the goal of a **collaborative care model** is to manage patient care more effectively and to improve patient outcomes (Worsham, 2022a). Benefits of a collaborative care model include improved quality in care, reduced cost, and increased convenience to the patient. These benefits are achieved through a unified approach that uses data sharing, a streamlined referral process, and integrated scheduling.

The Intercollaborative Health-Care Team

Regardless of its specific composition, an intercollaborative care team aims to use PCC to achieve improved patient outcomes. The efficiency of the team is determined by each team member's ability to work cohesively and in tandem, creating a streamlined workflow of communication and delivery of care.

An interprofessional heath care team comprises many individuals from a range of disciplines, such as nurses, physicians, social workers, and dietitians. As intercollaborative team members, nurses have a great impact on PCC and optimal patient outcomes. The nurse's knowledge and experience contribute to the development, implementation, and ongoing improvement of quality care and patient safety as well as the associated initiatives within the health-care delivery system.

Members of an interprofessional team often work together in the same facility. However, teams may also include specialists who work in the community, such as pharmacists, chiropractors, and optometrists. Efficiency within the team structure is necessary for all members to work effectively together. To improve the efficiency of this process and create stronger teams, some practice groups choose to partner within the same location, such as a primary care

group and a behavioral health group, to collaboratively provide holistic care. Furthermore, the increasing availability of telehealth has streamlined the collaborative patient care process by allowing providers to coordinate with additional team members as needed.

When PCC is not implemented, patients may experience a lack of individualized attention and consideration of their unique needs and preferences. For example: Mary, a 65-year-old female grappling with a chronic health condition, undergoes a challenging hospital admission during which the health-care team primarily focuses on the medical facets of her illness, focusing on one component versus the whole person.

Throughout her stay, Mary receives minimal information about her treatment plan, potential side effects, and anticipated outcomes, yet she directed about what to do. The health-care providers overlook inquiring about her preferences, because of the busyness on the unit, leaving Mary feeling like a mere statistic rather than an individual with unique needs. The lack of personalized attention and understanding of her background and values results in an impersonal and disconnected health-care experience for Mary. Subsequently, the treatment plan prescribed for Mary fails to consider her lifestyle, values, and cultural background. The oversight leads to a lack of motivation on Mary's part to adhere to the prescribed regimen, which potentially could result in complications. The cumulative effect of neglecting preferences and Mary's emotional well-being diminishes Mary's trust in the health-care system, ultimately influencing her willingness to share crucial information and follow medical advice.

Communication

Communication is an essential component for establishing an effective workflow within the interprofessional team. Teams can set themselves up for successful communication by clearly defining each member's role and outlining their expected responsibilities; teams should then meet regularly to confirm everyone is fulfilling their responsibilities and catch potential problems before they negatively affect patients. All these efforts help promote a coordinated effort when providing collaborative patient care.

Effective Methods of Communication

Effective communication requires more than just speaking and writing well. It includes nonverbal communication such as interpreting facial expressions and body language, listening attentively, and developing positive relationships with colleagues, patients, and family members.

A variety of software options are available to enhance effective communication between intercollaborative team members. One key tool is the **electronic health record (EHR)**, a digital copy of a patient's medical history. EHRs, which will be further discussed later in this chapter, allow each team member to read the notes of other health-care professionals, avoid duplication, and better implement the patient care plan. Additional benefits of EHRs include written and legible documentation and dashboards that offer alerts to help the team avoid potential adverse events—for example, from inadvertently prescribing incompatible medications. Some EHRs can be shared with patient portals, enabling patients and providers to communicate directly across multiple platforms.

ISBAR Technique

The **ISBAR** technique is a common tool clinicians use to structure written and verbal communication about a patient's condition. It is easy to remember and helpful for highlighting the critical points that require immediate attention or action. Table 1.1 identifies the components that make up ISBAR.

ISBAR Technique	Description	Example
I = Introduction	Introducing who you are, your role, where you are, and why you are communicating	Hi, This is Susie Jones. I am the registered nurse in the Emergency Department caring for Ms. Kennedy. I am calling to give her transfer report.
S = Situation	A brief statement describing the problem	Ms. Kennedy is an 80-year-old woman in Observation Bay 321, admitted last night at 22:30. She arrived via ambulance from Marshall's Place Nursing Home, where she reportedly fell in the bathroom.
B = Background	A concise overview of the situation	Ms. Kennedy is diabetic and has Alzheimer disease. All supporting documentation has been entered into the chart, including a DNR. Family was notified of the fall by the nursing home. I contacted the son with an update after the admission. Family expected to meet with the physician this morning.
A = Assessment	Analysis or summary of what you observed or thought	Diagnostic X-ray reveals a left hip fracture. Physical examination shows bruising to the left hip. Skin warm, dry, intact. Patient reports severe pain. Morphine administered by emergency department staff at 01:30.
R = Recommendations	A suggested action to address the problem	Consultation scheduled with surgeon for this morning. Continue morphine as needed for pain. Follow-up with surgeon regarding next steps.

TABLE 1.1 Components of ISBAR

ISBAR provides a simple structure that can be replicated by each team member to keep communication on track, creating a workflow for the intercollaborative team while also promoting patient safety.

LINK TO LEARNING

The Institute for Healthcare Improvement provides this web page with information about SBAR, including downloadable guidelines and a worksheet (https://openstax.org/r/77ihi) for implementing the technique.

Influence on Critical Thinking, Clinical Judgement, and Decision-Making

Nurses are faced daily with complex situations and issues resulting from advanced technology, high-acuity care, ethical and cultural issues, and an aging population with complex disease processes. The decision-making process related to problem solving in health care is equally complex and requires critical thinking.

A multidimensional, systematic, and organized way of reasoning is known as **critical thinking**. It involves purposeful, outcome-directed thinking and requires mindfulness, effort, practice, and experience (Benner et al. 2008). Critical thinking skills develop over time as foundational knowledge and key concepts combine with nursing

experience. Critical thinking enables the nurse to draw conclusions that lead to creative and appropriate decisions that promote effective solutions and positive outcomes. Components of critical thinking include

- asking questions and gathering information
- validating and analyzing information
- drawing on past clinical experiences
- maintaining a flexible attitude
- considering available options
- formulating decisions

Nurses use **clinical judgment** to make decisions about patient care based on observations, assessments, and interpretations of relevant information, goes beyond the application of technical skills and involves the integration of both empirical knowledge and practical wisdom. Two nurses with different levels of clinical judgment may review the same data from a patient and arrive at opposite decisions regarding care. The nurse with better clinical judgment will be more likely to understand the data and consequently to make a better decision that produces a better outcome for the patient (American Association of Colleges of Nursing, n.d.). The National League for Nursing has taken a firm stance that clinical judgement is a better problem-solving approach than the nursing process (Ignatavicius & Silvestri, n.d.).

Applying both critical thinking and clinical judgement in nursing care decisions is called **clinical decision-making**. Critical thinking enables nurses to sift through all the data and make evidence-backed decisions. Clinical judgement is the synthesis of the information, and clinical decision-making is the result. When nurses use this skill, they draw on their own experiences with patients as well as relevant, quality research they have gathered to choose the best course of action for a particular patient in a particular context.

Let's summarize and provide applicable examples of critical thinking, clinical judgment, and clinical decision-making.

- Critical thinking: A nurse critically assesses a patient's EHR, noting a sudden change in vital signs. Critical thinking is demonstrated as the nurse questions potential causes, considers relevant factors such as medications or recent interventions, and decides to gather additional information through direct patient assessment or by consulting with other health-care team members. The nurse analyzes the situation to form an initial hypothesis about the cause of the changes in the patient's condition.
- Clinical judgment: In a fast-paced emergency department setting, a nurse is caring for a patient with chest pain. Clinical judgment comes into play as the nurse integrates subjective and objective data, recognizing the urgency of the situation. The nurse forms a comprehensive understanding of the patient's condition, considering potential diagnoses and anticipating the need for prompt interventions such as an electrocardiogram or administration of medication. Clinical judgment guides the nurse in prioritizing actions to ensure the patient receives timely and appropriate care.
- Clinical decision-making: A nurse, after critically analyzing a patient's laboratory results and using clinical judgment to understand the implications, engages in clinical decision-making. In this scenario, the nurse decides to collaborate with the health-care team to adjust the patient's medication dosage and initiate additional monitoring. Clinical decision-making involves selecting the most appropriate interventions based on the analysis of data and the application of clinical judgment to improve patient outcomes. The nurse actively participates in creating and adjusting the patient's care plan to address the evolving clinical situation.

Clinical Judgment Measurement Model

The National Council of State Boards of Nursing developed the Clinical Judgement Measurement Model as an evidence-based framework to identify and enhance the cognitive skills essential for nurses to make effective clinical judgments. The model comprises six key cognitive skills:

1. Recognize cues: Identify relevant information or cues from the patient's condition and the health-care environment.
2. Analyze cues: Critically examine and interpret the collected cues to form a comprehensive understanding of the situation.
3. Prioritize hypotheses: Evaluate potential hypotheses or explanations for the patient's condition and prioritize them based on their significance and relevance.

4. Generate solutions: Develop a range of possible interventions or solutions in response to the prioritized hypotheses.
5. Take action: Implement the chosen interventions or actions on the basis of the generated solutions, considering the patient's unique needs and the clinical context.
6. Evaluate outcomes: Assess the effectiveness of the interventions by evaluating the outcomes and comparing them to the expected results. This step involves reflecting on the success of the chosen actions and making adjustments if necessary.

The Clinical Judgement Measurement Model outlines a systematic approach to clinical judgment, emphasizing the cognitive skills required for nurses to make informed and appropriate decisions in the complex health-care environment. The model guides nurses through the process of recognizing and analyzing cues, prioritizing hypotheses, generating solutions, taking action, and evaluating outcomes. This structured framework supports nurses in developing and applying their clinical judgment skills, contributing to improved patient care and outcomes. This topic is discussed further in a later chapter.

1.3 Health Policy and Ethical Considerations

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Describe health policy and the role of the nurse as they relate to patient-centered care
- Identify social determinants of health
- Explain core principles of ethics and their application to health care

Health policy regulates the delivery of health-care, with the focus on optimal patient outcomes. Everyone has the right to have access to the highest quality and safest care, regardless of their social status or other factors that might affect their health. This idea is the core of health-care reform, an important issue of our day. Ethical considerations are also key to ensuring that all patients are treated fairly and justly, with dignity and respect. Ethical health care promotes trust and confidence.

What Is Health Policy?

The laws and regulations that define the actions and decisions that promote a society's health goals make up its **health policy**. Regardless of one's profession or position in society, everyone has a stake in health policy. Nurses, however, have a unique perspective because they work directly with patients, observing firsthand the types of reform that would best serve the community.

Advocacy in Nursing

Nurses have a frontline role in direct patient care, giving them firsthand experience in all aspects of the health-care system. As direct care providers, nurses also understand what individual patients value the most—a key consideration in providing quality PCC. Nurses varied experiences enable them to provide a voice of expertise as advocates for health-care reform, particularly with respect to the delivery of care and patient safety. With the support of the ANA, nurses work diligently to make their voices heard at all levels where health policy decisions are made.

The Affordable Care Act

The Affordable Care Act (ACA) led to a significant regulatory overhaul and expansion of health-care coverage in the United States. It was signed into law in March 2010 to promote health equity throughout the country. The goals of the ACA include providing health coverage without limits and protecting people with preexisting conditions. The ACA has led to historic health-care advancements, enabling millions of Americans to have access to essential health benefits such as preventive care, wellness visits, rehabilitative care, mental health care, and prescription medications.

Social Determinants of Health

Factors that appear to fall outside of the healthcare system but play an active role in the health outcomes of a population are called **social determinants of health (SDOH)**. They include environmental factors (e.g., where one was born, where one grew up), as well as a broader set of factors that shape daily life, such as access to health care and education, economic stability, community development, social and society norms, education, and political

systems. A person's race and ethnicity can also play roles in their health; for example, certain groups are genetically predisposed to certain diseases. Examples of SDOH include

- access to healthy food and physical activity
- education, language, and literacy skills
- job opportunities and income
- race and ethnicity
- safe housing and transportation

SDOH can result in health disparities and inequities, which is why it is important for public health organizations to partner with education, transportation, and housing sectors to improve underserved residential communities.

Ethics

The study of right and wrong actions is called **ethics**. Each profession has its own code of ethics, providing an agreed-upon framework for making and evaluating decisions. In this respect, ethics is different from morality. Although the terms are often used interchangeably, ethics generally refers to standards of right and wrong that are agreed on by a particular community (e.g., a professional nursing organization); morality refers more to a personal standard that an individual uses to determine what is right and wrong.

Nurses make life-and-death decisions daily, making ethics an especially important foundation for the nursing profession. Ethical decision-making respects the patient's rights and individuality and ensures equitable treatment and care that aligns with each patient's beliefs and values (Sinaiko et al. 2019; Ethics in health care 2023). The ANA and other professional nursing organizations work diligently to develop ethics and human rights policies at the state, national, and international levels. The ANA Center for Ethics and Human Rights was established to help nurses navigate the ethical complexities of life-and-death decisions commonly found in everyday practice. Regardless of the present-day challenges in health care, the ANA's Code of Ethics for Nurses unites nurses in advocating for safe, quality care for all patients and communities, regardless of socioeconomic status.

LINK TO LEARNING

Read the entire ANA Code of Ethics (https://openstax.org/r/77anaethics) on their website.

Ethics in Nursing

The nursing code of ethics provides a solid foundation for nurses as they navigate the complex health-care system. It reminds nurses to keep several ideals foremost in mind as they make decisions and practice their skills. The following are four main principles in the field of nursing ethics:

- Patient **autonomy** acknowledges that patients have the right to maintain control and make their own decisions related to treatment and care.
- Provider **beneficence** refers to the health-care provider's responsibility to act in their patient's best interests. The ANA defines beneficence as "actions guided by compassion."
- The principle of **justice** means treating all patients fairly.
- Provider **nonmaleficence** refers to the health-care provider's responsibility to do no harm (Gaines, 2023).

CULTURAL CONTEXT

Patient Dilemma: Cultural Context in Health Care Decision-Making

Scenario

Imagine a patient—let's call him Mr. Nguyen—who finds himself grappling with difficult health-care decisions without a clear understanding of his treatment options. Mr. Nguyen, an older adult who has emigrated from Vietnam, lacks fluency in the local language and faces barriers in accessing culturally appropriate health-care information. Furthermore, he has no family members available to assist him in making critical decisions, such as choosing

between treatment options or considering a do-not-resuscitate order.

Cultural Barriers to Understanding

Mr. Nguyen's cultural background and language barriers present significant challenges in navigating the health-care system. Without access to information in his native language or cultural context, he struggles to comprehend complex medical terminology and treatment plans, which hinders his ability to actively participate in decision-making processes regarding his care.

Nursing Role in Cultural Competence

In such cases, nurses play a pivotal role in bridging cultural gaps and advocating for culturally sensitive care. By recognizing Mr. Nguyen's unique cultural needs and communication preferences, nurses can collaborate with interpreters or cultural liaisons to ensure he receives information in a manner that aligns with his cultural beliefs and values. Through patient education and empowerment, nurses empower individuals like Mr. Nguyen to make informed decisions about their health care, ultimately promoting health equity and enhancing patient outcomes.

Ethical Dilemmas

Nurses will inevitably face ethical dilemmas due to the nature of their work with people. Regardless of the specific circumstances of a given dilemma, here are some common causes of ethical dilemmas in nursing:

- assignments that are contradictory to personal, cultural, or religious beliefs or to the Code of Ethics for Nurses
- burnout associated with unsafe practices
- complicated family dynamics of patients
- dishonesty of peers
- hostile work environments, such as bullying in the workplace
- life and death decisions that must be made
- patients who refuse treatment
- short staffing or staff who fail to meet their responsibilities

Avoiding ethical dilemmas is impossible, but equipping yourself with knowledge and resources to face these dilemmas is essential. The most important thing is to deal with each situation in a professional manner that promotes quality care and patient safety.

The best way to recognize an ethical dilemma is to take notice of how a situation causes you to think and feel. You may feel pulled in two directions as you consider two courses of action. Neither course of action may be clearly incorrect; instead, each may emphasize different principles and values. You may feel you have to choose between right and wrong or that either choice could have negative consequences. Your facility should have some resources to help you make your decision, so be sure to consult them.

Examples of Ethical Dilemmas in Nursing and Health Care

Ethical dilemmas come in all shapes and sizes. Table 1.2 describes a few examples.

Dilemma	Possible Solution
Holly, a nurse on the medical-surgical floor, has been assigned to work on the postpartum floor due to short staffing. Although Holly has been a nurse for 5 years, she has limited experience working with postpartum patients. It is not uncommon for nurses to be reassigned to other areas, but the dilemma occurs when Holly finds herself being asked to provide care she does not regularly perform: helping a mother who is having trouble with breastfeeding.	Holly should notify a supervising nurse that she has limited experience with this type of care and ask for guidance. The supervising nurse should either accompany Holly to the patient's room to provide instructions for the patient and Holly, or assign an experienced nurse to help Holly. If the supervising nurse refuses to help, it might be necessary for Holly to contact the next highest person in the chain of command or to locate resources on how to teach a new mother about breastfeeding.
Bill is a new nurse. He has worked on the medical-surgical floor for a few weeks, but his training on the floor was cut short due to short staffing and he is working unsupervised for the first time. One of Bill's patients recently had a total hip replacement; there are orders for the patient to be turned every 2 hours. Bill doesn't feel comfortable turning his patient alone, knowing that he could cause harm to the new hip if the patient isn't turned properly.	Bill should contact his nursing supervisor to express his concerns. The supervising nurse should either assist Bill with turning the patient or assign an experienced nurse to help him; whoever assists should also take the opportunity to review the proper technique. If the supervising nurse refuses to help Bill, he should contact the next highest person in the chain of command or ask another nurse on the floor for help.
Steve and Sandy are nurses caring for cardiac patients. Today was an unusually busy day, which resulted in Steve forgetting to report to the physician that one of his patients experienced an abnormal spike in blood pressure. The patient's blood pressure returned to normal with no incident, so Steve chose not to document the occurrence. Later in the day, Steve told Sandy what had happened. Sandy now finds herself in a dilemma: she knows that nurses are responsible for providing safe, competent care for all patients and she ought to report Steve's error and bad decision; however, she worries this will damage what, to this point, has been a positive working relationship with Steve.	Sandy could begin by encouraging Steve to retroactively document the blood pressure spike and report it to the physician. If Steve still does not do this, Sandy should report the incident to the supervising nurse. It's true this might damage her working relationship with Steve, but the safety and well-being of patients are more important.

TABLE 1.2 Ethical Dilemmas

1.4 Evidence-Based Practice

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Define evidence-based practice
- Discuss the components of nursing research and its applicability to patient care
- Differentiate between evidence-based practice in nursing and nursing research
- Discuss the applicability and impact of quality improvement initiatives on patient care

The process of **evidence-based practice** involves making clinical decisions based on the best available evidence from the most up-to-date research. By keeping up with the latest research, nurses can implement EBP into their patient care. Nurses using EBP promote better outcomes with reduced costs and increased patient satisfaction. Implementing EBP requires lifelong learning and a desire for QI in your nursing practice. It also requires disseminating evidence-backed results so other nurses can implement the same processes into their own practice—with the ultimate goal of improving policies throughout the health-care system. The ultimate return on this

investment will be nursing excellence.

EBP in Nursing

EBP enables nurses to implement best practices into patient care. Not only does EBP maintain the relevance of health-care practices, it also ensures practices remain current. Nurses involved in the delivery of care are instrumental in analyzing the **data**, or evidence, from current research and refining the processes related to QIs (which you will learn about later in this module). This firsthand knowledge is vital to continuous improvement of quality patient care.

EBP in nursing requires the critical thinking and judgment skills that come with experience and training. The nurse's decision-making process should include using research-based evidence in combination with their clinical expertise while also incorporating the patient's values and expectations into the process. This can be accomplished through the following actions:

1. asking clear questions to determine the patient's desired goals
2. learning to locate evidence from credible sources and read research reports critically
3. analyzing the validity of the evidence and research
4. applying the evidence to clinical practice, combining your nursing expertise with the new information
5. assessing the outcome to determine its efficacy and how it might benefit other patients

Using EBP in your nursing practice begins with identifying the specific issue or problem to solve. Nurses can then locate solutions that are appropriate for the population they are working with and share them with their patients and families to ensure they are part of the decision-making process. Doing all this enhances nursing autonomy, fine tunes critical thinking and confidence, and sharpens the nursing practice with new interventions and protocols.

Nurses who incorporate EBP into their practice also become more familiar with new technologies and treatments while promoting the growth of science in nursing and closing the gap between theory and practice. All these benefits help to ensure positive patient outcomes (Faubion, n.d.).

History of EBP in Nursing

Some believe the origins of EBP trace back to the 1800s, when Florence Nightingale gathered data and formulated conclusions related to unsanitary conditions and failing health while working as a nurse in military hospitals during the Crimean War (1854–1856). Nightingale brought to nursing a systemic, knowledge-based approach that relied on the best possible research and access to government statistics and expertise. Nightingale recognized that health data that governments routinely collected were not being used to inform decisions about health policy. Unfortunately, when Nightingale initially presented her ideas and philosophies, they were largely ignored, though her insights about using the best available evidence provided a useful framework for her own nursing practice.

The formal term *evidence-based practice* gained prominence in the latter part of the 20th century; however, along with Florence Nightingale, several major developments in the field of professional nursing paved the way for the integration of evidence into nursing care. Nursing research began gaining recognition as a formal field of study in the early to mid-20th century. The establishment of nursing research as a distinct field continued to evolve over several decades.

The late 19th to early 20th centuries saw a significant shift toward professionalism in nursing. For example, the National League for Nursing was established in 1893 and advocated for scientific principles in nursing education and practice. The nursing process began to emerge as a formal framework for EBP in the 1950s and 1960s. The introduction of the clinical nurse specialist role also occurred in the 1950s, reflecting a shift toward specialization and expertise within nursing. The mid-20th century saw the establishment and growth of nursing research journals, providing a platform for disseminating evidence. Then, during the 1970s and 1980s, there was an increased emphasis on developing evidence-based guidelines to standardize care. Systematic reviews and meta-analyses gained prevalence during this period.

The 1980s were also notable for the implementation of quality assurance (QA) programs. Hospitals began to implement QA programs to establish accountability to the community for appropriate, quality care and the associated costs. Eventually, The Joint Commission, formerly known as The Joint Commission on Accreditation of Healthcare Organizations, required QA programs for reimbursement of services and accreditation. The Joint

Commission then developed a model that included objective, measurable indicators to monitor, evaluate, and communicate patient care.

By the 1990s, health-care providers had recognized the difficulty of using criteria from regulatory agencies to measure quality of care. These criteria measured minimal expectations but did not identify problematic causes or processes for improvement. The resulting movement, named Continuous Quality Improvement, seemed a more effective mechanism to improve the quality of health care. Whereas QA focuses on incidents and errors, Continuous Quality Improvement focuses on the interrelated processes that affect patient outcomes and satisfaction. Consequently, The Joint Commission revised its standards to affirm patients' right to age-specific care that respects their dignity and their cultural, spiritual, and psychosocial values.

Nurses can be involved in QI in a variety of ways, including incorporating EBP into patient care guidelines. Because bedside nurses are involved in direct patient care, they are instrumental in analyzing the latest data and refining processes accordingly. Practicing EBP in this manner is a way to minimize the theory–practice gap. The **theory–practice gap** in nursing refers to the divide between theoretical knowledge acquired in academic settings and the practical application of that knowledge in real-world clinical settings. This gap can create challenges for nursing professionals as they attempt to translate theoretical understanding into effective patient care. Theoretical knowledge is essential for informed decision-making and EBP, but the ability to seamlessly apply that knowledge at the bedside is crucial for delivering quality patient care.

Nursing Research

Inquiry that is systematically designed to provide knowledge for important issues relevant to the nursing profession is considered **nursing research**. It is designed to generate evidence to help nurses make evidence-based decisions that improve the care and quality of life for their patients. Nursing research not only provides the data that inform EBP, it can also help in a variety of problem-solving situations. For example, by eliminating actions that do not achieve desired outcomes, nurses can help to contain the costs of care.

Approaches to Nursing Research

Many research opportunities and roles exist for nurses. As clinicians, nurses should remain informed about current issues and trends in their specialized area of clinical practice. Some nurses go further, using the best available clinical evidence to initiate QI projects in their practice. Other nurses become members of interprofessional teams to confront complex health problems, or they work as independent nurse-scientists and formulate a line of scientific inquiry. Researchers may conduct clinical studies to generate knowledge related to the guidance of clinical practice. They may work as a team, combining clinical, theoretical, and methodological skills to conduct collaborative studies. Regardless of one's role, common goals of nursing research are to better understand factors that affect health and illness; to discover innovative methods to detect, diagnose, treat, and prevent disease; and to justify changes to ineffective practices.

Research does not have to be complex or long term. Consider a floor nurse who asks patients to complete a simple, anonymous survey about their satisfaction with their hospital experience. Patients' responses can identify problems and point hospital staff toward potential solutions. Through these and other methods, each nurse can be a part of expanding the scope of nursing knowledge through the research they conduct, read, and disseminate.

Qualitative Research

A method called **qualitative research** focuses on personal experiences obtained through observation and interaction with patients. Table 1.3 describes common designs for qualitative research.

Design	Goal	Process
Phenomenology	To describe a phenomenon as an individual experiences it	Researchers interview people familiar with the specific phenomenon being studied, then draw conclusions based on the data.
Grounded theory	To understand how people are influenced by their interactions with other people and groups (Noble & Mitchell, 2016)	After interviewing each patient and their family members, researchers use the data to develop a theory about what they observed (Noble & Mitchell 2016).
Ethnography	To understand the influences of culture on individuals	Researchers interview members of the culture being studied, then synthesize the data into a description of that culture's unique characteristics and influences.
Narrative inquiry	To understand how an individual interprets specific events in their history	Researchers consider the content and structure of the narratives that each individual shares, then analyze each narrative for themes.

TABLE 1.3 **Qualitative Research Designs**

Quantitative Research

A method called **quantitative research** uses deduction and generalization from empirical evidence to draw conclusions. Objective data gathered by the senses from observations or experiments is known as **empirical evidence**. It is generally depicted by numbers in charts and tables for statistical purposes. Examples include identifying percentages, averages, and the mean of data. Researchers then determine whether the evidence supports or refutes the theory in question and to what extent conclusions can be generalized to a larger population.

Quantitative research can be experimental or nonexperimental. Experimental studies have an active intervention that affects the study participants, whose response to the intervention is measured. Experimental designs require a control to establish a correlational relationship between variables or make justified predictions. The experiments are usually double blinded, meaning information that may influence the participant or the experimenter is withheld until after the experiment is complete. This prevents biases either from the participant's expectations or the observer's assumption, which may influence the results. For example, researchers studying a new medication would not know which of the participants receives the medication and which receives a placebo; the participants would also be unaware.

Experimental designs include true experimental design and quasi-experimental design. In a true experimental design, the experiment is conducted in a controlled environment to study relationships, usually among two groups who receive different treatments through a randomly assigned process. Pharmacology research is a classic example that demonstrates whether a medication has a desired effect on the participant. A quasi-experimental design is similar to a true experimental design except it does not include random assignments.

A nonexperimental study offers no new intervention; instead, researchers closely observe study participants to analyze their behavior, or they analyze existing data to find patterns. Nonexperimental designs include descriptive studies and correlation studies.

Descriptive studies involve observing people or phenomena to provide a detailed depiction. In these studies, the observer describes the observed phenomenon, notes the frequency of its occurrence, and categorizes the gathered information. Essentially, descriptive studies aim to offer a comprehensive account of the characteristics and occurrences related to the individuals or events under observation. For example, one might observe and document the care practices in a hospital's critical care unit. The observer would detail the various nursing interventions performed (e.g., medication administration, wound care), note the frequency of each intervention, and categorize the information. In this descriptive study, the aim is to provide a comprehensive snapshot of the care activities in the critical care unit, shedding light on the common practices and their occurrence patterns.

Correlational studies focus on exploring the relationship between two variables. In these studies, researchers measure the identified variables, analyze the obtained data, and present their findings in statistical form. For example, a correlational study might investigate the relationship between the frequency of patient education sessions (variable A) and the level of patient adherence to a prescribed treatment plan (variable B). By measuring both variables and using statistical analyses, researchers can explore whether there is a correlation between the amount of education provided and the extent to which patients adhere to their recommended treatments. The results may help health-care professionals understand the potential impact of education on patient adherence.

Overview of the Nursing Research Process

The nursing research process is a systematic and organized approach nurse researchers follow to investigate and explore various aspects of nursing practice, patient care, and health-care outcomes. It involves a series of steps that guide the research process, from identifying a research problem to disseminating the findings. Here is a general description of the nursing research process:

1. Identify the research problem: The first step is to identify a research problem or question that requires investigation. This can be derived from gaps in knowledge, clinical observations, or the need to improve patient outcomes.
2. Review existing literature: Once the research problem is identified, a comprehensive review of existing literature is conducted. This helps the nurse researcher to understand what is already known about the topic and identify the research gaps that need to be addressed.
3. Formulate research objectives or questions: Based on the identified research problem, clear and specific research objectives or research questions are developed. These objectives or questions guide the direction of the study.
4. Design the study: The next step is to design the research study. This involves making decisions about the research design, sample size, data collection methods, and ethical considerations. The research design can be experimental, observational, qualitative, or quantitative, depending on the nature of the research question.
5. Obtain ethical approval: Before conducting the study, ethical approval must be obtained from the appropriate research ethics committee or institutional review board. This ensures that the study is conducted ethically and protects the rights and welfare of participants.
6. Collect data: Once the study design and ethical approval are in place, data collection can happen. Depending on the design, researchers may collect data through interviews, surveys, observations, medical records review, or other appropriate methods.
7. Analyze data: The collected data are then analyzed using appropriate statistical or qualitative analysis techniques. This helps researchers draw conclusions and answer the research objectives or questions in the next step.
8. Interpret and draw conclusions: The analyzed data are interpreted, and conclusions are drawn on the basis of the findings. The nurse researcher examines the results in the context of the existing literature and evaluates their implications for nursing practice, patient care, or policy.
9. Communicate findings: The next step is to disseminate the research findings to the wider nursing and health-care communities. This can be done through academic publications, conferences, presentations, or other appropriate means. Sharing the findings contributes to the advancement of nursing knowledge and informs EBP.
10. Evaluate and apply findings: Finally, the impact of the research findings is evaluated and considered for potential application in nursing practice. This may involve integrating the findings into clinical guidelines, protocols, or policies to improve patient outcomes and enhance nursing practice.

Throughout the nursing research process, it is important for nurse researchers to adhere to ethical principles, maintain the privacy and confidentiality of participants, and ensure the validity and reliability of the study findings. Collaboration with other health-care professionals and stakeholders is also important to enhance the relevance and impact of the research.

Phases of the Research Process

Nursing research is conducted in five phases (Brunt & Morris, 2023):

1. Conceptual phase
2. Design and planning phase

3. Empirical phase
4. Analytic phase
5. Dissemination phase

Phase 1: Conceptual

The conceptual phase in nursing research involves the identification and development of research ideas, hypotheses, and theoretical frameworks. It sets the foundation for the entire research process. At the start of a research project, researchers typically formulate a research question or hypothesis. They use skills such as creativity, deductive reasoning, insight, as well as a solid grounding in previous research on the topic of interest. Table 1.4 lists important issues that nursing researchers consider when developing a research question:

Considerations	Examples
Substantive issues	Is the research question significant?
Clinical issues	Could the findings be useful in clinical practice?
Methodological issues	How can the study be designed to yield high-quality evidence?
Practical issues	Are adequate resources available to do the study?
Ethical issues	Can this question be addressed without committing ethical transgressions?

TABLE 1.4 Important Considerations for Nursing Research

To organize the goals of a research project, nursing researchers often use **PICOT**, an acronym that reminds researchers of five key elements of an effective question. Table 1.5 lists these five elements and gives examples relevant to nursing research. The PICOT question is versatile, allowing assessment across different clinical domains like intervention, diagnosis, etiology, prevention, prognosis or prediction, quality of life, or therapy. When in the research phase, it's crucial to craft the PICOT question effectively, aiming for an evidence-based recommendation that enhances patient care and outcomes as the result.

PICOT Format	Examples
P = Population or Problem	Who are the patients to be studied? What characteristics are we focusing on (e.g., age, race, gender, disease, health status)? What problem is being addressed (e.g., mortality, morbidity, compliance, satisfaction)?
I = Intervention	What specific intervention (e.g., therapy, medication, educational approach) will be implemented?
C = Comparison	What alternative(s) will we compare the intervention to (e.g., placebo, no intervention, different medication)?
O = Outcome	What will be measured and how? What is the identified goal (e.g., fewer symptoms, increased satisfaction, reduced mortality)?
T = Time Frame	How long will the intervention be implemented and data collected?

TABLE 1.5 PICOT (Brunt & Morris 2023)

Phase 2: Design and Planning

During this phase of a study, researchers brainstorm and determine which method they will use for their study. From a broad perspective, research methods are the techniques researchers use to gather and analyze information

relevant to a research question or topic. The goal of this process is to limit errors that could contaminate conclusions or invalidate findings. An example of an error that could contaminate or invalidate nursing research is selection bias. This occurs when there is a systematic difference between the characteristics of the group that is selected for the study and the larger population from which it is drawn.

For example, imagine a study in which researchers want to investigate the effectiveness of a new nursing intervention for managing pain in postoperative patients. If the researchers only include patients who voluntarily agree to participate in the study, there might be a bias toward individuals who are more willing or motivated to try new interventions. This selection bias could lead to overestimating the effectiveness of the intervention because the sample may not be representative of the entire population of postoperative patients. Addressing and minimizing such biases are crucial in the methodological planning phase of nursing research to ensure that the study's findings accurately reflect the broader population and can be applied more reliably to real-world clinical settings.

Phase 3: Empirical

During the next phase, researchers collect data. Collectively, the pieces of gathered information are referred to as a data set. Quantitative data include numbers and other objectively measurable information; qualitative data consist of subjective descriptions of observations or experiences. The empirical phase is often the most time-consuming part of the investigation; it is conducted in accordance with the data collection plan (where, when, and how the data will be collected) that was determined during the planning phase.

Phase 4: Analytic

The analytic phase must be done in a processed, orderly manner to enable researchers to discern and validate relevant patterns and relationships in the data. After researchers have analyzed the data, they determine how the study's findings can best be used in clinical practice. This is when the researchers come full circle to answer the research question from phase 1. However, research is not complete until the results are disseminated in the final phase.

Phase 5: Dissemination

In the final phase of a study, the researchers communicate their findings so others can use the information in their clinical practice. This phase also allows other researchers to try to replicate the study to see if they obtain similar results. Researchers typically communicate by publishing a research report so others can easily access it. The most common types of research reports are theses and dissertations, books, presentations, and journal articles.

Many studies do not have a direct impact on clinical practice; ideally, however, the concluding step of research is to plan for its application to the clinical setting. Even when researchers are unable to implement such a plan, they can still contribute to the process by developing recommendations on how practicing nurses might someday implement the findings. Of course, many studies produce inconclusive results or even data that contradict the hypothesis. These findings are useful, too! They can help guide future researchers to identify flaws in the study or to develop better hypotheses that are supported by data.

Roles and Responsibilities in Nursing Research

Nursing researchers strive to promote participant safety and well-being during a study. They develop plans to ensure the study runs smoothly while keeping the participants fully informed. Researchers also rely on clinical nurses to put their findings into action. The efforts, successes, and failures of practicing nurses often lay the groundwork for future research. Working in tandem, researchers and clinicians continue to close the gap between theory and knowledge-based practice.

Ethics and the Research Process

Researchers often face ethical dilemmas when designing studies. Institutional review boards exist to ensure that studies are designed ethically, with the welfare of participants foremost in mind. The three major ethical principles incorporated into most research guidelines are beneficence, justice, and respect for human dignity. Recall that beneficence is the principle of doing good while also protecting the participants from physical and psychological harm and exploitation (nonmaleficence). Justice includes the right to fair and equitable treatment and to privacy. Privacy may be maintained through **anonymity**, wherein the researchers do not know each participant's identity, or through formal confidentiality procedures that safeguard the information provided by the participants.

Respect for human dignity ensures the participants' right to autonomy, also known as self-determination, which

means they have the freedom to control their own activities, including their choice to participate in the study. To ensure this, at the beginning of the study, the researchers provide each participant with a **full disclosure** that completely describes the study, including the risks and possible benefits. Each participant also signs an **informed consent** indicating they have a thorough understanding of the study and agree to voluntary and informed participation.

Once all data have been collected, researchers sometimes offer debriefing sessions for the participants. This process provides the participants an opportunity to learn about the study, ask questions, and voice any complaints.

Application of Nursing Research and EBP in Practice

EBP and nursing research have similarities, but they are not the same. The main difference between the two is their purpose. The purpose of research in nursing is to evaluate current knowledge and theories to formulate better nursing practices for improved patient outcomes. The purpose of EBP in nursing is to use the evidence from research to make informed decisions regarding patient care and outcomes. EBP is vital to providing the highest quality of patient care and safety. As defined by Melnyk and Fineout-Overholt (2023), EBP typically includes seven steps:

1. encouraging a spirit of inquiry or curiosity
2. asking questions
3. searching for evidence
4. appraising the evidence
5. integrating the evidence into practice
6. evaluating outcomes of the practice change
7. sharing the results

Examples of Nursing Research

Nurses are firsthand observers while providing patient care, enabling them to directly assess and document processes and ideas that could be improved through further investigation. The topics nurses may choose to research are endless; they are the drivers of evidence-based knowledge to promote improved patient outcomes. Here are just a few examples of the countless possible topics for nursing research:

- adapting nursing in a digital era
- causes and prevalence of stress in nurses
- ethics related to artificial hydration and nutrition
- personalized diets for older adults to promote healthy aging
- strategies for raising awareness of cancer-causing air pollution
- the opioid crisis and its social impacts

Regardless of the topic, the process begins with developing a question (often using the PICOT format), choosing the design for your research, and setting clear goals (Riva et al., 2012).

Examples of EBP in Nursing

EBP is intended to promote positive outcomes through shared decision-making, but another essential goal is to prevent complications. These achievements, in turn, help reduce health-care costs, improve patient satisfaction (which further improves reimbursement rates), and reduce the demand for health-care resources, enabling organizations to reallocate resources to other areas where they will be more effective. Table 1.6 lists some examples of EBP in nursing.

Example	Outcome
Elevating the head of a patient's bed between 30° and 45°	Supports the airway and reduces the risk of aspiration
Turning and repositioning a patient every 2 hours	Helps to maintain clean, dry skin and prevent skin breakdown

TABLE 1.6 Examples of EBP in Nursing

Example	Outcome
Wearing personal protective equipment as necessary, using proper hand hygiene, and maintaining a clean environment	Prevents hospital-acquired infections and reduces the spread of other infections
Administering oxygen when treating chronic obstructive pulmonary disease	Improves the survival rate by reducing the risk of hypoxia (a deficiency of oxygen reaching the body tissues) and organ failure

TABLE 1.6 Examples of EBP in Nursing

Quality Improvement

The framework used to improve patient care and outcomes in a systematic manner is called **quality improvement**. This is accomplished with standardized processes and structures to reduce variation and achieve predictable results to improve patient outcomes. Processes might include standard protocols for operating procedures, education, and training. Structures might include up-to-date technology and a culture of quality that ensures everyone is working together to deliver quality health care for patients. A QI mindset encourages providers to become leaders in researching and delivering positive changes and improvements in every component of the health-care system.

The QI process involves a collaborative effort from various stakeholders within a health-care setting, including health-care professionals such as physicians, nurses, administrators, and support staff. Nurses play a crucial role in the QI process, contributing their frontline experience and expertise in patient care. They actively participate in identifying areas for improvement, implementing changes, and monitoring outcomes. Nurses are instrumental in ensuring that quality standards are met, patient safety is prioritized, and EBPs are integrated into daily care.

Models for QI

When undertaking a QI project, it is important to use a model that will guide the project and provide feedback related to progress. Two common QI models used in nursing originated in the manufacturing industry: the Six Sigma model and the Lean Model. The Six Sigma model was created by Motorola. Its main goals are to decrease variation and defects in products (Earlam, 2016). The Lean model was created by Toyota. Its main goals are to eliminate waste and improve efficiency so tall work adds value (John's Hopkins Nursing Center for Nursing Inquiry, 2022).

A third QI model was developed specifically for health care by Associates for Process Improvement in partnership with the Institute for Healthcare Improvement (IHI). The resulting Model for Improvement was created by expanding the plan-do-study-act (PDSA) cycle. The PDSA cycle is a continuous process that works to improve quality by following the steps of the scientific process: making a hypothesis (plan), testing the hypothesis (do), examining the results (study), and reporting the results (act).

Phase 1

The Model for Improvement is divided into two phases. Phase 1 begins by asking three pertinent questions:

1. What are you trying to accomplish?
2. How will you know that a change is an improvement?
3. What changes can you make that will result in improvement?

These questions help structure the phase, which consists of setting aims, establishing measures, and selecting an intervention (changes).When setting aims, or goals, it helps to use the SMART format:

- *Specific:* Make goals straightforward, stating specifically what you want to happen.
- *Measurable:* Choose goals with outcomes that can be measured to assess your progress.
- *Achievable:* Ensure goals are attainable and not overambitious.
- *Relevant:* Choose goals that align with those of your organization.
- *Time-bound:* Set a reasonable time frame in which to attain each goal.

Establishing measures helps the team determine if a change results in a tangible improvement. There are four common types of QI metrics:

- Balancing metrics involve assessing unintended consequences or potential negative impacts of QI initiatives. Although the primary focus is on improving specific aspects of care, it's essential to monitor for any adverse effects on other areas. Balancing metrics help prevent unintended harm and ensure a balanced approach to QI efforts.
- Outcome metrics are used to assess the results or impacts of health-care processes or interventions. Examples include patient outcomes such as mortality rates, readmission rates, complication rates, and patient satisfaction scores. Outcome metrics provide insights into the overall effectiveness of health-care practices.
- Process metrics focus on the steps or activities involved in delivering health care. They measure the efficiency, reliability, and adherence to established protocols. Examples include the time it takes to complete a specific procedure, compliance with evidence-based guidelines, and adherence to safety protocols.
- Structure metrics assess the organizational and environmental factors that can influence the delivery of healthcare. These may include the availability of resources, staffing levels, infrastructure, and the implementation of best practices. Monitoring structure metrics helps ensure the necessary components are in place to support high-quality care.

For example, suppose a hospital wants to decrease its rates of hand-borne infections. The QI team might use the *structure* measure of the availability of hand-sanitizer pumps, the *process* measure of handwashing compliance rates, the *outcome* measure of hospital-acquired infection rates, and the *imbalance* measure of skin breakdown among the staff.

The final step in phase 1 is selecting an intervention or solution. This is accomplished by determining the cause of a particular problem. QI teams do this by conducting a root cause analysis. By determining the root cause of a problem, you can more easily determine the appropriate interventions.

Phase 2

The second phase of the Model for Improvement is to test the intervention using the PDSA cycle:

- Plan: Identify stakeholders—anyone who is key to the project's success or otherwise invested in it—and begin building the implementation team. This should include management and clinical staff as well as patients and their families. It's also important to know which stakeholders, if any, may hinder the advancement of the project, to determine how frequently to engage with everyone. For example, a nondisclosure or identification of a conflict of interest can halt a study.
- Do: Take the necessary time to set the plan in motion, implementing the intervention while collecting and documenting data relevant to the project's success.
- Study: Analyze the data and compare the actual results to the initial hypothesis.
- Act: Take the necessary time to act on what was learned. Did it work? Do you need to adapt changes to begin a second PDSA cycle because the first approach didn't quite attain your goal? Or do you need to abandon the intervention because you observed no improvement or a worse outcome?

Attributes of QI

The goal of QI is to adopt a reputable model to guide a project while collecting and analyzing data and testing the effects of interventions. Implementing QI is vital to any organization that seeks to provide quality care and improve efficiency, safety, and patient outcomes. Here are some recent examples of QI by health-care organizations (Health Catalyst Editors, 2022):

- Allina Health implemented an initiative for pharmacist-led medication therapy management that reduced the cost of care and improved patient outcomes.
- Mission Health in North Carolina began using a data-driven approach to promote early sepsis identification and standardize the treatment of sepsis.
- UnityPoint Health established a prioritization and implementation approach to improve outcomes that produced the following results: (1) the deployment of interventions in sepsis alerts, order sets, and other clinical support tools resulted in variable costs being reduced; (2) the reductions in level of service resulted in patients returning home sooner; and (3) there was an increase in sepsis screenings being completed and an increase in sepsis order sets being used in the emergency department.

1.5 Health-Care Delivery Systems

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the impact that various service providers and agencies have on health-care systems
- Differentiate between the types of preventive services available in health-care systems
- Identify factors affecting health-care delivery

The **health-care delivery system** consists of all the individuals and organizations collectively responsible for providing and overseeing health care in an area. These components include providers (e.g., physicians, nurses, technicians), facilities (e.g., hospitals, private practices), and insurers, all of which operate in a variety of configurations, from independent practices to groups and networks. They may be in the public sector or private sector; they may be for-profit or not-for-profit organizations; and they may emphasize primary, secondary, or tertiary prevention. The system also includes regulators from state and federal agencies.

Health-care delivery systems change as the needs and expectations of populations change. Systemic changes are influenced by factors such as shifting population demographics, an increase of chronic illnesses or disabilities, a heightened focus on social and economic conditions, and technological advances.

Types of Health-Care Services and Agencies

Health care is provided by many different providers and agencies working in a variety of settings, such as hospitals, skilled nursing facilities, clinics, assisted living facilities, and in-home care. Agencies that provide in-home care may offer a range of services, such as physical and occupational therapy, palliative care, hospice, and infusion therapy. A variety of community services may also be available, including public health departments, physical therapy centers, dialysis centers, senior centers, and adult day care centers.

Although access to health insurance is a determinant to access routine health care, government agencies and programs exist to help low-income populations access services as well. These include Medicare, Medicaid, the Department of Health and Human Services, the Department of Family and Children Services, the Department of Behavioral Health and Developmental Disabilities, and the Area Agency on Aging, to name a few. There are also Medicaid Waiver Programs to help with in-home care services or to assist with accommodation in personal care and group homes. The names of these agencies may vary from state to state. Patients often require the medical community to provide guidance, education, and support on an individual basis to access all the services available to them.

Inpatient Services

Hospitals provide inpatient services for patients who are acutely ill, experiencing complications from a disease, or undergoing or recovering from a surgical procedure. Additionally, some hospitals provide specialized care. For example, there are children's hospitals, hospitals with cardiac care units, cancer centers, burn units, and many other specialty centers. Even hospitals that provide the same inpatient services may be structured in a variety of ways. Some hospitals are-for profit entities, whereas others also have a nonprofit component. Additionally, states designate certain hospitals as providers of care for the area's low-income population (indigent care).

Subacute inpatient settings are for patients who still need skilled care but are no longer sick enough to remain in the hospital. This type of care is provided in skilled nursing facilities (sometimes called nursing homes), as well as in specialty hospitals for patients who require certain services, such as those receiving ventilatory support. Another type of subacute setting is independent rehabilitation centers, which may be housed within hospitals or nursing homes. There are also specialized rehabilitation centers for conditions such as brain injuries and in Veterans Administration hospitals, where military veterans may be recovering from spinal cord injuries or learning to live with blindness.

Outpatient Services

Many people who live at home still need outpatient, or ambulatory, care. This care, which provides employment opportunities for many health-care workers outside of hospitals, includes diagnostic, observation, treatment, and rehabilitation services. Examples of outpatient services include

- acute care clinics

- centers for chemotherapy and radiation treatment
- dialysis centers
- imaging centers for computed tomography scans, magnetic resonance imagining, ultrasounds, mammograms, and other types of scans
- laboratories for processing outpatient blood samples
- outpatient surgery centers
- settings for physical and occupational therapy
- wound care centers

Post-Acute Services

Patients who are well enough not to require inpatient care as they recover from an acute condition may benefit from a variety of post-acute services in the community. The goal of post-acute care is to increase a person's ability to care for themselves and to promote as much independence as possible. Outpatient post-acute services are offered by many providers and include the following:

- Assisted living facilities provide medical oversight for medically frail persons who can no longer live safely at home.
- Home health agencies provide skilled care as well as physical and occupation therapy for patients in their home.
- Hospice agencies support patients with a prognosis of 6 months or less to live.
- Infusion therapy agencies deliver intravenous medications or fluids to patients who need them.
- Memory care facilities assist individuals at risk of wandering, such as those with diagnoses such as Alzheimer disease and other types of dementia.
- Personal care and group homes provide medical oversight in a residential, family-type environment and tend to be less expensive than traditional assisted living facilities. For low-income individuals, Medicaid waivers can assist with this expense.
- Rehabilitation centers provide physical and occupational therapy to improve strength and mobility for people recovering from illness, injury, or stroke.

Adult Care Services

Every community includes people who require assistance to stay in their homes. Community-based services that can provide this help include in-home care and adult day care.

In-home care is different from home health care. In-home agencies provide a care assistant: some are certified nursing assistants and personal care aides, others are individually trained by the agency they work for. These aides help with bathing, dressing, grooming, and light household chores and errands. The care is supervised by a nurse in the agency, but no skilled care is involved. Aside from private pay, different types of funding are available that vary from state to state through Medicaid and associated waiver programs. Additional programs are available for individuals with developmental disabilities, veterans, and other special populations. The Area Agency on Aging is a good resource for seniors to find and gain access to community services.

Adult day care centers provide respite for caregivers, enabling them to continue working or otherwise live their life while their loved one is being cared for. Unlike traditional senior centers, where relatively healthy individuals can socialize, exercise, and take classes, adult day care centers are for individuals who have physical and cognitive conditions that require supervision and a higher level of need. Research has shown that these services have a positive impact not only on patients but also their caregivers (Kiger, 2017; Ellen et al., 2017).

Public Health

Public health agencies, through government funding, shoulder much of the responsibility of providing care to the underserved, the uninsured, and other at-risk populations. The goal of public health is the prevention of premature death and disability through measurable improvements in health status and quality of life. To ensure success, political figures may need to be better trained in public health so that legislation and policies go beyond the science to also consider how economic, ideological, and personal factors can affect the needs of people in the public health system.

The decision-making process within political systems at the national, state, and local levels is the vehicle through which public health initiatives and delivery systems are funded. Health is a key determinant of economic vitality, but

it is dependent on the effectiveness of health-care delivery systems. To sustain economic vitality and development, the workforce requires affordable health care as well as affordable housing, transportation, and other social and economic determinants. Thus, the outcomes related to public health are directly related to and reliant on the decisions of elected officials, many of whom do not necessarily see how their decisions affect the delivery of public health. Facilitating constructive dialog between public health advocates and legislators could lead to sustainable improvements to public health policies and programs.

Types of Preventive Services

Wherever an individual or organization is situated within the health-care delivery system, their ultimate goal is to promote quality care and improved outcomes by meeting each patient where they are. Depending on the progression of their particular disease or illness, a patient may seek any of three main types of preventive services: primary, secondary, or tertiary.

Primary Prevention

The goal of **primary prevention** is to prevent disease before it occurs. This can be accomplished by making lifestyle changes to correct unhealthy choices or unsafe behaviors, preventing exposure to environmental hazards, and taking measures to increase resistance to disease or injury. Strategies for primary prevention include

- becoming more knowledgeable about the signs and symptoms of and risk factors for relevant diseases or illnesses within one's family, such as diabetes, high blood pressure, stroke, and pulmonary and heart-related diseases
- choosing to be immunized against infectious diseases
- choosing to eat healthier foods
- making better, more informed choices regarding exercise, diet, and other behaviors
- supporting enforcement to mandate safe practices such as wearing seatbelts
- supporting legislation to control the use of hazardous environmental products

Vaccination programs to prevent infectious diseases, public health campaigns promoting healthy lifestyles and behaviors, and education on the importance of regular exercise and a balanced diet all fall under primary prevention. Community health centers, schools, workplaces, and public health departments are common physical locations for primary prevention efforts.

Secondary Prevention

The goal of **secondary prevention** is to promote early diagnosis and treatment to slow the progression of a disease or injury and reduce its long-term impacts. This process begins with early detection and incorporates strategies such as:

- modifying work for injured or ill workers to enable them to return to work safely
- regularly screening for cancers (e.g., mammograms to screen for breast cancer; oral screenings to detect mouth cancers)
- screening for high blood pressure
- taking low doses of aspirin daily to prevent a stroke

Secondary prevention often occurs in health-care facilities and clinical settings. Examples include hospitals, clinics, diagnostic centers, and physician offices, where screenings, health check-ups, and early detection activities are conducted.

Tertiary Prevention

The goal of **tertiary prevention** is to decrease the impact of an ongoing illness or injury (e.g., educating people about how to manage their long-term condition). Effective tertiary treatment can help patients regain mobility and bodily function and maintain a positive quality of life. Examples include

- chronic disease management programs (e.g., diabetes, depression) to slow the disease's progress and develop modifications to promote quality of life
- palliative care to reduce and relieve symptoms of chronic illness
- stroke rehabilitation programs
- vocational rehabilitation programs to retrain injured or ill workers for new jobs

Tertiary prevention is frequently implemented in rehabilitation and specialized care facilities. Hospitals with rehabilitation units, outpatient rehabilitation centers, and chronic disease management clinics are common physical locations for tertiary prevention efforts. Support groups and counseling services may also be located in community centers or health-care institutions.

Factors Affecting Health-Care Delivery

As previously discussed, SDOH are the economic and social factors that affect health outcomes. These nonmedical factors (e.g., where individuals are born, live, and age) have a direct impact on daily life and are directly influenced by larger forces such as economic policies, social norms, development agendas, and political systems.

How effectively a health-care system addresses SDOH plays a major role in whether that system promotes **health equity**, giving everyone the same fair opportunities to attain the highest level of health outcomes. In contrast, systems that fail to adequately address SDOH tend to be rife with **health inequities**, or disparities. In fact, research indicates that SDOH can have a greater impact on health outcomes than health care or lifestyle choices can.

Patient Demographics

Population demographics directly influence the need for health care and its delivery. In fact, the effectiveness of traditional health-care delivery in the United States has been greatly affected by changing demographics, necessitating innovative changes throughout the health-care delivery system (Vespa et al., 2020). Not only is the US population increasing but its composition is changing due to a variety of factors, including immigration and social trends. Other factors that affect patient demographics are birth and death rates, socioeconomic status, cultural diversity, the relative sizes of different age groups, the number of people living in urban versus rural communities, and the number of homeless people versus the number of families in an area. Table 1.7 summarizes some of the main ways that US demographics are changing.

Category	Major Changes
Age	By 2034, older adults are projected to outnumber children for the first time in US history. One in every five Americans is projected to be of retirement age.
Diversity	By 2028, the foreign-born share of the US population is projected to be higher than any time since 1850. By 2045, non-Hispanic White people are no longer projected to make up the majority of the US population. By 2060, one in three Americans (32 percent of the population) is projected to be a race other than White, and the number of people who identify as two or more races is projected to grow some 200 percent.
Growth	During the 2020s, the US population is projected to grow by about 0.7 percent annually. By 2030, immigration is projected to become the primary driver of population growth.

TABLE 1.7 US Demographic Trends (US Census Bureau, 2020)

Beyond 2030, the US population is projected to grow slowly, to age considerably, and to become more racially and ethnically diverse.

Access to Health Care and Insurance

Although access to health care is an important determinant of health, having health insurance is even more important. Health insurance is an essential factor to accessing routine health care, especially preventive care, and it is directly correlated with better health outcomes. It ensures a regular source of care with the most appropriate use of health services, which, in turn, improves access to disease screening, early detection, and care for chronic and acute conditions.

People without health insurance are at an increased risk of going without health care. This is particularly damaging for children, because lack of access to health care promotes poor health and decreased productivity throughout their lives and increases the risk of premature death.

Advances in Technology

Many advances in technology have resulted in changes within the health-care delivery system. The introduction and spread of **telehealth**, sometimes called e-health or m-health (mobile health), has enabled patients to access health-care services remotely, though personal computers, tablets, or smartphones, rather than in person. Telehealth has been exceptionally helpful in remote areas where access to health-care facilities is limited. Goals of telehealth include

- facilitating patients' self-management of their care
- improving communication and coordination of care among all members of the health-care team
- keeping people safe from infectious diseases such as COVID-19
- making access to health care easier for those with limited mobility or transportation
- offering primary care and specialist care simultaneously (e.g., through an online conference call or meeting)

Additionally, through a range of innovations such as remote monitoring, patient portals, personal health apps, and accessible personal health records, technology has brought about much-needed changes in the health delivery system to improve patient outcomes (Nursing informatics n.d.). Rapid, reliable communication is one of the most important aspects contributing to patient safety, and the aforementioned innovations have greatly improved turnaround times for physician orders and enabled everyone on the care team to access EHRs more quickly, resulting in reduced medical errors, fewer delays to patient care, and lower costs of health care.

Triple-Aim Initiative

The IHI has developed a framework intended to optimize the performance of health-care delivery systems by pursuing three dimensions simultaneously: (1) improving the patient experience of care, (2) improving the health of the population, and (3) improving health equity by reducing the per capita cost of health care.

IHI calls this initiative "Triple Aim." Triple Aim recognizes that chronic health problems resulting from an aging population with increased longevity have become a global challenge and created new demands on medical and social services. Though it broadly focuses on health at the community level, Triple Aim requires systemic, ambitious improvement at all levels of the system (IHI, n.d.).

The IHI believes communities and organizations that successfully implement Triple Aim will have healthier populations because they will identify problems and solutions upstream, before they require acute health-care services; this will alleviate the need for complex care coordination and decrease the burden of illness. Furthermore, stabilizing or even reducing the per capita cost of care will allow private providers to be more competitive, relieving the pressure on publicly funded health-care budgets and giving communities greater flexibility to invest in SDOH such as schools and the environments where people live and work.

LINK TO LEARNING

The Institute for Healthcare Improvement (https://openstax.org/r/77ihitriple) provides an in-depth look at the IHI Triple Aim Initiative.

1.6 Systems-Based Practice

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Define systems-based practice
- Evaluate the role of the nurse in the delivery of systems-based practice
- Discuss the role of interdisciplinary teams in health-care delivery

A system can be defined as "a collection of interdependent elements that interact to achieve a common purpose" (Nolan, 1998). In **systems-based practice** (SBP), a clinician considers the multiple systems that are involved in a patient's condition and uses evidence about their interactions to develop a treatment plan that incorporates the intricacies involved in the patient's care. It takes time to acquire knowledge about all the relevant systems and to acclimate to systems-based thinking. The clinician who achieves this can use the skill to determine the interventions most likely to address all the patient's issues. (Johnson et al., 2008; Marshfield Clinic, n.d.;

HealthStream, 2021)

What Is Systems-Based Practice?

SBP focuses on the broader context of patient care, including the recognition that multiple layers make up the health-care system. These layers include

- consumers of care (patients and their families)
- delivery systems (hospitals, physician networks, drug and technology companies, community resources)
- insurers of care (private companies, Medicare, Medicaid)
- providers of care (physicians, nurses, health-care teams that provide direct care)
- purchasers of care (individuals, employers, governments)

Recognition of establishments such as the structures, systems, rules and regulations, payor sources, as well as the impacts of each to patient care provides a comprehensive understanding of how these entities need to work together as a whole and why their collaboration is important. Examples of SBP in health care include

- approaching identified problems with the goal of solving them versus relying on a workaround
- developing insight into the legal, political, regulatory, and economic factors that influence the delivery of health care
- having an understanding of cost containment, resource allocation, patient advocacy, and interdisciplinary collaboration in the delivery of quality care
- recognizing the outcome of individual and group actions on quality care and patient safety
- understanding how each different care setting works together for patients
- working in interdisciplinary teams to improve patient outcomes

SBP assumes that each patient exists in a context of interconnecting, interdependent systems. These systems may be large or small, complex or relatively simple, The ability to recognize each system and understand how they work together and fit into the overall structure is essential to promoting the quality of patient care while also reducing errors.

Microsystems

Although health-care providers work within a complex system, the area in which they conduct their daily work is considered a **microsystem**. Microsystems coexist with other microsystems that are typically embedded within a larger health system or organization. For a small-scale example, consider a surgical team, a cardiology unit, and a dialysis/renal unit: these are all microsystems housed inside a larger macro-organization: the hospital. Each microsystem has a common core of elements, including a focused type of care, a defined patient population, skilled staff trained to provide the care processes, and the needed information and technology to support these processes. Effective microsystems evolve over time and can foster collaboration.

Macrosystems

A **macrosystem** is the culture or society that surrounds smaller systems and gives them structure. Its components include laws, rules and regulations, government agencies, political systems, social policies, and educational resources, all of which have a direct impact on health care, public health, health equity, and the systems in which health care is delivered. SBP incorporates the multiple layers (microsystems) that make up health care (a macrosystem) into the context of quality patient care, patient safety, and health outcomes (Sawatzky et al., 2021).

Role of the Nurse in SBP

Nurses are a key component of an effective SBP strategy. Effective nurses recognize how they function within their respective microsystem as well as how their actions affect each aspect of the macrosystem in which they work. They are responsive to the complexities of these systems and able to call on all the other resources available to them. They can determine the cost of care, analyze risks and benefits, advocate for quality patient care, work within an interdisciplinary team, identify system errors, and develop and implement system solutions.

It is also important to note that systems can be improved upon. As frontline care providers, nurses can effect change because they observe firsthand the impacts of various systems on delivering patient care. These observations can be used to bring about changes to improve patient safety and quality care, which are the goals of

SBP.

Role of the Interdisciplinary Team

SBP applies to all areas of health care. Mastering SBP enables a clinician to have a thorough understanding of every direction to which care can lead as well as what is optimal for each patient.

SBP also encourages providers to pay attention to health equity and work together to improve the delivery of care. Effective teamwork is essential to developing competence in SBP. Bringing together team members with specialized skills and training from a variety of disciplines improves both the delivery of care and outcomes for each patient. By implementing interdisciplinary patient rounds, team members can brainstorm solutions to identified problems and coordinate their implementation.

For example, consider the newer routine of having grand rounds on a unit each day at a specific time. Several members of the interdisciplinary team come together to review the needs of the patient and the health plan. The team often consists of the patient's nurse, charge nurse, house supervisor, physician, pharmacist, social worker, physical therapist, and dietitian. By working together, the team begins to see how each team member contributes a valuable perspective to the care for each patient, enabling the team to develop holistic approaches that enhance the delivery of PCC. Communication among all team members involved in the patient's care also enables the team to have a better understanding of the patient's needs and expectations.

1.7 Technology and Informatics

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Explain the importance of informatics in nursing
- Explain how technology has affected nursing education and practice
- Explain the impact of the Health Insurance Portability and Accountability Act (HIPAA) on delivering care

As technology has evolved in health care, nurses have used these advances to improve patient care in numerous ways. The huge leaps in health-care technology over the past few decades have resulted in invaluable tools. Examples include the use of medical devices and mobile health apps to help monitor patient care, and the use of EHRs to document and track patient's medications, tests, laboratory results, and orders. These technological advancements, in conjunction with the field of nursing informatics, have promoted the efficiency, effectiveness, and safety of patient care.

Informatics

The specialty that uses information and technology to improve the efficiency of health care and its delivery is called **nursing informatics**. This field of nursing focuses on methods of storing the three building blocks of communication as well as wisdom in computer programs and software so they can be analyzed and used to support improvements in health care (Nursing informatics, n.d.).

Let's look at how these four components—data, information, knowledge, and wisdom—breakdown.

- The term *data* refers to raw, unprocessed facts or observations. In nursing, data can be objective and measurable information collected during patient assessments, such as vital signs (e.g., heart rate, blood pressure, temperature) or laboratory values. Examples include numeric values representing a patient's blood glucose levels or a list of recorded symptoms (e.g., pain scale scores).
- Information is processed and organized data that provides context and meaning. It transforms raw data into a structured form, facilitating understanding. In nursing, information may involve interpreting and contextualizing data to support decision-making. For example, aggregated vital signs data, over time, enable providers to detect trends and patterns that help identify changes in a patient's condition.
- Knowledge involves the synthesis and interpretation of information to derive insights and conclusions. It reflects a deeper understanding and application of information in specific contexts. In nursing, knowledge integrates information to guide clinical reasoning and decision-making. For example, a nurse may apply information from a patient's medical history and about current symptoms and responses to interventions to formulate a comprehensive care plan.

- Wisdom is the ability to make sound judgments and decisions based on a deep understanding of situations. In nursing informatics, wisdom goes beyond knowledge and involves the application of experience and ethical considerations to guide actions and outcomes. An example is making informed decisions about patient care that not only consider clinical data and knowledge but also incorporate ethical principles, patient preferences, and long-term implications for well-rounded and compassionate care.

In nursing informatics, the progression from data to wisdom reflects the evolution of information into actionable insights, ultimately contributing to improved patient outcomes and the overall quality of nursing practice.

The Importance of Informatics

Nursing informatics is essential in helping nurses make informed decisions. Nurses have always used data, information, and knowledge in their daily practice. With the advancement of nursing informatics, however, these components are immediately available for each patient to assist each nurse in making sound decisions about care and effectively communicating these decisions—and their outcomes—with the interdisciplinary team. In addition to developing communication and information technology, nursing informaticists also work as educators, researchers, and software engineers to develop evidence-based policies and procedures for organizational use in the nurse's clinical practice.

Application to Professional Nursing

Nurses need quick access to each patient's medical history, medication lists, laboratory values, and imaging results, as well as to notes from physicians and other members of the interdisciplinary team. All this information gives a comprehensive picture of a patient's clinical status, enabling the nurse to make informed decisions to improve patient outcomes and to effectively communicate with all members of the interdisciplinary team. Communication is, without doubt, one of the most important components of patient safety. Nursing informatics has been instrumental in developing and advancing the capabilities of EHRs (discussed later in this module) and the ability of physicians to immediately input digital orders for patient care. This has effectively reduced medical errors, patient care delays, and health care costs.

Technology in Nursing Education

Throughout one's nursing education, it's important to stay abreast of the advancements in technology. This enables nurses to remain in sync with the industry's expectations for health-care delivery and with patients' expectations for health outcomes. More fundamentally, technology has come to play a vital role in nursing education, from learning in a classroom (and assessing that learning) to conducting research in the field. Even what counts as a "classroom" has evolved as technological advances have enabled many educational institutions to move to online platforms.

A particularly important advance in technology for nursing education has been the development of high-tech simulation laboratories ("sim labs") using manikins that closely resemble real people. The manikins are programmed to simulate real-life patients and clinical situations; for example, they can talk and blink, their pupils dilate, and their "heart" beats. This enables nursing students to work in an environment that parallels the real world. After each sim lab experience, students can debrief, talking through what went right and wrong, which further promotes their knowledge and critical thinking skills. Working through simulated scenarios during nursing school better prepares nursing students for their entry into high-pressure clinical situations. After graduation, nurses may still use simulations to renew certification skills such as cardiopulmonary resuscitation.

Technology in Nursing Practice

New medical technologies also make nurses' lives easier when delivering care and, when used properly, they can also improve patient safety and outcomes. Today, a variety of technologies help nurses complete their daily routines while decreasing human mistakes and errors—especially important when working long hours with a heavy caseload. Technology will never replace the human experience, which is crucial for positive patient outcomes, but with the right balance, it can help ease the demands associated with direct patient care. Examples of technologies that facilitate routine nursing tasks include

- automated intravenous infusion pumps
- centralized command centers
- EHRs
- portable monitors

- smart beds
- telehealth and apps
- wearable devices

Technology has also enabled the use of e-prescribing, enabling a prescriber to electronically send an accurate, error-free, and understandable prescription directly to a pharmacy from the point of care. This has become an important element in improving the quality of patient care.

Electronic Health Records

EHRs provide immediate access to patient information, enabling the nurse to access a patient's medical history, medications, and laboratory and other test results to promote sound decision-making. EHRs also promote effective communication between the providers within the interdisciplinary teams, minimizing delays in treatment, reducing errors, and improving health-care costs.

In 2009, the Health Information Technology for Economic and Clinical Health (HITECH) Act was signed into law. HITECH's main goal was to encourage the adoption of EHRs by creating a financial incentive for providers to transition from paper to electronic records. In addition, HITECH strengthened existing regulations to ensure electronic data remain secure. As a result, many providers have implemented the use of portals for patients to access and even record or supplement their own health data (US Department of Health and Human Services, 2017; Alder, 2023).

The Health Insurance Portability and Accountability Act

The **Health Insurance Portability and Accountability Act (HIPAA)** became federal law in 1996. It created national standards to protect patient privacy, primarily by prohibiting the disclosure of health information without a patient's consent or knowledge. It has two components: the HIPAA Privacy Rule and the HIPAA Security Rule.

The HIPAA Privacy Rule provides standards relating to the use and disclosure of an individual's health information, which is known as "protected health information" (PHI), by "covered entities" that are subject to this rule. The Privacy Rule also provides standards for individuals' rights to understand and control how their health information is used. The covered entities include health-care providers and practices, health plan providers, health-care clearing houses, and business associates such as billing and claims processors, data analysis providers, and utilization review entities. The primary goal of the Privacy Rule is to protect individuals' health information while also enabling the flow of the health information needed to provide quality care (Alder, 2023).

The HIPAA Security Rule protects public health information, which is a subset of information covered by the Privacy Rule. This subset includes individually identifiable health information that a covered entity creates, receives, maintains, or transmits in electronic form (known as electronic protected health information [e-PHI]); it does not apply to PHI transmitted orally or in writing. To ensure compliance with the Security Rule, all covered entities must ensure confidentiality, maintain integrity, and provide accessibility to all e-PHI; be aware of and safeguard against anticipated threats to the security of e-PHI; provide protection against any anticipated impermissible uses or disclosure not permitted by the Privacy Rule; and ensure compliance by their employees (Alder, 2023).

Summary

1.1 Professional Nursing Practice

- Medical-surgical nurses provide care for adult patients of all ages who are preparing for or recovering from surgery. They also care for patients with an exacerbation of symptoms or complications related to a variety of long-term illnesses.
- Patient safety is of the utmost importance when it comes to quality health care.
- The nursing scope of practice is the range of activities a nurse is permitted to perform, as defined by state's regulatory body.
- The QSEN project focuses on six main competencies: patient-centered care, teamwork and collaboration, evidence-based practice, quality improvement, safety, and informatics.
- Each year, The Joint Commission gathers information related to emerging patient-safety issues. The organization then uses this information to create specific programs for its National Patient Safety Goals.
- PCC is essential to quality care, positive patient experiences, and optimal patient outcomes. Of all members of a care team, the nurse spends the most time with a patient, so they typically play the biggest role in PCC.
- PCC involves listening to each patient to understand their values, concerns, and directives. This practice should be the center of each individualized plan of care and treatment decision.
- The patient and their family should be treated as team members who participate in discussions and treatment decisions.
- Team members should provide information in a timely manner to ensure the patient and family are making well-informed decisions.

1.2 Intercollaborative Care

- Effective communication requires a wide range of skills. These skills include nonverbal modes of communication such as interpreting facial expressions and body language, listening attentively, and developing positive relationships with each team member, patient, and family member.
- ISBAR is an acronym that stands for Introduction, Safety, Background, Assessment, and Recommendation. The ISBAR format provides a structure of written communication that can be replicated by each team member to keep communication on track, create a workflow for the intercollaborative team, and promote patient safety.
- The intercollaborative health-care team comprises many individuals and entities. It works collaboratively through a team approach to promote whole-person care, which is patient-centered to promote optimal patient safety and outcomes.
- Critical thinking is a multidimensional, systematic, and organized way of thinking.
- Clinical judgement refers to the mental processes by which nurses draw on their knowledge and experiences to interpret the information in a particular case.
- Clinical decision-making refers to the process of drawing on experiences, research, and other sources of quality evidence to choose the best course of action for a particular patient in a particular context.

1.3 Health Policy and Ethical Considerations

- Health policy is defined by the World Health Organization as "the decisions, plans, and actions that are undertaken to achieve specific health-care goals within a society." It regulates the delivery of health care with the focus on optimal patient outcomes.
- Health policy is driven by nurses who are direct providers of patient care and, therefore, understand what patients value most, which is key to quality PCC.
- Being at the bedside, nurses develop a voice of expertise to advocate for health-care reform, including the delivery of care and patient safety.
- With the support of the ANA, nurses work diligently to make their voices heard at all levels where health policy decisions are made.
- SDOH are the nonmedical factors that have an influence on health outcomes. They include environmental factors such as where one was born, grew up, lived, and aged.
- SDOH also include a broader set of factors that shape daily life, such as access to health care and education, economic stability, community development, social and society norms, political systems, and race and

ethnicity.

- Ethics is the study of right and wrong actions. Ethical nursing emphasizes the principles of autonomy, justice, beneficence, and nonmaleficence.
- Autonomy acknowledges that patients have the right to maintain control and make their own decisions related to treatment and care.
- Justice is the principle of treating all patients fairly.
- Beneficence refers to the health-care provider's responsibility to act in their patient's best interests. The ANA defines beneficence as "actions guided by compassion."
- Nonmaleficence refers to the health-care provider's responsibility to do no harm.

1.4 Evidence-Based Practice

- Evidence-based practice (EBP) is the process of making clinical decisions based on the best available evidence from the most up-to-date research.
- EBP enables nurses to implement best practices in patient care.
- EBP promotes better outcomes, reduces costs, increases patient satisfaction, and maintains the relevance and currency of health care practices.
- Nurses involved in the delivery of care are instrumental in analyzing the current data (evidence) and refining the processes related to quality improvements.
- Nursing research provides the evidence that guides nurses in EBP.
- Research is conducted in five phases: conceptual, design and planning, empirical, analytic, and dissemination (Riva et al., 2012).
- Researchers often use the PICOT format to ensure their questions specify the population (or problem), the intervention, the comparison, the outcome, and the time frame.
- EBP and nursing research are similar, but they have different purposes. The purpose of research in nursing is to evaluate current knowledge and theories in order to formulate better nursing practices for improved patient outcomes, whereas the purpose of EBP in nursing is to use the evidence from research to make informed decisions regarding patient care and outcomes.
- QI focuses on improving the interrelated processes that affect patient outcomes and satisfaction.
- Nurses have a variety of ways to be involved in QI, including by analyzing nursing research and incorporating relevant findings into patient care guidelines.
- With EBP, assessing patient outcomes is the framework to develop standardized plans of care and clinical guidelines to promote QI.
- The quest for evidentiary knowledge that bridges the gap between theory and practice to improve patient outcomes continues to close with the advances and implementation of EBP.

1.5 Health-Care Delivery Systems

- The health-care delivery system is the organized manner in which health care is provided. It includes clinicians, facilities, insurers, and regulators.
- Inpatient services may be provided in hospitals, skilled nursing facilities, and rehabilitation centers.
- Outpatient services may be provided in outpatient surgery centers, acute care clinics, and a variety of specialty centers.
- Other services provide support for patients in their home settings, including some post-acute services and adult care services.
- Public health agencies use government funding to provide health care to a large, diverse population, including the poor and uninsured.
- Health-care systems provide different types of preventive services. Primary prevention aims to prevent disease before it occurs. Secondary prevention promotes early diagnosis and treatment to slow the progression of a disease or injury. Tertiary prevention aims to decrease the impact of an ongoing illness or injury.
- Advances in technology have changed the health-care delivery system. Telehealth is especially helpful for patients living in remote areas with limited access to health-care facilities.
- Factors that affect patient demographics include birth rates, the aging population, the number of people living in cities versus rural communities, the numbers of homeless people versus the number of families in an area,

socioeconomic status, and cultural diversity.
- SODH include income; job stability versus unemployment; education; access to insurance, routine health care, and quality care; and cultural diversity.

1.6 Systems-Based Practice

- SBP is health care that considers the multiple systems and interactions involved in a patient's condition and incorporates them into patient care.
- SBP requires team members to recognize microsystems (the relatively small systems in which each provider works) and the larger macrosystem in which all these systems coexist.
- SBP also requires team members to learn how to effectively use the systems in an interdependent manner, which is the cornerstone to providing optimal health care.
- Systems also include the rules and regulations that determine the relationships between components of the system and their responsibilities to patients and to each other.
- Nurses must recognize how different people function within each system as well as how each person's actions affect each aspect of the system.
- Nurses must have an awareness of the complexities of the system as well as a responsiveness and an ability to call on the other resources within the larger context and system of health care.
- Nurses should also be aware of the cost of care, clearly understand risks and benefits, possess advocacy skills for quality patient care, participate in interdisciplinary teamwork, and have the abilities to identify system errors and develop and implement system solutions.
- Interdisciplinary teamwork is essential to developing competence in SBP in today's health-care environment. It brings together team members with specialized skills and training from a variety of disciplines, thereby improving the delivery of care, patient outcomes, and health equity.
- Interdisciplinary teamwork encourages the coordination of solutions to identified problems.
- Interdisciplinary teamwork helps team members appreciate how others contribute to the care for each patient, leading to more holistic approaches and enhancing the delivery of PCC.
- Interdisciplinary teamwork promotes communication between each team member involved in the patient's care, enabling the team to have a better understanding of the patient's values and expectations.

1.7 Technology and Informatics

- Nursing informatics is defined by the ANA as "the specialty that integrates nursing science with multiple information and analytical sciences to identify, define, manage and communicate data, information, knowledge and wisdom in nursing practice."
- Nursing informatics focuses on the storage of data, information, and knowledge in computer programs and software in order to help health-care providers offer high-quality, safe patient care.
- Nursing informatics helps nurses make informed decisions and reduces medical errors, patient care delays, and health-care costs.
- Nurses use and communicate data, information, and knowledge in their daily practice.
- With the advancement of nursing informatics, patient information and interdisciplinary team notes are immediately available to each nurse for each patient to help with sound decision-making for patient care.
- In the nursing profession, technologies can help with daily routine processes and decrease the incidence of human mistakes and errors, especially for nurses working long hours with a heavy patient caseload.
- Technologies will never replace the human experience that is crucial for positive patient outcomes, but with the right balance, they can help ease the demands associated with direct patient care.
- HIPAA became federal law in 1996.
- HIPAA created national standards to protect a patient's privacy by preventing their health information from being disclosed without their consent or knowledge.
- HIPAA has two components: the HIPAA Privacy Rule and the HIPAA Security Rule.
- The Privacy Rule provides standards relating to the use and disclosure of an individual's health information, known as protected health information, by covered entities that are subject to this rule.
- The Privacy Rule also provides standards for individuals' rights to understand and control how their health information is used.
- The Security Rule protects public health information, which includes individually identifiable health

information that a covered entity creates, receives, maintains, or transmits in electronic form (known as electronic protected health information); it does not apply to PHI transmitted orally or in writing.

Key Terms

anonymity state of being unknown; refers to a participant in a study whose identity is not disclosed
autonomy right to make one's own decisions related to treatment and care
beneficence responsibility to act in the patient's best interest
clinical decision-making application of both critical thinking and clinical judgment to make decisions about nursing care
clinical judgment process by which nurses make decisions about patient care on the basis of observations, assessments, and interpretations of relevant information
collaborative care model approach to health care in which a team of providers works together to manage patient care more effectively and improve patient outcomes
critical thinking multidimensional, systematic, and organized way of reasoning
data pieces of information that help researchers answer questions and draw relevant conclusions
electronic health record (EHR) digital version of a patient's medical history; enables providers to immediately access information about a patient's health, including conditions, medications, and test results
empirical evidence objective data gathered by the senses from observations or experiments
ethics study of right and wrong actions
evidence-based practice process of making clinical decisions on the basis of the best available evidence from the most up-to-date research
full disclosure process of providing a complete description of a study or medical procedure, including the risks and possible benefits
health equity condition in which everyone has the same fair opportunities to attain the highest level of health outcomes
health inequities disparities created by socioeconomic systems and the status of different populations
Health Insurance Portability and Accountability Act (HIPAA) federal law to protect sensitive patient health information from being disclosed without the patient's consent or knowledge
health policy laws and regulations that define the actions and decisions that promote a society's health goals
health-care delivery system individuals and organizations collectively responsible for providing and overseeing health care in an area
informed consent legal document an individual signs to indicate a thorough understanding of a study, medical treatment, or procedure and to agree to participate
intercollaborative care team-based approach that uses shared responsibilities, interactive planning, and collaborative decision-making to promote person-centered care and improve patient and health system outcomes
ISBAR acronym that stands for Introduction, Safety, Background, Assessment, and Recommendation. The ISBAR format provides a structure of written communication that can be replicated by each team member to keep communication on track, create a workflow for the intercollaborative team, and promote patient safety
justice principle that all patients should be treated fairly
macrosystem culture or society that surrounds smaller systems and gives them structure
microsystem relatively simple, localized system, such as the one in which a health-care provider directly works
nonmaleficence responsibility to do no harm
Nurse Practice Act law passed by a state's legislature regulating nurses' scope of practice
nursing informatics specialty that uses information and technology to improve the efficiency of health care and its delivery
nursing research inquiry that is systematically designed to provide knowledge for important issues relevant to the nursing profession
patient-centered care (PCC) model of care that requires listening to patients to understand what they value most, then using the information as the catalyst for health-care decisions
PICOT acronym based on the elements of a clinical research question: population or problem, intervention, comparison, outcome, time frame
primary prevention health care intended to prevent disease before it occurs

qualitative research inquiry that focuses on personal experiences obtained through observation and interaction with patients
Quality and Safety Education for Nurses (QSEN) project focusing on the preparation of future nurses to promote the quality and safety of health-care systems
quality improvement (QI) framework to improve patient care and outcomes systematically
quantitative research inquiry that uses deduction and generalization from empirical evidence to draw conclusions
scope of practice range of activities a licensed person is permitted to perform as part of their work
secondary prevention health care that promotes early diagnosis and treatment to slow the progression of a disease or injury
social determinants of health (SDOH) nonmedical factors that have an influence on health outcomes
systems-based practice health care that considers the multiple systems involved in a patient's condition and uses evidence about their interactions to develop a treatment plan that incorporates all the entities involved in the patient's care
telehealth use of digital communications technology to remotely provide health-care services
tertiary prevention health care intended to decrease the impact of an ongoing illness or injury
The Joint Commission independent, not-for-profit organization that sets standards for quality care, quality improvement, and patient safety for organizations and workers in the health-care industry
theory–practice gap divide between theoretical knowledge acquired in academic settings and the practical application of that knowledge in real-world clinical settings
whole-person care holistic care that focuses on all of a patient's needs

Assessments

Review Questions

1. What action reflects The Joint Commission's contribution to a health-care organizations' improvement initiatives?
    a. setting standards for quality care, QI, and patient safety
    b. excluding nurses from safety and improvement initiatives
    c. focusing on emergency management and infection prevention
    d. eluding the National Patient Safety Goals

2. What component reflects a key element of PCC?
    a. excluding the patient's family from the care setting
    b. ignoring the patient's emotional well-being
    c. customize care based on the patient's values and perspectives
    d. respecting the patient's physical comfort

3. Ms. Hutto is complaining of pain (8 out of 10) in her lower back and abdomen. As the patient's nurse, you determine her abdomen is soft but distended, with positive bowel sounds in all four quadrants. Interventions such as ambulation, position changes, warm compresses, and warm prune juice have provided no relief. This scenario highlights what component of the ISBAR communication tool?
    a. situation
    b. background
    c. assessment
    d. recommendation or request

4. What is the primary goal of an intercollaborative care team in the context of patient-centered care?
    a. achieving financial targets
    b. streamlining administrative processes
    c. improving patient outcomes through personalized care
    d. minimizing the workload for health-care providers

5. A nurse is caring for a 72-year-old female with a diagnosis of atrial fibrillation. When making his shift change report, the nurse realizes that 4 hours ago, he administered 0.5 mg of the patient's antiarrhythmic medication

instead of 5.0 mg. When the nurse realizes the error and calls the physician to report the incident, what ethical principal is described in this situation?

a. nonmaleficence
b. justice
c. autonomy
d. beneficence

6. Mr. Johnson is scheduled for an endoscopy. Despite the excruciating abdominal pain he is experiencing, Mr. Johnson refuses to have the procedure. What ethical principal is described in this scenario?

a. beneficence
b. justice
c. autonomy
d. nonmaleficence

7. What option is a social determinant of health?

a. medical history
b. promotion of healthy choices
c. homelessness
d. life expectancy

8. As a nurse practicing EBP, what process related to improving patient satisfaction will be most effective?

a. checking on each patient's pain level every 4 hours
b. administering medications as close as possible to the administration times
c. making rounds on each patient hourly
d. offering a bath daily to each patient

9. Joann, a nurse in the medical-surgical unit, would like to implement a project to improve the cleanliness of patient rooms. Aside from the nurses, what group of key stakeholders should be included in the planning?

a. hospital maintenance staff
b. physical therapists and technicians
c. housekeeping staff and unlicensed assistive personnel
d. occupational therapy team

10. A nurse manager has received an increase in patient complaints that monitor alarms are sounding for extended periods, which is disrupting their sleep and creating unnecessary anxiety. After close observation, the nurse manager realized the nurses appeared as if they did not hear the alarms while charting. What type of QI plan would be most appropriate for the nurse manager to consider for her unit?

a. a plan of correction related to nurses not promptly addressing the monitor alarms
b. a process improvement project to address alarm fatigue
c. a plan to ensure all the patients have standing orders for medications to relieve their anxiety
d. a plan to have the nurses increase the volume of the monitor alarms

11. Ms. Blanchard is presently being treated for a new diagnosis of high blood pressure. Her primary care physician has recommended that, in addition to her daily dose of medication, Ms. Blanchard should also stop smoking. This recommendation demonstrates what level of prevention?

a. primary prevention
b. secondary prevention
c. tertiary prevention
d. intermediary prevention

12. What is an example of a statement that reflects the role an agency has on the health-care continuum?

a. Agencies provide a variety of in-home care, including physical and occupational therapy.
b. Government agencies exist to supplement middle-class populations.

c. All hospitals provide inpatient services at low to no cost to patients in need.
d. Subacute inpatient settings are no longer needed for sick patients.

13. What is the best description of systems-based practice in health care?
a. the focus on individual patient care, considering their immediate medical needs
b. the use of advanced medical technologies to enhance PCC and outcomes
c. recognizing the various layers of the health-care system and understanding how they impact patient care
d. implementing standardized procedures in health-care settings to ensure consistency in patient treatment

14. What is a nursing informaticist?
a. a nurse who is skilled at communicating complex information to patients
b. a nurse who is an expert on laws protecting patient information
c. a nurse who develops technologies that securely store and communicate information
d. a nurse who uses information and technology to improve the efficiency of health care

15. How has technology affected nursing education, particularly in sim labs?
a. by reducing the need for clinical experiences in real health-care settings
b. by providing high-tech sim labs with realistic manikins for hands-on practice
c. by eliminating the importance of critical thinking skills in nursing education
d. by decreasing the need for online platforms in nursing courses

Check Your Understanding Questions

1. What are the six main competencies of Quality and Safety Education for Nurses?

2. Identify examples of PCC in which the nurse takes an active role.

3. Identify two different social determinants of health and explain how they can affect a person's health.

4. What is the difference between EBP and nursing research?

5. Identify social determinants that affect the delivery of health care.

6. In your own words, define systems-based practice.

7. What building blocks of communication influence nursing?

8. What is the purpose of the Health Insurance Portability and Accountability Act?

Reflection Questions

1. Reflect on a recent patient you may have cared for during clinicals or discussed in a recent scenario in class. What questions could you have asked to guide you through the critical thinking process?

2. A 35-year-old patient with a history of opiate misuse is admitted to the emergency department with multiple stab wounds. Two days after extensive surgery to repair the wounds, the patient reports severe, unrelenting pain and reports the administered pain medication (an opioid) is not diminishing the pain. Because of the patient's history of substance use, some staff members do not believe the patient's reported pain level; they assume the patient just wants to obtain more medication. Keeping in mind the four main principles of nursing ethics, how do you address pain relief for this patient? How would you address the views of the staff members who believe the patient should not receive additional medication?

3. In your own words, describe what evidence-based practice is and why it is used in the nursing profession.

4. Why is SBP important in nursing?

5. Describe the impact of an interdisciplinary approach to health-care delivery.

6. How has medical technology improved the delivery of health care?

What Should the Nurse Do?

Mary, a nursing student in her final year of training, is about to start her clinical rotation at a busy urban hospital. She is eager to apply her knowledge and skills in patient care while adhering to the competencies outlined by the QSEN. During her first day on the medical-surgical unit, Mary encounters a patient named Mr. Johnson, a 65-year-old man admitted with a diagnosis of congestive heart failure.

1. What steps should Mary take to ensure she is adhering to the QSEN competencies in her care of Mr. Johnson?
2. How can Mary ensure that she effectively engages Mr. Johnson in his care to provide patient-centered care?
3. How can Mary empower Mr. Johnson to actively participate in his care decisions and express his treatment preferences to the health-care team?

Emily, a registered nurse working in a community health center, is caring for a diverse patient population. She encounters Mrs. Lopez, a patient with low income who is struggling to access affordable health-care services due to financial constraints. Emily recognizes the importance of advocating for Mrs. Lopez's needs and ensuring she receives patient-centered care despite socioeconomic challenges.

4. What SDOH might Emily consider when caring for Mrs. Lopez?
5. How can Emily fulfill her role as an advocate for Mrs. Lopez in providing patient-centered care?
6. How can Emily apply core principles of ethics when advocating for Mrs. Lopez's health-care needs?

Mark is a nurse working in a community health clinic that provides preventive health-care services to a diverse population. He encounters several patients with different health-care needs, ranging from preventive screenings and vaccinations to chronic disease management and health education. Mark navigates various factors influencing health-care delivery, including the role of health-care agencies and the availability of preventive services.

7. What actions should Mark take to differentiate between the types of preventive services available in the health-care system?
8. How can Mark discuss the impact agencies have on health-care systems based on his experiences in the community health clinic?
9. What factors affecting health-care delivery should Mark consider when providing care to patients in the community health clinic?

Competency-Based Assessments

1. During patient assessment, what cues might indicate that a patient's care is not adequately patient-centered, and how would you address these cues?
2. If a patient expresses dissatisfaction with their care, outline the steps you would take as a nurse to address their concerns and enhance the patient-centeredness of their care.
3. Explain how effective communication methods play a crucial role in the interdisciplinary health-care team. Provide examples of best practices for communication that enhance collaboration among team members.
4. Define critical thinking and clinical judgment in the context of health care. How do these cognitive processes impact the roles and interactions of members within an interdisciplinary health-care team?
5. As part of providing PCC, the nurse should determine a patient's cognitive abilities as well as any relevant knowledge deficits or learning disabilities. You are assigned to teach an older adult patient about medications they will be taking at home. Create a plan for assessing this patient's condition and psychosocial situation to determine how to best instruct her about her medications. Explain how you would modify your teaching plan if the patient were hard of hearing, visually impaired, or unable to read or write.
6. Identify three SDOH and explain how they can affect a patient's experience of care. Describe strategies a nurse can use to address these determinants and enhance PCC.
7. Describe a situation where ethical principles clash with health policy, creating a challenge for the nurse in advocating for PCC. How can the nurse navigate this dilemma to ensure ethical considerations guide patient care?
8. As a clinical nurse, how can you effectively incorporate both EBPs and nursing research into your daily practice to enhance patient care?

9. How can nurses actively engage in QI efforts to enhance the overall health-care experience for patients?

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CHAPTER 2

Culturally Competent Care

FIGURE 2.1 Addressing culture is vital to effective health care. (credit: "Iraqi doctor" by Debbie Morello/USAID, Public Domain)

CHAPTER OUTLINE

INTRODUCTION Nursing student Jane is caring for a woman who emigrated from Sri Lanka. Jane does not speak the patient's language and is not sure how to proceed to address her unique needs, values, and beliefs about health and illness. She delivers good-quality care by administering medications properly and safely and by providing attentive nursing care but fears she may be missing important elements of her spiritual and cultural care. She wants to learn more about her culture to provide appropriate patient education to the patient and her family. Her experience with this patient has made her more interested in truly learning how culture can impact health and healing. By learning more about how culture can impact a person's health and wellness, nurses can provide effective care, improve health outcomes, and avoid stereotypes or biases that may hinder the quality of care.

2.1 Concepts in Culture

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Explain the concepts of culture and race
- Describe cultural competence and cultural humility
- Discuss the importance of culture to nursing care

A fundamental principle of nursing is that every patient deserves to be respected and valued. This is especially important in a diverse society like ours, which contains individuals from a wide variety of cultural backgrounds.

Nurses who consider the impact of culture show respect for each patient's unique identity, beliefs, and needs. Patients who speak different languages or practice different customs or traditions may also have different ways of expressing themselves and interpreting other people's behavior. Learning to identify and accommodate these practices allows nurses to establish effective communication, which is essential for proper diagnosis and treatment. Sensitivity and open communication help nurses avoid biases that may impact the quality of their care. A **bias** is a tendency for or against a thing, person, or group, usually in an unfair manner. Furthermore, respecting the cultures and diversity of all patients is mandated by regulatory bodies and codes of ethics. Patients have the right to receive, and nurses are ethically bound to provide, culturally sensitive care (Office of Minority Health, n.d.). Culturally sensitive nursing care leads to improved health outcomes (Sharifi et al., 2019).

What Is Culture?

The characteristic beliefs, values, customs, traditions, behaviors, history, and artifacts shared by a particular group of people are considered their **culture**. It consists of a people's language, religion, social norms, art, cuisine, and many other components of society, and it plays a crucial role in shaping individual perspectives and behaviors, including health practices (Office of Minority Health, n.d.). Therefore, culture is a vital consideration in nursing care. Culturally relevant nursing care acknowledges and incorporates the cultural beliefs, values, and practices of patients into their health-care experience. Through this approach, nurses develop **cultural sensitivity**, which is the awareness of cultural differences and the potential impact they may have on an individual's beliefs, behaviors, and experiences. Culturally sensitive nurses recognize and respect their patients' diverse backgrounds and tailor care to meet each person's specific needs and preferences.

Differentiating Culture and Race

People sometimes confuse culture with terms such as *race* or *ethnicity*. For centuries, people held the belief that people could be divided into distinct racial groups, based on inherited physical characteristics, to justify racism, slavery, and all manner of discrimination. Today scientists reject this notion of race based solely on skin color. Instead, **race** is considered a social construct used to group people by certain physical, social, or geographic characteristics, such as skin color, language, or country of ancestry. For example, Black Americans practice a wide variety of religions, have different social traditions, and trace their ancestry to different parts of the world including Africa and the Caribbean.

Another social construct, **ethnicity** refers to shared key cultural traits, including traditions, heritage, and ancestry (Foronda et al., 2016). Nurses should not assume that people who share an ethnicity belong to the same culture. For example, the 2020 U.S. Census identified "Hispanic or Latino" as an ethnicity (Jensen et al., 2021), but this category includes people from any region with a Spanish or Spanish-influenced culture, including Spain, Mexico, Cuba, Puerto Rico, and many other parts of Central and South America and the Caribbean. All these subgroups have their own distinct cultural practices.

A culture based on ethnicity is often considered a primary element of culture, whereas secondary elements extend beyond the physical features and include other features (National Human Genome Research Institute, 2023). Members of a cultural group may share other characteristics, including age, sexual identification, social class, spiritual practices, and geographic location. Culture is also found in specific vocations or places of employment, for example, different companies may have different work cultures. Cultural groups can be found in the categories of marital or family status, political affiliations, levels of education, military service, hobbies, and any number of interests, beliefs, or practices. For example, married couples have a culture distinct from single people, and military members share a unique cultural bond distinctly different from that of the general public.

Generalizations and Stereotypes

A cultural group is made up of individuals who may be different in many ways but who nevertheless share several key traits. Concluding that every individual in a particular cultural group shares the same values, beliefs, or practices is a generalization. A statement may be true of a cultural group in general but not apply to every specific member of that group. For example, it is generally true that members of certain cultures avoid making eye contact with authority figures. A Chinese patient may consider it disrespectful to meet a provider's eyes, and a Muslim woman may consider it inappropriate to have a male provider (Galanti, 2000). However, nurses should not assume that every Chinese or female Muslim patient feels this way. To do so would be stereotyping.

A **stereotype** is a widely held but oversimplified assumption about a particular group of people. Stereotypes can

result from malice or bigotry, as when people hold racist or sexist views, and apply generalizations about a group to individual members of that group. Stereotypes often perpetuate fixed and biased ideas, portraying people in an unfavorable light without considering their individuality. Even when they do not put patients in physical danger, stereotypes can prevent nurses from building meaningful, trusting relationships with the individuals in their care each day. It is important to note that neither stereotypes nor generalizations can represent the full diversity and complexity of individuals within a cultural group. However, generalizations are typically grounded in observed, verifiable evidence, while stereotypes often rely on biases, assumptions, or misconceptions about a particular group.

Cultural Competence in Nursing

Multicultural awareness has become increasingly important for nurses as travel and communication have produced a "smaller," more interconnected world. Because we do not work in isolated communities where everyone is the same, we must be able to treat diverse populations effectively. This skill is part of **cultural competence**, which is the ability to effectively interact with individuals from different cultures. For example, nurses exhibit culturally competent care by delivering culturally tailored patient education and health promotion materials to help bridge the gap between health-care information and the patient's cultural beliefs and practices, enhancing their understanding, compliance, and self-management skills.

LINK TO LEARNING

Review this tool kit for cultural competence in nursing (https://openstax.org/r/77toolkit) provided by the American Association of Colleges of Nursing.

Evolution of Cultural Competence

The emergence of cultural competence as a concept in the nursing profession began with approaches such as the Sunrise Model, developed by Madeline Leininger in 1991, and Josepha Campinha-Bacote's Process of Cultural Competence in the Delivery of Healthcare Services, developed in 2002 (Leininger & McFarland, 2006; Campinha-Bacote, 2011). (See 2.2 Cultural Assessment for more information on these models.) As more nurses realized not only the necessity but also the value of delivering culturally relevant and sensitive care, the objective of cultural competence began to be incorporated into nursing curricula and professional standards (Marion et al., 2016). Some state boards of nursing have made cultural competence training a requirement for licensure, and nurse researchers are increasingly exploring evidence-based practices to guide culturally competent care (Gradellini et al., 2021; Long, 2012, 2016). Consequently, the utilization of resources like cultural assessments, cultural competence training programs, and cultural brokering services expanded. A **cultural broker** is a person who translates sociocultural differences between cultures. This could include nuances related to body language, expression, systems differences across cultures, or even how an experience may be viewed from a certain cultural lens. Cultural brokering goes beyond simple language interpretation.

REAL RN STORIES

Nurse: Sarah, RN
Years in Practice: Three
Clinical Setting: Cardiac step-down unit
Geographic Location: Suburban West Coast

Sarah, a registered nurse, was assigned to care for Mr. Patel, a 70-year-old immigrant from India who had recently undergone a cardiac procedure. Sarah understood the significance of providing culturally sensitive care to Mr. Patel and his family to promote a positive health-care experience. Upon meeting Mr. Patel, Sarah noticed his hesitancy and apprehension to be in the hospital. She decided to take a proactive approach by engaging in open and respectful communication. Knowing that Mr. Patel primarily spoke Gujarati, Sarah worked with the hospital's language services to arrange for a Gujarati interpreter to attend all interactions, either virtually or in person, when possible.

Sarah's efforts to bridge the language and cultural gap were instrumental in building trust with Mr. Patel and his family. She took the time to learn about their cultural values, religious beliefs, and health-care preferences. She discovered that Mr. Patel valued family involvement in decision-making and preferred natural remedies alongside conventional medicine. She used this knowledge to collaborate with the health-care team and adapt the care plan to align with these preferences. She involved his family in discussions, explaining medical procedures, medications, and potential side effects. As Mr. Patel progressed in his recovery, Sarah witnessed the positive impact of culturally sensitive care. The open lines of communication and shared decision-making resulted in increased patient satisfaction, improved adherence to the care plan, and a smooth transition to home care.

Cultural Humility

An attitude of openness, self-reflection, and lifelong learning regarding cultural differences is called **cultural humility** (Nguyen et al., 2020). Nurses with cultural humility recognize and challenge their own biases, practice respectful and nonjudgmental attitudes, and strive for equitable and patient-centered care. They also acknowledge the inherent power imbalances that exist in health-care settings. Nurses should be aware of the historical and systemic factors that contribute to health-care disparities among diverse populations, such as systemic racism and mistrust of health-care systems. By actively disrupting power imbalances, nurses can advocate for equitable care, promote social justice, and work toward reducing health-care disparities.

Elements of Cultural Humility

To effectively practice cultural humility, nurses must cultivate the essential elements listed in Table 2.1 (Nguyen et al., 2020).

Element	Description	Example
Self-awareness	Nurses must engage in continuous self-reflection to recognize their own cultural biases, assumptions, and limitations. By doing so, nurses become more open to learning about other cultures and challenging their preconceptions.	A nurse who has treated many Chinese American patients begins seeing an increasing number of recent immigrants from China. The nurse recognizes these new patients have different cultural backgrounds and therefore may not respond positively to approaches that have previously worked with Chinese American patients.
Openness to learning	Nurses practicing cultural humility approach encounters with individuals from diverse cultures as learning opportunities. They acknowledge gaps in their knowledge and actively seek reliable information about different cultures, including beliefs, traditions, values, and health-care practices.	The nurse admits they do not know enough about Chinese culture to provide culturally competent care to the recent immigrants. After discussing the issue with several Chinese American colleagues at the hospital, they are directed to several relevant books, podcasts, and websites.

TABLE 2.1 **Elements of Cultural Humility**

Element	Description	Example
Respectful communication	Effective communication is crucial for cultural humility, Nurses should strive to engage in active listening, using open-ended questions and empathetic responses to understand patients' cultural experiences and health-care needs. They should also be prepared to request translators to bridge language gaps.	The nurse does not speak Mandarin Chinese, the language spoken by her new patients. However, the hospital has contracted with a translation service, and the nurse is able to ensure an interpreter is always present for appointments, either virtually or in person.
Nonjudgmental attitude	Culturally humble nurses know enough about specific cultures to make reasonable generalizations about patients from those cultures. However, they refrain from stereotyping individuals based on their culture, and they do not negatively judge behavior that they do not sufficiently understand.	The nurse is accustomed to having warm, collaborative relationships with her Chinese American patients, particularly the younger ones who were born in the United States. The nurse is therefore surprised when younger patients from China remain distant, even guarded, after multiple appointments, but they assume the patients have understandable reasons for this behavior, and they remain positive during visits.
Collaborative partnership	Cultural humility promotes a collaborative partnership between nurses and patients. Nurses acknowledge patients as experts on their own culture, value patients' input, and actively involve them in making decisions regarding their care.	After several months, the nurse is pleased to find her efforts paying off. Her new patients are asking more questions about their health care, and while they still tend to defer to their providers' judgments, the nurse has used information from their conversations to help shape their treatment plans. With more time and positive reinforcement, the nurse believes the patients will become increasingly comfortable as active collaborators in their care.

TABLE 2.1 Elements of Cultural Humility

What Cultural Humility Achieves

Cultural humility is a vital part of the effort to promote patient-centered care and eliminate health-care disparities (Danso, 2018). In the context of nursing practice, cultural humility achieves several important outcomes relevant to these goals. First, it fosters respectful, nonjudgmental interactions with patients from diverse cultural backgrounds. Nurses practicing cultural humility recognize the inherent value of everyone's culture and avoid making assumptions or stereotypes based on cultural differences. This approach builds trust, strengthens nurse-patient relationships, and encourages open communication. The concept of **cultural safety**, which aims at creating an environment that is safe, respectful, and affirming for individuals of all cultures, particularly those from marginalized or oppressed backgrounds, also extends to the larger health-care system. Nurses bring cultural safety to the organizational and societal levels when they advocate for inclusive practices and policies that respect the rights and dignity of all individuals, and when they challenge discriminatory practices or barriers that may exist within their community. The following are examples of advocating for cultural safety:

- insisting that health-care providers use a language line or medical interpreter that speaks the patient's native language when providing information or obtaining consent
- collaborating with dietary services to offer a patient culturally appropriate food choices
- involving family members in decision-making

CLINICAL SAFETY AND PROCEDURES (QSEN)

QSEN Competency: Patient-Centered Care

Definition: Recognize the patient and family as a full partner in providing coordinated and compassionate care based on respect for the patient's preferences, values, and needs.

Knowledge: The nurse will integrate understanding of the multiple dimensions of patient-centered care and recognize how diverse backgrounds function as a source of patient and family values.

Skill: Provide patient-centered care while maintaining respect and sensitivity to their values. The nurse will do as follows:

- Complete a cultural assessment to determine the patient's values, preferences, and expressed needs.
- Document any patient requests in the medical record.
- Coordinate with ancillary staff in order to meet patient needs.
- Utilize resources as appropriate, such as a medical interpreter, to communicate with the patient and family.

Attitude: The nurse will respect and encourage patient expression of values and willingly support patient-centered care when a patient's values are different.

Impact on Health-Care Delivery

Culture influences an individual's beliefs, values, attitudes, and behaviors in all aspects of their life, including health and health care. It shapes their understanding of illness and wellness, as well as their perceptions of health-care providers and expectations of health-care services. By recognizing and acknowledging these cultural beliefs, health-care providers can engage in open and respectful discussions with clients and accommodate a patient's cultural preferences. Some cultures may prioritize natural or herbal treatments over pharmaceutical interventions or have specific dietary requirements (e.g., Jewish people may keep kosher, Muslim people may eat halal food, and Hindu people may not eat beef). Another example is a primary nurse who adjusts medication administration times to accommodate prayer times for a religious patient.

Cultural norms and values also affect patients' communication styles, expressions of pain or discomfort, and attitudes toward sharing personal information. Health-care providers need to be aware of these cultural nuances to ensure effective communication and care delivery.

2.2 Cultural Assessment

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Describe best practices for performing a cultural assessment
- Explain the models and theories that guide cultural assessment
- Explain the impact of a cultural assessment on patient outcomes

Completing a cultural assessment on a patient is important for nurses to provide holistic and patient-centered care. A **cultural assessment** is a method for systematically gathering information about a patient's cultural beliefs, values, practices, and perceptions as they relate to health care. A cultural assessment enables nurses to deliver care that respects individual cultural values, beliefs, and practices. By incorporating cultural consideration into nursing assessments, interventions, and care planning, nurses can improve health outcomes, enhance patient satisfaction, and contribute to the elimination of health-care disparities.

Performing a Cultural Assessment

A cultural assessment of a patient can take on many forms but should address some main factors that can easily be overlooked in a health-care setting. Assuming that all people are the same and view the world through the same lens is not a way to provide patient-centered care. Best practices for performing cultural assessments are informed by the work of numerous theorists. A model by Giger and Davidhizar is widely used.

Giger and Davidhizar's Transcultural Assessment Model

Giger and Davidhizar's Transcultural Assessment Model is a model used by the nursing and medical professions to providing culturally competent care to diverse patient populations (Giger & Davidhizar, 2002). Marilyn Giger and Ruth Davidhizar as nurse researchers and theorists contributed to transcultural nursing with the development of the Transcultural Assessment Model. The model is a standardized approach to assess cultural factors in nursing practice. The purpose of the model is to guide nurses in conducting a comprehensive and culturally sensitive assessment of patients by collecting data on the impact of cultural factors on health beliefs, health care–seeking behaviors, and treatment preferences (Giger & Davidhizar, 2002).

LINK TO LEARNING

Read this article on transcultural nursing (https://openstax.org/r/77transcultural) to learn more about Giger and Davidhizar's Transcultural Assessment Model and to see a visual of its application to nursing practice.

The Transcultural Assessment Model includes considering language barriers, nonverbal cues, and culturally appropriate communication styles, and understanding cultural perspectives on time, attitudes toward punctuality, scheduling, and the perception of illness (Giger & Davidhizar, 2002). The nurse must also recognize biological differences influenced by ethnicity, genetics, and race that may impact health outcomes. An example is the importance of recognizing that Black Americans are at higher risk of developing hypertension or sickle cell anemia. Cultural factors also influence the prevalence of high-risk behaviors such as substance misuse, unprotected sex, or unhealthy dietary practices. Nurses must assess and be aware of patient dietary restrictions, such as Orthodox Jewish people who request the kosher eating practice of not combining meat and dairy foods together and having food blessed by a rabbi. Pregnancy and childbearing practices are also impacted by culture as are rituals surrounding death, dying, and end-of-life care.

Cultural Considerations

When performing a cultural assessment, the views around several important concepts should be explored. These concepts are time, space, communication, social organization, environmental control, and biological variations. The following sections explore what is meant by each of these concepts and how they impact cross-cultural health-care experiences.

Communication

The concept of communication varies among different cultures due to a range of factors, including language, nonverbal cues, communication styles, and cultural norms. Communication is a complex process influenced by cultural values, beliefs, and practices, and even defined roles within the culture.

CULTURAL CONTEXT

Decision-Making across Cultures

Although it is assumed that people aged 18 years or older make their own decisions, that is not the norm in all cultures and family structures. For example, in the Hispanic patriarchy, the dominant male is in charge as the key decision-maker. In some African American cultures, the matriarch is considered a key decision-maker and must be counseled for family decisions. Social status within the Japanese culture may require the son of older parents to be the sole decision-maker, even if the eldest child or children are daughters. It is important to include the appropriate members of your patient's family to ensure everyone has the correct information and informed health-care decisions can be made.

Language plays a fundamental role in communication. All languages have distinct language patterns, such as dialects or slang, that can pose challenges in conveying and understanding messages accurately. Health-care professionals should be aware of language differences even within the same culture and utilize certified medical interpreters or translation services when necessary to ensure clear and accurate communication with patients. It is important to find out what language services are available at your health-care facility, including telephonic, live

interpreters, or even the use of live streaming for American Sign Language services.

Communication includes both verbal and nonverbal elements, with 90 percent of messaging coming mainly from nonverbal communication, which includes body language, facial expressions, gestures, and eye contact (Park & Park, 2018). In some cultures, eye contact may be seen as a sign of attentiveness and respect, such as in North American culture, while in others, it may be considered disrespectful or confrontational, as in American Indian or Asian cultures. Being sensitive and aware of these differences helps health-care professionals avoid misinterpretations and misunderstandings.

Communication styles can vary along a continuum, ranging from direct to indirect. In some cultures, direct communication is preferred, which is expressing thoughts and opinions explicitly, such as in North American or German cultures. However, in other cultures, such as American Indian or Asian cultures, indirect communication relies on nonverbal cues and context. Hierarchical structures represent the way individuals identify authority figures and social structure, and these also vary within cultures. Many cultures have a male hierarchy, which traditionally gives authority and preference to males making key decisions.

CLINICAL JUDGMENT MEASUREMENT MODEL

Analyze Cues: Determining Communication Style

Ms. Gonzalez has been admitted to the medical-surgical unit for a urinary tract infection. She seems very quiet and won't give the nurse a medical history. Twenty minutes later, her husband arrives on the unit and asks to speak to the nurse. When the nurse arrives, Mr. Gonzalez admits that his wife knows little English and that he can answer any questions the nurse has. The nurse decides to utilize a medical interpreter, who reveals that Ms. Gonzalez would prefer her husband to be in the room for all conversations.

The nurse compares the closed-off body language of Ms. Gonzalez before her husband arrived to the more open, relaxed body language she exhibits now that he's in the room. The nurse makes a note in the chart to have a medical interpreter and the patient's husband available for any care conversations or education.

Another element of cultural communication is high context versus low context, which considers the amount of implicit information shared. High-context communication requires an understanding of the background of the situation and person. For example, eye contact and physical touch can be interpreted in many ways without a context. In contrast, low-context communication, such as clear verbal communication and concise written communication, does not need additional context and conveys what someone is saying without having to read into a double meaning.

Cultural norms regarding politeness, formality, and respect can significantly impact communication. For example, some cultures prioritize maintaining harmonious relationships and may use indirect language to convey messages or avoid confrontation. In contrast, other cultures may value directness and explicitness. Being aware of these cultural variations helps health-care providers navigate sensitive topics and maintain effective communication. A nurse may be puzzled why a family is not making a critical health-care decision, but knowing there are layers of meaning and cultural implications may help the nurse develop more empathy.

Because communication is so complex, even when we speak the same language, remember that asking a patient an open-ended question to explain *what* they understand is better than asking the closed-ended question of *if* they understand.

Time

The interpretation of the concept of time varies among different cultures, and it significantly influences individual's behaviors, attitudes, and expectations. Some cultures may have a stricter monochronic approach to completing tasks on time, while others may complete multiple tasks at once and not pay a lot of attention to time. In health-care settings, understanding these cultural variations in the interpretation of time can help health-care providers communicate effectively, manage appointment scheduling, and address patient expectations. Being aware of these differences allows for more culturally sensitive and patient-centered care delivery.

Space

The concept of space is an important cultural concept for nurses to understand because it ,significantly influences patient care and interpersonal interactions. In the context of health care, space refers to the physical, psychological, and social dimensions that affect human relationships and communication. Respect for personal boundaries is important as different cultures have varying norms and expectations regarding personal space. Some cultures, such as the Latinx culture, may value closer physical proximity during interactions, while others may prefer more personal space, such as the Asian culture. Being aware of and respecting these differences fosters trust, enhances patient comfort, and promotes effective communication. Cultural norms regarding personal space and touch can differ significantly. An example is a female nurse who is unfamiliar with Japanese culture could inadvertently offend an older adult male when she goes to grab his arm to check his dialysis shunt without asking permission first. Another example is the offense a female Muslim patient may take if cared for by a male nurse who is trying to offer personal hygiene care.

Privacy is a fundamental right for patients, and nurses must honor this patient right. Honoring privacy respects patient's privacy and confidentiality. It involves providing adequate physical space for confidential discussions, ensuring appropriate privacy measures of closing doors or dividing curtains, and considering cultural norms when determining the level of privacy required for different individuals. As with any patient, nurses can design spaces that promote relaxation, reduce anxiety, and encourage a sense of peace.

Social Organization

The concept of social organization is highly relevant for nurses to understand because it plays a crucial role in shaping an individual's health beliefs, behaviors, and health-care experiences. Social organization refers to the way societies structure themselves, including their social hierarchies, roles, norms, values, and relationships. By comprehending the social structures and dynamics within a particular culture, nurses can better understand patients' health beliefs and decision-making and health care–seeking behaviors. For example, if a woman from South Asia is nonadherent in taking her medications, it may be due to a complex social structure within her family that the husband does not believe in Western medicine and she is to comply with his will.

Factors such as socioeconomic status, access to health care, discrimination, and power differentials within societies can greatly impact health outcomes. These are known as social determinants of health. For example, an immigrant family whose members do not have transportation or English fluency may struggle with tasks such as knowing how to get to a doctor's office or hospital. Different cultures have distinct family structures, kinship systems, and community networks that impact health-care decision-making, caregiving practices, and patient support systems. Trying to understand these dynamics can help a nurse serve as a patient advocate and connect the patient to resources. Striving to understand the social organization and its associated ethical perspectives allows nurses to navigate complex ethical dilemmas, respect cultural values, and ensure ethical care delivery.

Environmental Control

Some cultures may value the use of natural remedies or traditional healing practices that involve manipulation of the physical environment. By understanding these cultural perspectives, nurses can provide culturally appropriate care that respects and integrates patients' beliefs and practices related to environmental control. Cultural factors, such as dietary preferences, physical activity patterns, and exposure to environmental risks, are often influenced by environmental factors. Nurses who understand the cultural concept of environmental control can help patients identify and modify environmental factors that negatively impact their health and empower them to make healthier choices and lifestyle practices that are congruent with their cultural values.

Advocating for health equity can also help reduce health-care disparities caused by an unhealthy environment. An example would be supporting public policy that advocates for safe, lead-free housing for families who have a lower socioeconomic status. Another example is supporting community initiatives or providing education on environmental health hazards, such as air pollution or tainted water.

Environmental control is particularly relevant in the context of disaster preparedness and response. Different cultures have varying knowledge, beliefs, and practices regarding environmental emergencies. Some cultures may rely on governmental agencies to rescue and recover their belongings and food supply, whereas other cultures may be self-reliant. Nurses can enable individuals and families to develop culturally sensitive disaster plans, provide appropriate education and resources, and engage communities in disaster preparedness efforts. Through

recognizing the cultural dimensions of environmental control, nurses can provide culturally sensitive care, advocate for healthy environments, and empower individuals and communities to exert control over their physical surroundings resulting in improved health and well-being.

Biological Variations

The cultural concept of biological variations is essential for nurses to understand as it has a significant impact on health-care delivery and patient-centered care. Biological variations refer to the diversity and differences in human biology, genetics, and physiological processes that exist among individuals and populations. Genetic differences, metabolic variations, and susceptibility to certain diseases can vary across populations. Nurses can advocate for targeted screenings, genetic counseling, and interventions that address the specific needs of diverse populations. An example is a nurse who is aware that Ashkenazi Jewish people have an increased risk of having Gaucher disease, cystic fibrosis, and Tay-Sachs disease (National Gaucher Foundation, 2023).

Biological differences can influence how individuals understand and process health information. Nurses can tailor their communication to account for varying levels of health literacy, cultural beliefs, and individualized needs. When nurses acknowledge and validate the impact of biological factors on health outcomes, patients feel heard and understood. This fosters a therapeutic relationship built on trust, allowing nurses to deliver patient-centered care that acknowledges the unique biological needs and experiences of individuals.

Cultural Theory

While Giger and Davidhizar's theory and model are a good starting point for understanding the importance of performing a cultural assessment, there are other theorists and models that further explore the topic. In particular, Madeline Leininger, a pioneer in transcultural nursing, and Josepha Campinha-Bacote, who takes the theories of providing culturally competent care to a new level, ask health-care providers to engage in self-reflection and to retain a stance of "cultural humility."

Leininger's Cultural Care Diversity and Universality Theory

Leininger's Cultural Care Diversity and Universality Theory is a significant framework in nursing that emphasizes the importance of cultural factors in providing effective and culturally competent care. Developed by Madeleine Leininger, a nursing theorist and transcultural nursing pioneer from the University of Utah, this theory has had a profound impact on the understanding and practice of culturally congruent care. She stressed that the concept of culture was a central focus of nursing care. Her emphasis on the need for health-care professionals to develop cultural competence to provide effective care was key to really meeting the patient's needs. She introduced her Sunrise Model, which was an interplay between cultural and professional care factors in the delivery of culturally congruent nursing care. Understanding an individual's cultural history should include having knowledge of their heritage, migration, and historical experiences. Ideally, knowing about a patient would enhance the nurse's ability to deliver individualized care, yet the reality often challenges the time to obtain this information for every patient.

Leininger emphasized the need for a nurse to explore the influence of cultural values, beliefs, and practices on health-care decision-making and treatment choices. Individuals express and communicate their cultural values and beliefs through language, art, and even rituals. Her conclusion was that health-care professionals should address the potential need for modifying or reorganizing medical delivery or nursing practices to promote better health outcomes as needed for the patient's individual needs (McFarland & Wehbe-Alamah, 2019).

LINK TO LEARNING

The Transcultural Nursing Society (https://openstax.org/r/77tcns) was founded by Madeleine Leininger. It is a professional organization dedicated to promoting culturally congruent, equitable, and quality health care for all individuals. The society's website provides valuable resources, educational materials, and research articles related to cultural competence in nursing.

It also provides information on conferences, webinars, and educational events focused on cultural comptence development and offers access to publications such as the *Journal of Transcultural Nursing*, which features evidence-based practices and research findings on cultural competence.

Sunrise Model

Nurses can use Leininger's theory to conduct a cultural assessment to gather information about patients' beliefs, values, and practices following her Sunrise Model, which depicts elements of culture (McFarland & Wehbe-Alamah, 2019). The model depicts a bridge between nursing theory and practice. Strategies for implementing culturally congruent care interventions include using cultural brokers who understand the culture, interpreters who translate language, and appropriate communication techniques, such as culturally appropriate touch or lack of touch. The model focuses on shared human needs such as physical comfort yet incorporates the overarching concept of culture as individuals from different cultures may define health, illness, and pain differently. North Americans, for example, tend to be stoic with pain compared to Latine people who may be freer to express pain in verbal manifestations. Delivering culturally congruent care considers cultural nuances to promote understanding between nurses and patients from different cultural backgrounds. Providing culturally congruent care may improve patient satisfaction, and adherence to treatment can assist the nurse in recognizing unique needs, collaborating with the patient to find ways to accommodate their needs, and explaining the rationale for medical treatment in ways the patient can understand.

LINK TO LEARNING

Read this article to learn about Madeleine Leininger and her Transcultural Nursing Theory (https://openstax.org/r/77leininger) and to see a visual of the Sunrise Model.

Campinha-Bacote's Process of Cultural Competemility in the Delivery of Health-Care Services

Josepha Campinha-Bacote created a new word, "competemility," which is a combination of the words "competence" and "humility" intended to guide health-care service providers through care that transcends cultural competence and addresses personal biases. The two-pronged approach of **competemility** asks one to *be* in the process of cultural humility and at the same time *become* culturally competent. Campinha-Bacote completed the final revision of the Process of Cultural Competemility in the Delivery of Health-Care Services in 2018. This model includes the mnemonic "A-S-K-E-D," which challenges those in health care to pose the following self-reflective questions:

Awareness: Am I aware of biases?
Skill: Can I conduct an assessment in a culturally sensitive way?
Knowledge: Do I have knowledge of different cultures and their respective health implications?
Encounters: Do I have encounters with diverse people? Do I want conflicts in such encounters to have positive outcomes?
Desire: Do I want to act with *competemility*?

Self-reflection on the A-S-K-E-D questions helps the health-care team members prepare for completing an assessment in a culturally sensitive manner.

LINK TO LEARNING

Read this article to learn more about the Process of Cultural Competemility (https://openstax.org/r/77competemility) evolution of Dr. Campinha-Bacote's Process of Cultural Competemility in the Delivery of Healthcare Services and to see visuals of the model's conception. Also, note the ambigram connecting "competence" and "humility."

The Impact of a Cultural Assessment

The impact of a cultural assessment can be profound if the nurse does not identify the unique needs of the patient. When conducting a usual physical and history patient assessment, the nurse should ask about any cultural or religious needs the patient may have. Conducting a cultural assessment for each patient is essential for the following reasons:

- provides individualized care
- improves communication
- fosters trust with the patient and family members
- identifies the patient's health beliefs and practices
- addresses health disparities
- complies with legal and ethical standards
- promotes interdisciplinary collaboration

2.3 Health Equity and Disparities

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Define health equity and disparities
- Discuss the impact of social determinants of health on patient outcomes
- Explain how nurses can assess and customize care to decrease health disparities

Many factors can impact the way a certain patient receives care. From the fair or equitable distribution of health-care services to the differences with which one may access health care based on belongingness to a certain group, there are lots of reasons why a certain patient may have better or poorer health care. Social determinants of health play a large role in those variances; nurses should strive to provide quality care to all individuals regardless of these circumstances, and they should support equitable access and treatment for all.

Health Equity

The condition in which all individuals in a community have fair opportunities to achieve optimal health and receive appropriate, high-quality care regardless of their social or demographic characteristics is health equity (see Figure 5.2). Achieving health equity requires recognizing and addressing the root causes of health disparities. A **health disparity** is a difference in health outcomes and access to health care between different population groups (Agency for Healthcare Research and Quality, 2021). Essentially, health disparities are differences in health outcomes and access to health care between different population groups. These disparities are exacerbated by structural barriers such as systemic inequities and social injustices. Certain historically marginalized populations, such as communities of color and people living in underserved or impoverished areas, are disproportionately affected by health disparities and thus face higher rates of disease and health-care costs, lower quality of life, and early death (Collins, 2023). For example, consider the following in the United States (Collins, 2023):

- Non-Hispanic Black people have higher heart disease death rates than people of other racial and ethnic groups.
- Hispanic adults are the most likely to lack health insurance and have unmet needs for medical care.
- Adults with no high school diploma or GED are more than four times as likely to smoke cigarettes than someone with a bachelor's degree or higher.

Reducing health disparities and promoting health equity are crucial goals for health-care professionals. Nurses are well positioned to be leaders in these efforts, for example, by providing culturally competent care, advocating for at-risk populations, helping patients access all available resources, and collaborating with interdisciplinary teams and local organizations to bring health promotion and disease prevention programs to underserved communities. Through these and other measures, nurses around the world are working toward the day when every individual has a fair opportunity to live their best, healthiest life.

Social Determinants of Health

Health disparities are related to social determinants of health, or the conditions in which individuals are born, live, work, and age (Figure 2.2). These conditions, which play a critical role in shaping health outcomes, encompass a wide range of factors, including social environment, economic stability, and access to quality education, employment, housing, and health care (Healthy People 2030, n.d.). These social factors interact with biological and personal characteristics to influence an individual's health status and well-being. Recognizing and addressing social determinants of health is essential for nurses and health-care professionals to provide holistic, patient-centered care and promote health equity.

FIGURE 2.2 This graphic, created by the U.S. Department of Health and Human Services, organizes social determinants of health into five domains: economic stability, education access and quality, health-care access and quality, neighborhood and built environment, and social and community context. (credit: Office of Disease Prevention and Health Promotion, U.S. Department of Health and Human Services, public domain)

One of the key social determinants of health is **socioeconomic status (SES)**, which measures an individual's social and financial standing in their community, encompassing factors such as income, education, and perceptions of social class. Individuals with higher SES tend to have better access to health care, education, and employment opportunities; consequently, they have the resources to access and pay for quality health care (Healthy People 2030, n.d.). Lower SES is associated with limited access to health care, increased risk of chronic conditions, and higher rates of mortality. Nurses must understand the influence of SES on health outcomes and advocate for policies and interventions that address socioeconomic disparities, such as increasing access to affordable health care.

The physical and social environments where people live and work are also important social determinants of health. An individual's health is significantly affected by the quality of their housing, the safety of their neighborhood, and the robustness of their social support networks. Individuals living in a polluted neighborhood with limited access to healthful food and recreational spaces can contribute to stress, poor nutrition, and increased risk of chronic diseases. Nurses can play a role in promoting healthy environments by educating individuals and communities about environmental health risks, advocating for safe and accessible housing, and collaborating with community organizations to improve neighborhood conditions.

Two more social determinants of health to highlight are access to education and employment opportunities. Education is associated with better health literacy, healthier behaviors, and improved access to health care (Healthy People 2030, n.d.). Unemployment and job insecurity can lead to financial strain and increased stress levels as well as limited access to health care. Nurses can help to address these issues by providing education and resources to individuals and communities, advocating for equal educational opportunities, and assisting individuals in accessing employment and social support programs.

Nutrition and Nutritional Deficits

Nurses play a vital role in promoting culturally sensitive nutrition care. By understanding cultural influences on nutrition and dietary practices, nurses can educate individuals and communities about balanced diets that incorporate cultural preferences while meeting nutritional needs. Vegans, for example, do not eat any animal products, which can put them at risk for iron deficiency or folate deficiency anemia. Nurses can help vegans to collaborate with registered dietitians, cultural advisers, and community resources to develop appropriate nutrition plans. Moreover, nurses can advocate for policies that address food disparities, improve access to nutritious foods, and promote health equity. By considering cultural contexts, respecting dietary preferences, and addressing nutritional deficits, nurses can support individuals in achieving optimal health and well-being.

Holiday Observances

Holidays hold deep cultural and religious significance and often involve specific rituals, traditions, and dietary practices. Recognizing and respecting these practices is essential for providing culturally sensitive and patient-centered care. This includes understanding the historical and cultural context as well as the associated customs and practices. For instance, certain holidays may require modifications to the care plan to accommodate dietary restrictions, fasting practices, or specific rituals. Nurses should engage in open and respectful communication with patients and their families, seeking their input on how to incorporate holiday observances into care while maintaining safety and promoting well-being, especially during a hospitalization. Examples could include modifying a hospital menu for a Catholic patient who is fasting during Lent, and reorganizing a treatment schedule for a Muslim patient who wants to observe the five daily calls to prayer while hospitalized.

Educational Beliefs

Educational beliefs and values also differ across cultures and can have a significant impact on health care. In some cultures, for example, education is considered an essential component of health and well-being. Individuals from these cultures may place a strong emphasis on health literacy and view a provider as one of many possible sources of information.

Conversely, certain cultures take a more deferential approach to education and health care. Patients may rely heavily on health-care professionals for guidance and defer their decision-making authority to the health-care provider.

Cultural Groups and Disease Risk

Members of certain cultural and ethnic groups have elevated disease risks, which researchers have documented (Hill et al., 2023) (Table 2.2). Nurses should be aware of these risks to ensure they provide culturally sensitive care and targeted health interventions. At the same time, they must not stereotype. Table 2.2 shows common conditions seen among races at risk.

Ethnic/Cultural Group	Common Conditions
Black or African American	Hypertension, diabetes, obesity, breast, and prostate cancer (CentraState Healthcare System, 2022)
Hispanic/Latinx	Obesity, metabolic syndrome, diabetes, cardiovascular disease (Northwestern Medicine, 2024)
American Indian/ Alaska Natives	Type 1 diabetes, obesity, substance use disorder, alcoholism (Centers for Disease Control and Prevention, 2023)
Asian Americans	Chronic hepatitis B, tuberculosis (U.S. Department of Health and Human Services Office of Minority Health, 2023)
LGBTQIA+	Depression, sexually transmitted infections, suicide (Hafeez et al., 2017)

TABLE 2.2 Documented Risks for Disease Elevated in Certain Cultural and Ethnic Groups

LINK TO LEARNING

Read this article about a 2022 study about COVID-19 (https://openstax.org/r/77covidstudy) that demonstrates how the pandemic disproportionality affected communities of color.

How Nurses Can Customize Care to Decrease Health Disparities

To provide patient-centered care and decrease disparities, it is important to recognize any bias or stereotypical assumptions about patients from culturally diverse backgrounds. These biases can have negative effects on nurse-patient communication and interactions (Oruche & Zapolski, 2020). Nurses can help decrease health disparities on individual, organizational, and policy levels (Oruche & Zapolski, 2020).

On an individual level, nurses can decrease health disparities by providing culturally competent care. Strategies that nurses can use to incorporate culture in their plan of care are as follows:

- Ask the patient about their cultural traditions and preferences. By doing this, the nurse can gain insight into the client's values and beliefs and incorporate these elements into the plan of care in a way that is respectful and meaningful to the patient.
- Use interpreters. If the patient and the nurse do not speak the same language, using an interpreter can help the nurse understand the patient's beliefs and preferences. This can help the nurse incorporate these elements into the plan of care.
- Involve family members (when culturally appropriate). Family members can play an essential role in incorporating traditions and personal views into the care plan. Involving family members in discussions about the plan of care can help the nurse understand the patient's cultural beliefs and preferences.
- Be flexible. Being willing to adapt the plan of care to meet the patient's needs and preferences is essential. This can involve adjusting the timing of treatments or medications to accommodate the patient's religious practices or dietary restrictions.
- Use culturally appropriate resources. Educational materials and videos can help the nurse provide respectful and culturally sensitive care.

INTERDISCIPLINARY PLAN OF CARE

Plan of Care for an Underserved Patient

For a patient with little to no resources or low SES, a comprehensive interdisciplinary plan of care would be crucial to address patient needs after discharge. The nurse and provider begin by recognizing any needs that the patient may have during a comprehensive admission assessment. After the identification of needs, they would collaborate with the social worker.

Social workers would assess the patient's social support network, financial resources, and housing stability. They would assist in navigating insurance coverage for medications, accessing community resources for support groups, and addressing any legal or employment concerns.

Pharmacists would collaborate with the provider and patient to ensure proper medication adherence, educate the patient on potential side effects, and monitor for drug interactions. They would also assist in managing medication schedules and addressing any concerns the patient may have about their treatment regimen. If necessary, pharmacists would also counsel the provider about medications, such as generics or combination pills, that could be substituted into the regimen to increase patient compliance.

This interdisciplinary approach ensures that the patient receives comprehensive care addressing social and pharmaceutical aspects of their health. It emphasizes the collaborative effort needed to manage care effectively and improve the patient's quality of life.

On an organizational level, nurses can assist with creating an inclusive workplace culture, developing policies that foster inclusion and diversity, and providing adequate training and education resources. Supporting weekend clinic

hours can increase community access to care. Assisting with improving health-care access through telehealth services and mobile health clinics can also decrease community health disparities (Oruche & Zapolski, 2020).

On a legislative or policy level, nurses have the health-care knowledge to inform policymakers about the health-care needs of disadvantaged populations and advocate for policies that nurture increased patient access (Oruche & Zapolski, 2020). Nurses can push for better accessibility of cultural services, such as interpreter services.

Summary

2.1 Concepts in Culture

- Culture consists of the characteristic beliefs, values, customs, behaviors, and artifacts shared by a particular group of people. Conversely, race is used to group people by certain physical or geographical characteristics, and it is a social construct.
- Culturally sensitive nurses recognize and respect their patients' diverse backgrounds and tailor care to meet each person's specific needs and preferences. Although they recognize that generalizations about cultural groups may be valid and used to guide practice, they avoid stereotypes (widely held but oversimplified assumptions about groups).
- Cultural competence is the ability of health-care professionals to provide effective care to patients from diverse cultural backgrounds. It has become a focus in nursing practice, reflecting the growing recognition of the influence of culture on health care. Embracing cultural competence as an ongoing journey is crucial for nurses to provide patient-centered care in an increasingly multicultural society.
- Cultural humility takes cultural competence a step further. It is an attitude of openness, self-reflection, and lifelong learning regarding cultural differences. Cultural humility enhances equitable care, promotes social justice, and works toward reducing health-care disparities by asking nurses to recognize and challenge their own biases, practice respectful and nonjudgmental attitudes, and strive for equitable and patient-centered care.
- There are many reasons for nurses to deliver culturally sensitive care, including improved communication and increased trust between patients and caregivers, improved outcomes for patients, and a reduction of health disparities in society.

2.2 Cultural Assessment

- Completing a cultural assessment helps the nurse identify unique needs the patient may have.
- Giger and Davidhizar's Transcultural Assessment Model provides a best practice on how to conduct a comprehensive and culturally sensitive assessment by collecting data on the impact of cultural factors on health beliefs, health care–seeking behaviors, and treatment preferences.
- Factors such as language barriers, nonverbal cues, culturally appropriate communication styles, understanding cultural perspectives on time, and the perception of illness are important to include in a cultural assessment and care.
- Cultural assessment can illuminate differences in concepts of time, space, communication, social organization, environmental control, and biological variations.
- Leininger's Cultural Care Diversity and Universality Theory emphasizes the importance of cultural factors in providing effective and culturally competent care. Her Sunrise Model helps nurses recognize culturally specific needs and the necessity for collaboration between the nurse and patient to accommodate those needs. This is culturally congruent care.
- Josepha Campinha-Bacote's Process of Cultural Competemility in the Delivery of Healthcare Services combines the ideas of "competence" and "humility" to create the concept of competemility. This encourages health-care providers to self-reflect on questions aimed at providing care that transcends cultural competence and addresses personal biases.
- A cultural assessment identifies the patient's health beliefs and practices to help the nurse provide individualized care, improve communication, and foster trust. In addition, a cultural assessment complies with legal and ethical standards, promotes interdisciplinary collaboration, and addresses health disparities.

2.3 Health Equity and Disparities

- Health equity is the condition in which all people have a fair opportunity to achieve optimal health and receive appropriate, high-quality care regardless of their social or demographic characteristics. Health disparities are differences in health outcomes and access to health care between different population groups.
- Social determinants of health are the conditions in which individuals are born, live, work, and age. They impact access to and the ability to afford health care, safety and security, nutritional status, lifestyle choices, stress levels, and health literacy, to name a few.
- Factors that impact health include nutrition, holidays observances, educational beliefs, and risk factors for

illness.

- Nurses can help decrease health-care disparities through culturally competent patient care, supporting their organization with increasing health-care access, and supporting legislation that addresses health-care disparities in the community.

Key Terms

bias tendency for or against a thing, person, or group, usually in an unfair manner
competemility word created to combine "competence" and "humility" for cross-cultural delivery of care
cultural assessment method for systematically gathering information about a patient's cultural beliefs, values, practices, and perceptions as they relate to health care
cultural broker person who translates sociocultural differences between cultures
cultural competence ability of health-care professionals to provide effective care to patients from diverse cultural backgrounds
cultural humility attitude of openness, self-reflection, and lifelong learning regarding cultural differences
cultural safety aim of creating an environment that is safe, respectful, and affirming for individuals of all cultures, particularly those from marginalized or oppressed backgrounds
cultural sensitivity awareness and recognition of cultural differences and the potential impact they may have on an individual's beliefs, behaviors, and experiences
culture characteristic beliefs, values, customs, traditions, behaviors, and artifacts shared by a particular group of people
ethnicity social group that shares key cultural traits, including traditions, heritage, and ancestry
health disparity difference in health outcome and access to health care between different population groups
race social construct used to group people by certain physical, social, or geographic characteristics
socioeconomic status (SES) measure of an individual's social and financial standing in their community, encompassing factors such as income, education, and perceptions of social class
stereotype widely held but oversimplified assumption about a particular group of people

Assessments

Review Questions

1. What statement best reflects the importance of cultural awareness in nursing practice?
   a. Cultural awareness is necessary to avoid legal liabilities.
   b. Cultural awareness helps nurses identify patient's insurance coverage.
   c. Cultural awareness enhances nurses' understanding of patients' unique needs.
   d. Cultural awareness is required for nurses' continuing education.

2. What is an action that demonstrates cultural competence in nursing care?
   a. assuming all patients from a particular culture have the same health-care preferences
   b. using interpreters to facilitate effective communication with patients who speak a different language
   c. ignoring patients' cultural practices and focusing solely on evidence-based interventions
   d. applying stereotypes to guide the delivery of care to patients from different cultural backgrounds

3. How can nurses avoid stereotypes when delivering culturally competent care?
   a. Engage in self-reflection and recognize personal biases and assumptions.
   b. Assume that patients from the same culture share similar health beliefs and practices.
   c. Provide standardized care regardless of patients' cultural backgrounds.
   d. Avoid communication with patients who do not speak the same language.

4. What is a description of cultural awareness in nursing?
   a. understanding the importance of personal space in patient interactions
   b. having knowledge of various cultural practices and beliefs
   c. recognizing and respecting cultural differences in health care
   d. being aware of the influence of social determinants of health

5. A nurse is conducting a cultural assessment for a patient. What step should the nurse take to complete the cultural assessment effectively?
    a. Ask the patient about their personal medical history.
    b. Gather information about the patient's cultural background.
    c. Focus solely on the patient's physical symptoms.
    d. Skip the assessment if the patient appears uncomfortable discussing cultural beliefs.

6. A nurse is caring for a patient from a different cultural background. What is an example of an action by the nurse that demonstrates cultural competence?
    a. providing care based solely on the nurse's own cultural beliefs and practices
    b. utilizing a standardized care plan for each patient
    c. engaging in self-reflection and seeking knowledge about the patient's cultural background
    d. avoiding discussions about cultural beliefs and practices to prevent misunderstandings

7. What are components of culture? Select all that apply.
    a. interpretation of time
    b. comfort for personal space
    c. food preferences of dairy versus meat
    d. social position
    e. roles in the family

8. What is a description of the impact of culture on health?
    a. Culture has no significant impact on health outcomes.
    b. Culture only affects dietary habits and has minimal impact on overall health.
    c. Culture affects physical health but has no influence on mental health.
    d. Culture plays a crucial role in shaping health beliefs, behaviors, and practices.

9. What is a description of social determinants of health?
    a. genetic factors that influence an individual's health status
    b. biological conditions that contribute to disease development
    c. social, economic, and environmental factors that impact health outcomes
    d. individual's personal lifestyle choices and behaviors

10. What is a statement that accurately describes health disparities? Select all that apply.
    a. Health disparities refer to differences in health outcomes and access to health care between various populations.
    b. They can be attributed solely to genetic factors.
    c. Socioeconomic status, race, and ethnicity are factors that contribute to health disparities.
    d. Health disparities are limited to physical health conditions.
    e. Health disparities can be eliminated by providing equal access to health-care services.

Check Your Understanding Questions

1. How are cultural sensitivity, cultural competence, and cultural humility different?
2. How does a cultural assessment have a positive effect on patient outcomes?
3. What are some ways you can decrease health-care disparities?

Reflection Questions

1. How can you assess and address your own prejudices and biases when providing care to patients?
2. As a nursing student, reflect on your own cultural awareness by answering the following question:

    How has your cultural background and experiences shaped your perspective on health care and patient care

delivery? How do you feel about people who are ill, Black, White, Asian, Hispanic, LGBTQIA+, single, divorced, widowed, disabled, or who have obesity or substance use disorder?

3. You are a nursing student completing a clinical rotation in a community health center with a diverse patient population. As part of your learning experience, you are assigned to assess the health risks and needs of individuals from various cultural backgrounds. What factors will you consider to best customize your care of the following groups: Black American and LGBTQIA+.

Reflect on the following scenario and consider how nurses can effectively assess for health risks in different cultures You are assigned to work with a group of recent immigrants from Southeast Asia who have settled in your community. Many of them have limited English proficiency and adhere to traditional cultural practices that you are not familiar with. As you interact with the individuals, you notice some common health concerns, such as high rates of hypertension and diabetes within the community. Answer the following questions regarding this cultural group:

4. What cultural factors should you consider when assessing the health risks of individuals from Southeast Asia?
5. What culturally sensitive assessment techniques can you utilize to gather relevant health information from individuals who may have different cultural beliefs and practices related to health and wellness?
6. How might your own cultural biases and assumptions influence your assessment, and how can you remain culturally humble and open-minded in your interactions?

What Should the Nurse Do?

1. Ms. Rodriguez, a 40-year-old Hispanic female, is admitted to the hospital with a newly diagnosed chronic illness of type 2 diabetes. She speaks conversational English and primarily communicates with her family members in Spanish. The nursing team is responsible for providing her with culturally sensitive care and ensuring effective communication. When the nurse explains how to take her metformin and test her blood glucose daily, Ms. Rodriguez replies, “Si, dios quiere,” which interpreted means, “If God wants it to be.” How would you reply to Ms. Rodriguez’s response?

2. You are a nursing student assigned to care for a patient from a cultural background different from your own. The patient’s cultural beliefs and practices are unfamiliar to you, and you want to ensure that you provide culturally sensitive care. What should you do to promote cultural awareness in this situation?

You are a nurse working in a community health clinic. One of your patients, Ms. Johnson, a 45-year-old single mother of two children, recently lost her job due to company downsizing and is struggling to make ends meet. She has been experiencing chronic stress and anxiety due to her financial situation and has begun smoking again. She also lives in a neighborhood with limited access to fresh and affordable nutritious food options and buys fast food for her children almost every day. Her children attend a school where there is a lack of physical activity programs and limited access to health-care services. They have also been struggling academically due to the stressors at home. As her primary care public health nurse, you recognize the significance of addressing the social determinants of health in improving Ms. Johnson’s overall well-being.

3. What social determinants of health are impacting Ms. Johnson’s health status and well-being? Identify at least three social determinants in her case.
4. How can you collaborate with other health-care professionals, community organizations, and social workers to address the social determinants of health affecting Ms. Johnson and her children?

Competency-Based Assessments

1. Give an example of what you could say to apply each of the essential elements of cultural humility (self-awareness, openness to learning, respectful communication, nonjudgmental attitude, and collaborative partnership) now as a nursing student providing care for patients (actual or simulated).

2. Develop a ten-minute presentation to train the nurses on your unit to identify techniques used for a cultural assessment.

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CHAPTER 3

Health Promotion and Patient Education

FIGURE 3.1 Nurses have an obligation to promote health to all members of their patient population. Patient education and health-promotion activities are important to improve the health for all members of society. (credit: Sgt. Ashley Tsoi/U.S. Air Force/TRICARE Newsroom, Public Domain)

CHAPTER OUTLINE

INTRODUCTION Health promotion and patient education may be the most important interventions that nurses perform for patient care. Promoting optimal health one patient at a time can effectively and efficiently decrease the rates of health-care problems and improve the quality of life for individuals, which leads to improvement of large groups or the population as a whole. Patient education affects health-care outcomes because it gives the patient the information they need to understand why and how to achieve their health and wellness goals. Nurses must elevate the importance of health promotion and patient education in their clinical practice at all stages of life.

3.1 Health Promotion and Wellness

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Define key components of health promotion
- Identify factors that nurses must consider when developing a health-promotion plan of care
- Discuss the role of key components of health promotion and how to maintain a holistic, patient-centered approach to health promotion

Health promotion and preventive health measures are foundational nursing interventions, and they are becoming more and more important as the climate of the health-care industry shifts from a reactive to a proactive (preventive) model. Nurses need to understand why people value being healthy, what motivates them to make choices related to their health, what can convince them to make lifestyle changes for better health outcomes, and, of course, what health means. Nurses also need to understand that the concept of health has changed over time and varies according to culture and across the lifespan. Health was previously considered to be the absence of disease or similar problems. But current conceptions establish that **health** is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity (World Health Organization, 1946).

People may receive health information, but it does not always result in changes in lifestyle or health-related behaviors. The Health Belief Model (Rosenstock, 1974) suggests that even though people recognize the consequences of poor health behaviors, they will not take action to change their behaviors unless:

- they believe that they are susceptible to (at risk for) the health condition;
- the health condition poses serious consequences;
- behavior change will result in decreased risk;
- the benefits of change will outweigh the costs of change;
- they believe they can change their behaviors and the changes will pay off (Paul, 2020).

For nurses to positively affect people's health through health promotion, according to the Health Belief Model, the information presented to patients must be individualized, relevant to their current lifestyle, and provide enough facts for the patients to make behavior changes. Consider the use of pamphlets; if a nurse determines that a patient is at risk for a sexually transmitted infection (STI), the nurse would typically provide the patient with a pamphlet to read regarding prevention of STIs. Evidence reveals, however, that providing pamphlets without additional educational interventions is ineffective (Bhattad & Pacifico, 2022). A written pamphlet may not include all the information needed for the patient to believe they can make the needed lifestyle change. The nurse should explain why the patient is susceptible to an STI, explain the consequences of contracting an STI, and provide the patient with education on safe sex practices.

Betty Neuman (2011), a nursing theorist, describes a person's health as a continuum in which illness and wellness are opposite states of being. According to Neuman, the response to stressors (health issues) can move people across the continuum toward illness or wellness. A nurse's responsibility when a person experiences a stressor is to intervene with the appropriate level of prevention, either primary, secondary, or tertiary. The prevention of health issues through identification of risk factors and education and intervention to reduce the amount of risk for those health issues before they ever occur is primary prevention. Examples include wearing a helmet while biking or getting immunizations. In secondary prevention, a provider decreases the impact of a health issue through early detection, intervention to slow the progression of an illness, or rehabilitating to a former health state. Examples include a Pap smear for detection of cervical cancer or a mammogram for detection of breast cancer. When a patient has a chronic health problem, tertiary prevention is intervention to prevent further complications, improve functional ability and quality of life, or extend life expectancy.

To focus nurses and other health-care providers on the most important health-care issues, the U.S. Department of Health and Human Services (2023) created the guide Healthy People 2030. The Healthy People 2030 guide supports the development of health promotion and wellness goals for U.S. residents. Healthy People 2030's goal is for each member of society to have the ability to attain optimal health and well-being during each stage of their life (U.S. Department of Health and Human Services, 2023).

LINK TO LEARNING

Review the information on the priority areas of focus: [health equity, social determinants of health, and health literacy (https://openstax.org/r/77PriorityAreas)](https://openstax.org/r/77PriorityAreas) from Healthy People 2030.

Health Promotion

The holistic and proactive process of prevention of health issues through which people are empowered to take

control of their health-related choices and reach the best possible health status is called **health promotion**. In health promotion, nurses act as coaches and guides to promote healthy choices rather than authorities that offer prescriptive guidelines and treatment for established health issues only. Health promotion is a holistic practice, which is a departure from the traditional medical model. While the health-care provider plans and prescribes treatment based solely on the medical diagnosis, holistic health promotion empowers patients to meet their own health needs through knowledge and action in their personal, social, or environmental situations. For example, a person who has an addiction can be treated with medication to help decrease their cravings for a substance, but if that person is not empowered to change their social and environmental habits, they will find themselves in the same friend group or social group and will have barriers to maintaining their sobriety. If the patient with an addiction is given medication-assisted treatment, provided with social supports that encourage new relationship building, and empowered to feel strong enough to make needed behavioral changes, they are more likely to be successful in recovery.

If health is defined as optimal functioning and the absence of physical, mental, or social problems, then health promotion must include:

- disease prevention and management
- patient participation in their health-care plans
- healthy lifestyle education
- patient understanding of treatment options
- partnership
- open communication
- social justice
- mental health support

The seven core principles of health promotion are summarized in Table 3.1.

Principle	Description
Empowerment	Facilitating the patient's independence and proactivity
Participation	Engaging the patient in their health-care decisions
Holism	Treating the patient as a whole being, addressing mind, body, and spirit
Intersectionality	Realizing that there is overlap in social categories (race, ethnicity, etc.)
Equity	Providing equal health care to every individual regardless of background
Sustainability	Maintaining change over a long period of time
Combining multiple strategies	Using more than one of the principles of health promotion at once

TABLE 3.1 Core Principles of Health Promotion (Rootman, 2001)

Positive Health Concept for Ideal Health Promotion

A **positive health concept** is a subjective view of one's health status that allows a person to function at optimal levels, cope with life's stressors, and maintain a feeling of satisfaction, even though they experience stressors (Vermunt et al., 2018). Research by Dr. Martin Seligman (2024) found that people with a higher level of life satisfaction can cope with health issues better than those who have lower life satisfaction. An optimistic or positive health concept increases the acceptance of health promotion and teaching because the person believes that they are capable of behavior changes that will positively impact their health status. A patient's outlook on their health can change the course of their well-being: Positive outlooks are linked to positive health outcomes, whereas negative outlooks are linked to more health challenges.

Participation and Involvement for Ideal Health Promotion

The concept of health is shifting from being defined as the absence of disease to a positive health model with the overall goal of positive health and wellness (Doornenbal et al., 2022). Ideal health promotion is a concept in which nurses partner with patients to help them achieve their personal health and wellness goals (Figure 3.2) (Fertner & Grim, 2022). Partnership between the patient and nurse is essential in creating individualized health and wellness optimization according to the patient's values. Allowing room for this individualization based on the patient's personal value set takes into consideration their cultural background, therefore improving cultural sensitivity in the delivery of health care.

FIGURE 3.2 A health-care provider–patient partnership is the ultimate goal of patient health-care involvement. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Creating a patient partnership and involving the patient in their health-care choices is using a person-centered approach. When employing a person-centered approach, the nurse focuses on the person and their experiences instead of solely focusing on the disease process and its symptoms. A person-centered approach to health care builds on the nurse-patient partnership and allows patients to have information about and collaborate in the planning, delivery, and evaluation of their care while ensuring the patient's dignity (Fertman & Grim, 2022).

Action Competence for Ideal Health Promotion

The **action competence learning model** is a critical thinking model that is used to create health-promotion activities (Figure 3.3). Action competence informs the health-promotion delivery process for nurses to plan, act, and evaluate actions with the aim of improving health outcomes for a patient population. The action competence learning model can be used with patients, nursing students, or nurses to guide them through the process of transferring knowledge and self-awareness, being accountable for the actions taken, and reflecting on the results of the action (Bergen & Santo, 2018).

FIGURE 3.3 Health-promotion activities are developed using the action competence learning model. (credit: Untitled by New Zealand Curriculum; CC BY 3.0)

When action competence is applied to a group, community, or population, it is considered **collective action competence**. Collective action competence can be applied to health promotion as the capability of a population to direct their health and wellness behaviors toward common health and wellness goals based on collective health-care literacy, collective health competence, and collective health needs or goals. One example from the Healthy People 2030 is to increase medical care to rural areas noted as underserved.

Equity and Health for Ideal Health Promotion

Health promotion, well-being, positive health, and optimal health should be facilitated through a health-care system that treats people from all backgrounds equally. Patients from all backgrounds should have the same opportunity to achieve their health-care goals through health promotion and the guidance of their health-care team. This equal opportunity to achieve desired health-care outcomes is called **health-care equity**. Nonetheless, health-care disparity is plaguing the U.S. health-care system and blocking certain groups from equal access to health care. When a certain group of people have worse health outcomes than other groups of people for no obvious medical reason, it is called **health-care disparity**. For example, recent data in the United States concludes Black maternal mortality (death) is 55.3 per 100,000 live births, whereas White maternal mortality is 19.1 per 100,000 live births (Hoyert,

2023).

Health promotion is not a privilege; it is a right that should be provided to every human. It is important to consider health-care equity when planning health-promotion activities for patient populations. The social determinants of health are factors that appear to fall outside of the health-care system but play an active role in the health outcomes of a population. Therefore, health-promotional activities should take social determinants of health into consideration and target a diverse audience while striving to improve the health outcomes for all. Social determinants of health take into consideration many aspects of a person's life, such as birth, childhood, education, work, play, worship, and aging, which impact health, functioning, and quality-of-life outcomes. The World Health Organization (WHO, 2024) identifies the following items as social determinants of health:

- access to health services
- culture
- education levels
- employment and working conditions
- genetics
- gender
- income and social status
- personal behavior and coping skills
- physical environments
- social support networks

LINK TO LEARNING

Social determinants of health are not always easy to identify in a patient population. Using a screening tool can improve the identification rate of social determinants of health and increase the health promotion of people who are the most in need. A screening tool from the Centers for Medicare and Medicaid Service (https://openstax.org/r/77ScreeningTool) can be used with any patient population.

Wellness

Wellness and *health* are often used in context to mean the same thing; however, **wellness** is the subjective interpretation of a person's state of holistic health (Pender et al., 2018). When a person experiences wellness, they feel satisfaction with their physical, mental, spiritual, and social health status. Nurse coaching is a nursing specialty that focuses on assisting people to improve their overall wellness, gain a sense of well-being, and achieve life balance (Dossey & Keegan, 2020). The nurse coach partners with patients and provides a safe space for exploration of the patient's wellness goals. The goal of the nurse coach/patient partnership is to engage the patient in the process of identifying, assessing, planning, and evaluating behaviors that could be changed to improve health or to reach wellness goals.

Physical Wellness

While exercise is extremely important for people to achieve optimal levels of health and wellness, it is not the only aspect of physical wellness that exists. A person's **physical wellness** is their optimal physical function, which includes maintaining healthy nutrition, proactively seeking treatment for medical issues, and minimizing risky health behaviors (Melnyk & Neale, 2018). Table 3.2 lists the factors involved in maintaining physical wellness.

Factor	Examples
Healthy dietary choices	Minimizing processed foods Drinking approximately two liters of water daily Consuming a variety of fruits and vegetables
Proactive health care	Establishing a relationship with a health-care provider Getting regular check-ups Preventive health care/testing Maintaining a consistent sleep schedule Reducing stress
Minimizing risky activities	Limiting alcohol consumption Avoiding nicotine Minimizing risky physical activities

TABLE 3.2 **Maintenance of Physical Wellness**

Mental, Emotional, and Social Wellness

The state in which a person feels satisfaction and can effectively cope with changes in their mental, emotional, and social health status is considered their **mental, emotional, and social wellness**. Emotional wellness requires the ability to identify, express, and manage the full range of emotions (Melnyk & Neale, 2018). Social wellness is based on the person's interaction within their social system, meaning social wellness requires social support, relationships with respect and trust, and social connections that assist with stressful or challenging situations. "Mental wellness" refers to a state in which a person can effectively cope with the stressors in their life while maintaining relationships and contributing to their community.

The promotion of mental, emotional, and social wellness requires nurses to know the context in which the person is living. Mental, emotional, and social support are not always available given the patient's situation. If mental, emotional, or social support is not present in a patient's life, the nurse can help identify the need and provide resources to help the patient meet those needs. For example, a person of color may not be able to achieve emotional or social wellness in a racist environment that continually makes them feel unsafe. Providing this person with counseling and social support can help provide a safety net until the patient can improve their level of mental, emotional, and social wellness. The health-care system can also provide coping skills education and emotional intelligence education, and can connect the patient to social groups that can provide other types of support.

Spiritual Wellness

An important component of the holistic wellness model that should not be overlooked by nurses and other health-care professionals is **spiritual wellness**, the optimal functioning of a person's spirit. This type of wellness is subjective and individualized to each person and, therefore, cannot be provided through a one-size-fits-all model. Spirituality can be just as important to holistic health as other aspects such as physical or emotional health. A person's **spirituality** is what gives them a sense of meaning and purpose in life. Achieving spiritual wellness involves actively making choices that improve the capacity for creating a fulfilling spiritual life. The aspects of life that define spirituality include religion, faith, values, beliefs, principles, and morals (Ghiya, 2019). The organized system of beliefs that reflect a person's approach to or understanding of spirituality is considered **religion**, but spirituality is broader than religion, and a person may be spiritual without being religious (Dossey & Keegan, 2020).

Supporting the spiritual health of patients requires conversations about spirituality and understanding of the individual's spiritual history, symbols, beliefs, and practices. For example, if the nurse is promoting the health and well-being of a member of the Muslim population, it would be important to whether the person prays and, if they do, at what times of day in order to coordinate care around their prayer times. This type of accommodation should be looked upon as supporting the spirituality of the patient rather than an inconvenience of scheduling.

Spirituality is a sacred connection to something; it can be a connection to a sacred source (like God, Tao, or Allah), nature, others, or self. Health promotion regarding spirituality must provide for the connections to these things to be successful. Planning and building a sacred garden in an urban housing complex would support the spiritual

connection to nature for the people who live there.

Ways to promote the spiritual health and well-being of patients include teaching communication skills, active listening, storytelling, encouraging regular practice of meditation (including prayer or centering), fostering connections, facilitating religious rituals, engaging in art, and allowing for periods of restful peace. Any of these recommended activities can support a patient's spiritual health and well-being, but they may need guidance in how to incorporate them into their schedules or how to do them.

If spirituality is overlooked in a health-care situation, then the patient has not reached true holistic wellness and healing. Spirituality is an area in which nurses are challenged (and sometimes unable, due to lack of knowledge) to provide culturally competent and culturally relevant spiritual guidance. To provide holistic health care, more focus on educating nurses and other health-care providers about their roles in spiritual wellness is needed.

REAL RN STORIES

Nurse: Bethannie
Years in Practice: Twenty-seven
Clinical Setting: Community-based parish hospital
Geographic Location: Oregon

At the end of my career, I began a parish nursing role. I specialized in delivering a comprehensive approach to nursing care within a faith-based community setting. As an integral member of the ministry team, I collaborated closely with religious leaders to enhance the holistic well-being of our community members. My community-wide interventions span a wide spectrum of initiatives aimed at promoting health and wellness. I developed programs that encompassed awareness and wellness, such as a children's vaccination program. I coordinated my efforts with community health services, health counseling, and facilitated referrals to available resources. I found myself being the advocate for community needs. My role included tasks such as volunteer training, conducting health screenings, facilitating support groups, and conducting educational classes on health-related topics. Through these multifaceted approaches, I was able to play a pivotal role in fostering the overall health and vitality of my faith community. Becoming a parish nurse was the highlight of my career.

3.2 Strategies for Improving Healthy Habits

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Describe strategies for helping to improve physical health
- Describe strategies for helping to improve psychosocial health

Recent changes and trends in health-care access, information, and technology, including incorporating the consequences of the COVID-19 pandemic, have emerged as standard practice. Nurses' use of social media, telehealth, and other online platforms to educate patients and promote health have increased.

During the pandemic, people heightened their focus on physical health by adopting preventive measures like hand hygiene and mask-wearing and prioritizing immune-boosting behaviors such as sleep and exercise. The pandemic also exacerbated mental health challenges due to stressors like fear, economic instability, and social isolation. Coping with changes in routines and experiencing grief added to emotional strain. Individuals adapted by reassessing priorities, spending more time with family, and embracing self-care practice. Communities responded by supporting at-risk groups and promoting mental health awareness through initiatives like online support groups and education campaigns.

Physical Exercise

Physical exercise decreases the risk for obesity, chronic illness, and age-related changes. Physical exercise can not only prevent disease, but it can also help with stress management and improve well-being. It is important to provide options to people when promoting physical exercise because finding a physical exercise regimen that is enjoyable increases the likelihood that the person will continue to engage in the activity.

There are four basic components required for a well-balanced physical exercise routine (Dossey & Keegan, 2016). They are:

1. flexibility
2. muscle strength
3. cardiorespiratory endurance (aerobics)
4. postural stability

Each patient should be encouraged to engage in all four components of physical exercise to provide the most health benefits. Doing so keeps patients from getting bored with their exercise routine and allows them to find exercise modalities that they enjoy. Table 3.3 provides more details on the four components of well-balanced exercise routines.

Component	Examples	Benefits
Flexibility	• Yoga • Stretching • Pilates	• Decreases risk for injury • Improves joint movement • Increases blood flow
Muscle strength	• Resistance bands • Free weights • Isometric training • Polymetric training	• Increases endurance • Protects bone health • Improves sleep quality
Cardiorespiratory endurance	• Running • Jogging • Swimming • Stair climbing • Cycling	• Increases stamina • Strengthens cardiac and respiratory muscles • Boosts mood
Postural stability	• Stability ball • Balance training • Range of motion • Gait training • Running in place	• Prevents falls • Improves balance • Decreases fatigue • Enhances motor skills

TABLE 3.3 **Examples and Benefits of the Four Basic Components of a Well-Balanced Exercise Routine**

Exercise has cumulative benefits, meaning that any effort to exercise is an improvement from the baseline and provides positive health effects. This is important for patients who may have tried to implement exercise routines in the past and were unsuccessful. Encouraging patients to incorporate small amounts of exercise into their routines and then expanding those efforts is less intimidating for a person with a sedentary lifestyle.

Nurses should avoid approaching the subject of physical exercise from a shaming and blaming standpoint. Shaming a patient does not improve exercise efforts. Exercise should be discussed in a nonjudgmental way that allows the patient to view physical exercise as a part of their lifestyle rather than a punishment for previous lifestyle choices. The challenges of physical exercise should be discussed with patients of all ages, cultures, and weights, not just patients identified as having obesity.

Mindful Self-Care

Mindfulness and self-care are essential to the holistic health and well-being of patients and their communities. A **mindfulness practice** allows a person to quiet the mind and focus their awareness on the present state of being. A **self-care practice** promotes the health and well-being of the individual and gives time for patients to focus on what

their body needs. Mindful self-care suggests that a person quiet the mind, becoming aware of the current state of their health and well-being, and identify ways to promote or improve the state of well-being through self-care. promote or improve the state of well-being through self-care.

CLINICAL SAFETY AND PROCEDURES (QSEN)

Mindfulness

An individual's state of awareness, achieved through personal focus, being in the present, and/or meditation is called mindfulness. Paying attention and being fully cognizant of a situation without extreme reaction can provide calming and centering. The practice of mindfulness dates back to ancient times and was originally grounded in Buddhist and Hindu traditions. Practicing mindfulness can improve a person's overall sense of well-being and mental health. In addition, the use of mindfulness techniques—being fully present in the moment and being aware of one's surroundings, environment, and senses—is another protective factor that reduces stress and thereby lowers risk factors for mental illness. Examples of mindfulness techniques include meditation and keeping gratitude journals, instead of ruminating about the "what-ifs." By mastering the capacity to pay attention in the present moment and the ability to recognize the reality of our complex lives, the nurse can address all QSEN competencies and then is able to skillfully provide the patient with the same set of knowledge and skills.

Mindful self-care can take many forms, such as meditation, journaling, or breathing exercises. These activities are as varied as the patients who practice them and should be individualized for the patient's optimal idea of well-being. Whatever the activity, it should encourage development of one's inner consciousness, support well-being, and focus on creating balance and satisfaction in life. Mindful self-care should be practiced daily in a comfortable environment. If the patient is having trouble working mindful self-care practices into their daily routine, some quick options include taking deep breathing breaks throughout the day, journaling for 10 minutes a day, joining a mindful/self-care group like a drumming circle (Figure 3.4), planning a mindfulness or self-care retreat, or finding a friend who has a similar goal and practicing together.

FIGURE 3.4 Participation in a drumming circle can help to promote mindfulness and well-being. (credit: "Drum circle" by Selena N.B.H./Flickr; CC BY 2.0)

Work-Life Balance

Work-life balance can be achieved through the creation and maintenance of healthy boundaries. A **healthy boundary** is a guideline that people set to regulate relationships. In this case, it is the relationship between work

and home life where people need to achieve a healthy balance. Examples of healthy boundaries regarding work include not checking email after work hours, working only during "work hours" (this will depend on the person's work schedule), or not being available for calls or meetings on weekends. Healthy work boundaries are more difficult to set for people who work from home, have on-call hours, or are in a management or salaried position. Completing a thorough assessment of how work and home life feel out of balance will help you and the patient identify where boundaries need to be drawn.

Work-life balance is a common cause of stress for patients. Research indicates that those who have small children, a new marriage or job, caregiving responsibilities, or any number of other responsibilities are more susceptible to work-life challenges (Rathnaweera & Jayathilaka, 2021). If there are things that the patient can cut out of their schedule to make it less stressful, it is recommended to do so according to how important each activity is to them. For example, if the patient is working a full-time job, has children, works part-time at a senior center, and volunteers for a local charity, the patient can identify which of these are the least important and cut it out of their schedule to decrease the demands on their time. This would require the patient to consider the advantages and disadvantages of each activity and determine which activity, if removed, would decrease their stress level to a manageable level. When creating a healthy work-life balance, the patient needs to learn to prioritize and set boundaries to create the healthiest scenario for themselves. The nurse's role is to help the patient identify when there is a work-life imbalance, empower the patient to take steps toward achieving work-life balance, and provide resources to make the process successful. Less stress can lead to more productive work and feelings of being more present in one's home life (Rathnaweera & Jayathilaka, 2021).

Healthy Eating

The food that people consume is the basis for all the energy needed for the body to function normally. Foods should be nutrient dense and satisfying. Fad diets or unproven diet plans should be avoided. When educating patients, recommend simple, whole-food options. The most nutritious diets contain a variety of fruits, vegetables, healthy fats, and lean proteins (Figure 3.5), whereas the least nutritious diets contain large amounts of processed ingredients, high sugar content, and large amounts of unhealthy fats.

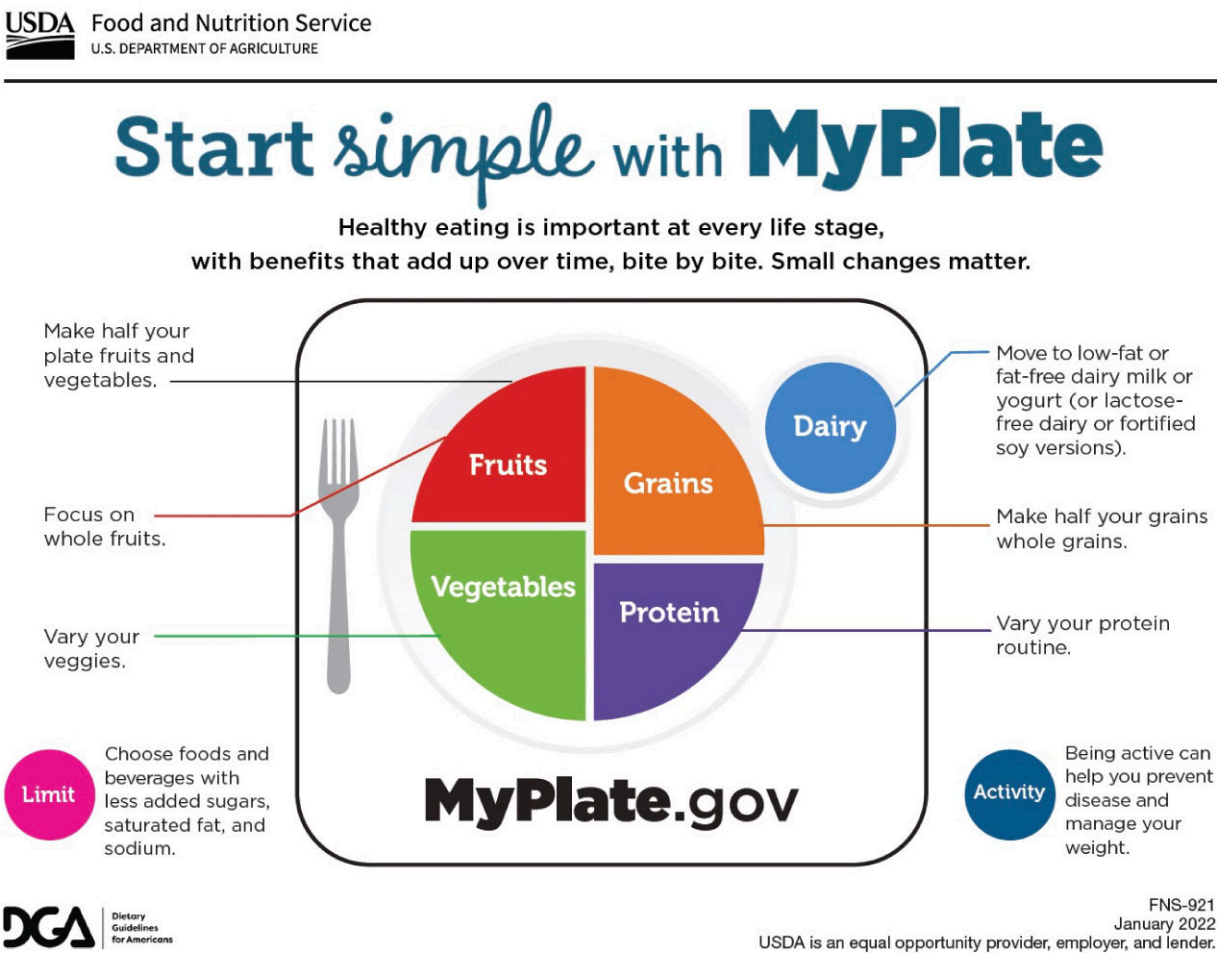

FIGURE 3.5 The U.S. Department of Agriculture created MyPlate to help promote healthy eating. (credit: Untitled by MyPlate.gov/U.S. Department of Agriculture, Public Domain)

Promoting healthy eating habits starts with educating the patient. It is also important to encourage small, manageable changes in eating habits, such as portion control. These small changes can be managed in the long term rather than trying to change everything all at once. Some other examples of small changes include swapping out sugary drinks for water, eating one meatless dinner each week, and eating freshly prepared meals instead of pre-made processed meals.

Sleep Hygiene

The rituals a person practices surrounding their bedtime and sleep routine is called **sleep hygiene**. The sleep routine is an underutilized health-boosting practice. The benefits of having a healthy sleep hygiene routine include longer, more restful sleep, less daytime sleepiness, and more energy.

A healthy sleep hygiene routine is one that is consistent. Many people do not have the ability to maintain a consistent schedule due to work or other obligations, but sleep routines should be prioritized as much as possible. Consistently going to bed and waking up at the same time promotes the natural rhythm of the body. Avoiding stimulants, like nicotine and caffeine, prior to going to bed will allow the body to fall asleep more readily. If a patient is having trouble sleeping, identify nonpharmacological sleep aids and avoid over-the-counter options. Nonpharmacological sleep aids include meditation, diffusing lavender or chamomile essential oils, massage, and a relaxing bath before bed. Aspects of a healthy sleep hygiene routine include exercising during the day to expend extra energy, adjusting bedroom temperature, avoiding screens (TV or phone) in bed, darkening the room while sleeping, and making the room quiet. Doing the same ritual before lying down to sleep is also helpful, like bathing, brushing teeth, and plugging in the phone.

Social and Family Support

Encouraging patients to seek social and family support can cause hesitation in some individuals who view the act of

seeking help as a weakness rather than a strength. Identification and introduction to social support systems within their communities are important to improve overall health outcomes. Assisting patients with these difficult conversations with family members is an appropriate nursing role and will improve the chances of opening communication between the patient, family members, and identifying support people.

Lifestyle Changes

What motivates an individual to make lasting lifestyle change? How can a nurse influence an individual so profoundly that they make the necessary changes to improve their health? Examining these questions assists nurses with goal development and care when assisting patients with successful lifestyle changes.

A nurse's role in the promotion of lifestyle changes in patients is that of coach or facilitator. To facilitate changes in lifestyle, a nurse must assess the patient's daily practices. This assessment, called a **lifestyle assessment**, identifies a patient's everyday patterns of living and establishes how those activities influence the patient's overall health (Pender et al., 2018). Once the assessment is completed, the nurse can determine which area presents the most need for the patient. Together the nurse and patient can create a plan of action that will help the patient make specific lifestyle changes. This plan includes self-determined goals, feedback on progress, identifying and responding to challenges, and determining success.

Lifestyle health promotion activities can be divided into two categories: preventive and reactive. A **preventive lifestyle health-promotion activity** is geared toward preventing adverse health outcomes, whereas a **reactive health-promotion activity** focuses on stopping poor lifestyle behaviors that are known to lead to disease. For instance, a preventive lifestyle health-promotion activity is planned to increase consumption of a healthy diet, this healthy diet will prevent development of disease or illness. A reactive lifestyle health-promotion activity would focus on a group of patients diagnosed with diabetes. The identified goal would be making appropriate changes in the diet to prevent complications of diabetes.

Lifestyle changes do not have to be extreme; in fact, the change of small behaviors may be more sustainable than making a complete overhaul. Small scale lifestyle behaviors that can lead to improved health include things like:

- eating more fruits and vegetables
- substituting water for sugar-filled drinks
- avoiding processed foods
- eating out less often
- replacing unhealthy snacks with healthier options
- incorporating stretching into the daily routine
- proactively staying up to date on current vaccination recommendations
- minimizing noise levels when possible
- removing electronic devices from sleeping area
- avoiding electronic devices one hour prior to sleeping
- engaging in social activities with friends or relatives
- using a reflection journal for 5–10 minutes each day (Gorstein, 2019)

Reactive lifestyle health-promotion activities are essential to improve the quality of life for patients who are already experiencing health concerns. Health-promotion activities focused on smoking cessation, reducing alcohol consumption, avoiding illicit drug use, safe sexual practices, and heart-healthy diets are examples of reactive lifestyle health-promotion activities.

Community Involvement

A **community** is the group of people of which an individual is a part. A community is a collective of people who have something in common or "belong" together. They share values, have social norms or traditions, have established communication patterns, and work together to solve problems (Pender et al., 2018). Being a part of a community is an important aspect of human existence; it can determine a person's health status through the social norms established by that community. Social norms in a community can influence how often a person exercises, how they engage in self-care, what a person eats, and their level of emotional intelligence.

Humans are not meant to be solitary beings, so being part of a community is essential to the holistic health and

well-being of an individual. Communities provide their members with resources and relationships that can promote optimal health, decrease stress, and improve mental health (Salfas et al., 2019). The improved health of an individual community member helps to optimize overall community health.

The role of health promotion in a community setting extends from each individual community member to the whole community. Community health promotion can be used to change the entire community's health status. Examples of Healthy People 2030 goals that could be improved by community health initiatives include increased screenings for oral health, decreasing drug overdose deaths, decreasing suicide rates, and decreasing infant death rates (U.S. Department of Health and Human Services, 2021). The community must recognize that the health goal is important to the health of the community members to buy into the health-promotion campaign.

3.3 Challenges Throughout the Lifespan

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss health challenges encountered with young adults
- Discuss health challenges encountered with middle-aged adults
- Discuss health challenges encountered with the older adult population

As individuals grow and develop throughout their lives, health challenges and health-promotion opportunities change. The type of health issues and methods of health promotion must take into consideration a wide range of factors, including health literacy, physical limitations, motivations, family dynamics, support systems, and access to health services. Creating health-promotion activities with these factors in mind can increase the success of the activity.

Young Adults

The young adult age group is 18 to 35 years old. Erik Erikson (a human growth and development theorist) described the goal of this age group as intimacy versus isolation and summarized the challenges for this group as trying to achieve affiliation, community, and love (Erikson, 1995). The major events in a young adult's life include attending college or career training, entering the workforce, living independently for the first time, navigating a serious intimate relationship, becoming a parent, and making the adjustment to adulthood (Edelman & Kudzma, 2022). Accidental injury, via motor vehicle accidents primarily, is one of the leading causes of death in the young adult age group (CDC, 2024). When providing health promotion and patient education to young adults, nurses should keep in mind possible financial constraints (students or entry-level employees) and focus on building a healthy foundation for optimal health as they age (Table 3.4).

Category	Education Topic
Nutrition	• Healthy diet • Weight management
Substance use	• Alcohol use screening • Tobacco use screening • Illicit drug use screening
Mental health	• Depression screening • Suicide prevention

TABLE 3.4 Health-Promotion Topics Relevant to Young Adults (White et al., 2018)

Category	Education Topic
Safety/violence	• Family/intimate partner violence • Vehicle safety: seatbelts, helmets • Bullying • Guns
Reproductive health	• Pregnancy • Sexually transmitted infections • Birth control
Cancer screenings	• Testicular • Breast • Skin • Ovarian
Infectious diseases	• Recommended vaccinations

TABLE 3.4 **Health-Promotion Topics Relevant to Young Adults** (White et al., 2018)

Middle-Aged Adults

The middle-aged adult group comprises people ages 35 to 65 years old. The Erikson growth and development stage applied to the middle-aged adult group is generativity versus stagnation, which focuses on their need to be productive in society and make an impact on the world (Erikson, 1995). Most middle-aged adults are creating or raising a family and may also be needed to assist in the care of aging parents. Being in between these two groups and having to provide both groups with care earns the middle-aged adult group the nickname the "**sandwich generation**" (Edelman & Kudzma, 2022).

CULTURAL CONTEXT

Chronic Kidney Disease

For 37 million individuals in the United States, chronic kidney disease (CKD) is an everyday reality (Phillip et al., 2022). One of the identified social determinants of health, food insecurity, plays a significant role in the progression of CKD. Dietary choices directly impact complications such as high blood pressure. Notably, food insecurity is more prevalent among Black and Hispanic population groups (Phillip et al., 2022).

In the realm of CKD and associated diagnoses of high blood pressure, patient education and health promotion are indispensable for fostering self-management of the disease processes. While educating patients about healthy food choices is crucial, it becomes complex when dealing with patients experiencing food insecurity, influenced by factors such as food deserts and socioeconomic status. In these instances, nurses need to be mindful of tailoring information to the patient's specific circumstances.

Addressing food insecurity involves identifying community resources that can provide healthy food options for affected patients. Additionally, a critical aspect of patient education for those with CKD and high blood pressure is the importance of a low-sodium diet. Unfortunately, readily available and affordable foods like potato chips, canned goods, processed meats, and snacks are often high in sodium. This poses a challenge for individuals facing food insecurity who may have limited access to healthier alternatives. The relationship between food insecurity and health conditions highlights the challenges faced by individuals striving to make healthy choices, particularly those contending with severe health conditions alongside food insecurity.

Health promotion for middle-aged adults should focus on disease prevention and lifestyle modifications for health

optimization. The most common causes of death for middle-aged adults include cardiovascular disease, cancer, and unintentional injuries (CDC, 2024). Because of the large amount of modifiable risk factors associated with these causes of death, health promotion for the middle-aged adult is of great importance. A factor that a person can control that increases the probability that the person will get a disease is called a **modifiable risk factor**. An example of a modifiable risk factor is diet, whereas race, age, and genetic make-up are nonmodifiable risk factors. A **nonmodifiable risk factor** is a factor that is out of a person's control. Identifying modifiable risk factors and educating patients about them is part of health promotion.

Self-destructive lifestyle behaviors such as cigarette smoking, alcohol and caffeine consumption, and unhealthy eating have become more of a problem for middle-aged adults (Eldeman & Kudzma, 2022). Middle-aged adults start to see the effects of these self-destructive lifestyle behaviors on their bodies and may seek out health-promotion information related to these issues (Table 3.5). Still, it is important for nurses to proactively promote lifestyle behavior changes as appropriate regarding these self-destructive behaviors.

Category	Education Topic
Nutrition	• Low saturated-fat diets • Increasing calcium and vitamin D intake • Caffeine reduction • Low sodium diet
Elimination	• Constipation prevention • Urinary continence maintenance
Physical activity	• Increasing physical activity
Sleep	• Improving sleep hygiene • Insomnia prevention • Sleep apnea awareness
Cognition	• Maintenance of intellectual ability • Cognitive decline awareness
Sensory changes	• Identification of vision changes • Eye diseases common with aging
Stress	• Management of stress
Menopause	• Awareness • Identification • Management
Caregiver role	• Role strain prevention
High-risk lifestyle behaviors	• Smoking cessation • Caffeine reduction • Alcohol consumption management

TABLE 3.5 **Health-Promotion Topics Relevant to Middle-Aged Adults** (Edelman & Kudzma, 2022)

Category	Education Topic
Cancer screenings	• Breast • Colorectal • Cervical • Prostate • Smoking-related cancers: lung, esophageal, mouth, laryngeal
Oral health	• Gingivitis prevention • Improving dental hygiene • Avoiding dental decay

TABLE 3.5 Health-Promotion Topics Relevant to Middle-Aged Adults (Edelman & Kudzma, 2022)

Older Adults

The older adult age group, ages 65 years and older, is the fastest-growing age group (Edleman & Kudzma, 2022). The growth and development stage associated with older adults is integrity versus despair, which suggests that older adults are focused on whether their life has provided them personal satisfaction or has been wasted (Erikson, 1995). The mindset of this age group determines how engaged they will be with health promotion. An older adult who is satisfied with their contributions to society may have more motivation to maintain optimal health than an individual who feels like their life has been a waste of time and energy. People in the older adult age group are often finished raising kids, have retired from jobs, and are adjusting to a new lifestyle. A social determinant of health that is applicable to this age group is poverty since many older adults who are not working depend on Social Security benefits as their only income. Older adults have been found to have poor health literacy, which means that they may not readily comprehend or understand health concepts (Stewart, 2020).

LIFE-STAGE CONTEXT

Meals on Wheels

America's Meals on Wheels Program is a network of 5,000 programs across the nation that provide older adults with healthy meals to help decrease hunger and isolation (Meals on Wheels America, 2023). This rapidly growing population is considered at risk due to their fixed incomes (the inability to make more money), compromised health, and higher risk for malnutrition. Meals on Wheels America delivers 251 million meals a year to older adults. It improves their health, makes them feel more secure, and allows them to live independently for longer.

(Meals on Wheels America, 2023).

Falls are the most common cause of injury in older adults (CDC, 2023a). Fall prevention is crucial for older adults because falls are a leading cause of injury and loss of independence among this demographic. As individuals age, changes in balance, vision, and muscle strength increase the risk of falls. Implementing fall prevention strategies are essential, such as regular exercise to improve balance and strength, home modifications to reduce hazards, and medication management to minimize side effect that could lead to falls. By addressing fall risk factors, older adults can maintain their independence by reducing the likelihood of fall-related injuries that may result in hospitalization or long-term care placement.

Cognitive stimulation is another vital health-promotion topic for older adults. As individuals age, cognitive decline becomes more common, impacting memory, reasoning, and decision-making abilities. Engaging in activities that stimulate the brain, such as puzzles, reading, socializing, and learning new skills or hobbies, can help preserve cognitive function and delay the onset of cognitive decline or dementia. By promoting cognitive stimulation, older adults can maintain their independence by preserving their cognitive abilities, allowing them to continue living actively and autonomously for longer periods. Additionally, maintaining cognitive function enhances overall well-being and quality of life, enabling older adults to remain engaged and fulfilled in their daily activities and

relationships

Health promotion for older adults should also focus on preventing new diseases and managing their chronic diseases (Table 3.6). Older adults are at increased risk for developing diseases like dementia, heart disease, type 2 diabetes, arthritis, and cancer (CDC, 2023b). Other topics to consider for health promotion in older adults include warning signs of dementia, caregiver wellness, screening and prevention of disease or disability, promotion of independence, and promotion of physical activity (CDC, 2023b).

Category	Education Topic
Nutrition	• Food insecurity • Bone health
Elimination	• Constipation prevention • Urinary continence maintenance
Physical activity	• Maintaining physical ability • Promotion of independence • Pain prevention/alleviation
Cognition	• Maintenance of intellectual ability • Cognitive decline awareness • Dementia/Alzheimer disease risk awareness
Sensory changes	• Identification of vision changes • Eye diseases common in aging
Community	• Encourage active roles in the community
Chronic disease	• Risk reduction • Prevention and management

TABLE 3.6 Health-Promotion Topics for Older Adults (Edelman & Kudzma, 2022)

LINK TO LEARNING

Resources for Older Adults

The National Council on Aging presents the Center for Healthy Aging for Professionals. This resource provides evidence-based health-promotion information (https://openstax.org/r/77EvBasHeaInfo) with the goal of helping older adults live healthier lives.

3.4 Purpose of Health Education and Patient Teaching

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Define the objectives of health teaching
- Discuss the facilitators and barriers to patient education
- Describe resources utilized in patient education

The purpose of health education is to empower individuals to make the best behavior choices to improve their quality of life, promote adherence to prescribed interventions and medications, increase the understanding of their

conditions or treatments, and maximize patient satisfaction (Gusman, 2022). Nurses are the largest group of health-care providers, with the most interaction with patients, putting them in an optimal position to educate patients (AACN, 2023).

Health Teaching Objectives

Health teaching should occur at every encounter between the nurse and patient. Each encounter is an opportunity for health promotion through primary, secondary, or tertiary prevention. The model of incorporating unique learning styles, educational background, and assessment to facilitate increasing patient health knowledge levels is considered **health teaching**.

Patients will inevitably be diagnosed with new conditions, be prescribed new medications, or be introduced to new health-promotion activities as they move through their life. When a new condition is diagnosed, it is important to start the task of educating the patient about management of the condition and its potential complications. Discussing complications of the condition provides the motivation to manage the condition to the best of the patient's ability. The more knowledge about the health condition that the patient has, the better they are at self-management, and this improves their quality of life (Lord et al., 2021).

Medication Education

Medication education is critical for patients to understand how to safely self-administer without complications. Medications taken incorrectly can cause side effects, adverse events, or even death. Medication errors cause unexpected hospital admissions, increased lengths of stay, and increased health-care costs (Aldhafeeri & Alamatrouk, 2019). Medication compliance and the importance of taking medications as prescribed for safety and efficacy should also be included in the provided education. When teaching a patient about medications, the nurse must explain the different names, such generic and trade names. Each medication has a generic and a brand name, and it is important that the patient understands this because they could inadvertently take two of the same medications if given bottles with name variations. Another essential aspect of medication education is the medication's known side effects. A **side effect** nonlethal but irritating health effect of a medication, and the patient needs to know that it is possible to have them after taking the medication. Conversely, an **adverse effect** (or complication) is a medication-caused issue that is more serious, may be life threatening, and should be reported to the prescribing provider. The patient should be taught the common adverse effects of a medication so that they report the issues and avoid devasting consequences of taking the medication.

A **contraindication** is a situation in which a medication should not be taken by the patient for a specific reason, like another disease process or because of another medication. A common contraindication is pregnancy, meaning that if the patient is pregnant, trying to get pregnant, or becomes pregnant, they should not be taking the medication. Knowing the contraindications of medications can help the patient avoid harm related to the contraindicated aspect of their health. Medication safety is a complex topic and may be overwhelming to the patient, especially if they have multiple prescription medications. It is vital that the nurse not rely only on pharmacy handouts to educate the patient regarding important medication safety information. During each encounter, the nurse should address any patient or family concerns regarding the medications.

Because medication safety is an extremely important safety concern for people of all ages, nurses are required to complete a medication reconciliation process when a patient encounters the health-care system. The goal of a **medication reconciliation** is to prevent common medication errors through a comparison process, making sure the medications that the patient is taking are the medications that have been prescribed, and compiling an accurate list of current medications (Anazi, 2021). The medication reconciliation process has helped to prevent medication errors such as omissions, duplications, dosing errors, or drug interactions (Anazi, 2021).

Discharge Teaching

The nursing intervention that allows the patient to understand how to care for themselves at home after an acute health issue is called **discharge teaching**. Hospitalization has occurred due to a change in the health status of the individual, whether that change was an illness or surgery. Changes in the health status create a knowledge deficit for the patient, and discharge teaching is designed to bridge the knowledge gap so that the patient can adequately care for themselves at home and not be readmitted to the hospital for further complications. Discharge teaching includes education about any new medications the patient has been prescribed, any new interventions that the patient must perform (dressing changes, medication, etc.), what complications may occur, when and how to report any

complications, and when follow-up appointments with providers should take place. The Joint Commission (2018) requires that discharge education include follow-up appointment information, that the patient or caregiver be given a hard copy of any discharge documents, and that the process be thoroughly documented in the medical record. The nurse must not forget to measure the patient's successful understanding or need to re-teach, reinforce, and re-educate the patient before discharge.

INTERDISCIPLINARY PLAN OF CARE

Interdisciplinary Care for Patient Discharge

Nurses work with an interdisciplinary team and coordinate care for patients being discharged from the hospital. The following are examples of these team members:

- The nurse is responsible for providing discharge instructions and education.
- A respiratory therapist is responsible for providing post-discharge instructions for any pulmonary machines, such as a sleep apnea machine. They provide the patient with education on breathing treatments and pulmonary exercises such as an incentive spirometer.
- The provider orders the discharge of the patient and any specialty referrals needed to manage the patient's care once discharged.
- The case manager coordinates ancillary departments needed to sign off on the patient's plan of care, such as a wound care specialist or dietician and coordinates resources and follow-up for the family once the patient is discharged.

Barriers to and Facilitators of Patient Education

Not all patients have the same level of access to health-care or patient education. Barriers to patient education include reading level, comprehension level, spoken or written language barriers, cultural barriers, learning style, motivation to learn, and health literacy levels (Gusman, 2022). A thorough history and assessment can identify many of these barriers, and a plan to circumvent them can be made. For example, if a patient has a third-grade education level, then the nurse can create handouts that are at an appropriate reading level for the patient to refer to at home.

Another barrier to patient education is **health literacy**, which is the level of knowledge that an individual has about health care, health issues, and overall health and well-being. Having a low health literacy level can affect the amount of knowledge that a person has about health in general, and especially their understanding of disease processes or treatment options. Patients at risk of having low health literacy levels include those with language barriers, some disadvantaged groups, and older adults (Gussman, 2022). Low health literacy can account for a patient's noncompliance with prescribed care, missed appointments, and medication errors. Researchers found that approximately 65 percent of patients admitted to the hospital did not understand the treatments they were receiving or why they had been admitted to the hospital (Wang & Lo, 2021). For patients with low health literacy, it is essential to present information in a clear, easily understandable format and avoid complicated medical terms or jargon. Nurses should always evaluate patient understanding using methods, such as teach-back.

LINK TO LEARNING

Health Literacy

The definition of health literacy (https://openstax.org/r/77HealthLitDef) was updated and released with the U.S. government's Healthy People 2030 initiative.

All nurses are responsible for providing patient education and health promotion, but some specific roles within nursing focus on these objectives directly. Job roles that focus on patient education promote positive patient outcomes and improve patient satisfaction. A nurse navigator or patient navigator role improves the communication between patients and providers, improves the patient's compliance with appointments and treatments, and works to remove any barriers the patient may have to receiving the care that is needed (Doyle, 2019). Another nursing role

that facilitates patient education is the case manager or care coordinator. Care coordinators can bridge the gap between the provider's prescribed plan of care and the patient's individual needs and preferences. There are medical roles for specific types of education, such as a diabetes educator or renal transplant educator. Both educator roles focus on a specific patient population and specific education content.

Resources for Patient Education

Topic-specific education resources are available from health-care associations specializing in specific types of health. For instance, if a patient has a heart condition, there are many free patient education resources from the American Heart Association. These resources are organized according to disease process and are available on their website. There are a multitude of health-care associations that provide free educational resources, including the American Stroke Association, the American Cancer Society, and the American Diabetes Association. Patients can be referred to resources like these for their personal use. Nurses can print relevant handouts for patients or obtain patient education ideas from these resources.

Not all educational resources contain legitimate and up-to-date information. The nurse must be able to identify sources of quality information for teaching and referral. Credible resources are relevant to the patient's situation, backed by research, and contain information written in an easy-to-read format.

LINK TO LEARNING

Reliable Online Information

Read this article about finding reliable health information online (https://openstax.org/r/77ReliableHeInf) on the National Institutes of Health's website.

3.5 Strategies for Optimal Patient Education

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Explore visual methods for delivering patient education
- Explore audio methods for delivering patient education
- Discuss technology utilized in patient education
- Summarize methods of educating patients with a different language

Patient education can empower a patient to make more informed health-care-related choices and, through those choices, improve or maintain their quality of life. Patient education should be a well-thought-out and planned encounter, not an afterthought of the nurse-patient encounter. Providing quality patient education requires nurses to understand the content they are teaching and understand how to teach it for the best results.

Patient teaching requires clear communication and often takes time to achieve the optimal level of patient knowledge. The time devoted to patient education includes preparation and implementation of the education plan. Nurses can use education templates to assist with typical or recurring patient education needs. For example, if a nurse works on a stroke care floor, the patients and caregivers will need to understand follow-up care for strokes. This stroke education can be structured so that each patient receives the same teaching points, and the nurse can individualize teaching on a patient-by-patient basis, such as using the patient's native language. This allows for the most important educational points to be covered within the template and individual needs to be met through additional individualized content.

Audio/Visual Methods

A **visual method** of communication involves patient education material that has a visual component, such as posters, graphics, brochures, handouts, and maps. Educational materials that require the patient to read content should be written at or below a sixth-grade reading comprehension level (Baumann et al., 2023). Visual education materials are convenient for the educator and can serve as reinforcement of face-to-face education.

An **audio method** of communication involves patient education material that has an audio component, such as videos, audio recordings of patient education materials, musical or lyrical lessons, and informational podcasts.

Audio patient education options are convenient for those with visual impairments or an inability to read. Audio methods of patient education materials need to be presented in a logical format that clearly identifies the purpose of the educational material and does not distract from the needed patient information (Shoemaker et al., 2020).

Kinesthetic Methods

Many patient education situations require patients to learn a skill or maneuver that is specific to their health issue. For example, a postoperative patient will require education on how to change a wound dressing. The most effective education for this type of skill is hands-on learning, also known as **kinesthetic learning**. A patient who can perform a skill with the supervision of a nurse will have more confidence and understanding of the skill and therefore will perform the skill as prescribed instead of improvising. The nurse will demonstrate the skill for the patient, then require the patient to return-demonstrate the same skill to prove their understanding, which is a learning evaluation called the **teach-back method**. This provides practice for the patient, and an opportunity for the nurse to identify any problems with the technique used to perform the skill.

Nurses can allow a patient to return-demonstrate skills in almost any nursing setting, including hospitals, clinics, home-care settings, and long-term care facilities. The return-demonstration technique can also be used to educate a caregiver on the proper way to perform caregiving tasks when the patient is home. Some health facilities have patient learning centers where learning, practicing, and demonstrating health-related skills allows patients and their families to become instrumental in their own care.

Technology

Technology and the internet have increased access to health-care information for patients. It is extremely important for nurses to be familiar with how to identify a reliable information source and how to refer patients to these expert sources of information. Clarifying reputable sources prevents misconceptions and avoids delays in treatments caused by patients attempting to self-treat through internet research.

There are some drawbacks regarding technology, including that some patients, especially older adult patients, may not have access to technology or the internet, or they have a knowledge deficit regarding how to use technology or access information on the internet (Stewart, 2020). The nurse should assess both the patient's ability to use technology and their access to it before recommending a technology-focused health-promotion modality.

The provision of health-care services remotely through a telecommunications device like a computer or phone is called **telehealth**. Telehealth services have been able to provide patients with a quality of care for many health conditions similar to what they would receive in face-to-face encounters with providers. Telehealth and has also been found to provide some cost savings to both the patient and the provider (Shaver, 2022). Telehealth services include virtual visits, provider-patient conversations, online portals with patient results, sending or receiving messages from providers, appointment scheduling, or prescription requests (Watson, 2020).

The telehealth service that enhances patient self-care management and assists with the patient awareness, self-management of chronic diseases, early detection of acute exacerbations, reduces emergency hospital admissions, and provides more frequent interactions with health-care providers is called **telemonitoring** (Chow et al., 2023). Patient education is not the only objective of this type of telemonitoring program; it also provides the patient with more opportunity to increase awareness of their own disease process. The patient can then participate in managing their own health goals.

Patients Who Speak a Different Language

Patients may have difficulty understanding patient education terms if English is not their native language. Providing patient education in the person's first language will facilitate more comprehension and understanding. Many resources can be found that are premade in common non-English languages like Spanish, French, German, or Arabic.

It is important to provide patients with an interpreter when they do not speak the same language as the health-care provider. It is not adequate to use a lay person as an interpreter because they may not have the health-care knowledge to interpret conversations correctly to the patient. The patient cannot legally consent if the family interprets for them. When a face-to-face interpreter is not available, nurses can easily access language lines, telephone interpretation services, or video interpreter services, a service offered by every accredited health-care facility.

Evaluation of Patient Learning

After completing any intervention, nurses are required to complete an evaluation of the intervention. Evaluation of learning helps the nurse identify whether the patient has any further learning needs or if the education has been effective. The effectiveness of patient education can be evaluated by asking the patient questions to gauge their understanding of the topic, having the patient demonstrate something that they just learned, or having them explain the topic back. The teach-back method is when the learner is required to teach the content back to the educator to demonstrate understanding of the topic. The teach-back method is a relatively quick and accurate way to determine if there are any misunderstandings of the material. Depending on the education setting, a quiz about the topic could be completed by the patient and graded by the educator.

The evaluation stage of patient education is very important because it gives the nurse the opportunity to clarify misunderstandings, re-explain concepts, or even offer alternate education modalities if the patient is having trouble understanding the concept. This step is often overlooked in practice and causes the patients to be released or discharged without the minimum knowledge of how to maintain the plan of care that has been designed for them. It is common for a patient to be labeled as nonadherent (not following provider's orders) when instead they did not actually understand what they were supposed to be doing or how to carry out the task.

The nurse can evaluate a patient's learning by asking them to repeat key facts, quizzing the patient, or asking for a return demonstration of a skill. Once the patient has demonstrated increased knowledge of the subject, the nurse must document that the education session has occurred. Patient education documentation should include the topic of the patient education session, the patient's learning style, the learning goals, a summary of the information or skills taught, the teaching methods used, and an evaluation of the learning (EuroMedInfo, n.d.).

Summary

3.1 Health Promotion and Wellness

- The Health Belief Model highlights factors influencing individuals' decisions to change health behaviors and the significance of individualized, relevant information in promoting behavior change.
- Betty Neuman's health continuum emphasizes the role of health-care workers in intervening at different stages to promote wellness and prevent illness. Primary, secondary, and tertiary prevention strategies can be used to prevent health issues or improve quality of life.
- Ideal health-promotion principles include patient participation, empowerment, and holism.
- A positive health concept can impact a person's well-being.
- Health-promotion activities that consider social determinants and aim for health-care equity are essential. Using the World Health Organization's social determinants of health, patients in need can be identified and targeted for health promotion.
- Wellness is the realization of potential through goal-directed behavior and satisfying relationships.

3.2 Strategies for Improving Healthy Habits

- The COVID-19 pandemic necessitated changes in health-care delivery, prompting nurses to adopt new methods like social media and telehealth for patient education and health promotion.
- Health disparities underscore the need for tailored approaches in health promotion to address underserved populations.
- Health-promotion efforts target various areas, including nutrition; obesity prevention; vaccination compliance; mental health; chronic disease management; opioid addiction, overdose, and death; and domestic abuse.
- Physical exercise is crucial for preventing obesity, chronic illnesses, and age-related changes, with flexibility, muscle strength, cardiorespiratory endurance, and postural stability being key components.
- Mindful self-care practices, such as meditation and journaling, are essential for holistic well-being and promoting awareness of one's health status and ways to improve it.
- Establishing healthy boundaries between work and personal life is vital for managing stress and achieving work-life balance.
- Educating patients about nutritious eating habits and encouraging gradual, sustainable changes is important for long-term health.
- Maintaining good sleep hygiene, including consistent sleep schedules and avoiding stimulants before bed, promotes restful sleep and overall well-being.
- Supporting spiritual health involves understanding and respecting patients' spiritual beliefs, practices, and needs, and incorporating activities like meditation or religious rituals.
- Encouraging social and familial support and community involvement enhances overall health outcomes and fosters a sense of belonging and support.

3.3 Challenges Throughout the Lifespan

- Health challenges and promotion opportunities change as individuals grow and develop throughout their lives.
- Considerations for health-promotion activities include health literacy, physical limitations, motivations, family dynamics, support systems, and access to health services.
- Young adults (18 to 35 years) face challenges related to education, job security, and starting families, with health promotion focusing on building a healthy foundation amid financial constraints and, sometimes, accidental injuries.
- Middle-aged adults (35 to 65 years) experience the "sandwich generation" phenomenon, balancing family care and work responsibilities. Health promotion targets disease prevention, lifestyle modifications, and modifiable risk factors like self-destructive behaviors.
- Older adults (65+ years) grapple with issues like health literacy, poverty, and adjusting to retirement. Health promotion emphasizes maintaining independence, addressing common causes of death like falls, and promoting healthy lifestyle choices and self-care practices.

3.4 Purpose of Health Education and Patient Teaching

- Health education aims to empower individuals for optimal behavior choices, thereby enhancing their quality of

life and promoting compliance with interventions and medications. It also seeks to increase understanding of conditions or treatments and ultimately improve patient satisfaction.

- Health teaching is an integral part of every nurse-patient encounter, focusing on primary, secondary, or tertiary prevention strategies. It addresses new health conditions, medications, and discharge instructions to ensure comprehensive patient education.
- Medication education is crucial for safe self-administration. Nurses educate patients about generic versus brand names, distinguish between side effects and adverse effects, highlight contraindications, and ensure patients understand the importance of medication safety beyond pharmacy handouts.
- Discharge teaching bridges the knowledge gap post-hospitalization, empowering patients to manage their health at home effectively. It includes medication education, instructions on interventions, recognition of complications, and guidance on follow-up appointments.
- Various barriers such as reading level, comprehension, language, cultural differences, learning styles, motivation, and health literacy levels can hinder patient education efforts. Recognizing and addressing these barriers is essential for effective education delivery.
- Nurse navigators, patient navigators, case managers, and care coordinators play pivotal roles in facilitating patient education. Specialized roles like diabetes or renal educators also contribute to tailored and effective education strategies.
- Health-care associations provide valuable resources tailored to specific diseases or conditions. Patients can access these resources online or through printed handouts, offering comprehensive educational support beyond clinical settings.

3.5 Strategies for Optimal Patient Education

- Patient education is crucial for informed health-care decisions and improved quality of life.
- Effective patient education requires thorough planning and clear communication.
- Nurses need to understand the content and use suitable teaching methods.
- Visual aids like posters and brochures, along with audio resources, help with effective communication.
- Kinesthetic methods, involving hands-on learning, are beneficial for teaching practical skills.
- Technology, including telehealth and telemonitoring, expands access to health-care information.
- Disparities in technology access must be addressed to ensure equitable health-care education.
- Providing education in patients' native languages, supported by professional interpreters when necessary, facilitates comprehension.
- Evaluation of patient learning is crucial to assess understanding and address misconceptions.
- Patient education is essential to optimize health-care outcomes and should be integrated thoughtfully into clinical encounters.

Key Terms

action competence learning model critical thinking model that is used in the creation of health-promotion activities

adverse effect (also: *complication*) medication-caused issue that is more serious, may be life threatening, and should be reported to the prescribing provider

audio method patient education material that has an audio component like videos, audio recordings, musical lessons, informational podcasts

collective action competence when action competence is applied to a group, community, or population

community group of people that an individual is a part of

contraindication situation in which a medication should not be taken by the patient for a specific reason

discharge teaching nursing intervention that promotes patient understanding of how to care for themselves while outside of the health-care setting

health a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity

health literacy level of knowledge that an individual has about the health-care system, health issues, and overall health and well-being

health promotion holistic and proactive process of prevention of health issues through which people are empowered to take control of their health-related choices and reach the best possible health status

health teaching model of incorporating individualized learning styles, educational background, and assessment to facilitate increasing patients' level of health knowledge
health-care disparity when a certain group of people have worse health outcomes than other groups of people for no obvious reason
health-care equity equal opportunity for people to achieve their desired health outcomes
healthy boundary guideline that people set to regulate relationships
kinesthetic learning patient education technique that provides hands-on interaction with learners, such as models or practice labs
lifestyle assessment identifies everyday patterns of living and how those patterns influence the individual's health status
medication reconciliation prevention of common medication errors through a comparison process making sure the medications that the patient is taking are the medications that have been prescribed and compiling an accurate list of current medications
mental, emotional, and social wellness state in which a person feels satisfaction with and can effectively cope with changes in their mental, emotional, and social health status
mindfulness practice allows a person to quiet the mind and focus their awareness on the present state of being
modifiable risk factor disease risk factor that the person is in control of; can increase the probability that the person will get the disease
nonmodifiable risk factor disease risk factor that is out of a person's control but increases the probability that the person will get the disease
physical wellness optimal physical function
positive health concept subjective view of one's health status that allows a person to function at optimal levels, cope with life's stressors, and maintain a feeling of satisfaction, even though they experience stressors
preventive lifestyle health-promotion activity activity geared toward preventing adverse health outcomes
reactive health-promotion activity activity that focuses on stopping poor lifestyle behaviors that are known to lead to disease
religion expression of a person's spirituality that is usually an organized, community-based experience
sandwich generation middle-aged group caring for both their own children and their parents
self-care practice promotes the health and well-being of the individual and give time for patients to focus on what their body needs
side effect nonlethal but irritating health effect of a medication
sleep hygiene rituals a person practices surrounding their bedtime and sleep routine
spiritual wellness optimal functioning of a person's spirit, which is subjective and individualized to each person
spirituality concept of what gives an individual a sense of meaning and purpose in life
teach-back method learning evaluation in which the will demonstrate the skill for the patient, then require the patient to return-demonstrate the same skill to prove their understanding
telehealth health care that is provided remotely through a telecommunication device like a computer or phone
telemonitoring type of telehealth that enhances a patient's ability to care for themselves and manage chronic disease, detect acute changes, and decrease the need for hospitalization by providing frequent interaction with health-care providers
visual method patient education material that have a visual component, such as posters, graphics, brochures, handouts, and maps
wellness goal of the health continuum, signifying peak holistic function

Assessments

Review Questions

1. What is the key factor in motivating health-related behavior change according to the Health Belief Model?
   a. perceived susceptibility and consequences
   b. knowledge alone
   c. social pressure
   d. external rewards

2. What is the primary purpose of Healthy People 2030?

a. to provide health-care coverage for all
b. to set goals for health promotion and wellness
c. to address immediate health-care needs
d. to focus on individual medical treatments

3. What principle emphasizes the importance of involving patients in the planning, delivery, and evaluation of their care?
a. holism
b. equity
c. intersectionality
d. empowerment

4. What are the four basic components of a well-balanced physical exercise routine?
a. strength, cardiovascular activity, meditation, flexibility
b. flexibility, muscle strength, cardiorespiratory endurance, postural stability
c. weightlifting, running, yoga, aerobics
d. cardio, weight training, Pilates, mental stability

5. What is the nurse's role in promoting lifestyle changes, and how are lifestyle health–promotion activities categorized?
a. The nurse is an authority figure, and activities are categorized based on age.
b. The nurse is a coach, and activities are categorized as physical or mental.
c. The nurse is a passive observer, and activities are not categorized.
d. The nurse is a researcher, and activities are categorized alphabetically.

6. What is a reason why being part of a community has a positive effect on holistic health?
a. Communities have strict rules that individuals must follow.
b. Being part of a community is irrelevant to individual health.
c. Communities provide resources and relationships that promote optimal health.
d. Community involvement only affects mental health, not physical health.

7. What is the primary focus when promoting health among middle-aged adults, considering the most common causes of death for this age group?
a. mental well-being
b. muscular strength
c. disease prevention and lifestyle modifications
d. social engagement

8. What is the leading cause of death in the young adult age group?
a. cardiovascular disease
b. cancer
c. accidental injury
d. diabetes

9. What age group is often referred to as the "sandwich generation"?
a. young adults
b. middle-aged adults
c. older adults
d. adolescents

10. What is the primary purpose of health education?
a. to increase health-care costs
b. to decrease patient satisfaction

c. to empower individuals to make informed choices
d. to limit patient access to medications

11. What is an example of a task that would empower a patient to prevent readmissions to the hospital?
a. providing entertainment options
b. suggesting new hobbies
c. educating on medication management and potential complications
d. discussing unrelated health topics

12. What is health literacy?
a. the ability to read medical textbooks
b. the level of knowledge an individual has about health care
c. the ability to perform medical procedures
d. the understanding of medical jargon

13. What method of patient education is most suitable for individuals with visual impairments?
a. reading brochures and handouts
b. watching educational videos
c. listening to audio recordings
d. exploring the MyChart feature of the patient portal

14. What patient education method is best suited for teaching practical skills such as wound dressing changes?
a. visual methods
b. audio methods
c. kinesthetic methods
d. technological methods

Check Your Understanding Questions

1. Describe Betty Neuman's health continuum and how nurses can use it to guide interventions at different points on the continuum.

2. How does a positive health concept contribute to individuals' acceptance of health promotion and teaching? Provide examples.

3. Discuss the importance of considering social determinants of health in health-promotion planning.

4. Explain the significance of a consistent sleep hygiene routine and provide examples of nonpharmacological sleep aids.

5. What are the key principles for promoting healthy eating habits, and why is it important to encourage small, manageable changes?

6. Describe the role of mindfulness in promoting holistic health and well-being.

7. Describe two health-promotion topics relevant to older adults and explain why they are important for maintaining their independence and well-being.

8. Identify one modifiable risk factor for disease that is prevalent among middle-aged adults and explain its significance in health promotion.

9. Explain the importance of health education in empowering individuals to obtain their optimal level of health.

10. Describe the role of nurses in health teaching.

11. Describe the significance of preparing and implementing an education plan in patient teaching.

12. Discuss the advantages and drawbacks of technology-focused patient education, considering factors such as access and internet literacy.

13. Explain the importance of providing patient education in the patient's primary language and discuss strategies for overcoming language barriers in health-care settings.

Reflection Questions

1. How can nurses address health-care disparities and promote health equity in their practice?
2. Reflect on the role of spirituality in promoting holistic health. How might understanding and supporting the spiritual aspects of diverse communities contribute to effective health-promotion strategies?
3. Reflect on how societal attitudes toward health promotion might differ among young adults, middle-aged adults, and older adults. How might these attitudes influence the effectiveness of health-promotion initiatives targeted at each age group?
4. Consider the concept of "modifiable risk factors" discussed in the context of middle-aged adults. Reflect on how individuals' awareness and management of these factors might evolve as they transition through different life stages.
5. Consider the concept of health literacy discussed in the content. How might you adjust your communication approach when interacting with a patient with low health literacy levels?
6. Consider the role of nurse navigators and care coordinators in patient education. How do these roles contribute to improving patient outcomes and satisfaction?
7. Reflect on the importance of using external resources for patient education. How can health-care professionals leverage resources from health-care associations to enhance patient understanding and engagement?
8. Reflect on the significance of evaluating patient learning in the patient education process.
9. Consider the impact of technology on patient education. How can nurses address disparities in access to technology and internet literacy among patients?

What Should the Nurse Do?

Selena is a 35-year-old female who works full-time as a marketing executive. Her lifestyle is busy, and she often works overtime. Selena has been feeling fatigued and stressed. Concerned about her health, she schedules a visit with her primary care provider.

Nursing Assessment: Selena reports feeling tired, stressed, and overwhelmed by her schedule. She reports irregular sleep patterns, lack of exercise, and a fast-food diet. Selena's blood pressure is elevated, and her BMI and other measurements indicate that she is overweight.

The nurse must come up with a health-promotion plan for Selena.

1. Selena's lack of exercise is a physical wellness issue. What health-promotion topics would help Selena improve her physical wellness?
2. Stating that she is overwhelmed and stressed indicates that Selena has a mental and emotional wellness imbalance. What health-promotion topics are appropriate to improve Selena's mental and emotional wellness?
3. Patient partnership is key to health-promotion planning. What important contributions can Selena make to the health-promotion plan to individualize it to her value set and personal preferences?

Jorge is a 45-year-old male who has attempted to make lifestyle changes in the past but has faced difficulties sustaining them. He is frustrated by his previous failures and is hesitant to try again. Jorge has a sedentary lifestyle and poor eating habits, and he struggles with work-life balance.

4. How would you as a nurse approach Jorge to understand the reasons behind his previous failures in making lifestyle changes? Outline key strategies to assess his barriers and concerns.
5. Develop a new plan for Jorge that addresses his past challenges and increases the likelihood of sustainable lifestyle changes. Provide two tailored recommendations with rationales.

6. Sarah is a registered nurse working in a community health-care center. Her role involves providing health promotion and education to individuals across different age groups. Recently, she has encountered a challenging situation where she needs to differentiate her teaching approach for young adults, middle-aged adults, and older adults.

   Sarah's first patient of the day is Tom, a 23-year-old college student. Tom is experiencing symptoms of stress and anxiety due to upcoming exams and adjusting to living away from home for the first time. Sarah knows that young adults like Tom often face challenges specifically related to education, financial pressures, and mental health.

   Next, Sarah meets with Lisa, a 45-year-old mother of two who is struggling to balance her career, family responsibilities, and caring for her aging parents. Lisa expresses concerns about her hectic lifestyle and its impact on her health. Sarah recognizes that middle-aged adults like Lisa often face challenges related to managing multiple roles and coping with stress.

   Last, Sarah meets with Mr. Johnson, a 70-year-old retiree who is struggling with mobility issues and chronic health conditions. Mr. Johnson expresses concerns about his increasing dependence on others and fears of losing his independence. Sarah understands that older adults like Mr. Johnson often face challenges related to aging, health literacy, and maintaining independence.

   How can Sarah tailor her education strategies to address the specific concerns of young adults, middle-aged adults, and older adults and effectively promote health and well-being across the life span?

Jamal, a registered nurse working in a busy hospital, is assigned to care for Mr. Sun, a 62-year-old male from China who speaks little English. He is admitted for exacerbation of heart failure. Mr. Sun has a history of heart disease and hypertension. During Jamal's initial assessment, he realizes that Mr. Sun has limited knowledge about his condition and the medications he is prescribed. Additionally, he observes that Mr. Sun seems overwhelmed and anxious about his health.

Jamal faces a dilemma in balancing the need to provide comprehensive health education to Mr. Sun while navigating various barriers that may hinder effective communication and understanding. He recognizes the importance of empowering Mr. Sun to manage his condition effectively to improve his quality of life and prevent readmission.

7. What level of health literacy does Mr. Sun exhibit?
8. What are some cultural or language barriers that could affect Mr. Sun's learning?
9. What are some resources that Jamal could provide for Mr. Sun?

Mariah is a nurse working in a community health center. She encounters diverse patients with varied learning needs daily. By tailoring her approach to accommodate the unique learning needs of each patient, Mariah can ensure that all individuals receive comprehensive education and support to effectively manage their health conditions and improve their overall well-being. How can Mariah address the learning needs of the following four patients?

10. Emma is a 45-year-old female who recently underwent surgery for glaucoma and is now visually impaired. She visits the health center for diabetes management education.
11. Jack is a 60-year-old male who recently suffered a stroke, leaving him with partial paralysis in his right arm and leg. He relies on public transportation because he cannot drive and seeks education on stroke rehabilitation.
12. Adam is a 30-year-old male with dyslexia who struggles with reading comprehension. He visits the health center for education on managing his asthma.
13. Mia is a 55-year-old female who is deaf and communicates primarily through American Sign Language (ASL). She visits the health center for education on heart disease prevention.

Competency-Based Assessments

1. Use the template to create a health-promotion plan for Selena, a 35-year-old female who works full-time as a marketing executive. Her lifestyle is busy, and she often works overtime. Selena reports feeling tired, stressed, and overwhelmed by her schedule. She reports irregular sleep patterns, lack of exercise, and a fast-food diet. Selena's blood pressure is elevated, and her BMI and other measurements indicate that she is overweight.

Health-Promotion Aspect	Individualized Health-Promotion Activity
Physical wellness	
Mental/emotional wellness	
Social wellness	
Spiritual wellness	
Recommended resources	

2. Perform a literature search about a specific type of recent infections in your area, such influenza, COVID-19, or H1N1. Determine how it employs mechanisms to evade the body's immune response. Develop a brief educational presentation for community members to help reduce the risk of infection.
3. Create an engaging handout for patients regarding the importance of obtaining annual influenza and COVID vaccines.
4. Maria is a 65-year-old female who recently underwent knee replacement surgery. She is eager to learn how to properly perform postoperative exercises and manage her pain at home. What are the best methods of patient education to effectively communicate with this patient?
5. Ahmed is a 40-year-old male who was diagnosed with diabetes. He is struggling to understand how to monitor his blood sugar levels and make appropriate dietary changes. What are the best methods of patient education to effectively communicate with this patient?
6. Ella is a 25-year-old college student who has been experiencing symptoms of anxiety. She is interested in learning relaxation techniques and coping strategies to manage her stress. What are the best methods of patient education to effectively communicate with this patient?
7. Javier is a 55-year-old Spanish-speaking male who recently had a heart attack. He has limited English proficiency and requires education on his medication regimen and lifestyle modifications. What are the best methods of patient education to effectively communicate with this patient?
8. Linda is a visually impaired 70-year-old female who needs education on managing her hypertension and taking her medications correctly. What are the best methods of patient education to effectively communicate with this patient?

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CHAPTER 4

Clinical Judgment in the Nursing Process

FIGURE 4.1 Health-care providers collaborate to ensure quality patient care. (credit: "Collaborating in the ER: Reservists assist, learn in community hospitals" by Senior Airman Jonathan Stefanko/US Air Force, Public Domain)

CHAPTER OUTLINE

INTRODUCTION Picture this: You are a newly graduated nurse fresh off orientation in a critical care unit. You get reports on two of your patients: one who is on a ventilator after a head injury, and the other who is being treated for heart failure. The nurse giving you the report mentions that the patient with heart failure has been receiving a large dose of diuretic medications and has been having some irregular heartbeats on the monitor. Reflecting on your nursing knowledge, you remember that abnormal potassium levels can affect the heart's rhythm, so you pull up the patient's chart to check. As you suspected, the patient's potassium level is very low, likely from the high dose of diuretics being administered—certain diuretics cause a loss of potassium. You quickly get in contact with the treating provider to recommend potassium replacement to get the patient's levels back to normal.

Had you not made this connection, the patient could have experienced cardiac arrest or other life-threatening symptoms related to their low potassium level. You used your nursing knowledge to make a clinical judgment call that most likely saved your patient's life. The ability to critically think and exhibit clinical judgment in practice are imperative skills for new nurses to have. This chapter explores the shift in nursing practice and education that is currently taking place to put more emphasis on clinical judgment to better prepare new graduates for situations like this.

4.1 Critical Thinking and the Nursing Process

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Identify the purpose of the nursing process
- Define and apply the steps of the nursing process to patient care
- Explain how clinical judgment is used to guide patient care using the nursing process

The steps of the nursing process provide direction for nurses when making patient care decisions (Figure 4.2). Each decision affects the patient's health status, and safe and effective decisions by nurses enhance patient outcomes (Nibbelink & Brewer, 2018). The thought process that allows nurses to arrive at a conclusion based on objective and subjective information about a patient—and thereby achieve positive patient outcomes—is called clinical judgment. This thought process is an essential part of safe and effective decision-making in nursing practice (Tanner, 2006). This chapter focuses on how to use clinical judgment when providing nursing care for medical-surgical patients.

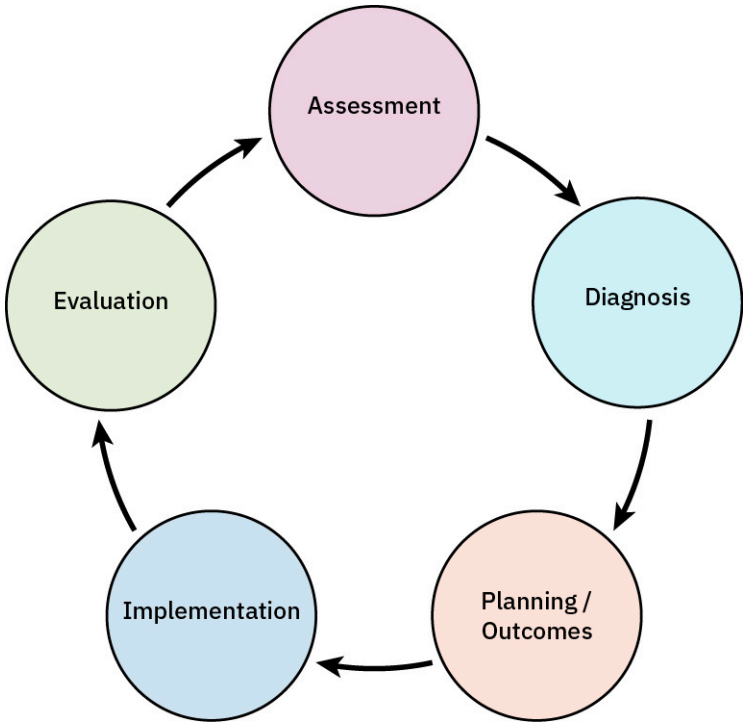

FIGURE 4.2 The nursing process consists of five steps. The nurse usually follows the cyclic direction of the steps but may need to move forward or back based on the patient's responses. (credit: modification of work from *Maternal-Newborn Nursing*. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

The Nursing Process

The nursing process represents how nurses think. Nurses assess patients to discover subjective and objective patient data. The analysis of the data leads the nurse to diagnose a patient's problems. It is important to note that nursing diagnoses differ from medical diagnoses: they are broader and holistic, encompassing aspects of physical health in addition to psychosocial, cultural, and environmental factors that affect the patient's health. A nursing diagnosis is not the actual medical condition but rather the problems related to the medical condition. The diagnosis leads to the identification of patient outcomes (goals). The nurse begins to develop a plan of care based on prioritizing the identified problems and desired outcomes. The nurse then implements actions to treat the problems, prevent complications, and improve the patient's overall health status. The patient's condition is then evaluated by the nurse to determine if the actions brought about the expected patient outcomes and achieved care goals. The nursing process consists of five steps: assessment, diagnosis, planning, implementation, and evaluation (also known as ADPIE), each of which is discussed in more detail in the following sections.

Assessment

When providing nursing care, assessment includes gathering data from the patient, the patient's medical record, the

patient's family members or caregivers, and physical assessment findings. Assessment also involves analyzing relevant data within the context of the patient's current situation (Benner et al., 2009). This analysis enables the nurse to discover the essential data necessary for making patient care decisions. The nurse acknowledges the expected data, focuses on unexpected findings, and looks for patterns in the data to assist with the formation of a nursing diagnosis and an individualized plan of care. An example is when the nurse notices that over the past three cardiology clinic visits, there has been a gradual rise in the patient's blood pressure measurements to above normal values. The blood pressure pattern is recognized as a trend and is not routine or expected in a healthy patient.

Diagnosis

The analysis of data provides direction for the nurse to identify or determine the patient's current or potential problem(s) and develop a problem-based nursing diagnosis. The nurse also considers the patient's specific situation. Continuing the example from the previous section, based on the assessment data, the patient receives a medical diagnosis of hypertension; some potential problem-based nursing diagnoses would be decreased cardiac output, risk for impaired cerebral tissue perfusion, and activity intolerance. Notice that the nursing diagnoses are broader and encompass problems the patient is experiencing; they do not simply name the condition with which the patient is diagnosed. During this step, the nurse also prioritizes the patient's diagnosed problems. If the same patient arrived in the emergency department with a chief complaint of 10/10 chest pain, the patient's potential myocardial infarction (heart attack) takes priority over treating the patient's underlying hypertension. In this example, the context of the patient's situation has changed. Prioritization of the established diagnoses is the foundation of the patient's plan of care, which leads to the next step in the nursing process: planning.

Planning

For each diagnosis, the nurse identifies outcomes and goals that will enhance the patient's condition and health status. For example, consider the patient with previously diagnosed hypertension who presents to the emergency department with 10/10 chest pain: the planned outcome is opening the blocked vessel to limit cardiac tissue damage. To achieve the intended outcome, the nurse observes and monitors for changes in objective data such as patient vital signs, cardiac rhythm, and physical symptoms such as chest pain and nausea, and reports abnormal findings to the provider. Everyone involved with the patient's care is made aware of the planned actions to achieve the outcomes and provide optimal and targeted patient care.

Implementation

To achieve the prioritized outcomes, the nurse implements a series of planned actions, or nursing interventions. These actions are based on the planned patient outcomes. In the previous example, the actions are planned around the goal of preventing complications from the heart attack. The nursing actions are also prioritized to enhance patient safety and the effectiveness of the treatment and interventions.

Evaluation

Once the nursing interventions have been implemented, the nurse evaluates the patient's current health status to determine if the actions were effective and if the patient outcomes were achieved. This evaluation may result in modifications of the diagnosis, plan, or nursing actions, and reflects the circular nature of the nursing process (see Figure 4.2). The nursing process continues to cycle as the plan of care is modified appropriately (American Nurses Association, 2021). For example, if a patient's pain is not relieved by the prescribed pain medication, the nurse must return to the plan and modify it with additional interventions, such as advocating for a change in the medication order or providing nonpharmacological methods of pain control, such as position change, distraction, or application of ice.

Benefits of Using the Nursing Process in Practice

Using the nursing process has many benefits for nurses, patients, and other members of the health-care team. Using the nursing process

- promotes quality patient care;
- decreases omissions and duplications;
- provides a guide for all staff involved to provide consistent and responsive care;
- encourages collaborative management of a patient's health-care problems;
- improves patient safety;
- improves patient satisfaction;

- identifies a patient's goals and strategies to attain them;
- increases the likelihood of achieving positive patient outcomes;
- saves time, energy, and frustration by creating a care plan or path to follow; and
- improves continuity of care between various providers and institutions.

Clinical Judgment in Nursing

Historically, nursing was often viewed as a task-oriented career, meaning that nurses took orders from physicians without question and carried out nursing tasks. These tasks were usually simple, such as changing bed linens, helping patients use the toilet, and providing hygiene care. However, the profession of nursing has evolved into a more complex and autonomous career over the last several decades. As a valuable part of the health-care team, nurses now use critical thinking skills and clinical judgment in everyday practice to achieve positive patient outcomes. Many times, nurses are the ones tasked with making clinical decisions that will significantly affect the lives of their patients because they are often the first to notice changes and recognize potential problems. For example, a medical-surgical nurse notices that a patient develops facial droop and dysarthria and cannot move their arm. Based on these findings, the nurse decides to make the patient NPO (*nil per us*, which means "nothing by mouth") as a safety precaution to prevent aspiration. The nurse will also perform a neurological assessment and notify the stroke emergency responders according to their institution's policy.

In recent years, nursing education has also evolved to better train nurses to think critically and use clinical judgment in practice. The **Clinical Judgment Measurement Model (CJMM)** was developed by the National Council of State Boards of Nursing (NCSBN) to allow nurse educators to teach, assess, and measure the development of clinical judgment skills in nursing students and new graduates taking the National Council Licensure Examination (NCLEX-RN). The Next Generation NCLEX-RN (NGN) provides a better way to assess the clinical judgment and the decision-making abilities of nursing school graduates. This helps identify nurses who are prepared for contemporary practice, which requires nurses—even newly licensed ones—to make increasingly complex care decisions (National Council of State Boards of Nursing, 2024). The CJMM helps nursing students connect knowledge learned in the classroom to effective clinical care in practice. This model serves as the foundation for nursing critical thinking and skill development and is discussed in more detail throughout the rest of this chapter.

4.2 Clinical Judgment Measurement Model Overview

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Identify the purpose for development of the Clinical Judgment Measurement Model (CJMM)
- Understand how to apply the CJMM to the nursing practice

Researchers at the National Council of State Boards of Nursing (NCSBN) developed the NCSBN Clinical Judgment Measurement Model (CJMM) as a framework for the valid measurement of clinical judgment and decision-making within the context of a standardized, high-stakes examination. Although clinical judgment and decision-making have been important elements in most prelicensure education programs for many years, significant research and development were required to isolate and measure these traits with psychometric rigor. This model is used as a teaching tool within nursing school curriculums and as a guiding framework for the development of new types of questions on the national board exam (NCLEX) to examine the clinical judgment and critical thinking skills of nursing students. By using the CJMM, nurse educators can be confident that they are preparing nursing students to enter practice with high-level critical thinking skills and the ability to make sound clinical judgments when caring for their patients.

LINK TO LEARNING

You can learn more about the NCLEX examination (https://openstax.org/r/77newNCLEXexam) that incorporates concepts from the CJMM and get prepared for test day.

The Clinical Judgment Measurement Model

Though the traditional ADPIE nursing process has existed for a long time and still provides great value to nursing,

many nursing schools are now utilizing the CJMM more, as it further expands on the nursing process and allows it to be broken down into more measurable components.

LINK TO LEARNING

The National Council of State Boards of Nursing created the Clinical Judgment Measurement Model (CJMM) (https://openstax.org/r/77CJMM) to explore new ways of testing clinical judgment in nursing as part of the National Council Licensure Examination (NCLEX). The diagram at this site shows the layers of the model.

Application of the CJMM to Nursing Practice

There are several layers to the CJMM framework. Layer 0 at the top is the broadest layer, encompassing all the clinical decisions that a nurse makes to address a patient's needs—essentially the entire nursing process. However, as you move down the model, you can see that this process is broken into more specific steps that nurses can use to make clinical decisions and address patient needs. As nurses move through layers 2 through 4, they are working through a specific cognitive process that helps them make clinical decisions for patients, using clinical judgment to do so (as represented by the broad layers 0 and 1 at the top of the model). The more specific layers (2 through 4) are discussed in more detail in the following sections.

Form, Refine, and Evaluate Hypotheses

Layer 2 is composed of three different parts: form hypotheses, refine hypotheses, and evaluation. The nurse uses specific patient assessment findings ("cues"), to develop hypotheses about the patient's condition. The nurse uses the cues in combination with their foundational clinical knowledge to determine potential explanations for the patient's situation. As the nurse assesses more cues and obtains more information about the patient, the nurse can refine their initial hypothesis and determine its accuracy. As the nurse moves through the steps in layers 3 and 4 to make clinical decisions, they are also checking in with the parts of layer 2 to continuously reevaluate the plan of care. As you will read in the next section, each of the cognitive skills in layer 3 corresponds to a component of layer 2. As the nurse assesses and cares for a patient, they can determine whether their actions have satisfied the goals of care. If the goals are "not met," the nurse can move again through the steps in layers 3 and 4 to revise the care plan and make different clinical decisions that will hopefully assist in better meeting the patient's needs.

For example, a nurse is caring for a patient who presents with a cough and fever. The nurse assesses the patient and determines that the patient also has a runny nose, shortness of breath, and dyspnea on exertion. The nurse hypothesizes that the patient has a respiratory virus and administers an influenza and COVID-19 test per the provider's order. The COVID-19 test comes back positive, confirming the nurse's hypothesis, so the nurse notifies the provider and initiates appropriate measures as ordered, including supplemental oxygen and intravenous (IV) fluids. The nurse reevaluates the patient several hours later and determines that the patient's symptoms have improved. This is an example of how a nurse could move through the steps of the CJMM to make clinical decisions to address the patient's current needs.

Application of Cognitive Skills

Layer 3 of the CJMM is composed of six steps that involve a repetitious process that improves with time and nursing experience. Eventually, these steps become second nature to a more experienced nurse, but they serve as a framework for nursing students and early-career nurses to use as a more deliberate guide for making clinical decisions. These six cognitive skill steps (also known as clinical judgment functions) are described in more detail in Table 4.1 and throughout the rest of the chapter.

Cognitive Skill	Description
Recognize cues	• Assessment data are collected; this can be subjective (from the patient or family) or objective (from physical assessment performed by the nurse). • Data can also be collected from the electronic health record. • Nurse uses these bits of assessment data and looks for "cues" that may be indicative of what is going on with the patient. • Nurse tries to determine what information is relevant, what is the most important, and whether anything is of immediate concern.
Analyze cues	• Nurse takes the assessment data collected from the previous step and considers how they relate to the patient's history and current situation. • Nurse considers whether the cues collected in the previous step are consistent with the patient's current condition, if any of the cues are immediately concerning, and if there are any additional data that need to be collected. • Nurse attempts to link recognized cues to the patient's clinical presentation and establish probable patient needs, concerns, or problems.
Prioritize hypotheses	• Nurse examines all possibilities for the patient's situation based on collected cues. • Nurse determines which possibilities are most likely, which are most serious, and which are the highest priority to treat first. • Priorities of care are established based on the patient's current health problems and cues assessed in the first two steps.
Generate solutions	• Using hypotheses for the patient's condition from the previous step, nurse plans specific actions to achieve goals and outcomes. • Actions can be classified as "indicated," "contraindicated," or "nonessential" to help determine priority actions. • During this step, the nurse should identify outcomes that are expected with each nursing action and plan care that addresses patient's current needs.
Take action	• Nurse performs interventions; these may include further assessment, monitoring, or teaching, depending on the patient's needs. • Actions are based on nursing knowledge, priorities of care, and planned outcomes to achieve optimal health outcomes for the patient.
Evaluate outcomes	• Nurse reviews patient response to actions and interventions. • Nurse compares observed outcomes with expected outcomes to determine if the plan of care needs to be revised.

TABLE 4.1 Cognitive Skills in the CJMM

The CJMM is more advanced than the traditional ADPIE nursing process for several reasons. First, the focus of the CJMM is critical thinking and clinical judgment. Using this model, the nurse must continuously reassess, adapt, and refine their clinical judgment to make appropriate decisions as new information becomes available or the patient's condition changes. Additionally, the CJMM is more patient-centered; it tailors nursing care by incorporating contextual factors such as the patient's unique preferences, values, and culture, as well as social determinants of health. It is important to recognize that in a time-sensitive situation, clinical judgment might lean toward quick decision-making, whereas critical thinking may advocate for a more deliberate analysis. Navigating conflicts involves balancing the urgency of the situation with the need for a thoughtful approach, ensuring that both critical thinking

and clinical judgment contribute to optimal patient care.

Expected Responses and Behaviors

For each cognitive skill, there are specific responses and behaviors that the nursing student is expected to exhibit. When expected responses are performed by the student, it indicates that the cognitive skill has been adequately demonstrated and the student is using clinical judgment effectively.

- Expected responses and behaviors by the student that would indicate they are able to successfully recognize cues include recognizing assessment data that are pertinent to the patient's condition, identifying subtle changes in the patient's condition, and using knowledge and experience to thoroughly assess the patient.
- For analyzing cues, it is expected that the student can recognize abnormal assessment findings, anticipate patient needs, identify potential complications that may arise, and begin to prioritize patient problems.
- When prioritizing hypotheses, the student nurse should be able to organize data and findings based on patterns and trends and prioritize the patient's goals and needs.
- During the generate solutions (planning) step, the student nurse is expected to collaborate with the interprofessional care team to establish goals of care, prioritize nursing interventions based on the patient's needs, and continuously modify the plan of care based on changes to the patient's condition.
- When the student begins to take action, it is expected that they will accurately perform nursing interventions based on previously established patient priorities and needs, document care appropriately, and provide education to the patient and family.
- When evaluating outcomes, expected behaviors include reassessing the patient's condition to determine whether goals and outcomes have been met, evaluating how effective nursing interventions were, and modifying patient goals and priorities as needed.

Consideration of Factors

It is important to use clinical judgment to make practice decisions within the context of environmental and individual factors, which form layer 4 of the CJMM. These factors help the nurse make informed, personalized decisions. The contextual factors surrounding a nurse's ability to provide care, such as time pressure, prior experience, and task complexity, must be taken into account.

Environmental

External environmental factors are physical and social factors within the external environment that may affect the clinical decision-making process. These include the following:

- setting (e.g., hospital, long-term care, community health center)
- situational factors, such as safety considerations, available equipment, and surroundings
- patient demographics
- resources, such as supplies, staffing, and open beds
- individual medical information, including medical history, lab and diagnostic test results, intake/output, medications, and current treatments
- time pressure related to emergent orders and changes in patient condition
- culture (e.g., diet, religion, language, literacy)
- payment for health-care services

In addition to external environmental factors, there are also many internal environmental factors to consider. These include physiological, psychological, sociocultural, and spiritual factors that influence the patient from within.

CULTURAL CONTEXT

Cultural Context within the CJMM

Cultural factors must be considered as part of the clinical judgment process. Without this context, it may be difficult to ascertain the cause of the patient's condition. For example, in some cultures, a vegetarian diet is commonplace. In the context of this factor, the nurse must consider that a lack of protein and vitamin B_{12} may be the cause of certain medical issues within this population. Although considering cultural factors is important, it is even more important not to generalize information about cultures, as this can perpetuate stereotypes. There is a difference

between generalizing information about all members of a population and asking questions about the patient's culture to get specific information that can help the nurse make informed clinical decisions.

Individual

Individual factors that need to be considered during the clinical judgment process are factors related to the nurse. These factors include the following:

- nurse specialty, knowledge, and skills
- nurse characteristics, including attitudes, prior experiences, and amount of nursing experience
- cognitive load of the nurse (e.g., demands, job stress, problem-solving skills, memory)

REAL RN STORIES

Nurse: Gabby, BSN
Years in Practice: Three
Clinical Setting: Medical-surgical unit
Geographic Location: Small community hospital in rural Georgia

After clocking in for my shift, I was notified by the charge nurse that I would be floating to a different unit for the night. She told me that I would need to go to the labor and delivery unit to help out because there were several patients being admitted who were expected to deliver babies that night. I had only ever worked on a medical-surgical unit, so I expressed that I was concerned and uncomfortable taking care of this patient population. The charge nurse shrugged and told me to get going.

Once I got to the unit, the labor and delivery charge nurse told me I would be taking care of a patient who had just delivered a baby girl. I again expressed my discomfort, as I have never taken care of a new mother or a baby. The charge nurse seemed surprised by this and stated, "I was told they were sending down a nurse with OB experience. Let me make a quick call."

When the charge nurse came back from making her phone call, she informed me that there had been a mistake and a different nurse with OB experience was supposed to float to the unit, not me. I breathed a huge sigh of relief and headed back to my home unit, thankful that I had advocated for the patients and myself.

Throughout nursing school, we kept hearing about "clinical judgment" and making informed care decisions for our patients. I feel like I finally get it now. Even though I wasn't using my clinical judgment to make specific decisions for a patient, I used it to determine that I was not the most appropriate nurse for that assignment. And because I used my clinical judgment skills, I truly believe that patients in both the medical-surgical unit and the labor and delivery unit received higher quality care during that shift.

4.3 Recognizing and Analyzing Cues

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Describe how to recognize cues found in patient data
- Describe how to analyze the meaning of the relevant cues found in patient data

Recognizing cues is the portion of the CJMM that most closely reflects the assessment part of the nursing process. In the realm of nursing, **assessment**—the systematic and dynamic process of collecting and analyzing data about a client's health—forms the cornerstone of patient care (American Nurses Association, n.d.). The essence of a nursing assessment lies in its comprehensive approach to understanding a patient's health status. At its core, this process aims to identify the needs and concerns of patients, serving as the foundation for subsequent nursing care plans. A nursing assessment is not merely an evaluation of physical symptoms; it encompasses a broader analysis that includes physiological, psychological, sociocultural, and environmental factors influencing a patient's well-being.

In every assessment, nurses are tasked with deciphering a complex array of information. They must sift through various data points, from clinical signs and laboratory results to the patient's expressed concerns and behaviors to

analyze the cues. This process requires not only technical knowledge and expertise but also a keen sense of empathy and intuition. The goal is to create a holistic picture of the patient's health, enabling nurses to prioritize care and interventions effectively.

Recognizing Cues

The primary focus of a nursing assessment is to systematically identify a patient's health concerns. This process involves a detailed examination of the patient's current health status to identify any changes or risks that could affect care and treatment. By determining the urgency of different health issues, nurses can plan appropriate interventions.

To conduct an effective assessment, the nurse must be adept at recognizing a variety of cues: not only the signs of obvious physical health issues, such as high blood pressure or mottled skin, but also subtler indicators that might suggest underlying problems. For example, a patient might mention specific sources of stress or allude to a family history of a particular condition. Keep in mind that assessment is an ongoing, dynamic process; the nurse is continually gathering assessment data to monitor for changes in the patient's condition.

Imagine a patient, Mr. Silva, who has recently undergone knee replacement surgery. The care team, including the nurse, has developed a plan of care to address Mr. Silva's postsurgical needs. While the nurse is performing an assessment three days after surgery, they notice that Mr. Silva's incision is red and warm to the touch. The nurse recognizes that these cues are abnormal and require further investigation and follow-up.

LINK TO LEARNING

A checklist is a useful tool for ensuring the nurse conducts a comprehensive physical examination. This sample checklist (https://openstax.org/r/77checklist) provided by Nightingale College details the steps in a typical head-to-toe assessment.

Subjective and Objective Data Collection

The initial assessment serves as an opportunity to begin compiling a complete set of information about the patient. This database is the cornerstone for all subsequent nursing care and interventions. It includes detailed information about the patient's physical, psychological, and emotional status and forms the basis for developing an individualized care plan.

The process of creating a patient database involves gathering both subjective and objective data. The patient's own descriptions of their symptoms, feelings, and perceptions, as well as relevant descriptions from friends or family members, are known as **subjective data**. The measurable and observable information collected during a physical examination, such as blood pressure, heart sounds, lung sounds, and lab results, is called **objective data** (Lukey, 2023).

In addition to health-related information, a comprehensive database also includes an assessment of the patient's social and environmental factors. This encompasses family health history, social relationships, cultural background, and environmental factors such as living conditions and occupational hazards. These elements play a crucial role in understanding the broader context of the patient's health and wellness.

CULTURAL CONTEXT

Cultural Diversity and the Collection of Data

Understanding and respecting cultural diversity is essential in nursing assessments. Nurses often encounter patients from various cultural backgrounds, and recognizing how cultural factors influence health beliefs and practices is crucial for collecting accurate data. The following examples illustrate the importance of cultural awareness for the care of each individual patient (U.S. Department of Health and Human Services, n.d.):

- Communication styles: In some cultures, direct eye contact might be considered disrespectful, whereas in

others it is a sign of honesty and engagement. Some patients may avoid direct eye contact with health-care providers as a sign of respect, which should not be misinterpreted as disinterest or noncompliance.
- Pain expression: Cultural norms can influence how patients express pain. Some cultures encourage vocal expressions of pain, whereas others may value stoicism. Nurses must realize that a patient who does not outwardly seem to be in pain might nevertheless be hurting.
- Family involvement: In many cultures, family plays a central role in health-care decisions. Family members, including extended family, may participate actively in care discussions and decision-making. Understanding the family dynamics of each individual patient is important for communicating effectively and obtaining accurate health histories.
- Health beliefs and practices: Traditional health practices and beliefs can significantly influence a patient's approach to illness and treatment. Patients may use traditional healing practices alongside or in place of conventional medicine. Being open to these practices and discussing them respectfully can enhance trust and rapport.
- Dietary considerations: Dietary habits rooted in cultural practices can affect health and treatment plans. Certain religious practices, such as fasting during Ramadan for observant Muslims or dietary restrictions for many people who practice Hinduism, can affect medication schedules and nutritional needs.

By incorporating cultural awareness into the data collection process, nurses can ensure they are gathering complete and accurate information while also respecting each patient's cultural background. This approach contributes to more holistic and patient-centered assessments, a crucial component of quality health care.

Analyzing Cues

Analyzing the data collected during a nursing assessment is a critical step in the nursing process. It involves interpreting the gathered information to make informed decisions about patient care. This analytical process requires nurses to identify significant clues, make inferences, recognize patterns, and apply both inductive and deductive reasoning. These skills enable nurses to translate assessment data into actionable insights, forming the basis for accurate nursing diagnoses and effective care plans.

Thinking back to the example about Mr. Silva, the nurse begins to analyze the recognized cues. The nurse notes that the incision site is red and warm to the touch, which is worrisome in the context of having just had knee surgery three days ago. The nurse infers that these findings are related to the surgical procedure and understands that they will require further intervention.

Filtering Through the Data

After data collection, it is necessary to prioritize findings. Nurses are often faced with complex situations and multiple health issues that need timely attention. They must quickly identify which needs are most critical and must be addressed first to ensure patient safety and well-being. This approach is particularly vital in emergency settings or with patients having multiple chronic conditions of varying immediacy and severity. Prioritizing ensures that the most urgent conditions are treated promptly while still addressing other important health needs in a systematic manner. Even for routine assessments, it is important to prioritize, as not every piece of data is relevant to a patient's care. Some of the most effective methods for filtering through the data to prioritize care include using the ABCs (airway, breathing, circulation) and Maslow's hierarchy of needs. Once the priority patient issues have been established, the nurse can move on and begin analysis of the assessed cues.

LINK TO LEARNING

Learn more about Maslow's hierarchy of needs (https://openstax.org/r/77Maslow) in this article, which includes a figure of the hierarchy.

Clues and Inferences

Identifying clues involves recognizing significant pieces of information in the assessment data. For example, if a patient reports increased shortness of breath and the nurse observes swelling in the legs, these clues might suggest heart failure. A conclusion drawn from clues is called an **inference**. In this case, the nurse might infer that the

patient's heart failure is worsening. Making accurate inferences based on observed clues is crucial for identifying a patient's health issues and planning appropriate interventions.

Recognizing Patterns and Trends

Recognizing patterns and trends in the assessment data is another key aspect of cue analysis. Patterns can indicate the progression of a disease, effectiveness of a treatment, or development of complications. For instance, a pattern of increasing blood pressure readings over several visits might indicate poorly controlled hypertension. Recognizing these patterns helps nurses anticipate and prevent complications, adjust treatments, and advocate for changes in the care plan.

Inductive Reasoning

Noticing cues, making generalizations, and creating hypotheses are all part of **inductive reasoning**. Cues are data that fall outside of expected findings that give the nurse a hint or indication of a patient's potential problem or condition. The nurse organizes these cues into patterns and creates a generalization. A **generalization** is a judgment formed from a set of facts, cues, and observations; the act of generalizing is like gathering pieces of a jigsaw puzzle into patterns until the whole picture becomes clearer. For example, if a nurse observes that a patient's wound is not healing despite standard care, and similar cases have shown improvement with a different treatment approach, the nurse might conclude that an alternative treatment might be beneficial for this patient. Based on generalizations created from patterns of data, the nurse creates a **hypothesis**, or a proposed explanation for a situation, regarding a patient problem, which is the next step in the CJMM and discussed in more detail in the following section.

Deductive Reasoning

Another method for analyzing cues, **deductive reasoning**, is referred to as "top-down thinking." Deductive reasoning relies on using a general standard or rule to create a strategy. Nurses use standards set by their state's Nurse Practice Act, federal regulations, the American Nursing Association, professional organizations, and their employer to make decisions about patient care and to solve problems.

Think about this example: Based on research findings, hospital leaders determine patients recover more quickly if they receive adequate rest. The hospital creates a policy for quiet zones at night by initiating no overhead paging, promoting low-speaking voices by staff, and reducing lighting in the hallways. Nurses further implement this policy by organizing care for patients that promotes periods of uninterrupted rest at night. This is an example of deductive thinking because the intervention is applied to all patients regardless of whether they have difficulty sleeping.

REAL RN STORIES

Nurse: Maria, RN, BSN
Years in Practice: Twelve
Clinical Setting: Endocrinology unit
Geographic Location: San Antonio, Texas

As a nurse in the endocrinology unit, I encounter many patients with complex cases of diabetes. One such case that stands out involved a patient, Mr. Hernandez, who was admitted with poorly controlled type 2 diabetes and recurrent foot ulcers.

From the initial assessment, it was clear that Mr. Hernandez's situation was multifaceted. He reported being diligent with his medication, yet his blood glucose levels were consistently high. Through careful observation, I noticed his reluctance to discuss dietary habits and a general lack of knowledge about diabetes management. This was my first clue that there might be more to his condition than medication adherence.

Using my communication skills, I gently probed into his daily routine and eating habits. This revealed a pattern of sporadic mealtimes and consumption of high-carbohydrate foods, despite his medication regimen. It became evident that Mr. Hernandez's understanding of diabetes management was limited, affecting his ability to control his condition effectively.

Applying inductive reasoning, I hypothesized that a lack of education about diabetes and inadequate nutritional guidance were contributing to Mr. Hernandez's poor health outcomes. This was further supported by the pattern of

his uncontrolled blood glucose readings in relation to his eating habits.

Using deductive reasoning, based on the general principles of diabetes management, I concluded that comprehensive patient education was crucial. I worked with the diabetes education team to develop a tailored education plan for Mr. Hernandez, focusing on nutrition, medication management, and foot care.

The integration of in-depth assessment, inductive and deductive reasoning, and a focus on patient education led to significant improvements in Mr. Hernandez's condition. His experience is a testament to the effect of holistic nursing care and the importance of collecting and analyzing a wide range of data when managing complex health conditions.

4.4 Prioritizing Hypotheses, Generating Solutions, and Taking Action

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Describe the development and prioritization of nursing hypotheses
- Explain how the nurse generates solutions to address patient needs and achieve care goals
- Identify appropriate nursing actions based on specific patient situations

After assessing and analyzing cues, the nurse proceeds to the next steps in the CJMM, which are prioritizing hypotheses and generating solutions. The nurse uses the specific patient assessment findings (cues), in combination with their foundational clinical knowledge, to develop hypotheses, or educated guesses, about the patient's condition. As more cues are assessed and more information about the patient is obtained, the nurse can refine their initial hypothesis, determine its accuracy, and generate specific solutions and interventions for the patient.

Once the solutions and interventions are determined, the nurse can take action. Taking action involves implementing appropriate nursing interventions in an effort to achieve desired patient outcomes. The nurse uses a combination of clinical judgment and critical thinking skills to determine which nursing interventions are the priority actions and implements them accordingly.

Prioritizing Hypotheses

A hypothesis is a proposed explanation for a situation. It attempts to explain the "why" behind the problem that is occurring. If a "why" is identified, then a solution can begin to be explored. No one can draw conclusions without first noticing and then prioritizing cues. Paying close attention to the patient, environment, and interactions with family members is critical for inductive reasoning. As you work to improve your inductive reasoning, begin by first noticing details about the things around you. Be mindful of your five primary senses: the things you hear, feel, smell, taste, and see. Nurses need strong inductive reasoning patterns to be able to take appropriate action quickly, especially in emergency situations.

Remember the example involving Mr. Silva, who recently underwent knee replacement surgery. After assessing him, the nurse finds the surgical incision site is red, warm, and tender to the touch. The nurse recognizes these cues as signs of infection and then develops a hypothesis that the incision has become infected. The nurse also notices that an order has been placed to transition Mr. Silva from NPO status to a regular diet, which involves informing the patient and may involve contacting the dietary services department. The nurse prioritizes the incision findings because, left untreated, the infection could become more severe and eventually life-threatening. The provider is notified of the patient's change in condition, and a new prescription is received for an antibiotic. After the antibiotics have been ordered, the nurse moves onto changing Mr. Silva's diet. This is an example of prioritizing hypotheses in nursing practice.

Generating Solutions

Based on prioritized hypotheses, nurses must use clinical judgment and knowledge to determine both actual problems that the patient is currently experiencing and potential problems that the patient may experience in the future. This involves looking at the comprehensive patient history and significant findings and thinking of the best and worst possible outcomes. The best outcome indicates progress toward recovery. In contrast, the worst outcome will reveal patient deterioration and decompensation. The nurse must always be thinking two steps ahead. Most people do this type of thinking in everyday life and probably do not even realize it. Think back to the last time you

took a road trip. Did you just hit the open roads without any thought to the destination or plan to get there? Successful travelers put some serious planning into the trip to ensure the best possible outcome. The same example can be related to nursing practice. Before initiating interventions, the nurse must first establish specific patient goals (outcomes).

Thinking back to the example about Mr. Silva, the nurse decides that the provider should be made aware of the abnormal incision site findings. The nurse alerts the provider and anticipates that the provider will order antibiotics. The nurse also determines that it would be beneficial to change the patient's dressing to ensure that the site is left clean, dry, and intact to prevent worsening infection.

Outcomes or Goals

A desired result or goal after implementation of the patient's individualized plan of care is called an **outcome**. Identified outcomes may be long-term goals or short-term goals, but they should always follow the SMART goal format (Figure 4.3). The nurse considers five factors related to outcome identification:

- specific measurements to determine success of outcomes
- measurability of desired outcomes
- attainability of the outcome based on outlined timeline and available resources
- relevance of the outcomes for the specific patient with their unique qualities and need
- timeline that is appropriate for the desired outcomes

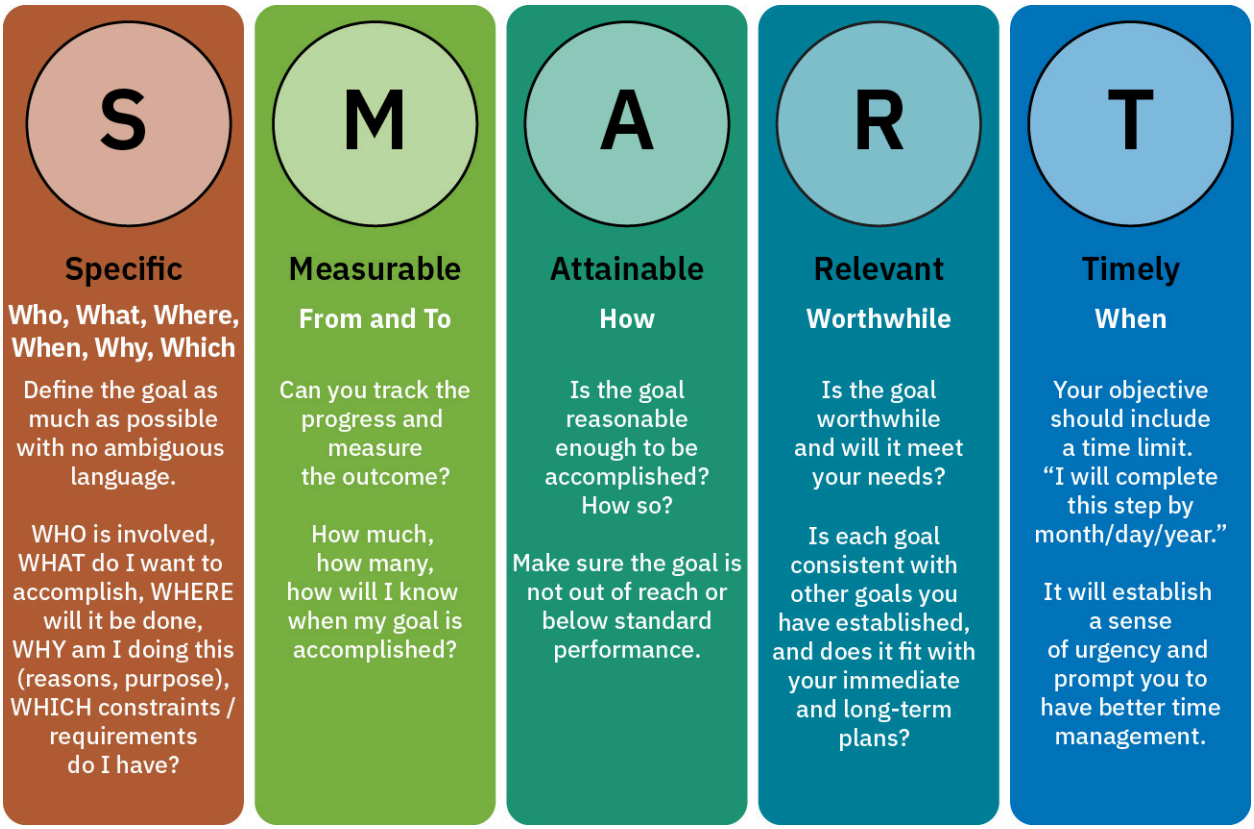

FIGURE 4.3 Patient goals should be specific, measurable, attainable, relevant, and timely (SMART). (credit: modification of work from *Fundamentals of Nursing*. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Realistic Outcomes

The nurse will determine if the outcome identified is realistic, meaning reasonable and attainable for this specific patient. For example, patients who experience minor surgical procedures typically begin to move very soon after surgery and possibly walk within a day of (or even the same day as) the procedure. However, this is not realistic for all patients. Think about a patient who has been prescribed physical therapy to gain muscle coordination and strength training after surgery. After one session of therapy, it is realistic and attainable to expect the patient to walk a few steps in the room with assistance. It is not realistic or attainable to expect that the patient will walk 500 ft (150 m) to the nurse's station and back without assistance. Although common sense can help with outcome

identification, a strong use of critical thinking is also warranted.

Expected Time Frame for Completion

Just as with any goal or expectation, a time frame for completion must be set. Having a set time frame enables the nurse to implement the interventions and, at the end of the period, evaluate the interventions' effectiveness. The nurse and health-care team should collaborate to set the time frame with the patient's input when possible. There are two types of outcome identification regarding time frames: short-term and long-term.

Short-Term Goals

A **short-term goal** has a time frame of days to a week; some are even within the assigned shift. Most short-term goals are intended to be achieved before the patient is discharged. This allows the health-care team to evaluate the effectiveness of a newly prescribed treatment, medication, or specific intervention. For example, a patient with an indwelling Foley catheter may have identified the following goal or outcome: "The patient will void (urinate) within two hours after removal of the Foley catheter." This outcome allows the health-care team to ensure the patient regains bladder function. Another example of a short-term goal is for a patient who has been recently diagnosed with diabetes. This patient might identify the following outcome: "The patient will demonstrate how to check their own blood sugar using the return demonstration method before discharge." Achieving this goal ensures the patient will be able to self-monitor their blood sugar upon discharge.

Long-Term Goals

A **long-term goal** generally has a time frame that lasts longer than a few days: it can be several weeks or even months. Long-term goals often involve ongoing activities or interventions, long after the patient has been discharged. Examples of long-term goals include wound care; medication protocols; and cardiac, respiratory, or physical rehabilitation. Long-term goals often are set to improve quality of life.

Generating Solutions to Achieve Goals

In the CJMM, generating solutions serves as a pivotal stage in the nursing process. This is where nurses translate their prioritized hypotheses into actionable interventions aimed at achieving patient-centered goals and outcomes. In combination with an understanding of the patient's health status, the nurse uses their clinical expertise and evidence-based practice guidelines to formulate tailored solutions. While generating solutions, the nurse must consider the physiological, psychological, sociocultural, and environmental factors influencing the patient's well-being, ensuring that interventions are not only clinically effective but also aligned with the patient's values, preferences, and individualized care needs. Whether administering pharmacological treatments, implementing therapeutic interventions, or facilitating health promotion strategies, nurses can use a variety of interventions to address patient care goals. As the nurse moves through the steps of the CJMM to make clinical decisions, they are also continuously checking in to reevaluate the plan of care. As the nurse assesses and cares for a patient, they can determine whether their actions have satisfied the goals of care.

Taking Action

Thinking back to Mr. Silva, the care team, including the nurse, has developed a plan of care to address Mr. Silva's postsurgical needs. This plan includes interventions for pain management, mobilization exercises to regain knee function, and wound care to prevent infection. The team is confident that the plan can achieve Mr. Silva's desired outcomes, which include effective pain control, improved mobility, and wound healing without complications (Cleveland Clinic, 2023).

However, the team also knows that simply having a plan is not enough; it needs to be implemented effectively in a patient-centered way. The implementation phase in nursing includes several key areas of emphasis: actively putting the plan into action and gauging the patient's response to the interventions. For example, in this stage of the CJMM, the nurse would implement specific actions to address the incision site findings, such as administering antibiotics as prescribed and changing the dressing.

Patient-Specific Interventions

For Mr. Silva, putting the plan into action begins with the nurse administering prescribed pain medication; this intervention should help to manage postoperative pain and facilitate early mobilization. The nurse also coordinates with the physical therapy team to initiate mobilization exercises and ensure the exercises align with Mr. Silva's pain management plan. This interprofessional coordination is crucial to balance pain control with the need for early

movement to prevent complications such as blood clots or stiffness in the knee.

In addition to these interventions, the nurse plays a pivotal role in wound care. This includes regularly changing dressings, monitoring the surgical site for signs of infection, and educating Mr. Silva on how to care for his wound. Effective implementation also requires all members of the health-care team to continuously evaluate the effectiveness of each intervention. Health care is a dynamic process, and Mr. Silva's evolving needs and responses should guide the implementation of his care plan. This same sentiment can be applied to care for all patients, regardless of their condition or the care setting. All interventions should be tailored specifically to the patient, ensuring that the care provided is optimized for the patient's needs and goals.

Gauging Patient Response

Gauging the patient's response to interventions is a critical aspect of the implementation, or taking action, phase. It involves observing and interpreting how the patient reacts to the care plan, both physically and emotionally. This process is essential for ensuring that interventions are effective and align with the patient's needs and comfort levels. Nurses assess responses through various means, including direct feedback from the patient, clinical observations, and monitoring vital signs or other relevant health indicators. This ongoing assessment allows the nurse to make timely adjustments to the care plan, ensuring it remains responsive and patient-centered.

In Mr. Silva's case, the nurse would closely monitor his responses to pain medication and physiotherapy. This might include observing changes in his pain levels, mobility, and overall comfort during and after mobilization exercises. If Mr. Silva reports increased pain or discomfort, the care team may need to reassess the approach to pain management or the intensity of the exercises. Similarly, the nurse would observe the healing of Mr. Silva's surgical wound, being alert to any signs of infection or poor healing so the team can make necessary adjustments to the wound care regimen. This careful monitoring ensures that Mr. Silva's recovery stays on track and that any concerns are addressed promptly.

REAL RN STORIES

Nurse: Emily, RN, BSN
Years in Practice: Five
Clinical Setting: Outpatient ophthalmology surgical center
Geographic Location: Seattle, Washington

As a nurse in an ophthalmology surgical center, I've seen a variety of postoperative cases, but one patient, Mr. Henderson, taught me the importance of swift adaptation during the implementation phase. Mr. Henderson, a 68-year-old retiree, had just undergone cataract surgery. Initially, his recovery seemed textbook-perfect: he was alert and his initial vision checks were promising. However, during a routine check the morning after his surgery, I noticed he was unusually quiet and seemed hesitant to open his operated eye.

After I gently inquired, Mr. Henderson admitted to experiencing "a bit of discomfort" in his eye, which he initially thought was normal after surgery. But as I further assessed his condition, it became clear that his discomfort was more than typical postoperative irritation. His eye was slightly redder and more swollen than expected, and he reported a sensation of "pressure" in his eye.

Recognizing these as potential signs of postoperative complications, possibly an infection or increased intraocular pressure, I immediately informed the ophthalmologist. We adjusted Mr. Henderson's care plan, increasing the frequency of eye drops to manage potential inflammation and scheduling an urgent follow-up examination.

The quick response was crucial. The ophthalmologist confirmed the early signs of infection and adjusted Mr. Henderson's medication accordingly. This intervention prevented what could have escalated into a severe complication, potentially jeopardizing his vision recovery.

This experience reinforced for me how critical it is to gauge patient responses meticulously during the implementation phase. Even seemingly minor complaints or changes in condition can be indicative of significant issues. It's a reminder that as nurses, our vigilance and ability to adapt care plans can have a profound effect on patient outcomes.

4.5 Evaluating Outcomes

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Evaluate nursing actions to determine if they were effective in achieving patient outcomes
- Describe how to modify nursing plans of care to more effectively achieve optimal patient outcomes

Imagine you have set a goal for yourself: to run a marathon. It is a challenging objective, requiring not just determination but also a strategic plan. Your plan will likely include a detailed training schedule, a balanced diet, and regular health checkups to monitor your fitness levels. However, creating this plan is just the beginning. The next crucial step is implementation: putting your plan into action. This means adhering to your training schedule, running regularly, gradually increasing your distance, eating according to your diet plan, and consistently monitoring your health. Each of these actions is a step toward your goal, bringing you closer to being marathon-ready.

Yet, the process does not end with implementation. The final phase is possibly even more important. Despite your best efforts, suppose that on the day of the marathon you are unable to complete the 26.2 mi (42.2 km). This is where you need to evaluate your plan by analyzing what went wrong and identifying areas for improvement. Did you train sufficiently? Were there nutritional gaps in your diet? Did you give your body enough time to recover between training sessions? Addressing these questions will help you understand the shortcomings of your initial plan and make necessary adjustments for your next attempt.

This process of planning, implementing, and evaluating is not just relevant for personal goals such as running a marathon. It is also a fundamental approach in various fields, including nursing. Nurses plan and implement care plans and then evaluate outcomes, ensuring that patient care is continuously improved and adapted to achieve the best possible outcomes.

Evaluating Outcomes

The systematic determination of a patient's progress toward the achievement of outcomes and goals set during the care-planning process is called **evaluation**. Looking at the CJMM, the evaluation phase follows the phase of taking action, marking the final step. Evaluation is a dynamic and ongoing activity in which nurses assess whether the patient's health status is improving, staying the same, or perhaps worsening in response to the nursing interventions. This phase is crucial as it determines the effectiveness of the nursing care provided, informs necessary changes to the care plan, and ensures that the patient's health needs are being met adequately (American Nurses Association, n.d.).

Let us revisit Mr. Silva, whose case we have been following throughout the implementation phase following his knee replacement surgery. The nursing team has diligently executed the planned interventions for Mr. Silva's postoperative care, including managing his pain, assisting with mobility exercises, and educating him about his condition. As we enter the evaluation phase, it is time to critically assess the outcomes of these interventions. Did they improve Mr. Silva's condition as expected? Are there any aspects of the care that need adjusting? This module will guide us through the systematic approach to evaluating Mr. Silva's progress, employing the essential tools and criteria nurses use to analyze and measure the effectiveness of the care provided (Cleveland Clinic, 2023).

Determine Patient Progress

In the evaluation phase, determining the patient's progress is a fundamental step. For Mr. Silva, who has been recovering from knee surgery, this involves a comprehensive review of his current health status compared to the expected outcomes outlined in his care plan. The nursing team assesses various factors, such as the reduction in pain levels, improvement in mobility, and adherence to postoperative instructions. This step is crucial as it provides an insight into the effectiveness of the interventions and whether Mr. Silva is on track with his recovery. This step is not only about noting improvements but also identifying any areas where progress might be lagging or any complications that may have arisen.

Analyze Current Data

Nurses are continually obtaining and analyzing data from their patients, and the evaluation phase is no different (Lukey, 2023). To analyze Mr. Silva's current data, the nursing team reviews his medical records since the start of the implementation phase, including vital signs, pain assessment scores, and progress in physical therapy sessions.

These objective data provide measurable, observable evidence of Mr. Silva's recovery progress. For instance, a decrease in pain scores and an increase in the range of motion in his knee indicate positive responses to pain management strategies and physiotherapy.

Furthermore, the team considers subjective data, such as Mr. Silva's own reports of pain and his feelings about the progress he is making. This type of information is crucial as it provides a holistic view of the patient's experience and recovery. The team also evaluates the effectiveness of patient education by assessing Mr. Silva's understanding of and adherence to postoperative care instructions, such as medication schedules and exercise routines. This comprehensive analysis helps the nursing team make informed decisions about any necessary adjustments to the care plan, ensuring it remains aligned with Mr. Silva's health needs and recovery goals.

Modifying Nursing Care Plans

After determining patient progress and analyzing current data, the nursing team should have a good idea about whether patient goals were met. This information is essential for guiding the next steps in patient care, whether the team continues with successful strategies or reevaluates and modifies the care plan to address challenges. This modification is based on the conclusions drawn from the evaluation data and can take several forms, depending on the patient's progress and current needs. For Mr. Silva, who is recovering from knee surgery, the nursing team faces decisions on whether to continue, revise, or terminate certain aspects of his care plan, depending on his recovery status and response to the interventions.

If the nursing team concludes that Mr. Silva is progressing well and meeting the recovery goals as expected, the decision may be to continue with the current plan. For instance, if Mr. Silva's pain levels are well-managed and he is showing steady improvement in mobility, the existing pain management strategies and physical therapy exercises would be continued. Continuing a care plan is appropriate when the patient is responding positively to the interventions and the goals are being progressively met.

Should the evaluation reveal that Mr. Silva's recovery is not progressing as anticipated, or if he encounters new challenges, the nursing team may decide to revise the care plan. This could involve altering his pain management regimen if his pain is not adequately controlled or introducing different physical therapy techniques if his mobility is not improving as expected. Revising a care plan is necessary when the current interventions are not fully effective or when the patient's condition changes.

REAL RN STORIES

Nurse: Junot, RN, BSN
Years in Practice: Six
Clinical Setting: Community health clinic
Geographic Location: San Diego, California

In my six years as a registered nurse, particularly in a community health setting, I've learned the importance of being adaptable and responsive when it comes to patient care plans. A memorable case that highlights this was with Mr. Jacobs, a 52-year-old patient with a diagnosis of high cholesterol.

Initially, we had developed a care plan focusing on lifestyle modifications: diet changes, increased physical activity, and regular health monitoring. Despite our efforts, Mr. Jacobs's cholesterol levels remained high during subsequent checkups. This was a clear indication that our initial plan was not as effective as we had hoped.

Acknowledging this, we revised Mr. Jacobs's care plan. We introduced a more structured diet program and added a cholesterol-lowering medication. We also involved a dietitian for more personalized dietary guidance and scheduled more frequent follow-ups to closely monitor his progress.

The revised plan showed significant improvement in Mr. Jacobs's cholesterol levels. He became more engaged in his care, often sharing his new recipes and exercise routines with us. His dedication and our collaborative approach paid off, and over time, his cholesterol levels stabilized to a point where we could gradually reduce and eventually terminate the medication.

This experience with Mr. Jacobs reinforced for me the dynamic nature of nursing care. It highlighted the necessity of continually evaluating and adjusting our care plans, staying patient-centric in our approach, and being open to changing strategies when initial plans don't yield the expected results. The success of this case was a testament to the power of collaboration, patient involvement, and the willingness to adapt for the betterment of patient health.

Summary

4.1 Critical Thinking and the Nursing Process

- The nursing process is a five-step process that serves as the foundation of nursing practice.
- The nursing process consists of assessment, diagnosis, planning, implementation, and evaluation.
- The nursing process typically moves in a forward direction, but at times the nurse must circle back to previous steps to gather more patient data or perform additional interventions.
- This is a continuous process that allows the nurse to provide and evaluate care to promote optimal patient outcomes.
- The Clinical Judgment Measurement Model (CJMM) was developed to help nursing students learn, practice, and demonstrate clinical judgment skills.

4.2 Clinical Judgment Measurement Model Overview

- Historically, nursing was often viewed as a task-oriented career, but in recent years the profession has grown in terms of autonomy and clinical judgment.
- The CJMM, a tool designed to measure critical thinking and clinical judgment in nursing students, was developed to allow educators to assess the development of nursing student's critical thinking skills to help ensure that they are ready to practice as a nurse after graduation.
- The CJMM involves several steps that have expanded upon the traditional nursing process model, making it an excellent framework to guide new nurses in making clinical judgment calls in practice.

4.3 Recognizing and Analyzing Cues

- Nurses use diverse sources and methods to gather critical subjective and objective data during patient assessments.
- Patient data collected by the nurse are analyzed and prioritized based on the patient's specific situation and current needs.
- By prioritizing throughout the nursing process, nurses ensure that immediate, life-threatening conditions are addressed, while also considering each patient's overall well-being and long-term health needs.
- Analyzing the data involves identifying clues and making inferences, recognizing patterns, and applying inductive and deductive reasoning.

4.4 Prioritizing Hypotheses, Generating Solutions, and Taking Action

- After recognizing and analyzing patient cues, the next steps of the CJMM are prioritizing hypotheses, generating solutions, and taking action.
- The nurse uses the cues from the previous steps to develop hypotheses, or educated guesses, about what is causing the patient's health problems.
- The nurse works closely with the patient to develop outcomes, or goals, of care and to generate solutions that aim to achieve those goals.
- Taking action involves implementing appropriate nursing interventions in an effort to achieve desired patient outcomes.

4.5 Evaluating Outcomes

- After implementing interventions, the nurse evaluates their effectiveness to determine whether care goals have been met.
- Based on these findings, the nurse can revise the plan of care and implement different nursing interventions as necessary.
- The evaluation phase technically marks the end of the CJMM cycle; however, CJMM is a continuous process that nurses move through when providing nursing care.

Key Terms

assessment systematic and dynamic process of collecting and analyzing data about a client's health

Clinical Judgment Measurement Model (CJMM) nursing practice and education model that allows nurse educators to teach, assess, and measure the development of clinical judgment skills in nursing students

deductive reasoning type of thinking that involves using a general standard or rule to create a strategy
evaluation systematic determination of a patient's progress toward the achievement of outcomes and goals set during the care-planning process
generalization proposed explanation for a situation
hypothesis judgment formed from a set of facts, cues, and observations
inductive reasoning type of thinking that involves noticing cues, making generalizations, and creating hypotheses
inference conclusion drawn based on collected information
long-term goal outcome that has a time frame of weeks to months
objective data measurable and observable information collected during a physical examination
outcome the desired result or goal after implementation of the patient's individualized plan of care
short-term goal outcome that has a time frame of days to a week
subjective data patient's own descriptions of their symptoms, feelings, and perceptions, as well as relevant information obtained from friends and family members

Assessments

Review Questions

1. Which step of the nursing process involves analyzing patient data within the context of the patient's current situation to discover essential information for making patient care decisions?
   a. diagnosis
   b. assessment
   c. planning
   d. implementation

2. What is the primary purpose of prioritizing problem-based nursing diagnoses in the nursing process?
   a. to identify current health issues and potential complications
   b. to enhance communication among health-care team members
   c. to evaluate care outcomes after interventions have been performed
   d. to address patient concerns and preferences

3. The nurse notices that a patient is experiencing an increased heart rate and blood pressure. Which step of the nursing process is the nurse currently in?
   a. assessment
   b. diagnosis
   c. planning
   d. implementation

4. An emergency department nurse is caring for a patient who presents with a cough and shortness of breath. The nurse asks the patient about their medical history and notes that they have a history of heart failure. The nurse determines that the cough and shortness of breath are likely related to heart failure exacerbation. Which cognitive skill of the CJMM is the nurse exhibiting in this situation?
   a. recognize cues
   b. analyze cues
   c. prioritize hypotheses
   d. take action

5. What is a situation that best illustrates a nursing student generating solutions?
   a. The student takes a blood pressure reading on a patient.
   b. The student checks the patient's chart to look at lab results.
   c. The student determines that the patient's wound is infected and needs a new dressing.
   d. The student performs skin care on the patient's open wound.

6. A nursing student is working within an interdisciplinary care team to establish care goals for a patient. Which step of the CJMM is the nurse using?

a. recognize cues
b. analyze cues
c. generate solutions
d. evaluate outcomes

7. What individual factor should a nurse consider when making clinical judgment calls in practice?
a. care setting
b. resource availability
c. cultural preferences
d. skill level

8. What assessment finding is an example of subjective data?
a. blood pressure
b. skin color
c. patient's stated chief complaint
d. respiratory rate

9. How does cultural diversity influence the collection of data during a nursing assessment?
a. by necessitating the exclusion of certain cultural practices to maintain objectivity
b. by affecting communication styles, pain expression, and dietary considerations
c. by encouraging nurses to rely solely on objective data rather than subjective reports
d. by limiting the types of information that can be collected during the assessment process

10. The nurse is conducting a comprehensive assessment of a 65-year-old patient admitted to the hospital with complaints of chest pain and shortness of breath. The patient has a history of hypertension, diabetes, and smoking. During the assessment, the nurse notices that the patient avoids making direct eye contact and seems hesitant to discuss their symptoms. Which aspect of the nursing assessment is highlighted in this scenario?
a. recognizing cues
b. obtaining objective data
c. documenting patient responses
d. showing cultural competence

11. The emergency department nurse notices that several patients admitted to the unit recently have reported experiencing nausea and vomiting shortly after receiving a specific type of medication. Additionally, these patients exhibit elevated levels of liver enzymes upon laboratory testing. What aspect of cue analysis is most relevant in this scenario?
a. identifying clues
b. making accurate inferences
c. recognizing patterns
d. drawing conclusions from observed data

12. The nurse notices a recurring pattern among patients admitted to the unit who have been prescribed a particular antibiotic for the treatment of infections. Despite following the standard treatment protocol, a subset of patients continues to exhibit persistent symptoms and delayed recovery. Based on this observation, what form of reasoning is the nurse likely to utilize in proposing alternative treatment approaches?
a. inductive reasoning
b. analytical reasoning
c. deductive reasoning
d. abstract reasoning

13. The emergency department nurse is caring for a patient who presents with sudden onset of chest pain, shortness of breath, and diaphoresis. What is an example that illustrates the nurse prioritizing a hypothesis?

a. The nurse applies supplemental oxygen.
b. The nurse suspects the patient is experiencing a myocardial infarction.
c. The nurse takes the patient's vital signs.
d. The nurse administers pain medication to the patient.

14. What is the primary purpose of prioritizing hypotheses in the nursing process?
a. initiate interventions without further analysis
b. determine the patient's preferred treatment options
c. develop a structured plan for care delivery
d. refine decisions for interventions based on the acuity of problems

15. While performing a head-to-toe assessment on a patient in the hospital, the nurse notices that the patient is experiencing sudden confusion and agitation. What is an example of a nursing intervention that most closely reflects the CJMM step of taking action?
a. Recommend the provider order a sedative medication.
b. Ask the patient why they are feeling agitated.
c. Assess the patient's vital signs and oxygen saturation levels.
d. Assume the patient is having a panic attack.

16. The nurse is caring for a patient who presents to the emergency department with worsening shortness of breath and sudden weight gain. The nurse performs a physical assessment and notes edema in the lower extremities and auscultates crackles in the lungs. The nurse anticipates that the patient is experiencing a heart failure exacerbation. Which step of the CJMM is the nurse illustrating?
a. assessing cues
b. prioritizing hypotheses
c. generating solutions
d. taking action

17. The nurse is caring for a patient who reports 6/10 arm pain. After administering acetaminophen, what evaluation finding would indicate that the action was effective?
a. decrease in patient's reported pain level
b. slowdown in urinary output
c. respiratory rate of 20 breaths per minute
d. clear sounds from lungs

18. The nurse is caring for a patient with chronic hypertension who is prescribed lisinopril. Despite taking the medication daily, the patient's hypertension is not improving. The nurse relays this information to the provider and advocates for an increase in the medication dosage. Which aspect of the CJMM does this action by the nurse most closely resemble?
a. assessing cues
b. recognizing cues
c. taking action
d. evaluating outcomes

Check Your Understanding Questions

1. Describe how the nursing process promotes quality patient care and enhances patient outcomes.

2. What is the difference between the ADPIE nursing process and the CJMM?

3. What is the difference between subjective and objective patient data?

4. What is the difference between short- and long-term goals?

5. What are the key components of the evaluation phase in the CJMM and why is this phase crucial in the nursing process?

Reflection Questions

1. Why do you think clinical judgment is an important skill to have as a nurse?
2. How have you used inductive or deductive reasoning when caring for patients in clinical?
3. Why is it important to prioritize hypotheses in nursing practice?
4. Describe a scenario from your nursing practice or clinical experience where you had to make adjustments to a patient's care plan based on your assessment of their progress. How did you determine whether the interventions were effective, and what factors did you consider when deciding on the modifications to the care plan?

What Should the Nurse Do?

Mrs. Johnson, a 65-year-old female patient, presents to the emergency department with complaints of shortness of breath and chest pain. She has a history of hypertension and hyperlipidemia. On examination, Mrs. Johnson appears anxious, with elevated blood pressure (160/90 mm Hg), increased heart rate (110 bpm), and labored breathing. Her oxygen saturation is 88 percent on room air. Mrs. Johnson reports that the shortness of breath and chest pain began suddenly about two hours ago while she was at home. She describes the chest pain as a crushing sensation in the center of her chest that radiates to her left arm. She has not experienced this type of pain before and notes that it is not alleviated by rest.

Further questioning reveals that Mrs. Johnson has a family history of coronary artery disease, with her father experiencing a myocardial infarction in his 60s. She admits to occasionally missing her hypertension medication due to forgetfulness. Additionally, she reports a recent increase in stress due to caring for an ailing spouse.

1. The nurse determines that Mrs. Johnson's medical history of hypertension and hyperlipidemia are related to her current presentation. Which step of the CJMM is the nurse in?
2. The nurse applies supplemental oxygen and performs an electrocardiogram (ECG), per the provider's orders. Which step of the CJMM is the nurse in?

Mr. Lee, a 50-year-old male, arrives at the clinic with complaints of chronic fatigue, unexplained weight loss, and persistent abdominal pain. He has a history of type 2 diabetes and hypertension. On examination, Mr. Lee appears visibly fatigued, with a blood pressure of 140/90 mm Hg, a heart rate of 95 bpm, and a body mass index (BMI) indicating recent weight loss.

As the nursing team delves deeper into Mr. Lee's case, additional information unfolds. Mr. Lee reports that the chronic fatigue has been progressively worsening over the past few months, significantly affecting his daily activities and overall quality of life. His unexplained weight loss, approximately 15 lbs (6.8 kg) over the last three months, has been unintentional and accompanied by a loss of appetite. The persistent abdominal pain, which he describes as a dull ache that intensifies after meals, is localized in the upper abdomen.

Further exploration of Mr. Lee's medical history reveals suboptimal diabetes management, with inconsistent blood glucose monitoring and irregular medication adherence. Additionally, he reports occasional episodes of dizziness and blurry vision, which he attributes to his hypertension medication.

3. Based on the information provided and using the CJMM, what cues should the nurse recognize as potentially being relevant to the patient's condition?
4. Based on the recognized cues, what further information should the nurse gather to analyze the cues?

Competency-Based Assessments

1. Consider a scenario where a patient presents with symptoms that are initially unclear. Prepare a presentation that discusses how a nurse might use the nursing process to navigate the uncertainty and how this would contribute to improved patient outcomes.
2. Create a flowchart indicating how the nursing process contributes to continuity of care for patients transitioning between health-care settings, such as from hospital to home care. Provide specific examples.
3. Write an example of a clinical story showing how a nurse effectively uses all parts of the CJMM to make a

decision that positively affects a patient outcome.

4. With a peer, debate a scenario in which critical thinking and clinical judgment might conflict. How can a nurse navigate such conflicts to ensure the best possible patient care?
5. Develop a SMART goal for a patient with activity intolerance related to heart failure exacerbation.

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CHAPTER 5

Ethical Decision Making

FIGURE 5.1 Decisions about ethical dilemmas should always be discussed among all members of the health care team. (credit: "3D Scales of Justice" by Chris Potter/flickr, CC BY 2.0)

CHAPTER OUTLINE

INTRODUCTION In today's complex, modern world, we are surrounded by ethical dilemmas. Ethical dilemmas in nursing practice are as common as they are diverse. In health care, the focus on ethics has intensified in response to the increasing number of controversial developments, such as advances in technology and the ability to prolong life, as well as access to health care and financial resources. This is further complicated by the increase in average life expectancy, resulting in more people seeking health care.

Although many individuals benefit from a better quality of life, some may find themselves in a situation of extended suffering when prolonging life, which often comes at great expense. There are also many ethical issues surrounding the delivery of health care and allocation of health care resources based on one's age, race, gender, disability, and social mores.

Although there may be no clear solutions to these dilemmas, the fundamental philosophical principles are the same. Nurses can use clinical judgement to reason their way through these dilemmas by having an awareness and understanding of underlying philosophical principles. This allows the nurse to provide safe patient care and provide education to patients in an ethical manner. Unique challenges are also created in the profession of nursing. This chapter will discuss the impacts of ethics on nursing care.

5.1 Clinical Judgment and Ethical Dilemmas

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the role of ethics in clinical judgment
- Define common ethical principles
- Analyze common causes of ethical dilemmas in health care
- Describe the process of ethical decision-making

Moral philosophy, or ethics, is the discipline related to what is morally right or wrong and creates a framework that guides decisions related to ethical patient care. Nurses make life and death decisions daily, making ethics the foundation of integrity within the nursing profession. Ethical decision-making ensures the patient's autonomy is respected and equitable and culturally competent care is provided in alignment with a patient's beliefs and values.

The principles outlined in the Nursing Code of Ethics are the foundation that guides nurses to use clinical judgement and provide high-quality, patient-centered care. Historically, the Nursing Code of Ethics is rooted in the Hippocratic Oath, which has guided health care professionals for centuries through the use of a set of principles. In 1950, the American Nurses Association (ANA) developed the modern-day version of the Nursing Code of Ethics that has evolved with the changing needs of patients and nurses.

Clinical Judgement

The process used by nurses when making decisions, called clinical judgment, is a key attribute of professional nursing. It is based on nursing knowledge, critical thinking, and clinical reasoning, which is then used to understand and interpret information related to the delivery of care and how it affects care outcomes. The steps involved in clinical judgement help a nurse gather and analyze data to make ethical decisions. Clinical judgement and the clinical judgement measurement model are discussed in greater detail in the chapter on Professional Medical-Surgical Nursing.

A basic understanding of concepts associated with moral philosophy as well as understanding one's role in ethical decision-making will prepare the nurse not only to articulate their ethical positions but also to develop the needed skills to make ethical decisions in alignment with their clinical judgement.

LINK TO LEARNING

The America Nurses Association (ANA) is an organization that represents the interests of the nation's registered nurses. The ANA fosters high standards within the nursing profession by promoting a safe and ethical work environment, promoting the health and wellness of nurses, and advocating for health-care issues that affect nurses and the public to ultimately improve the quality of health care for all. The ANA Code of Ethics for Nurses with Interpretive Statements (https://openstax.org/r/77ANA) will prepare you for situations that will arise throughout your nursing career.

Although the terms "morals" and "ethics" are often used interchangeably, they are not the same. The definitions of both terms describe beliefs related to right and wrong and suggest guidelines for a potential corrective action, but there are slight differences between the two terms. A person's or society's idea of what is right or wrong, called **morality**, is usually associated with one's behavior. The values or system of values that are considered moral by a community, called ethics, is often culturally based. Ethics focuses on a formal, systematic study of moral beliefs, whereas morality focuses on adherence of informal, personal values (Loggins, 2023).

Ethical Principles

The nursing profession requires a high degree of ethical responsibility. As health care providers, patients not only trust their nurses to make well-informed decisions to ensure quality care and optimal outcomes, but they also rely on nurses to advocate for their best interests. The ANA's Professional Standards includes a framework of principles and guidelines for the nursing profession. Specifically, the ANA Code of Ethics provides a definitive guide to ensure that ethical standards are upheld (ANA, 2015). Ethics includes the principles of autonomy, beneficence, justice, and

nonmaleficence. The core of nursing practice includes concepts such as respect, compassion, and empathy, upon which ethical principles are built. Adherence to ethical principles ensures patients receive the highest quality care while the integrity of the nursing profession is maintained.

Autonomy

The ethical principle of autonomy acknowledges that patients have the right to maintain control and to make their own decisions related to treatment and care (ANA, 2015). Autonomy is also referred to as the right to **self-determination**, meaning patients have the moral and legal right to determine what will be done with and to their person. By providing patients the information they need, informed decisions can be made that align with their values, beliefs, and preferences. This enables the interdisciplinary team to coordinate care in alignment with the patient's wishes as well as promote strong relationships that ensure quality care. For example, this principle would enable the interdisciplinary team to support and respect a patient's decision about the acceptance or refusal of life-sustaining treatments.

Beneficence

The ethical principle of beneficence relates to the nurse's responsibility to act in their patient's best interest; in essence, it is the duty to do good. The ANA defines this principle as "preventing harm, removing harmful conditions, or affirmatively acting to benefit another or others" (ANA, 2015, p. 41), and it emphasizes the promotion of the patient's well-being and interests to improve the patient's health outcomes and overall welfare. Nurses uphold this principle as they prioritize each patient's individual needs while providing compassionate, patient-centered care that includes health promotion and disease prevention strategies. As a nurse, there will be instances, such as noncompliance that results in frequent hospitalizations, that make it difficult to provide compassionate patient-centered care. An example is patients with heart failure; heart failure has the highest 30-day readmission rate, which is mostly due to ineffective self-care (Alnomasy & Harmon Still, 2023). Despite the frustration in these types of situations, the nurse has an ethical duty to provide compassionate care.

Justice

The ethical principle of justice refers to treating all patients fairly and equitably. This principle requires that all individuals, regardless of race, age, sex, sexual orientation, gender identity, ethnicity, or social status, receive quality care with safe outcomes to ensure equitable distribution of health care and resources. Nurses should recognize and address social justice issues as well as advocate for policies and practices that promote health equity. Whereas equality means giving everyone access to the same resources regardless of their own special circumstances, equity takes into account individual challenges and advantages, and means providing assistance necessary to create an equal outcome for all, *considering* their circumstances (Figure 5.2). For example, when free flu vaccines are offered first to all older adults, we are using the ethical principle of justice. It is more equitable to administer the vaccines to older adults first because they are at higher risk.

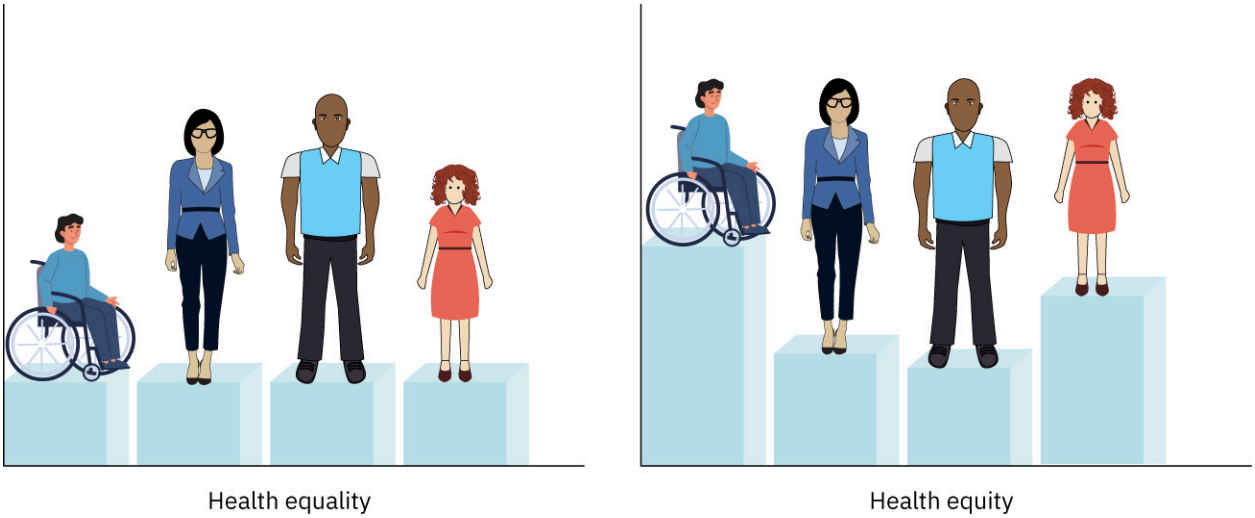

FIGURE 5.2 Equity takes into account individual circumstances and provides necessary assistance to create an equal outcome. (modification of work from *Psychiatric-Mental Health Nursing*. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Nonmaleficence

The ethical principle of nonmaleficence refers to the duty to do no harm, which we hear of as part of the Hippocratic Oath for medical doctors. It is also a foundational principle in nursing practice. This principle requires nurses to be vigilant, observant, and proactive while prioritizing potential risks and benefits of treatment options and simultaneously promoting healing, health, and well-being. All of these requirements can be achieved by selecting interventions that will cause the least amount of harm while also achieving the most beneficial outcome. For example, you may be caring for a mentally ill patient who has verbalized homicidal ideations that include a plan to harm someone and then themselves. As the patient's nurse, you may feel torn regarding the patient's privacy and the treatment plan that could divert the homicidal ideations (NCSL, 2022). However, a nurse's duty is to do no harm while also ensuring the patient's and other individuals' safety (Loggins, 2023).

It is important to note that most states have laws in place that either require or permit health-care professionals to disclose information about patients who may become violent (NCSL, 2022). These laws have received increased attention following the increase of mass shootings. Some states, such as New York, have changed the reporting requirements from a permissive to a mandatory duty for health-care professionals to report when they believe a patient may pose a danger to themselves or others. A specific case in California, Tarasoff v. The Regents of the University of California (Laves, 1979), created a passage of "duty to warn" or "duty to protect" laws in almost every state. These laws afford health-care professionals immunity from civil and criminal liability for disclosure of confidential mental health information. The specific requirements vary by state, making it important to consult your risk management department when faced with a duty to warn or protect.

Fidelity

There is also the ethical principle of **fidelity**, which includes a model of care delivery that incorporates altruism, loyalty, caring, and honesty. For example, when an older adult patient with intact cognitive function is diagnosed with a terminal illness but they do not want to share this information with their family, it can create an ethical dilemma. This requires that no health-care information be shared without the patient's consent to maintain the established trust between the patient and nurse. It also requires consultation within the interdisciplinary team members, such as case managers, social workers, and clergy, to identify community resources to provide support and services that the patient may need as their disease progresses.

Causes of Ethical Dilemmas

The human phenomenon of caring is the basis of the nursing profession. Though the nurse wants the best care for their patients, identification of the best care is not always easy; it may be compounded by an ethical dilemma. It is important for the nurse to be aware of major ethical dilemmas that are easily recognized, as well as daily interactions with patients and families that may give rise to ethical challenges that are not always easily recognized. Common topics that can create ethical dilemmas faced by nurses include

- Confidentiality of patient information, especially with the increased use and availability of computers
- End-of-life issues related to pain control, do not resuscitate (DNR) orders, do not intubate (DNI) orders, life support, or food and fluid issues
- Refusing to provide care for reasons ranging from a conflict in personal values to fear of personal risk of injury
- The use of restraints. It is important to weigh the risks of limiting a patient's autonomy against the increased benefits to patient safety.
- Trust issues related to the use of placebos (an inactive substance used in place of the actual medication) when conducting nursing research or situations in which the family and provider have decided it is better to withhold certain information from a patient.

Ethical Decision-Making

It is inevitable that nurses will encounter ethical dilemmas in many challenging patient care situations. Determining the correct action for each situation can be very stressful. Through use of the ethical principles of autonomy, beneficence, nonmaleficence, and justice outlined by the ANA, a solid foundation is provided for ethical decision-making (ANA, 2015). This foundation is a guide to promote a logical, systematic framework for ethical decision-making.

The approach to ethical decision-making can follow the steps in the Clinical Judgement Measurement Model (Table

5.1).

Step	Guidelines to Assist in the Ethical Decision-Making Process
Recognize and analyze cues (Assess the ethical/moral situation)	• Are there any procedural conflicts related directly to the patient or to the primary decision-maker, the family or guardian, or health-care providers? • Be attentive to any legal, ethical/moral, or professional dilemmas. • Collect data about the patient's interpretation of their health, their cultural beliefs, and resources or barriers. • Identify the most important people involved in the dilemma. • Recognize any moral problems in relation to ethical principles or professional obligations.
Prioritize hypotheses and generate solutions (Determine the nature of the dilemma, apply ethical principles, create potential courses of action)	• Address any associated legal data (e.g., DNR orders). • Assess the patient's decision-making capacity. • Include medical facts, diagnoses, and treatment options as well as the values, beliefs, and religious components. • Outline the ethical/moral issues associated with the situation; apply principles of autonomy, beneficence, nonmaleficence, and justice. • Plan possible courses of action.
Take actions (Consider potential consequences of options, list the alternatives)	• Ask "What if...?" or "If, then...?" questions. • Compare and contrast the potential outcomes. • Compare the alternatives with the associated ethical principles, as well as with the nursing code of ethics.
Evaluate outcomes (Decide and evaluate the decision)	• Are there any ethical reasons impeding your decision? If so, what is your response to these ethical reasons? • List the ethical reasoning for the decision. • What is the best or correct course of action?

TABLE 5.1 Use of the Clinical Judgement Measurement Model in Ethical Decision-Making

Hospital ethics committees began to emerge in the early 1980s and, in time, became the primary source for dealing with ethical issues. Described in more detail later in the chapter, ethics committees provide support for health-care professionals when ethical challenges arise during clinical practice and are often consulted by nurses to help guide decision-making when ethical dilemmas are present during health-care delivery (Aulisio, 2016). Ethical dilemmas arise for a host of reasons (Hajibabaee et al., 2016) and can include the following:

- Assignments that are contradictory to personal cultural or religious beliefs or with the Code of Ethics for Nurses
- Complicated decision-making processes in health care
- Considerations associated with advancing medical technology
- Considerations to protect a patient's rights
- Diversified beliefs related to medical involvement
- Diversity of lifestyles
- Diversity of morals, religious values, and cultural beliefs
- Incompetent peers
- Life and death decisions that must be made
- Patients refusing treatment

- Political and legal issues related to patient independence, euthanasia, and assisted dying
- Short-staffing or staff who fail to meet their responsibilities

Avoiding ethical dilemmas is impossible, but equipping yourself with knowledge to face these dilemmas is essential. The most important thing is to deal with each situation in a professional manner that promotes quality care and patient safety.

LINK TO LEARNING

This article from the *Journal of Medical Ethics and history of Medicine* provides an in-depth understanding of ethics committees (https://openstax.org/r/77CodeofEthics) and the ethical challenges faced by health-care providers.

5.2 Patient Care and Safety

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Analyze what it means for nursing to be the most trusted profession
- Discuss how ethical nursing care involves advocacy for patient safety
- Apply HIPAA and maintaining confidentiality to the role of the nurse

For nurses to promote integrity in patient care and safety, it is imperative to be knowledgeable about the ANA's Code of Ethics for Nurses. In addition, nurses must be knowledgeable about the standards of practice for the profession, including relevant federal, state, and local laws and regulations, as well as the employing organization's policies and procedures. When nurses encounter inappropriate or questionable practices or when incompetent, unethical, illegal, or impaired practices are not corrected, nurses should follow the established process for reporting and handling these matters.

When nurses must responsibly report these kinds of situations, the state nurse's associations should be available to provide advice and support for their members to navigate the development and evaluation of the reporting process and procedures. Reporting questionable practices will likely carry a substantial risk to the nurse (e.g., the fear of retaliation or threat to job security); however, the professional organization has a responsibility to protect the practice of nurses who choose to report their concerns. It is important to note this risk does not negate the obligation to report threats to patient safety.

The Most Trusted Profession

Not only is the nursing profession accountable to society but nurses have been named the most trusted profession for the twenty-first year in a row (ANA, 2023). This is because nurses are trusted not only by their patients but also because of the high ethical standards that are implemented during the delivery of patient-centered care. According to a Gallup poll, "nurses continue to garner the highest ethics ratings from Americans among a diverse list of professions, a distinction they have held for more than two decades" (Brenan, 2023, para 1). The ANA President also recognized the 4.4 million nurses in the United States and commended them on their role in maintaining the health and safety of their patients (ANA, 2023).

Ethical Care and Safety

The Code of Ethics for Nurses is the foundation of the nursing profession's promise to provide and advocate for safe, quality care for all patients and communities. Nurses work diligently to preserve patient-centered care and safety while navigating ethical dilemmas. It is of utmost importance that nurses remain alert to situations that present incompetent, unethical, illegal, or impaired practices or actions that could result in harm to a patient. When situations of this nature arise, nurses have a duty to take the appropriate action to resolve such matters. Examples of such situations are listed in Table 5.2.

Situation	Appropriate Action
An incompetent act within the organization that could result in patient harm	• Maintain a focus on the patient's best interests. • The concern should be expressed to the colleague involved in a clear and supportive manner. • Uphold the integrity of the nursing practice.
A colleague who is impaired while on duty	• Consult supervisory personnel. • Extend compassion and caring to the colleague throughout the process of identification, remediation, and recovery. • If appropriate, help the colleague access appropriate resources. • The concern should be expressed to the colleague involved in a clear and supportive manner.
A practice in the health-care delivery system or organization that could compromise a patient's welfare	• Express the concern to the responsible manager or administrator. • When indicated, express the concern to an appropriate higher authority within the organization. • Or, if necessary, express the concern to an appropriate external authority.
An incompetent, unethical, illegal, or impaired practice that is not corrected	• Nurses must report the issue to the appropriate external authorities. • External authorities include practice committees of professional organizations, licensing boards, and regulatory or quality assurance agencies. • Certain situations may warrant the notification of all such groups, including law enforcement.

TABLE 5.2 Unethical Situations and Appropriate Responses

When reporting potentially unethical acts, it is important that factual documentation and accurate data are included in the report. It is the duty of the nurse to protect the patient, the public, and the profession from practices that may result in harm. When responsibly reporting, the professional organizations also have a duty to protect the practice of nurses who choose to report their concerns through formal channels.

Advocacy

Nurses are on the frontline of care delivery and are at the center of patient communication when ethical dilemmas are inevitable. The act of pleading for a cause, idea, or policy, or **advocacy**, is an ethical obligation of all nurses to ensure their patients are protected from harm. Nurse advocacy is one of the most important responsibilities and is crucial to optimizing patient outcomes by:

- Communicating with providers on the patient's behalf
- Helping patients navigate the health-care system (e.g., billing, medical care, insurance, assisting with legal issues)
- Mediating obstacles to quality patient care
- Promoting patient safety
- Protecting against social injustice
- Protecting patients' rights
- Providing patient education
- Providing pertinent information and education to help patients make informed decisions

Patients rely on nurses to be their voice as well as to provide support during their time of need when they are not well and are confronted with uncertainties about their health and care. Nurses shoulder a big responsibility because they are often the first and last point of contact for patients, establishing an integral part of the patient-nurse trust relationship.

Refusing to Provide Care

The ANA Code of Ethics for Nurses indicates that nurses have the same duties to self as to others. This includes preservation of wholeness of character as well as preservation of integrity. There may be times when nurses find themselves in circumstances that exceed their moral limits or that violate their moral standards. When this occurs, nurses should express their concerns to the appropriate authority. Nurses are justified in refusing to participate on moral grounds when a specific decision or action is felt to be morally objectionable, especially when it may result in jeopardy to a patient, family, community, population, or to the nursing practice. Nurses who choose to not to participate on these grounds should do the following:

- Communicate the refusal in time for alternate arrangements to be made for patient care.
- Communicate this decision in a timely, appropriate manner.
- Express refusals in advance.

It is important to note that conscience-based refusals to participate in patient care do not include personal preference, prejudice, bias, convenience, or arbitrariness. Although conscientious objections are based on religions or moral grounds, they may not protect nurses from formal or informal consequences. In fact, refusal to provide care for a patient can be viewed as patient abandonment. Patient abandonment occurs when a health-care professional refuses to treat a patient or is negligent in not being available when a patient needs care. This act is a punishable crime and can result in the loss of the nurse's license.

Although nurses do have a right to refuse to participate in patient care that conflicts with personal religious beliefs, nurses cannot refuse care on the basis of discrimination or dislike. An example of a religious conflict may be refusing to provide abortion care; a discriminatory conflict may be related to providing care for an incarcerated individual or a patient with a substance use disorder. Although it can be quite challenging to care for certain patients if you have a moral objection, nurses have an obligation, a duty, to provide the same level of care to all patients.

Confidentiality and the Health Insurance Portability and Accountability Act

With the increased use of technology and increased access to information, maintaining patient confidentiality (privacy) in the health-care industry has become a daunting task. The Health Insurance Portability and Accountability Act (HIPAA), which became federal law in 1996, created national standards to protect patient privacy and prohibited health information from being disclosed without patient consent or knowledge in almost all situations. HIPAA has two components: the HIPAA Privacy Rule and the HIPAA Security Rule. These rules are designed to protect an individual's health information while also enabling the needed flow of the health information to provide quality care. It is important to note that no health information can be shared with an outside provider without the patient's written consent. Examples of HIPAA violations include speaking a patient's name while in another patient's room and leaving chart documents in public view.

Certain information may be disclosed under defined policies, mandates, or protocols. The written guidelines must ensure the patient's rights, safety, and well-being are protected. This type of information includes for purposes of

- Continuity of care
- Education
- Peer review
- Professional practice evaluation
- Quality improvement
- Risk management
- Third-party payments

Nurses must be vigilant in safeguarding privacy for individuals, families, and communities to maintain the trust developed through the nurse-patient relationship. The expectations are that personal information will not be disclosed without their consent, which is facilitated by nurses and other health-care providers maintaining this level of confidentiality. It is a nurse's duty to maintain confidentiality of all patient information, including personal and

clinical information in the work setting and while off duty. It is especially important that nurses remain diligent when maintaining data security when using electronic communications or working with electronic health records. Additionally, nurses not only advocate for privacy for individual patients, they also participate in creating policy and practices to protect both personal and clinical information throughout entire health-care practices and facilities. It is also important to note that patient information of any kind, including pictures of patients, should not be used on any personal social media sites.

LINK TO LEARNING

From salary to staffing, delegation to documentation, and even cutting-edge topics such as social media, ANA has principles aimed at giving you practical information (https://openstax.org/r/77ANAPrinciples) for your professional practice.

5.3 Ethical Patient Education

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Describe the ethics of providing patient education
- Discuss the benefits of focusing on ethics in patient education

Personal beliefs can affect how nurses approach patient education, especially when a nurse does not believe in or agree with specific treatments or health-care choices. Examples of this may include specific types of treatments or surgeries, medications, or certain vaccines. Despite personal beliefs, nurses have a responsibility to present factual, evidenced-based education to patients that is in alignment with current standards of care and practice. Education should be based on what a treatment does, and not what the nurse believes.

The use of systematic patient education improves the likelihood that patients can meet their specific health-care needs. Despite a patient's willingness to learn, the nurse has a responsibility to present information that will motivate the person to recognize the necessity to learn. Health education is vitally important to nursing care because it promotes the ability of patients and families to behave in ways that are conducive to optimal self-care.

How Nurses Educate Patients

The various learning experiences designed to promote behaviors that facilitate health are considered **health education**. It is essential to promote optimal patient outcomes. The function of teaching in nursing is included in state practice acts and the ANA Code of Ethics for Nurses. Nursing care is directed toward promoting, maintaining, and restoring health; preventing illness; and assisting people to adapt to the residual effects of illness. This mindset should result in making every encounter with a health-care consumer an opportunity for education.

Nurses should provide education that is simple, patient centered and **multimodal** (i.e., using a variety of methods) to ensure the health literacy of patients and caregivers is met. Health literacy, as defined by the Centers for Disease Control and Prevention (CDC), is "the degree to which individuals have the ability to find, understand, and use information to inform health-related decisions and actions" (CDC, 2023b, para 2).

It is also important to be mindful that patients can feel overwhelmed by receiving too much information, making it necessary to keep the process simple. To ensure patient education is easily understood:

- Do not go too in-depth into a disease process with a newly diagnosed patient.
- Provide written information to enable the patient to review it later.
- Provide the patient education in the patient's preferred language, when possible.
- Speak slowly and relay the instructions clearly.
- Use layman terms and visual aids.

To advance patient education:

- Begin patient education with each encounter starting at admission.
- Ask the patient how they would explain their disease (step-by-step teach-back technique).

- Be mindful of the patient's limitations and strengths.
- Determine the patient's learning style.
- Determine what the patient already knows and correct any misinformation.
- Include the family in all patient education as much as possible, using the same suggestions.
- Provide information about signs and symptoms of the patient's condition that may warrant immediate attention.
- Stimulate the patient's interest.
- Take advantage of educational technology.
- Use return demonstration, involving the patient from the very first treatment.

Providing Ethical Education

It is important to maintain an ethical mindset when providing patient education, to ensure the teaching focuses on what a treatment does and not what the nurse believes. Effective health education promotes individual and community wellness and is directly related to positive patient care outcomes. Teaching is an integral tool used by nurses to help patients and families adopt effective health behaviors and alter lifestyle patterns that create a predisposition to health risks. Providing ethical health education includes ensuring the education materials:

- Are accurate and up to date
- Consider the psychosocial situation of the patient
- Include cultural factors, religious beliefs, and values
- Take health disparities into consideration

Providing Education Ethically

To provide education in an ethical manner, the teaching cannot be biased. Just as every patient has a right to equitable patient-centered care, every individual has a right to the same patient education, regardless of age, gender, or socioeconomic status, that is aligned with a patient's beliefs and values.

Ethical development of patient education includes but is not limited to:

- Being mindful of cultural and religious differences
- Being mindful of the patient's communication barriers, especially sensory impairment such as sight or hearing, as well as cognitive disabilities
- Considering the health disparities of each patient
- Providing continuous, compassionate education, especially for patients who have a limited understanding of how behavior affects health
- Providing educational content in a variety of forms to capture patients' different learning styles
- Providing educational materials in the patient's native language with their health literacy in mind
- Writing down important information so the patient can take it after discharge

The preventable differences that underserved populations experience related to disease, injury, or violence that can negatively impact health are considered **health disparities** (CDC, 2023a). Health disparities result from multiple factors, which include poverty, environmental threats, inadequate access to health care, individual and behavioral factors, and educational inequalities. Nurses should be sure that any educational material is developed with the patient's health disparities in mind.

Benefits of Ethical Patient Education

Patient education that considers health disparities, health equity, cultural and religious differences, and health literacy is a win-win for the patient and the health-care team. Benefits of ethical patient education include

- Changing communities with each health consumer encounter
- Creating a stronger patient-nurse trust relationship
- Decreasing re-hospitalizations
- Helping patients manage their health more effectively to improve outcomes
- Improving health literacy
- Increasing the patient's ability to understand how behavior choices affect health
- Meeting consumers' expectations for comprehensive health information
- Motivating the patient's desire to learn

- Providing motivation to choose a healthier lifestyle
- Reducing health disparities while improving health equity

REAL RN STORIES

Nurse: Carolyn
Years in Practice: 15
Clinical Setting: Hospital

Carolyn, a nurse who has maintained the practice of compassionate care during her 15 years of nursing, practices mindfulness related to each patient's different learning styles. Carolyn is vigilant in providing educational material that is appropriate for each patient's learning style, which helps increase the amount of information the patient can absorb and use in their decision making.

Mr. Smith is a 70-year-old patient with congestive heart failure and chronic obstructive pulmonary disease who is preparing for discharge. Carolyn observed during the course of his hospitalization that Mr. Smith is a visual learner as well as a kinesthetic/tactile learner. To address Mr. Smith's visual style of learning, Carolyn teaches Mr. Smith disease management techniques daily so he can see and observe the techniques and decisions Carolyn uses in the daily in-patient care. Carolyn also provides written instructions, pictures, and diagrams for Mr. Smith to reference once he is home.

Carolyn sees that Mr. Smith learns best when he is physically engaged during the learning process. The physical engagement helps distract Mr. Smith from his difficulty sitting still, allowing him to learn through hands-on demonstrations and teaching. To address Mr. Smith's kinesthetic/tactile learning style, Carolyn walks Mr. Smith through using his metered-dose inhaler, setting up his continuous positive airway pressure (CPAP) machine, and administering breathing treatments. Carolyn and Mr. Smith work well together with the hands-on education and return demonstrations, or "teach-back" what they have learned.

Carolyn also has a second patient ready for discharge. Ms. Johnson is a 65-year-old patient with insulin-dependent diabetes. Carolyn observes that Ms. Johnson is an auditory learner as well as a reading and writing type of learner. Carolyn is mindful to talk through her daily routines and care during her time with Ms. Johnson, knowing Ms. Johnson will retain more beneficial information to ensure an optimal long-term outcome after discharge. Carolyn reinforces medication information by saying it out loud each time she administers Ms. Johnson's insulin to ensure Ms. Johnson will recall how to use her new insulin pen. Closer to the patient's discharge date, Carolyn begins having Ms. Johnson use return demonstrations that help reinforce her dietary and medication needs as well as lifestyle choices.

With Ms. Johnson also being a reading and writing type of learner, Carolyn helps Ms. Johnson write down the important information. The process of writing and reading the instructions reinforces the educational materials for Ms. Johnson and will also serve as a reference upon her return home.

Carolyn loves being a nurse and helping people. Carolyn's efforts to ensure her patients are equipped with the education to meet their needs have established trust, provided peace of mind for her patients and families, and will ensure better outcomes for the patients upon their arrival home. Taking time to help patients understand and manage their disease equips them to make healthier lifestyle choices to promote better outcomes. This is an important part of the foundation of how and why nurses have become the most trusted profession in the United States.

5.4 Ethical Challenges in Scope of Practice

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the Code of Ethics in Nursing practice
- Apply nursing ethics to medical-surgical nursing
- Summarize the role and actions of an ethics committee

Ethics is the framework that guides decisions related to patient care, and this guiding framework is important because lives are at stake. Nurses make life and death decisions daily, making ethics the foundation of integrity within the nursing profession. Ethical decision-making ensures the patient's autonomy is respected, equitable treatment is provided, and that the best care will be given in alignment with a patient's beliefs and values.

The ANA Center for Ethics and Human Rights was established to help nurses navigate the ethical complexities of life and death decisions commonly found in everyday practice. The ANA works diligently to develop ethics and human rights policy at the state, national, and international levels. Regardless of the present-day challenges in health care, the ANA's Code of Ethics for Nurses unites nurses while illustrating the integrity of the nursing profession and its promises to advocate for safe, quality care for all patients and all communities, regardless of socioeconomic status.

Code of Ethics for Nurses

As discussed earlier, the Code of Ethics for Nurses has been referred to by the ANA as the "social contract that nurses have with the U.S. public" (ANA, 2015, para 11). The Code of Ethics for Nurses is the foundation of the nursing profession's promise to provide and advocate for safe, quality care for all patients and communities. It creates unity among nurses to support each other to ensure nurses can fulfill their ethical and professional obligations.

The ANA points out that although the foundation of nursing care does not change, changes do occur in the structure, financing, and delivery of health care. The Code of Ethics for Nurses is updated regularly to address these changes to support nurses with the provision of respectful, humane, and dignified care, which is frequently challenged by the failings within U.S. health care and the associated negative social determinants of health. Despite the challenges, the Code of Ethics for Nurses personifies the proud ethical heritage of nursing that will be continued regardless of the challenges presented by the modern health-care system (ANA, 2015).

Ethics in Medical-Surgical Nursing

Ethical issues in medical-surgical nursing span a wide range of situations. Some of the more common situations involve questioning provider orders, the conflict between spirituality and science, use of opioids, end-of-life decisions, and the use of social media.

Questioning Provider Orders

It can feel intimidating to question a provider's order, but ethically, nurses have a responsibility to advocate for their patients' care and safety. Although nurses may not agree with a specific order from a provider, they cannot randomly decide to not follow an order without the possibility of facing disciplinary actions by their employer. It is the nurse's responsibility to follow the provider's orders. However, if an order seems incorrect or unclear, the nurse needs to call the provider for clarification.

However, when there is a safety concern, the nurse has an obligation to advocate for the patient by questioning the provider's order. For instance, one of the rights of medication administration is "right medication." If the nurse conducts a safety check and determines that a medication is not indicated, they should question the provider's order. If the provider insists on administering the medication, the nurse may need to move up the chain of command to speak to a provider in a higher position as well as notify the nursing supervisor of the situation. The alternative solution would be to administer the medication and risk the patient having an adverse outcome, which could create a risk to the nurse's license. Each individual state's Board of Nursing handles disciplinary action risking license suspension or revocation.

Cultural and Spiritual Implications

There may be situations in which nurse is presented with the dilemma of choosing a patient's spiritual preference versus an evidence-based scientific solution. For example, patients who are Jehovah's Witnesses do not believe in receiving blood products, yet these products may be needed in a life-threatening situation. A nurse can advocate for the patient by discussing with the provider the possibility of ordering epoetin instead of a blood product.

Although it is the duty of the nurse to present the evidence-based information to the patient so the patient can make an informed decision, it is equally important for the nurse to set aside their own personal beliefs to respect the patient's spiritual beliefs and decisions regarding their care. This is patient-centered care at its deepest level and requires a great deal of compassion from the nurse. Autonomy is the patient's right regardless of the evidence-

based information or scientific treatment presented, and beneficence is the nurse's duty to their patient.

Use of Opioids

The administration of opioids can create quite a dilemma. Although nurses have an ethical responsibility to manage the patient's pain and to provide comfort, nursing clinical knowledge indicates that high dosages of opioids can lead to respiratory distress and even death. Nurses also have to exercise caution when administering medications such as opioids to a patient with known or suspected substance use disorders who may request more than actually needed. To further complicate the administration of pain medication, some nurses are hesitant to administer large doses of pain medications to terminally ill patients. However, the risk of respiratory depression is not the intent of the action (the administration) and should not be used as an excuse for withholding the analgesia. Although it is important to report respiratory depression to the physician, the administration of pain medication should be governed by the patient's needs.

End-of-Life Decision-Making

End-of-life care and decision-making can be difficult for the nurse as well as for the patient and families. However, there is an established trust in the patient-nurse relationship, and the nurse is often looked to for guidance. It is important to set aside one's own beliefs to compassionately respect the patient's and family's beliefs and desires.

When a patient chooses to not be resuscitated if their heart or breathing stops, a verbal order is not sufficient. It is imperative to discuss this subject with all patients upon admission to ensure a DNR or DNI order has been signed by the patient (or their durable power of attorney) and placed in the patient's record. If the patient has an advance directive, it is also important to obtain a copy to be placed in the patient's record. Additionally, it is important to discuss the patient's wishes with the provider, which may lead to further communication with the family, especially if the family is afraid to let a loved one die with no efforts to resuscitate. Finally, compassion should also be extended to colleagues who are facing these difficult situations. Talking and listening can provide a level of needed support.

Maintaining Boundaries on Social Media

Social media and professional boundaries are challenging in today's world. Each generation of nurses comes into the nursing profession more technologically savvy than the previous generation, often resulting in a blurred line with professional boundaries, especially with the increased use of social media. The use of social media can also create a challenge in distinguishing between one's personal identity and professional identity. However, professional standards in the nursing profession are outlined by the ANA's Code of Ethics for Nurses. It is important to maintain one's integrity by adopting clearly established professional boundaries to support safe use of social media as well as to promote the future profession of nursing.

LINK TO LEARNING

When a hot topic arises in the industry, ANA will create an explanation, justification, or recommendation for a course of action, otherwise known as a position statement. Read the the ANA's position on social media use (https://openstax.org/r/77ANASocMedia) as it relates to the nursing profession.

Ethical Consultations and Ethics Committee

The hospital **ethics committee** is the primary source for dealing with ethical issues. Described in more detail later in the chapter, ethics committees provide support for health-care professionals when ethical challenges arise during clinical practice and are often consulted by nurses to help guide decision-making when ethical dilemmas are present during health-care delivery. The committee is composed of people of various professions, including physicians, nurses, clergy members, attorneys, social workers, and community members (Lifespan Health System, n.d.). As discussed earlier, avoiding ethical dilemmas is impossible, but having the knowledge to face these dilemmas is essential. The most important thing is to handle each situation in a professional manner that promotes quality care and patient safety.

Ethics committees provide support and guidance by:

- Adopting and promoting adherence of policies, procedures, guidelines, and staff bylaws

- Assisting in ethics-related educational programming and policy development within their institutions
- Assisting in facilitation of decision-making in individual cases
- Drawing upon resources of professional organizations to inform committee recommendations
- Protecting the confidentiality of information disclosed during discussions
- Respecting the rights and privacy of all participants
- Serving as advisors and educators

Summary

5.1 Clinical Judgment and Ethical Dilemmas

- Clinical judgement is guided by ethical guidelines as outlined by the ANA.
- Clinical judgement is based on nursing knowledge, critical thinking, and clinical reasoning which is then used to understand and interpret information related to the delivery of care and how it affects care outcomes.
- The principles outlined in the Nursing Code of Ethics are the foundation that guides nurses to provide high-quality, patient-centered care.
- Common ethical principles include autonomy, beneficence, justice, nonmaleficence, and fidelity.
- Autonomy is an ethical principle that acknowledges a patient has the right to make their own informed decision that should be upheld and respected by the interdisciplinary team.
- Beneficence refers to the nurse's responsibility to act in their patient's best interest, the duty to do good, which the ANA defines as "actions guided by compassion."
- Justice refers to the duty to treat all patients fairly and equally, regardless of social or financial status.
- Nonmaleficence refers to the duty to do no harm, which is a foundational principle of nursing practice.
- Common ethical issues faced by nurses involve topics such as confidentiality, the use of restraints, the maintenance of trust, and a variety of end-of-life issues that may be related to pain control, DNR orders, the use of life support, and the matter of continuing food and fluids.
- The ethical principles outlined by the ANA of autonomy, beneficence, nonmaleficence, and justice are a solid foundation for ethical decision-making. This foundation is a guide to help promote a logical, systematic framework for ethical decision-making.
- The approach to ethical decision-making can follow the steps of the clinical judgment measurement model, which includes recognizing and analyzing cues, prioritizing hypotheses, generating solutions, taking action, and evaluating outcomes.

5.2 Patient Care and Safety

- The nursing profession is accountable to society.
- Nursing has been named the most trusted profession for 21 years in a row.
- Nurses continue to use strong ethical principles during the delivery of patient-centered care.
- Navigating ethical dilemmas can take a toll on a nurse's caring nature.
- The ANA's Code of Ethics for Nurses is the foundation of the nursing profession's promise to provide and advocate for safe, quality care for all patients and communities.
- The Code of Ethics for Nursing with Interpretive Statements provides a systematic framework to help nurses navigate ethical dilemmas while also helping to preserve a nurse's caring nature.
- It is a nurse's duty to maintain confidentiality of all patient information, which includes personal and clinical information in the work setting as well as all venues when off duty.
- HIPAA created national standards to protect patient privacy by prohibiting health information from being disclosed without the patient's consent or knowledge except in certain situations to ensure continuity of care.

5.3 Ethical Patient Education

- Health education is essential to promote optimal patient outcomes.
- Health education is vitally important to nursing care because it promotes the ability of patients and families to improve their behaviors for optimal self-care.
- The function of teaching in nursing is included in state practice acts and the ANA Code of Ethics for Nurses.
- Nursing care is directed toward promoting, maintaining, and restoring health, preventing illness, and assisting people to adapt to the residual effects of illness.
- It is important to maintain an ethical mindset when providing patient education, to ensure the teaching focuses on what a treatment does and not what the nurse believes.
- Effective health education promotes individual and community wellness and is directly related to positive patient care outcomes.
- Teaching is an integral tool used by nurses to help patients and families adopt effective health behaviors and alter lifestyle patterns that create a predisposition to health risks.
- Patient education that considers health disparities, health equity, cultural and religious differences, and health

literacy is a win-win for the patient and the health-care team.
- Benefits of ethical teaching include improving health literacy and health equity, resulting in solid patient outcomes.

5.4 Ethical Challenges in Scope of Practice

- The ANA Code of Ethics for Nurses is the foundation of the nursing profession's promise to provide and advocate for safe, quality care for all patients and communities.
- The ANA Code of Ethics for Nurses creates unity among nurses to support each other to ensure that nurses can fulfill their ethical and professional obligations.
- There are many ethical dilemmas that can be encountered as a medical-surgical nurse, including issues with provider orders, cultural or spiritual conflicts with patients, end-of-life decision-making, and situations involving social media.
- The hospital ethics committee is the primary source for dealing with ethical issues.
- Ethics committees provide support for health-care professionals when ethical challenges arise during clinical practice and are often consulted by nurses to help guide decision-making when ethical dilemmas are present during health-care delivery.

Key Terms

advocacy act of pleading for a cause, idea, or policy
ethics committee appointed committee that provides support and guidance with ethical dilemmas to promote sound decision-making
fidelity duty to faithfully uphold one's commitments
health disparities preventable differences that underserved populations experience related to disease, injury, or violence that can negatively impact health
health education various learning experiences designed to promote behaviors that facilitate health
morality person's or society's idea of what is right or wrong; usually associated with one's behavior
multimodal having or using a variety of methods
self-determination moral and legal right to determine what will be done with and to an individual's person

Assessments

Review Questions

1. What term best describes a patient's right to self-determination?
   a. Justice
   b. Autonomy
   c. Nonmaleficence
   d. Beneficence

2. What term comes to mind when upholding the responsibility of a patient's best interest?
   a. Nonmaleficence
   b. Beneficence
   c. Fidelity
   d. Paternalism

3. You are asked by your supervisor to take photographs of residents and their family members during a holiday gathering at your long-term care facility. As a nurse, you recognize that HIPAA should be at the forefront of this decision. What action is most appropriate?
   a. Refuse to take the photographs because this is not your job responsibility.
   b. Take the photographs because the patients and families are smiling and appear happy as they enjoy the gathering.
   c. Take the photographs because it is a long-standing tradition at your facility.
   d. Refuse to take the photographs until you have received informed consent from all the patients.

4. You are a nurse manager for an acute care facility. What is an example of a statement from another nurse that indicates the need to provide additional education related to confidentiality and information security?
   a. "I refused to share my password with the new nurse in training on the unit."
   b. "I noticed an unattended computer in the hallway but did not have a password to log into it."
   c. "I don't pull up electronic records for other patients in our unit if I'm not providing their care.
   d. "I know Mr. Smith isn't your patient but would you mind proofreading my summary before I save it?"

5. You are caring for a high-risk pregnant patient. The patient and fetus are at a high risk for death. Some decisions will help promote the pregnant patient's life but create significant jeopardy for the fetus; other decisions will preserve the fetus' life at the expense of the patient's life. As the patient's nurse, what role is most significant in this ethical dilemma?
   a. Case manager
   b. Care coordinator
   c. Patient advocate
   d. Collaborator

6. As a nurse, you recognize that your patient does not have a good understanding of health information or how to make informed decisions based on information you have provided. What is a term or phrase that best describes this patient's knowledge deficit?
   a. Cognitive impairment
   b. Low health literacy
   c. Lack of willingness to learn
   d. Noncompliance

7. What is a true statement about teaching approach for ethical patient education?
   a. It remains the same regardless of cultural or religious practices or the patient.
   b. It is equal for all patients without consideration of health disparities.
   c. It considers psychosocial situation of the patient.
   d. It focuses on details the nurse learned when in nursing school.

8. What is a benefit of ethical patient education?
   a. Reduces the risk of readmission by increasing understanding
   b. Removes health disparities by providing equal education to all
   c. Decreases need for the patient to have additional questions
   d. Lowers patient expectations for health information

9. You are a nurse for a patient with diabetes who experiences frequent episodes of hypoglycemia (low blood sugar). You have noticed that the provider's order for the patient's insulin may put the patient at risk for hypoglycemia in the middle of the night. As your patient's advocate, what is an example of the most appropriate action?
   a. Mention to your nursing colleague that the provider's order was not well thought out.
   b. Administer the insulin as ordered and document the concern in the patient's record.
   c. Call the provider before administering the patient's insulin.
   d. Administer the insulin and inform the oncoming nurse to keep a close watch on the patient during the night.

10. What document has been referred to as a "social contract" for nurses to the public?
   a. The Health Insurance Portability and Accountability Act
   b. The ANA Code of Ethics for Nurses
   c. The Ethics Committee's Guidelines
   d. The Nurse-Patient Partnership

Check Your Understanding Questions

1. What is ethics?
2. Describe some differences between morals and ethics.
3. Differentiate equality and equity.
4. It is of utmost importance that nurses remain alert to situations that present incompetent, unethical, illegal, or impaired practices or actions that could result in harm to a patient. Describe some situations that might arise that would necessitate the nurse's attention.
5. Define health literacy.

Reflection Questions

1. Describe an ethical dilemma you have experienced in your clinical practice or personal life. How could you use the "Recognize and Analyze Cues" and "Prioritize Hypotheses and Generate Solutions" steps of the Clinical Judgement Measurement Model to weigh the ethical dilemma?
2. Why do you think nursing is considered the most trusted profession?
3. How might maintaining an ethical approach to patient education affect the nurse-patient relationship?
4. List some ways an ethics committee supports and guides ethical decision-making.
5. The spouse of your patient shares information with you about the patient that has not been revealed by the patient. How would you determine whether you should communicate this information to the patient's primary nurse?

What Should the Nurse Do?

Ms. Stein, a 45-year-old female patient, presents to the emergency department with severe abdominal pain. She reports a history of chronic digestive issues and recently underwent elective surgery for gallbladder removal. Her vital signs upon arrival are within normal range, but she appears distressed. Ms. Stein discloses concerns about the surgeon's decision-making process during her operation, raising ethical questions about the procedure's necessity. She feels inadequately informed about potential complications and alternative treatments.

1. What ethical principles might be applicable to Ms. Stein's situation, considering her concerns about the decision-making process and lack of comprehensive information?
2. What solutions could be proposed to address Ms. Stein's ethical concerns and improve her understanding of the surgical procedure?

You are caring for an older adult patient who has been newly diagnosed with type 2 diabetes mellitus. You are discharging the patient to home, and part of discharge instructions include educating the patient on the medications they will be taking at home.

3. How would you assess this patient's condition and psychosocial situation to determine how to best instruct them regarding their medications?
4. How would you modify your teaching plan if the patient was hard of hearing, visually impaired, or unable to read or write?
5. What are some specific benefits that might come of providing ethical education to this patient regarding their newly prescribed medication?

Mrs. Melton, a 52-year-old female patient, has presented to the medical-surgical unit with complaints of severe abdominal pain. She has a history of chronic kidney disease and diabetes. Her vital signs on admission include a blood pressure of 140/90 mm Hg, heart rate of 98 beats per minute, respiratory rate of 18 breaths per minute, and a temperature of 100.2°F. Mrs. Melton is visibly distressed and expresses concerns about her worsening abdominal pain. As a nurse, you need to consider the ethical principles outlined in the Code of Ethics in Nursing. Given her medical history, it is crucial to discuss the appropriate course of action with Mrs. Melton, ensuring that her autonomy is respected while considering beneficence and nonmaleficence. Additionally, the involvement of the hospital's ethics committee may be necessary to address complex decision-making involving Mrs. Melton's medical care.

6. Based on Mrs. Melton's medical history of chronic kidney disease and diabetes, how do you interpret the potential impact of these conditions on her current abdominal pain, and what additional information would you seek to refine your analysis?
7. Considering the ethical principles, what are potential solutions to address Mrs. Melton's abdominal pain while respecting her autonomy and ensuring beneficence and nonmaleficence?

Competency-Based Assessments

1. How might the nurse limit paternalism in health care?
2. Identify and analyze potential causes of an ethical dilemma when a patient requests the withholding of information about a serious diagnosis from their family. How would you approach this dilemma?
3. Discuss the potential ethical dilemmas a nurse might face when advocating for a patient's best interest.
4. As a working nurse, explain how you can address the challenges of balancing the duty to maintain confidentiality with ensuring effective interdisciplinary collaboration.
5. You are a nurse tasked with educating a patient about a sensitive medical condition. Discuss the ethical considerations you need to keep in mind when providing information about the diagnosis, treatment options, and potential outcomes.
6. Compare the outcomes of patient education that emphasizes ethical considerations versus scenarios in which ethics is not prioritized. What impact does an ethical approach have on patient outcomes and the nurse-patient relationship?
7. Define the ANA Code of Ethics.

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CHAPTER 6

Comprehensive Health Assessment and Physical Examination

FIGURE 6.1 Applying Your Learned Skills To A Comprehensive Health Assessment And Physical Exam Should Be Organized And Follow A Logical Plan. (modified from work from *Clinical Nursing Skills*. attribution: Copyright Rice University, Openstax, Under Cc By 4.0 License)

CHAPTER OUTLINE

INTRODUCTION The comprehensive health history and physical examination help the nurse devise a plan of care for the patient. To complete the health history and physical exam successfully, the nurse must use effective communication, critical thinking, and clinical judgment skills. The development of these skills arms the nurse with a solid foundation for practice. The concept of clinical judgment is the basis for decision-making and requires the nurse to integrate all data they have on the patient, including subjective and objective information.

The nurse's ability to communicate effectively is essential to gathering complete and accurate data from and about a patient, collaborating with other providers to coordinate care, and facilitating open, empathetic conversations with patients. The nurse will rely on their critical thinking skills to analyze patient data and piece together the "puzzle" of how to approach care. They must be able to identify patterns and establish priorities for their patients based on the data they have gathered and analyzed. The nurse will use each of these skills when taking a history and performing an exam on a patient. For example, the nurse will use their communication skills to explain what will happen during the exam to ease a patient's anxiety, critical thinking to adjust their questions according to a patient's needs, and clinical judgment to recognize and assess the data they gather during the patient encounter.

6.1 Critical Thinking in Assessment

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Define critical thinking
- Discuss the importance of critical thinking in nursing practice
- Explain the expansion of critical thinking to clinical judgment

Nurses use critical thinking skills every day, from one-on-one patient encounters in clinical settings, to the professional interactions they have with colleagues and the broader health care systems in which they work. Thinking critically means objectively considering and analyzing information and figuring out how to use it efficiently. According to the American Nurses Association (ANA), "critical thinking in nursing involves identifying a problem, determining the best solution, and implementing an effective method to resolve the issue using clinical decision-making skills" (ANA, 2024, para 3). It's a complex skill that incorporates education and training, experience, and available data. Critical thinking enables the nurse to make decisions that are well-informed, evidence-based, and **patient-centered**, which are decisions made with respect for the patient's interests, needs, culture, values, and preferences.

LINK TO LEARNING

You can read more about critical thinking (https://openstax.org/r/77ANAHub) on the ANA website.

This section defines critical thinking and explains why it is a foundation of nursing practice. The section will also tie critical thinking to another skill necessary for effective nursing practice—clinical judgment.

Critical Thinking Defined

Critical thinking allows the nurse to use rational standards to analyze information, interpret values/assessments, and ask questions about the data they obtain about a patient as part of a comprehensive health assessment and physical exam. Critical thinking is a skill nurses constantly use, and a skill that evolves with experience. Every decision the nurse makes is rooted in critical thinking. A nurse must combine assessment skills using the evidence of the physical exam to understand the patient's health concerns and help them achieve a positive outcome.

Critical Thinking in Nursing

The ability to think critically about information helps nurses make all kinds of decisions—from the day-to-day ones to the life-or-death ones. The nurse must consider all aspects of the data they have collected on a patient, whether it's going through current medications to check for potential interactions or assessing a patient's lifestyle risks. The nurse also needs to be aware of, and sensitive to, the different cues that patients give based on cultural diversity, gender, race, age, and ethnicity. There are also times when critical thinking can be more challenging, often because gathering data or being confident in those data may not be straightforward: for example, if a patient can't communicate clearly or if a nurse is contending with their own bias about a patient's situation. A nurse with critical thinking skills can make a split-second decision based on the health assessment that could save a patient's life. Even if not lifesaving, critical thinking skills help the nurse ensure positive patient outcomes.

REAL RN STORIES

Nurse: Sandy, BSN
Years in Practice: Eight
Clinical Setting: Primary care office
Geographic Location: A rural community in the Midwest

About a month ago, I had one of those "could have been worse" moments with a patient who showed up to the clinic for a routine annual physical, but ended up in the ER. Mrs. Kline is a 64-year-old patient at our office who was

simply coming in for a check-up. We're in a rural town, so it can sometimes be hard to get our patients to keep up with their annual screenings and visits since transportation can be a major issue. But Mrs. Kline always shows up like clockwork, remembers to bring her meds, is cheerful, compassionate, and always eager to update us on her grandchildren. She's one of those patients who is a joy to be around, really. So, when I came into the room to get her vitals and update her chart and saw her looking pretty downtrodden, my hackles went up.

"How are things going, Mrs. Kline?"

I was taken aback when she hesitated to answer—usually, she'd start chatting the moment I turned the doorknob. But on that day, she seemed discombobulated and uncomfortable. When she did start to talk, it seemed labored, like she couldn't catch her breath. She barely got out, "Oh, about the same as always, dear."

Well, clearly not!

"Mrs. Kline, how are you feeling right now?"

She winced a little, and her hand almost subconsciously touched her chest. "Oh, I'm just a little tired. I didn't sleep well last night."

I nodded, encouraging her to tell me a little more about what was wrong.

"Oh, I just had bad indigestion," she said. "But that's what I get for having a second bowl of rocky road!"

She tried to give me a smile, but I could see she was feeling pretty lousy. She was pale and appeared a little clammy. I asked her to tell me more about her symptoms, and she said that she'd been "feeling pretty nauseous" since last night and "had some gas up in her chest." I asked her to be a little more specific about that feeling, and she said it was "uncomfortable pressure."

I took her vitals, and her temp, RR, and O2 were normal, but her BP was a bit lower than I would have expected, and her heart rate was a little up.

I knew I still needed to do med reconciliation and ask her about any other changes, but it seemed like whatever was going on with her today needed to be the priority. As I was documenting the findings in her chart, Mrs. Kline started to get out of the chair, "I'm sorry, I think I need to use the restroom. . ." but as she stood, I could see how unsteady she was on her feet.

"Mrs. Kline, I'm very concerned about your symptoms," I said, helping her back to her chair. "I think we need to put your annual check-up on the backburner for now."

"I'm fine," Mrs. Kline insisted, "I think I just caught a little bug. . ."

"Could be, but I'd feel a lot better if we had Dr. Richards come in now," I said, reaching for the phone. I called up to the front desk and let them know I needed Dr. Richards to patient room 2, and she appeared just a moment later. She knew Mrs. Kline as well as I did, and the minute she looked at her, she also could tell something was really wrong. I gave her report quickly and she did a quick exam. Then, she said, "Mrs. Kline, I'm concerned that you could have having symptoms of a heart attack. I'm going to have Sandy call an ambulance to take you to the ER."

Mrs. Kline almost laughed, but painfully grimaced as she spoke. "Don't make a fuss over me," she said, "If you're worried, I could just drive. . ."

"Mrs. Kline, the nearest ER is 40 minutes away," I said gently, "And we want to get you there ASAP. The ambulance is the fastest and safest way."

She sighed, but almost seemed relieved. "Well, I guess I don't want to risk getting a ticket, right?"

Dr. Richards and I tried to give her a reassuring smile, but we were both nervous. By the time EMS arrived for transport, Mrs. Kline had started trembling and felt like she was going to pass out. As we sent her off, we wondered if she'd make it.

It was a few hours before we knew anything, but Dr. Richards came to the break room around lunch time to let me know that Mrs. Kline had an NSTEMI.

"I'm glad she came in for her annual," Dr. Richards said, "If she'd just been at home today, she probably just would have kept writing it off as indigestion. But I'm also glad that you did her intake—even though she wasn't a high-risk patient, you put the pieces together and probably saved her life."

While I did feel relief and a little bit of pride knowing that I'd done the right thing for the patient, I didn't let it go to my head. As nurses, we make quick but well-informed decisions every day, and yes, sometimes they're life or death. But it was really a team effort, from the coordination in our office to the EMS crew and the ER staff.

Critical thinking can be defined as habitually using a set of rational standards to guide decision-making (University of Tennessee Chattanooga, n.d.). Critical thinking skills allow nurses to gather a more complete picture when they are assessing and examining a patient. At times, what a patient is saying may not match what the nurse observes. The misalignment does not always mean the patient is lying. While critical thinking skills can help nurses identify when a patient is being untruthful or has limited health literacy, these skills are also crucial for helping the nurse identify barriers that can make it harder to get an accurate and cohesive picture of a patient's health. Patients may not understand why they need to share certain information with their health care providers or the consequences of withholding that information. They may struggle to recognize or remember information that would be useful for them to share during a visit. Patient factors, such as cognition, communication, social stress, mental health, cultural background, personal beliefs, and health literacy level, also affect how they communicate with the health care team.

For example, consider a scenario where the nurse is talking to a patient with dementia. Due to their cognitive condition, the patient may give answers to the nurse's assessment questions that don't line up with what the nurse is observing or expecting. The patient is not lying intentionally, but they are unable to be a reliable historian/informant about their own health. A patient with dementia may state that they do not take any medications, but the nurse can see in the patient's chart that they are prescribed several drugs to manage multiple chronic conditions, and the nurse may also know that the patient was administered a medication earlier that day. A patient with dementia may not recall any of their current health conditions and may not be able to describe their present state of health or concerns. The patient may say they feel "great," but the nurse may question that statement if they note an elevated temperature and heart rate.

To ensure a holistic picture of the representation of the patient, the nurse uses critical thinking skills during the comprehensive health assessment and physical examination to explore a patient's whole person needs. A comprehensive assessment and physical examination include not only details about physical state of health, but also the emotional, social, psychological, spiritual (Ambushe et al., 2023), cultural, sexual, energetic, and environmental aspects of a person's life (ANA, 2019). These factors impact the health and well-being of the individual and are important in planning care for current health problems and preventative care (Figure 6.2).

FIGURE 6.2 Older adult patients with cognitive decline or neurological diseases, such as dementia, may not be reliable historians. (credit: Mass Communication Specialist Seaman Apprentice Joshua Adam Nuzzo/U.S. Navy, Public Domain)

Critical Thinking in Clinical Judgment

Integrating nursing knowledge and experience with the data collected and analyzed to make informed decisions about patient care is called clinical judgment. Clinical judgment will evolve with experience. Over time, nurses also develop a degree of **intuition**, or a "sixth sense" of knowing that largely comes from years of education and problem-solving in real-world patient situations. But even experienced nurses who have a sense of intuition must still call on their critical thinking skills; they would not simply rely on intuition alone.

One framework that explains how to transition from critical thinking to clinical judgment is the Clinical Judgment Measurement Model (CJMM). The process outlined in the model has several components (NCLEX, 2024):

1. Recognizing cues: The nurse will acquire data from different sources, including the patient and medical records. They will identify specific facts or details within the data from assessments, patient conversations, and records to look for cues that will inform how they will approach caring for the patient.
2. Analyzing cues: The nurse will take the patient's needs into account and use the data to identify problems and create priorities. This includes organizing and analyzing the data to look for outliers or trends.
3. Prioritizing hypotheses: The nurse uses the data and analysis to set priorities based on the possible causes of the patient's condition and making sure that the most important problems are addressed first. They will work with an interdisciplinary team who is involved in the patient's care to set goals.
4. Generating solutions: The nurse will come up with possible interventions based on the patient's needs, interests, and evidence-based practice (EBP) from current literature.
5. Taking action: The nurse will objectively look at the interventions and assess how effective they are for the patient. They do research and seek insights from the interdisciplinary team to improve the patient's care plan. Ultimately, the overall goals and steps taken are nurse driven.
6. Evaluating outcomes: The nurse will look back on the clinical judgment process and identify areas of strength and weakness. They ask for feedback from colleagues to help them get an objective view of their skills, decision-making, and judgment.

REAL RN STORIES

Nurse: Mina, RN
Years in Practice: Ten
Clinical Setting: Renal department of a hospital
Geographic Location: Southeastern region of the United States

I've worked in the medical renal department for about 10 years now, but I still have moments when I feel like a nursing student solving a textbook patient puzzle! Recently, I cared for a 54-year-old male, Mr. Chen, who was admitted for shortness of breath. Mr. Chen had a history of diabetes and hypertension. During the assessment, he reported that he hadn't been able to walk down his driveway to get the mail and had gained two pounds in the last three days. He also reported weakness, lack of motivation, and trouble sleeping. In my thinking-it-through process, I paid attention to these subjective statements or "cues" the patient was giving me.

As I was entering data in his chart, I noticed that Mr. Chen took blood pressure medication, insulin, and a diuretic. I did medication reconciliation to confirm that he was still taking these prescriptions as directed. As I was doing the assessment on Mr. Chen, I noted swelling in both of his feet and a respiratory rate of 24 breaths/minute at rest. When I put my fingers against the bottom of his legs by his ankles, they left an indentation. These objective findings got added to my subjective cues from earlier. I started to piece together what I knew about Mr. Chen from his medical record, what he'd told me, and what I was observing based on the physical exam. Once I had all the data gathered, it was time to think about what it might be trying to tell me. Putting it all together, I realized that this patient's presentation could have been a textbook example of acute kidney injury or heart failure; either way, I knew Mr. Chen needed to be the provider's priority.

6.2 Effective Communication in the Nurse-Patient Relationship

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss maintaining a professional nurse-patient relationship.
- Describe methods of communication in medical-surgical nursing
- Define models of communication about patient care

Nurses develop and maintain various professional relationships in their careers, such as those with colleagues and mentors. The nurse-patient relationship is unlike any other professional or personal relationship. It is essential that nurses understand the rules that govern this unique and important relationship to protect themselves and their patients. This section defines the nurse-patient relationship and explains how it is established and maintained. It also discusses communication methods used in medical-surgical nursing, including the models that are used to convey information about patient care.

The Nurse-Patient Relationship

The path to becoming a nurse takes time, energy, resources, and dedication. As nurses progress through their careers, they gain knowledge, develop their skills, and hone their intuition, all while maintaining their values and having their own life experiences. Yet every patient they encounter will also bring their own needs, beliefs, and life experiences to the nurse-patient dynamic. Balancing each side of the relationship requires a deep understanding of effective communication, the nuances of human behavior, emotional intelligence, and cultural competence. The nurse must also be versed in the state and federal laws and regulations that govern the nurse-patient relationship.

The ability to forge therapeutic relationships with patients is central to patients' experience of receiving care (Molina-Mula & Gallo-Estrada, 2020), and the relationship serves more than one function. For the patient, the relationship is a safe, supportive space for asking questions and expressing needs. For the nurse, it is an invaluable tool for providing compassionate care (ANA, 2023). In both facets, the nurse-patient relationship can evolve and change over time. Given how important and complex the nurse-patient relationship is, there are standards of care and scopes of practice to guide the formation and maintenance of these beneficial and effective partnerships with patients. These guidelines also ensure that the nurse-patient relationship is appropriate and safe for everyone involved.

CULTURAL CONTEXT

Nurse-Patient Relationship for Muslim Patients

Islam is the second largest religion in the world, and non-Muslim nurses may find themselves caring for Muslim patients. Asking Muslim patients questions and listening actively to their answers creates a safe space for discussing religious and cultural needs a Muslim patient may have. Many Muslim patients pray multiple times a day; spiritual practices are an important part of the healing process. It is important for the nurse to respect religiosity, dietary restrictions, the strong patriarchal presence, and the preference of female nurses for female patients when caring for Muslim patients. Accommodating such cultural needs enhances the nurse-patient relationship by showing that the nurse cares about the unique religious needs and customs of their patient (Alfar, 2023).

The pillars of the nurse-patient relationship—trust, respect, empathy, and communication—are foundational to most other important relationships as well (Allande-Cussó et al., 2021). The nurse needs to understand other key elements, such as power imbalances and breaches of confidentiality, that have the potential to weaken rather than strengthen the nurse-patient relationship.

The nurse can uphold the pillars of this special dynamic by conducting the relationship within professional boundaries. A **professional boundary** is the clear separation between personal and work life when interacting with patients, designed to protect both the patient and the nurse. While the nurse must establish and then maintain professional boundaries at all times, it is not always easily done. The nurse must strike a balance: they need to be empathetic without being too personal. They need to use therapeutic intimacy from a professional and objective distance. They must nurture a rapport with patients but not befriend them. Although the nurse-patient relationship

exists within the safety of professional boundaries, it does not mean it has to be unfeeling or cold. The nurse will always respect the patient and work to earn their trust. Professional boundaries are a way to recenter the patient as the focus of care and prevent violations that could undermine trust and erode the therapeutic relationship (National Council of State Boards of Nursing, 2018).

Establishing and enforcing boundaries is the nurse's responsibility, not the patient's. At times, professional boundaries may blur or be challenging to maintain. The nurse may even unintentionally cross a line without realizing it. This is why it's crucial for the nurse to take a proactive approach to prevent lines from being crossed within the nurse-patient relationship. Here are just a few examples of potential boundary violations that nurses may encounter:

1. Oversharing personal information with patients
2. Being too emotionally vulnerable with patients
3. Touching patients in any nontherapeutic way that could be construed as overly familiar or potentially romantic/sexual
4. Uncomfortably infringing on a patient's personal space (e.g., sitting very close to them on the bed)
5. Talking about patients with family or friends
6. Posting about work experiences on social media and/or sharing personal information on public accounts (HIPAA violation)
7. Adding patients on social media (HIPAA violation)
8. Spending time with patients outside of work in a way that would be considered more of a casual friendship (e.g., taking part in shared hobbies together)
9. Accepting gifts, money, or any business-type exchange with patients

It may seem that these boundary violations would be obvious, but they can be subtle and exist more on a spectrum than being clear "stop signs." For example, a nurse who lives and works in a small community may frequently run into patients at the grocery store. They might be members of the same gym or have children that attend the same school. These interactions will not always be avoidable, and the nurse still needs to maintain professional boundaries. The nurse must be vigilant and ensure that their behavior is always professional and focused on the patient.

Methods of Nurse-Patient Communication

The nurse-patient relationship hinges not only on trust, respect, and empathy, but also on communication (Afriyie, 2020). It is only through effective, therapeutic communication that the nurse can establish trust and rapport with the patients in their care (Kwame & Petrucka, 2021). Effective, therapeutic communication begins as soon as nurses introduce themselves. Throughout the course of providing care, the nurse will evaluate and adjust their communication strategy to ensure that it is effective for the patient. One of the most basic examples, and also one of the easiest for a well-educated and experienced nurse to forget, is avoiding medical terminology (Afrieye, 2020). All information and teaching provided to the patient must align with their health literacy level. This means not using medical jargon, including acronyms, that may confuse or intimidate a patient. If a patient cannot understand the nurse's language, they won't be able to comprehend why the information the nurse is providing is important to their care. Effective, therapeutic communication also allows the nurse to gather data for clinical decision-making. For example, using open-ended rather than closed questioning helps the nurse gain valuable information from the patient and transition the assessment to the next phase of nursing care. (Table 6.1). In the nursing process, the next step would be to identify the nursing diagnosis and formulate a plan of care. In the CJMM, the nurse would next analyze cues and prioritize hypotheses.

	Therapeutic Communication	Nontherapeutic Communication
Offering self	Friendly, approachable, and inviting. When appropriate, use "we" and "us" instead of "you" or "I" to show unity and inclusivity.	Formal, guarded, and distant. May use "I" and "you" to emphasize individual roles.
Communicating nonverbally	Relaxed body language, open posture, consistent but comfortable eye contact, and active listening.	Tense body language, crossed arms, avoidance of eye contact, and minimal nonverbal feedback.
Encouraging elaboration, seeking clarification	Encourages questions and listens to different viewpoints. Asks open-ended questions to promote deeper discussion and help patients feel more at ease expressing their thoughts, concerns, and preferences.	Discourages or dismisses questions. Asks closed-ended questions ("yes" or "no") that limit responses or make patients feel cut-off and hesitant to share more about what they are thinking or feeling.
Giving information	Proactive in sharing information, values transparency, and explains the reasoning (or "why") behind decisions.	Reluctant to share information, prefers to keep things private, and may be secretive about decisions.
Restating, reflecting, summarizing	Actively listens to others, "teaches back" what they have heard to confirm understanding, and values feedback.	Appears disinterested in what others have to say, interrupts frequently, and dismisses feedback.
Encouraging collaboration	"What are your thoughts on this?" "How can we work together to achieve this goal?" "I'd like to hear what you have to say."	"You just need to do what we tell you to do." "Did you take your medication like you were supposed to or not?" "I don't have time to listen to your concerns."

TABLE 6.1 Effective, Therapeutic Communication

Imagine that a patient presents with a weeping (fluid-oozing) rash on his leg. The nurse can ask an open-ended question like, "What can you tell me about that rash I see on your leg?" or phrase it as a statement such as, "Please tell me about the rash I see on your leg," to open the door for further exploration into the patient's health. On the other hand, a question such as, "I see your left leg has a weeping rash. Did you tell your doctor?" is closed-ended. Here, the patient can only answer yes or no; they have either told the doctor about their rash or they have not. This question does not give the patient a natural opportunity to tell the nurse more about the rash and provide the crucial details necessary for a comprehensive assessment. In this example, the closed-ended question, "Did you tell your doctor?" could also make the patient feel judged or even guilty. If they have *not* told their doctor about the rash, they may feel that they've "been bad" and worry about what the nurse will think of them.

To communicate nonjudgmentally and without bias, the nurse constantly needs to reflect on both their verbal and nonverbal communication with patients. Nurses need to be self-aware and willing to correct their behavior if it's not contributing to open, effective, and compassionate communication. This requires a critical appraisal of their actions and words and an honest look at their beliefs and perceptions.

Effective communication in health care is not just verbal; it also includes nonverbal, written, and visual communication. The spoken word, in whatever language the patient can best communicate and understand is **verbal communication**. Physical movements or motions, including body language, that convey thoughts, attitudes, and sentiments to a patient are methods of **nonverbal communication**. A type of nonverbal communication based on physical movement and expression is **body language**. Reinforcement of verbal information given to the patient in a format they can read is considered **written communication**. Strategies like return demonstration can confirm a patient's understanding and is considered **visual communication**.

During the comprehensive physical assessment, the nurse will use verbal and nonverbal communication with patients. While verbal communication is the most effective, nonverbal communication can enhance the assessment by allowing the nurse to convey attentiveness and empathy. Nonverbal communication also has potential pitfalls, however, of which the nurse must be aware. Body language, facial expressions, eye contact, tone of voice, physical distance, and touch are all facets of nonverbal communication that can either enhance or hinder the nurse-patient relationship. Nurses have to be conscious of their own nonverbal cues, as even unintentional signals can convey messages contrary to their intended communication. An open, relaxed posture, appropriate eye contact, and a warm smile can foster trust and reassurance, and help build rapport with patients. On the other hand, closed-off body language like crossed arms, frowning, or excessive distance may send the message that the nurse is disinterested, disapproving, or unempathetic.

The nurse also needs to attentively observe—and interpret—a patient's nonverbal cues. An averted gaze, fidgeting, or incongruent facial expressions can indicate discomfort, fear, or confusion—even if what the patient says to the nurse conveys the opposite. Nurses have to integrate a patient's nonverbal cues with verbal communication to fully understand their needs.

There are many layers to understanding and interpreting nonverbal cues from patients, and it's not always as simple as paying attention to what they do and say. Cultural competence is critical to understanding nonverbal communication because different cultures ascribe different meanings to the same gestures, expressions, or social norms and concepts. What may be perceived as respectful in one cultural context could be seen as offensive or inappropriate in another. Making eye contact during a conversation and maintaining "personal space" are just two examples of relatively common aspects of nonverbal communication that are very culturally dependent. Nurses need to continually educate themselves about the cultural backgrounds and customs of the communities they serve to ensure they are providing culturally sensitive care.

Active Listening

Communication is not just about how the nurse speaks but also about how they listen. The nurse should strive to be an active listener when the patient is talking (Tennant & Toney-Butler, 2022). This means that they don't just hear but seek to understand what the patient is telling them.

To be an active listener, fully focus on the patient. One way to demonstrate openness to listening is simply looking at them or turning toward them. Taking a seat so that they can be at a similar level as the patient is also helpful, as standing over them can be intimidating. Avoid interrupting the patient as they are speaking. Use supportive statements and phrases to acknowledge what they have shared ("I understand that sharing these details is difficult for you. . ." and "It sounds like you are worried about. . .") and encourage them to elaborate or clarify ("Tell me more about that. . .").

When they are done sharing, the task of summarizing or explaining the message received gives patients a chance to correct any misunderstandings or offer more details. It also gives the nurse an opportunity to demonstrate empathy and understanding and develop trust further.

Communicating with Patients Who Speak a Different Languages

English may not be the first language of all patients. When nurses do not speak the patient's preferred language, the communication barrier can make it challenging to develop the nurse-patient relationship and gather a comprehensive health history and physical assessment.

Cultural awareness and competency guide nurses working with patients who have a preferred language other than English. To begin, the nurse must determine a patient's language preferences and decide what steps to take to ensure that the patient's needs are understood and met. It is the legal responsibility of a facility to provide language services for patients that meet certain standards (U.S. Department of Health and Human Services, n.d.). The nurse must know what language resources are available to them. Each health care organization has assistive technology that staff can use to communicate with patients. One example is Martti, a translation technology solution that integrates with EHRs, as well as tablets and mobile devices (Cloudbreak, n.d.).

The nurse should not use patient family members or nonapproved translators to communicate medical information. While a patient's family may be trying to help, medical translation is more complex than translating everyday conversation; it requires expertise (Villanueva, 2023). It is also not appropriate for a family member, such as a

patient's child, to translate for them, as it could allow for the transmission of personal medical information to someone who is not authorized to receive it or lead to a miscommunication if the family member is not well versed in medical terminology.

Using an approved translation service allows the patient to understand and answer the nurse's questions, which ensures the comprehensive physical and psychological assessment will be accurate. While the nurse should generally avoid "yes" or "no" questions, the simple binary can be helpful when there are language barriers, and the patient needs to communicate basic—but important—information to the nurse.

LINK TO LEARNING

A nurse who is multilingual may want to consider becoming a certified medical interpreter. The National Board of Certification for Medical Interpreters (https://openstax.org/r/77NBCMI) is one organization that offers certification in Spanish, Russian, Mandarin, Cantonese, Korean, and Vietnamese.

Communicating with Patients Who Have Auditory Impairments

Communication barriers can also emerge for reasons other than language. For patients who have auditory impairments, the nurse will again need to be aware of the resources available to help them complete a comprehensive health assessment and physical exam and provide care for the patient. A patient with total or significant loss of hearing would need approved assistive technology or sign language interpretation to ensure that the questions the nurse needs to ask are heard and understood.

Considerations that the nurse should keep in mind when speaking to patients who are deaf or who have hearing impairments including:

1. Assessing, identifying, and arranging for a patient's needs to be met.
2. Use a qualified sign language interpreter when needed. Do not rely on the nurse's basic skills or interpretation provided by a family member.
3. Confirming with the patient that their hearing aid (if applicable) is on and functioning in the setting.
4. Making sure the room is adequately lit and there are no distractions.
5. Facing the patient and maintaining eye contact while speaking to them.
6. Speaking clearly and articulating each word (but do not overly exaggerate or speak too loudly).
7. Being intentional about using body language and gesturing, as appropriate.
8. Using visual aids, as appropriate (Centers for Medicare and Medicaid Services, 2023; HLAA, 2023; National Association for the Deaf, 2018).

The nurse will need to adjust their approach to suit the patient's needs. For example, perhaps they planned to use a sign language interpreter for a deaf patient but discover that the patient is comfortable lip reading. In this case, they may not need the interpreter, and can adjust the plan so that they speak clearly and slowly to the patient and check for understanding frequently. In some health care settings, however, lip reading may be impossible, for example, because a provider is wearing a mask (Berry, 2021). The nurse also must consider that relying on writing to communicate with any patient can lead to misunderstandings, especially if the patient has low literacy or, more specifically, low health literacy. But for deaf patients who sign, the nurse should also keep in mind that American Sign Language (ASL) is not based on spoken English; there can be mistranslations just as there would be for other bilingual patients. In addition to being ineffective, writing can also be time-consuming and impractical for both the nurse and the patient, particularly in an emergency (National Association for the Deaf, 2018).

LIFE-STAGE CONTEXT

Considerations for Older Patients with Hearing Loss

One factor to consider when adapting nurse-patient communication to various clients is age. If taking care of an 85-year-old patient, be aware of how the aging process can affect communication and care. When conducting the assessment, notice concerns that the patient expresses both verbally and nonverbally. While talking to the patient,

notice, for instance, if the patient leans in closer to hear the questions. This observation will make clear that the patient may be having a hard time hearing the questions. It could be that the patient was brought into the hospital via ambulance, and the EMS crew did not retrieve the patient's hearing aids from their home. Perhaps the patient is embarrassed about their hearing loss and does not want to express that they are struggling.

The nurse should adjust their assessment to put patients of all ages and abilities at ease and ensure they understand the assessment questions. By focusing on the patient's needs and taking steps to address them, the nurse is fostering a trusting patient relationship, promoting effective communication, and ensuring that the data gathered are comprehensive and correct.

All patients, regardless of their communication needs, benefit from using the teach-back strategy to demonstrate their comprehension of the information the nurse has shared. The strategy, which involves having the patient explain the teaching provided to them in their own words, is an invaluable tool that helps the nurse assess for and quickly correct any gaps in knowledge or misunderstandings.

FIGURE 6.3 Nurses must be skilled communicators not just with patients but with other members of the health care team who are providing care for their patients. (credit: Staff Sgt. Samuel Morse/U.S. Air Force, Public Domain)

Models of Communication About Patient Care

Communication between the nurse and patient needs to focus on being effective and therapeutic. Communication with other health care professionals about patient care has a different goal completely. Communication about patient care is more direct, more streamlined, filled with jargon, and often requires one health care professional to convey the seriousness of a situation in as few words as possible so as not to delay care. Two models of communication health care professionals use with one another are Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS) and ISBAR. These two models enhance teamwork, efficacy, and efficiency in communicating about patient care, and thus enhance quality of care.

INTERDISCIPLINARY PLAN OF CARE

Admission to the Observational Unit Interdisciplinary Plan of Care

The interdisciplinary plan of care for a patient being admitted to the observational unit for diabetic venous ulcers and possible sepsis can involve several health-care disciplines working collaboratively. Members of the team may include physical therapists, respiratory therapists, case managers, dietitians, and a wound care nurse, each with their own role.

1. The physical therapist (PT) aims to improve the patient's mobility and strength, initiating ambulation within 24 hours, if medically capable, and conducting range-of-motion exercises to increase strength and endurance of all the extremities.
2. The respiratory therapist (RT) focuses on promoting oxygenation and improved cardiovascular health with activities of daily living. The RT provides education on supplemental oxygen or any needed adaptive breathing equipment.
3. The case manager (CM) assesses psychosocial needs, offers emotional support, and facilitates counseling for adjustment. The CM also arranges care across all disciplines, develops comprehensive care plans, and arranges any necessary post-discharge services.
4. The registered dietitian (RD) optimizes nutrition for healing based on the patient's compromised condition and advises the patient on dietary adjustments related to other comorbidities to prevent future decline.
5. The wound care nurse (WCN) monitors the patient's skin integrity, educating on proper risk factors, preventative measures, and infection control. The WCN intervenes promptly in case of complications.

Together, these interdisciplinary team members ensure a person-centered approach for providing support, as patients are admitted to a medical facility. Each health-care organization has a long list of specialty team members to meet the needs of the patient they serve.

TeamSTEPPS

Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS) is a training resource from The Agency for Healthcare Research and Quality (AHRQ) and the U.S. Department of Defense (DOD). The tools were developed by applying military teamwork, operations, and communications concepts and strategies to health care (American Hospital Association, 2023).

The four core competencies of TeamSTEPPS will be familiar from nursing education:

1. Team leadership: Delegating and coordinating tasks, motivating others, providing needed resources for optimal performance
2. Communication: Effectively conveying information through different strategies
3. Situation monitoring: Establishing and maintaining an agreed-upon way to monitor team performance
4. Mutual support: Knowing team member needs and taking steps to meet them

Nurses can be trained in the approach and apply the teaching to their work to enhance teamwork and patient outcomes. Nurses may use the TeamSTEPPS framework in a variety of clinical situations, such as when they are providing reports at the start of shift, including a patient's family in important treatment conversations, speaking up when they notice that a staff member is fatigued and may be unable to perform their duties, and participating in debriefs after procedures.

TeamSTEPPS has some similarities to another framework that nurses are familiar with—QSEN, which is often encountered early on in a nurse's education. While TeamSTEPPS is more focused on strengthening health care teams and QSEN is more about the individual nurse, both frameworks consider teamwork and communication to be core competencies in health care quality and safety. One main difference is that in QSEN, there are six focused competencies, of which teamwork and safety are two. These concepts are more of an embedded thread and driving force behind the overall framework in TeamSTEPPS. Because there is significant overlap, nurses often use both frameworks when providing care.

LINK TO LEARNING

Review AHRQ's TeamSTEPPS (https://openstax.org/r/77AgencyHRQ) and think about how to use these tools and resources in nursing practice.

ISBAR

The nurse is the patient's advocate. Effective communication with others in the interdisciplinary team is necessary to provide effective, coordinated, and patient-centered care. When communicating with other health professionals about patients, one evidence-based practice to use is ISBAR: identify, situation, background, assessment, and

recommendation (see 1.2 Intercollaborative Care). The ISBAR format allows nurses to efficiently and effectively communicate the information gathered on a patient during the comprehensive physical history and assessment. For example, a nurse who is handing off a patient to a colleague at the end of their shift can use the ISBAR framework (Table 6.2).

Component	Example
Identify the patient	"I'm Laurie Done, RN, and have been caring for Mrs. Martinez in room 204 today."
Explain the situation	"Mrs. Martinez was admitted last night from the ER with a complicated UTI and started on IV ceftriaxone."
Give background	"She has a history of UTIs. No known drug allergies. Her current medications are lisinopril and Zoloft."
Provide most recent assessment data	"Her vitals are stable, and she voided cloudy, yellow urine at 1450."
Offer recommendation	"I recommend encouraging oral hydration, monitoring her vitals, and continuing to administer medications as prescribed."

TABLE 6.2 ISBAR Use in Nursing Example

Once the receiving nurse has the information on the patient, the nurse can answer any questions or provide clarification before completing the hand-off.

6.3 Health History

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss how to obtain a comprehensive health history
- Discuss the different parts of the comprehensive health history

The health history of a patient provides direction for their care and helps clarify the patient's needs. There are two main nursing assessments: a focused health history and a comprehensive health history. A focused health history is tailored to the reason the patient's **chief complaint**, or the reason the patient is currently seeking care. The patient's health history, in this case, relates to exploring the chief complaint. When performing a comprehensive health history, the nurse must address the patient's problem in depth. At this level, the nurse will ask about the present illness but also about past medical history, allergies, social factors, lifestyle habits, and health risks, including family history. This assessment is a more thorough examination of the patient's overall health history and captures the various factors that affect a patient's health.

Obtaining a Comprehensive Health History

The most common way to obtain a health history is by interviewing the patient. As a nurse, there are some best practices to keep in mind when gathering this crucial health information. Make sure that the room is conducive to clear, effective communication. The space should be private, comfortable, and as free from distraction as possible. The nurse should then "prime" the conversation by building rapport and trust. Being an empathetic, active listener, ensuring communication needs are met, being self-aware, and keeping cultural and age-related factors in mind are all key to getting the information the nurse needs from the patient.

Following regulatory and institutional policies, procedures, and protocols for data gathering and recording may make this process more efficient, accurate, and streamlined. Following structured formats and using technology are among the key practical aspects of obtaining a health history. This may include using questionnaires to assess specific patient problems and knowing how to navigate and document in the patient's electronic health record (EHR). Throughout the process of data-gathering, nurses must observe how the patient is responding and adjust to facilitate effective communication. The nurse needs to continually monitor their own behavior and recognize when

their body language may be communicating a message to the patient that they do not intend. One common mistake nurses may make is staring too long at a computer screen while documenting, leaving the patient feeling isolated and ignored in the exam room. Try to maintain focus, both visually and verbally, on the patient. When the nurse has to attend to the computer, they should explain to the patient that reviewing and documenting relevant information helps with clinical decision-making. This way, the patient should not feel ignored. A nurse's position in the room can make a patient feel more open or closed off throughout the dialogue. For example, a nurse who is standing completely behind the rolling computer cart versus being seated, facing the patient, and "on their level" may be perceived to be less engaged, concerned, or empathetic (Lanier et al., 2021; Misto et al., 2019).

There will be times when the nurse needs to do a bit of problem-solving when obtaining the patient's history to establish clarity. If the patient is unable to provide a history, then the family can be interviewed to obtain the information. If the patient has brought many health documents with them, such as a list of medications or health conditions, notes on their surgical history, and/or advanced directives, this information may help the nurse piece together a complete history, along with what can be gathered from the patient's social and family history through interviewing. By assembling the components, the nurse gives the provider and care team a strong starting point to pursue the diagnostic puzzle and create a patient-centered, evidence-based treatment plan.

From the overall perspective of clinical practice, a focused (as opposed to comprehensive) assessment helps address the shortage of time that burdens the health care system at every level. Being efficient but thorough in gathering data respects the nurse's and patient's time (Figure 6.4). While the nurse must understand that each patient has a multifaceted and complex life, it is often necessary to focus the health history on the patient's current health. To ensure that the nurse is able to gather relevant data efficiently and accurately, they will need to guide the patient through the interview and maintain the focus on why they are seeking care from the provider at the present time.

FIGURE 6.4 Nurses have to collect and organize a lot of crucial information about patients, but there are a number of established frameworks to help them document a patient's history and physical exam findings. (credit: "Nurse with mask on, on the computer" by Rashid Mohamud/Flickr, Public Domain)

For example, a common chief complaint is pain. To help the provider solve the problem, the nurse will talk to the patient and recognize cues about the cause or source of the pain, as well as analyze and hypothesize how the pain could be treated or managed. The history, in this example, is not always one that is "far back" in the patient's life. Instead, it might be just a few days or weeks ago, depending on when the pain began.

Asking specific, open-ended questions like "How long have you had the pain?" gives the patient a chance to elaborate on what they're experiencing and supply the nurse with data. Asking more questions, such as whether

there is anything that makes the pain better or worse, and inquiring about associated symptoms (e.g., nausea), creates a more complete picture of the patient's problem.

Elements of the Comprehensive Health History

The elements of the health history help the nurse gather data to support the patient's current health concern. The format has several general components (UCF College of Medicine, 2018; Nichol et al., 2024):

- Chief complaint: Patient's specific, current problem (e.g., cough, sore throat)
- History of present illness: Details about chief complaint (e.g., duration and intensity)
- Past medical history: Chronic illnesses, mental health conditions
- Surgical history: Any procedures or surgeries
- Medications: Current prescriptions, over-the-counter (OTC) supplements, herbal remedies, or vitamins
- Allergies: Environmental, drug; details of symptoms, reactions
- Family history: Medical conditions, genetic disorders, risk factors
- Social history: Lifestyle habits, diet, physical activity, sexual health, living situation
- Review of systems (ROS): Allows the nurse to obtain specific, objective data on a patient's health by assessing each body system, one by one
- Social determinants of health: Sociocultural factors that may influence a patient's health

The ROS, physical exam, diagnostic tests, problem list, summary, and plan/assessment are information-gathering components that come later.

Chief Complaint and History of Present Illness

A health history starts with the patient's chief complaint, which is the reason they are presently seeking care. Asking about the history of present illness is how the nurse gathers additional context about the chief complaint to help the care team form a diagnosis and treatment plan.

Here's a common example: A 32-year-old patient comes to their primary care provider's (PCP's) office with a chief complaint of a sore throat. The nurse needs to get more details from the patient about the symptom to gather the information the provider will need to determine the cause of the patient's symptom. What possible explanations might the provider want to consider, and how can the health care team get the information necessary to solve the diagnostic puzzle? Is the patient experiencing a sore throat because they have strained or overused their voice? Do they have a viral illness? Is it related to a chronic condition?

The nurse needs to ask the patient questions like, "When did the sore throat start?" to establish a timeline of the problem. If the patient states that the pain began two days ago, the nurse can find what the patient was doing around that time that could have contributed to the pain. For example, if the patient visited a theme park the day before and rode roller coasters, screaming in excitement as they did, it's possible that the pain is from overuse or strain. But the nurse still needs to gather more information rather than making assumptions.

A patient who visited an amusement park would also have been spending time around others and could have been exposed to a virus. It's important to ask the patient whether they have any other signs or symptoms, like a fever or congestion, that could support the thought that their sore throat is from an illness. Asking about other signs and symptoms also provides information that helps differentiate between an infectious and noninfectious cause. A patient with a sore throat and congestion but no fever may have seasonal allergies, which could also be noted in their medical history. A patient with a fever and a sore throat may have a viral or bacterial infection, particularly if they report being around a sick person recently.

CLINICAL JUDGMENT MEASUREMENT MODEL

Recognize and Analyze Cues

Before a nurse can analyze cues to form a hypothesis, they must first make sure they have enough information about a patient's situation to correctly interpret the information and develop a plan of care. Suppose a patient claims to have an allergic reaction to all vaccines. The nurse will need to assess further. For example, the nurse will need to ask what symptoms the patient experienced to determine if the patient's reaction was truly an

allergen-induced response or a side effect of the vaccination. The patient may report an allergy to the flu vaccine by stating they experienced redness at the injection site after taking the flu shot last year. However, redness at the injection site is a common side effect of all vaccinations; it is not necessarily a sign of an allergy. Only after considering all relevant information should the nurse move on to the next step of the Clinical Judgment Measurement Model: prioritizing a hypothesis and providing the appropriate education to the patient.

(NCSBN, n.d.)

Past Health History

A patient's past health history includes any childhood illnesses, immunization record, current conditions, acute illnesses, accidents, injuries, and chronic illnesses, as well as any treatments. Even though these may not all be obviously relevant to the patient's chief complaint, they can provide the nurse with key insights.

Take the patient with a sore throat as an example. A patient with a fever and sore throat that began two days after a trip to an amusement park could have a common viral or bacterial infection like strep throat, the flu, a cold, or COVID-19. If the patient's past health history shows they were diagnosed with lupus several years ago, the nurse might consider that the excursion and ensuing exhaustion could have triggered a flare. What additional information does the provider need? Does the patient have a rash? Have they been taking their medications as prescribed?

Family History

When interviewing the patient, inquire about chronic conditions or diseases in the patient's immediate family, including parents and siblings, and ask about the health of their immediate family members, which primarily includes their parents and siblings. Do any of them have any chronic conditions? Are there any diseases or health risks that the patient may have a genetic predisposition to? While it may not seem immediately applicable to the patient's current problem, the information the nurse gathers here helps create a more complete picture of the patient's health.

Review of Systems

The ROS covers more of the physical health details of the patient's chief complaint. Each body system can offer clues about the patient's current problem, though the nurse will want to pay particular attention to those that are most relevant to the patient's present symptoms. For the patient with a fever and sore throat, the upper body systems—including the head, face, neck, and respiratory systems—may hold pertinent clues about the cause of the patient's throat pain. Whole-body, or **constitutional**, signs and symptoms, such as fever and fatigue, can also provide insight into the cause of the patient's pain.

The body systems covered in the problem pertinent ROS include (Vanderbilt University Medical Center, 2019):

- Constitutional: body-wide (e.g., fever, fatigue, weight loss)
- Head, eyes, ears, nose, and throat (HEENT)
- Respiratory
- Cardiovascular
- Gastrointestinal
- Genitourinary

There are also other system assessments that are part of an extended or more complete ROS:

- Metabolic/endocrine
- Neurological
- Psychiatric
- Integumentary
- Musculoskeletal
- Hematologic
- Immunologic

The nurse will document the findings of the ROS based on whether signs and symptoms are present in each system. The term **positive** is often used to note when a sign or symptom is present, while **negative** is used when signs and symptoms are absent from a system. In some provider documentation, the "+" may be used for positive and the "–"

sign for negative, with specific details pertaining to the problem within the body system. Other providers may use terms like "unremarkable" to denote an assessment that system assessment is normal.

Current Medications

When reviewing the patient's medical record, it's important to note that the medication list may or may not be up to date. It is essential that each time a patient is seen, they are asked about all medications, even OTC supplements or herbal remedies, that they are actually taking at home. If the patient has any prescribed medications, confirm the names, reasons for taking, dosages, and frequencies of each. Sometimes, patients will bring their medication bottles with them, which can be extremely helpful for medication reconciliation (AHRQ, 2019). It is also important to ascertain whether the patient has been taking medications as prescribed; in other words, it's not enough to simply ask *if* the patient is taking their medication but find out *how* they are taking it. When a patient reports they are no longer taking a specific medication (discontinued) or there has been a change in administration (e.g., increased or decreased dose), update their record. A precise and thorough medication reconciliation assists in preventing medical errors, which in turn decreases length of stay, lowers hospital costs, and reduces readmissions (Alghamdi et al., 2023).

Social Determinants of Health

There are also sociocultural factors about which the nurse needs to gather information to provide additional context about the patient's current health:

- Education
- Occupation
- Nutrition, diet, physical activity
- Financial status
- Environment (e.g., living, work)
- Lifestyle habits (e.g., tobacco, alcohol, substance use)
- Psychological well-being (e.g., stress)
- Spirituality
- Sexuality
- Cultural background

Including these factors ensures that the nurse has captured the details about a patient's life that could not only be relevant to their chief complaint but could affect the treatment decisions that will come after a diagnosis is made. This sociocultural history allows for more of a narrative about the person and not only the symptom that has brought them to see the provider. Here, the nurse can grasp more about who the patient is, what their life is like, and explore how the patient perceives and feels about their general health. The patient's social history is also an important opportunity to identify risk factors that could either be relevant to the patient's current problem or overall well-being. Table 6.3 compares protective factors with risk factors.

Protective Factors	Risk Factors
Strong social support network (e.g., family, friends, community)	Social isolation or lack of support
Stable employment and financial security	Unemployment or financial instability
Access to health care and health insurance	Lack of access to health care or inadequate insurance
Able to access and partake in health-promoting lifestyle habits (e.g., exercise, nutritious diet, sleep)	Sedentary lifestyle, lack of access to nutritious food, inadequate sleep
Positive coping mechanisms for stress	Negative coping mechanisms (e.g., substance misuse, isolation)

TABLE 6.3 Protective Factors versus Risk Factors in Patient Health

Protective Factors	Risk Factors
Engagement in meaningful activities and hobbies	Lack of purpose or meaningful engagement in life
Education and health literacy	Low literacy/health literacy
Safe and stable housing	Unstable housing or homelessness
No exposure to violence or trauma	Exposure to violence, abuse, or trauma
Spiritual or religious beliefs that provide comfort and support	Negative spiritual or religious beliefs/loss of faith, spiritual crises

TABLE 6.3 Protective Factors versus Risk Factors in Patient Health

6.4 Bedside Physical Assessment in Medical-Surgical Nursing

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Review the different parts of the bedside assessment
- Describe a focused physical assessment
- Discuss the importance of assessment of the safety and surroundings in medical-surgical nursing

While a **comprehensive physical assessment** is a detailed, inclusive assessment of body systems to provide a big-picture, broad view of a patient's overall health, a **focused assessment** is a physical examination centered on a patient's chief complaint. In this section, you will learn about the parts of a broader physical assessment—the bedside assessment—and how this more thorough approach differs from the focused assessment and contributes to the care of a hospitalized patient. The nurse may only focus on a single system during a focused assessment, but they can get an inclusive view of the patient's other systems during a bedside assessment. Not only does this help the nurse identify other potential areas of concern, but even normal findings will help establish a baseline for the patient. The comprehensive physical assessment, which includes all body systems along with the patient's history, gives the nurse a more complete picture of the patient's overall health situation and status. That, however, is often more valuable in primary care settings. In acute care settings, nurses mostly utilize bedside or focused assessments. Table 6.4 summarizes the types of assessments.

Assessment Type	Description	Components	Purpose
Focused Physical Assessment	Zeroes in on the patient's chief complaint, targeting the specific body system or area relevant to the presenting problem.	Varies depending on the chief complaint (e.g., cardiovascular assessment for chest pain, respiratory assessment for shortness of breath).	To timely identify and address the immediate concern or issue.
Bedside Physical Assessment	A systematic head-to-toe review of the patient's major body systems, often conducted upon admission or at the beginning of a shift.	General survey (height, weight, appearance), HEENT, cardiac, respiratory, abdominal, peripheral vascular, neuro-muscular, integumentary, genitourinary assessments.	To establish a baseline for the patient's condition and identify any potential issues that may require further investigation or intervention.

TABLE 6.4 Types of Assessments in Medical-Surgical Nursing

Assessment Type	Description	Components	Purpose
Comprehensive Physical Assessment	The most thorough assessment, encompassing all body systems, along with a detailed health history.	All body systems, plus a detailed history including past medical history, medications, allergies, family history, and lifestyle factors.	To provide a holistic view of the patient's health status and guide the development of a comprehensive care plan.
Safety/ Surroundings Assessment	Critical for preventing adverse patient outcomes, this assessment focuses on the patient's environment and potential risks.	Patient identification, fall risk, ambulatory aids, environmental hazards, domestic violence risk, suicidal ideation, isolation precautions, bed position, side rails, call bell accessibility.	To ensure a safe environment for the patient and prevent harm or injury.
Comprehensive Health History	A detailed interview with the patient to gather information about their past and current medical conditions, medications, allergies, family history, and lifestyle factors.	Medical history, surgical history, medication history, allergies, family history, social history (lifestyle, occupation, habits), review of systems.	To understand the patient's overall health status, identify risk factors, and tailor the care plan to their individual needs.

TABLE 6.4 **Types of Assessments in Medical-Surgical Nursing**

This section will also describe the importance of the safety/surroundings part of the assessment. This section will clarify how the comprehensive physical exam supports the comprehensive health assessment.

The Bedside Assessment of a Medical-Surgical Nurse

The nurse will perform a systematic exam of all patient body systems called a **bedside assessment**. This will include the general survey, HEENT, cardiac, respiratory, abdominal (gastrointestinal), peripheral vascular, neuromuscular, skin, genitourinary, and activity (Figure 6.5).

FIGURE 6.5 The wealth of information that the nurse can gather through physical exams can be organized and analyzed by using focused assessments for the body systems most related to the patient's current problem. (credit: "Combat nurses: The ER" by Tech. Sgt. D. Clare/ U.S. Air Force, Public Domain)

General Survey

The general survey assessment includes the patient's height, weight, physical appearance, chronic wounds, personal hygiene, and general behavior. Also included are the vital signs, such as blood pressure, heart rate, oxygen saturation levels, body temperature, and respiratory rate. The nurse will also consider the patient's verbal and nonverbal communication and must swiftly assess to determine if the patient needs a communication aid (such as a translation device). The nurse will appropriately document all findings in the physical assessment area of the patient's chart.

HEENT Assessment

In a systemic approach, the head, ears, eyes, nose, and throat (HEENT) exam are the first systems to be assessed.

- Head: The nurse will inspect and palpate the patient's head for abnormalities and look at the hair for obvious signs of illness (e.g., thinning, hair loss).
- Eyes: The nurse will inspect the eyes according to the eye assessment **PERRLA** (pupils equal, round, reactive to light and accommodation). They will also assess visual acuity (e.g., does the patient need glasses or contacts, when was their last eye exam), check for nystagmus, and confirm that the conjunctivae are clear.
- Ears: The nurse will inspect and document any hearing loss or difficulty, including whether the patient needs hearing aids. If so, the nurse should determine whether the patient is wearing their hearing aids or has the devices with them.
- Nose: The nurse will inspect and ask about any olfactory symptoms, including altered sense of smell, congestion, or irritation. The nurse will ask if the patient has had any surgeries or procedures on the nasal area.
- Throat: The nurse will inspect and document any signs or symptoms related to the mouth and throat. This includes assessing the gums, teeth, mucosa, tongue (e.g., appearance and deviation), pharynx, and tonsils.

Cardiac Assessment

The cardiac assessment requires inspection, palpation, and auscultation. This includes assessing cardiac rhythm, heart sounds, arterial pulse evaluation, capillary refill times, edema, circulation and sensation, and cyanosis.

Respiratory Assessment

The respiratory assessment involves inspection, palpation, auscultation, and percussion. This includes breath

sounds, respirations (e.g., effort and quality), presence of cough, production of sputum/secretions, abnormal visual/palpable masses, current respiratory treatment, and oxygen delivery.

READ THE ELECTRONIC HEALTH RECORD

Assessment of a Patient with Abdominal Pain

Patient Information
Name: Tanecia Smith
Age: 37 years
Sex: Female

Chief complaint:

- Severe abdominal pain, primarily in the upper right quadrant, for the past 3 days

Medical history:

- Diagnosed with hyperlipidemia 3 years ago
- History of vaginal delivery to a set of healthy twin boys 12 weeks ago
- Previous episodes of mild spasms related to gallstones, treated successfully with antispasmodics and diet change

Vital signs:

- Temperature: 89.3°F (38.5°C)
- Heart rate: 125 bpm
- Blood pressure: 140/90 mm Hg
- Respiratory rate: 26 breaths per minute
- Oxygen saturation: 99% on room air
- BMI: 38

Recent laboratory results:

- WBC count: 14,000/µL (elevated)
- Hemoglobin: 13.5 g/dL (normal)
- Hematocrit: 40.5% (normal)
- Platelets: 250,000/µL (normal)
- Amylase: 180 U/L (elevated)
- Lipase: 166 U/L (elevated)

Electrolytes:

- Sodium: 138 mmol/L (normal)
- Potassium: 4.0 mmol/L (normal)
- Chloride: 102 mmol/L (normal)

Imaging Results

- CT scan of abdomen and pelvis: Findings consistent with acute cholecystitis; presence of inflamed gallbladder, blockage of the biliary duct to the pancreas; no abscess or free air noted

Progress notes:

- Patient reports increased severity of abdominal pain and tenderness over the past 3 days after ingesting some pizza.
- Appetite has decreased, and she has experienced nausea after drinking even water.
- Vomiting noted today resembling biliary juices; steatorrhea noted.
- Patient has been compliant with reduced-fat diet until 3 days ago.
- Mild diaphoresis observed upon admission.

Current medications:

- Acetaminophen 500 mg every 6 hours as needed for pain
- Dicycloverine 10 mg up to three times a day to relieve spasms

1. What information in the patient's chart concerns you?
2. What information is the most concerning?
3. What is an expected finding?
4. What information should you question?

Abdominal Assessment

The abdominal assessment also relies on inspection, palpation, auscultation, and percussion. The nurse will assess the abdominal appearance, bowel sounds, and stool. The nurse will also inquire about the patient's nutrition (e.g., current diet) and appetite.

Peripheral Vascular Assessment

The peripheral vascular assessment uses inspection, palpation, and auscultation. This includes pain, pallor of skin, inability to regulate core temperature (**poikilothermia**), pulselessness, paresthesia, and paralysis.

Neuro-muscular Assessment

The neuro-muscular assessment relies on inspection. It includes orientation (e.g., person, place, and time), level of consciousness, Glasgow Coma Scale (GSC), speech assessment, gait assessment, movement and strength of extremities (e.g., equal or unequal), and pain.

Skin Assessment

The skin assessment uses inspection and palpation. This includes turgor, integrity, color, temperature, Braden Risk Assessment to assess for pressure sore risk, chronic wounds, and skin breakdown.

Genitourinary Assessment

The genitourinary assessment involves inspection of the urinary and reproductive system. This includes the character of voiding and discharge, urinary difficulty, or presence of a catheter. It also includes specific reproductive health concerns, such as menstrual/menopause, vaginal bleeding, and painful intercourse.

LINK TO LEARNING

Watch this video to see an example of a head-to-toe physical assessment (https://openstax.org/r/77Physical) at the patient's bedside.

The Focused Assessment of a Medical-Surgical Nurse

The focused assessment, like a focused history, starts with the patient's chief complaint. The nurse will center the physical examination on the reason the patient is seeking care at the present time. For example, the focus for a patient who presents with a sore throat will be head/eye/ear/nose/throat (HEENT). By focusing the exam on the patient's problem, the nurse will efficiently retrieve information that will help the health care team make the correct diagnosis and, if needed, appropriate plan of treatment.

Safety and Surroundings Assessment

The safety and surroundings assessment is critical to preventing adverse patient outcomes. It involves confirming the patient's identity through wrist band identification, and assessing fall risk, use of ambulatory aids, environmental concerns, domestic and family violence risk, and suicidal ideation. The safety and surroundings assessment helps the nurse avoid preventable errors, such as patient misidentification, allergic reactions, and falls or other injuries. It is also a method to guard against safety threats the health care professionals may face (for example, if a patient has an infectious disease or is violent). The patient safety assessment during hospitalization may include documenting:

- Patient activity
- Intravenous insertion sites, drains, pumps
- Oxygen delivery system

- Allergy wristband
- Isolation precautions
- Family in the room
- Bed position, side rails up
- Call bell within reach

CLINICAL SAFETY AND PROCEDURES (QSEN)

QSEN Competency: Informatics

Disclaimer: Always follow the agency's policy for medication administration.

Definition: Follow effective strategies to reduce human error when providing patient care. Examples include using allergy ID bands and checking that the bed is in the lowest setting.

Knowledge: The nurse will identify essential information that must be available in a common database to support patient care. Examples include staying up to date with current signs and symptoms of medication reactions.

Skill: Use clear and concise communication to raise awareness of observed concerns. Examples include contacting the provider if the patient exhibits signs of being a fall risk or has a potential medication reaction.

Attitude: The nurse will value national safety campaigns by implementing current safety initiatives into everyday practice guidelines. Examples include implementing safety checks and rounding on patients every thirty minutes.

(QSEN Institute, n.d.)

Summary

6.1 Critical Thinking in Assessment

- Nurses must develop critical thinking skills to gather and analyze patient data. These skills lay the foundation for clinical judgment, which underlies the nursing process.
- Clinical judgment allows nurses to synthesize their knowledge, experience, and intuition with the available data to make informed, evidence-based decisions about patient care.
- As nurses develop their critical thinking and clinical judgment skills, they will become more adept at evaluating their own process and recognizing areas in need of improvement.
- One of the key models used in nursing today is the Clinical Judgment Measurement Model (CJMM), which guides nurses as they develop critical thinking and clinical judgment skills.

6.2 Effective Communication in the Nurse-Patient Relationship

1. It is the nurse's responsibility to establish and maintain a trusting therapeutic relationship with each patient in their care.
2. The nurse-patient relationship is unique and complex, and the nurse will draw on their critical thinking and communication skills to develop and maintain it.
3. The nurse must establish professional boundaries, striking a balance between being empathetic and avoiding becoming too personal.
4. Both verbal and nonverbal communication are part of interactions with patients as well as colleagues.
5. In the clinical setting, the nurse must be aware of the resources and tools available to them to facilitate communication with patients based on needs, as well as strategies to enhance communication with other providers about patient care.
6. The nurse must understand how different models of communication are used and adjust their communication according to the situation.

6.3 Health History

- The comprehensive health history is a higher-level and more comprehensive view of a patient's overall health.
- The focused health history centers on the chief complaint that prompted the patient to seek care at the present time.
- When obtaining a complete/comprehensive health history, the nurse will systematically follow a structured format to ensure that all components have been covered.
- The chief complaint, history of present illness, past health history, family history, review of systems, current medications, and sociocultural factors all come together to help the care team form a diagnosis and plan for treatment.

6.4 Bedside Physical Assessment in Medical-Surgical Nursing

- A complete physical examination provides a top-level, thorough view of a patient's health. It is more comprehensive and inclusive than other assessments and provides an overall view of the patient's health.
- At each step in the assessment and examination process, the nurse must accurately document their findings so that the information can be efficiently and effectively communicated to the care team.
- The bedside comprehensive physical examination includes the following nursing assessments: general survey, HEENT, cardiac, respiratory, abdominal (gastrointestinal), peripheral vascular, neuro-muscular, skin, genitourinary, and activity.
- When a patient seeks care for a specific problem, the nurse will start with a focused assessment in which they will gather more information on the chief complaint.
- While the safety and surroundings assessment pertains to the patient's safety in the facility, the nurse must also assess the patient's home safety. The details of the assessment can also be important for the safety of the nurse and other staff.

Key Terms

bedside assessment systematic exam of all patient body systems
body language type of nonverbal communication based on physical movement and expression

chief complaint reason the patient is currently seeking care
comprehensive physical assessment detailed, inclusive assessment of body systems to provide a big-picture, broad view of a patient's overall health
constitutional relating to the whole body
focused assessment physical examination centered on a patient's chief complaint
intuition "sixth-sense" of knowing that largely comes from years of education and problem-solving in real-world patient situations
medication reconciliation process of reviewing a patient's medications listed in their medical record and comparing that list to what the patient is actually currently taking at home
negative used to note when signs or symptoms in a system are absent
nonverbal communication physical movements or motions, including body language, that convey thoughts, attitudes, and sentiments
patient-centered decisions made with respect for the patient's interests, needs, culture, values, and preferences
PERRLA eye assessment that determines if pupils are equal, round, reactive to light and accommodation
poikilothermia inability to regulate core temperature
positive used to note when signs or symptoms in a system are present
professional boundary clear separation between personal and work life when interacting with patients
verbal communication spoken word, in whatever language the patient can best communicate and understand
visual communication strategies like return demonstration that can confirm a patient's understanding
written communication reinforcement of verbal information given to the patient in a format they can read

Assessments

Review Questions

1. What is a definition of critical thinking skills in nursing?
   a. Habitually using a set of rational standards to guide informed decision-making.
   b. Taking action after considering all the available patient data.
   c. Feelings based on a combination of experience, emotional intelligence, and mental reasoning.
   d. Seeking feedback on personal performance and evaluating patient outcomes.

2. The nurse is gathering a history from a patient who presents to the ER with a severe headache. What is an action by the nurse that demonstrates the importance of critical thinking?
   a. The nurse asks the patient about what medications they are currently taking instead of checking the patient's chart.
   b. The nurse notes the patient's current medication list in the chart and does not ask them what medications they currently take to save time so they can prioritize a focused physical assessment.
   c. The nurse asks the patient what medications they currently take at home and compares them to the information listed in the patient's chart, noting there are discrepancies.
   d. The nurse does not ask the patient about current medications because assessing their pain level needs to be the priority.

3. In what way does critical thinking connect to clinical judgment?
   a. Critical thinking is part of clinical judgment but is a narrower set of skills.
   b. Clinical judgment must be the foundation for critical thinking.
   c. Clinical judgment stems from intuition, while critical thinking is not based on experience.
   d. Critical thinking and clinical judgment refer to the same set of nursing skills, and the terms can be used interchangeably.

4. A nurse working in a busy medical surgical unit has just received a new patient. They walk into the patient's room to start the comprehensive history and physical assessment. They notice that the patient is sitting on the stretcher, arms crossed, and frowning. What form of communication is this patient exhibiting?
   a. Verbal
   b. Welcoming

c. Nonverbal
d. Written

5. The nurse is caring for a patient who does not speak English. The patient's daughter offers to translate. What is the appropriate action for the nurse to take?
a. Allow the patient's daughter to translate the conversation.
b. Use a phone app to translate what needs to be communicated to the patient.
c. Follow the facility's guidelines for acquiring assistive technology or an interpreter.
d. Explain to the patient's daughter that all communication will need to be in writing.

6. What is the last component of the ISBAR method of communication?
a. Recommendation
b. Revision
c. Review
d. Restatement

7. The nurse is preparing to complete a comprehensive health history and physical assessment on a new admission from the emergency department. The patient is a 35-year-old female with a chief complaint of shortness of breath. What description correctly demonstrates how the nurse will start the assessment?
a. The nurse starts the focused health history with questions about the patient's broken foot that occurred 1 year ago.
b. The nurse starts the focused health history with questions about the patient's menstrual cycle patterns.
c. The nurse starts the focused health history with questions about the patient's last asthma attack.
d. The nurse starts the focused health history with questions about the patient's shortness of breath.

8. In what section of the history would the nurse document that the patient denies alcohol, tobacco, and drug use?
a. Medical
b. Social determinants of health
c. Family
d. Current medications

9. The nurse is taking a history on a 65-year-old patient with diabetes who is at the provider's office for follow-up to discuss their most recent labs. The patient mentions their vision has "been blurry lately." What step would the nurse take based on this cue?
a. Tell the patient that they may need to see an eye doctor.
b. Make a note for the provider to do a vision test.
c. Change the focus of the assessment to check the patient's eyes.
d. Reassure the patient the symptom is probably age-related.

10. The nurse is taking care of a patient who is admitted to the hospital for a chief complaint of chest pain. What is a description that demonstrates how the nurse would proceed with a physical examination?
a. Start with the head-to-toe approach, head, eyes, ears, nose, and throat.
b. Start by letting the patient care technician change the patient's sheets, since the patient complained that they like new sheets right away.
c. Start with the cardiac system, then continue the bedside physical examination.
d. Start with the respiratory system, then continue the comprehensive physical examination.

11. What are the components of the HEENT assessment?
a. Head, eyes, ears, nose, thorax
b. Head, eyes, ears, nose, throat
c. Head, eyes, ears, nose, trachea
d. Head, eye, ears, nose, taste

Check Your Understanding Questions

1. Describe how you could use the CJMM to better understand your critical thinking skills.
2. Describe how your critical thinking skills will lay the groundwork for the development of your clinical judgment as a nurse.
3. What questions would you use when doing a focused health history of a patient with a chief complaint of abdominal pain?
4. You are a nurse in a busy med/surg unit. You are about to start your admission database with your new patient admitted from the emergency department. Your patient is a 55-year-old male admitted for chest pain. Your questions will initially focus on the chief complaint, but then what types of other questions will you ask him?
5. Describe the assessment approach you would use for a patient who presents with dizziness and balance problems.

Reflection Questions

1. Explain how the nurse can use critical thinking skills to identify patient factors that could affect information gathering during the assessment.
2. Describe how the nurse would move through the steps of the CJMM when caring for a patient with dementia who is not able to provide a reliable history.
3. You are caring for an 81-year-old patient in the ER. When you come into the room and introduce yourself, the patient smiles but does not verbally acknowledge you. As you start to ask questions, you notice that the patient is turning their head to the side and leaning slightly toward you. You check the patient's chart and note that they were fitted for hearing aids six months ago, but they do not appear to be wearing them, and you don't see them in the room. Describe what steps you would take to assess the patient's needs.
4. You are about to start a comprehensive history and physical assessment on a new patient who has just arrived in your unit. You received your ISBAR report, and the nurse told you that the patient does not speak English. The patient has a spouse with them who speaks English. How would you begin your assessment?
5. Explain why medication reconciliation is an important component of the patient's history, regardless of their chief complaint.
6. The family member of a patient who is paralyzed after a stroke expresses concerns about caring for them at home. What would you specifically want to cover in the assessment to mitigate risks for the patient at home?

What Should the Nurse Do?

1. You have completed a comprehensive physical and history assessment on a young patient with whom you have developed a good rapport. You are leaving at the end of your shift and say goodbye. The patient asks you if you will be their nurse tomorrow. You answer honestly that you never know what your assignment will be the day before. The patient states that they would like to request you as their nurse so they can get to know you better, and asks if the two of you could have coffee in the cafeteria tomorrow. If you were the nurse, what would you do?
2. A nurse in a busy ER enters the room of a patient who presents with a broken wrist. The patient is in pain and becomes impatient as the nurse begins to ask questions. How should the nurse respond when the patient asks, "Can't you just look this all up in my medical record?"
3. An 88-year-old patient on the med-surg unit fell in their room after trying to get from bed to the bathroom without assistance. What safety and surroundings assessment components related to the patient's home environment could have helped prevent this incident?

Competency-Based Assessments

1. Research the National Council of State Boards of Nursing (NCSBN)'s CJMM. What are some similar

frameworks that are also used in nursing?

2. Create a comparison table or chart that shows how nurses use critical thinking and clinical judgment. Think about how the skills differ as well as when they may overlap.
3. Practice applying TeamSTEPPS to the following clinical scenario: A 72-year-old patient is brought to the ER via ambulance with signs and symptoms of sepsis, including a high fever, rapid respirations, and hypotension. He was found unresponsive at home by his wife, who states he has been sick with "a UTI" for the last week.
4. Develop a clinical example of using ISBAR to communicate patient information to providers who are part of the care team.
5. Compare the components of a comprehensive ROS versus the focused ROS you may complete on a patient complaining of shortness of breath.
6. A 21-year-old patient at the local university presents to the campus health clinic. List the components of the patient's social history you would ask the patient about.

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CHAPTER 7

Pain Assessment and Management

FIGURE 7.1 A patient in pain using a nonpharmacological method. (credit: modification of "Best Pillows for Shoulder Pain" by "samuelemunemu32"/flickr, Public Domain)

CHAPTER OUTLINE

INTRODUCTION Pain is subjective to the individual and may be characterized in many ways. Regardless, most people will experience it at some point in their life. The assessment and management of pain is a top priority for the nurse in providing comprehensive patient care. By conducting a pain assessment, the nurse can gain an understanding of the patient's subjective description of pain, including the severity of symptoms. Using the results from the assessment, the nurse can then implement both pharmacological and nonpharmacological interventions to manage the pain. Collaboration with the health care team is critical for achieving the best possible plan of care to relieve pain. This means the patient should be an active participant in the treatment plan, including establishing reasonable goals for managing pain.

7.1 Concepts and Causes of Pain

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Define pain and its causes
- Differentiate among types of pain

Pain is an important communication tool that bodies use to indicate that something is wrong. Although everyone experiences pain, the perception of pain is unique and varies from person to person. "Pain is whatever the experiencing person says it is, existing whenever they say it does" (McCaffery, 1968). Pain may be classified

according to a variety of factors, such as location, onset, duration, and cause. Being able to differentiate between the types and characteristics of pain is a crucial skill when assessing pain.

What Is Pain?

Generally, **pain** is an uncomfortable or unpleasant sensation that typically signifies injury or illness. The purpose of pain is to tell the individual that something is not right within their body and requires further attention. For example, if a person touches a hot stove, they feel a burning sensation (pain) on the skin that tells them to stop touching the stove. If a person's knee hurts when walking after a fall, their body is telling them not to put weight on that knee.

Pain is a physiological process caused by interaction with nociceptors. A **nociceptor** is a type of sensory receptor that responds to potentially damaging stimuli by sending nerve signals to the spinal cord and brain in a process called nociception. There are several types and functions of nociceptors:

- Thermal nociceptors are activated by noxious heat or cold, such as a hot pan.
- Mechanical nociceptors are activated by excess pressure or mechanical deformation, such as a finger getting caught in a car door. They also respond to incisions that break the skin surface.
- Chemical nociceptors are activated by a wide variety of spices commonly used in cooking. For example, capsaicin is a compound in chili peppers that causes a burning sensation of the mucous membranes. It is also used in common over-the-counter creams for pain relief because when it is applied to the skin, it blocks the transmission of pain impulses.

Nociceptors detect noxious stimuli and transduce them into electrical energy. An action potential is created and transmitted along nociceptor fibers. There are two types of nociceptor fibers, A-Delta and C (Kendroud et al., 2022). A-Delta fibers are fast-conducting fibers associated with the initial sensation of sharp, stinging, or pricking pain. C fibers are slower-conducting fibers associated with the secondary sensation of diffuse, dull, burning, or aching pain. The pain impulse is transmitted along these nociceptor fibers to the dorsal horn in the spinal cord, and then from the spinal cord to the thalamus, where pain messages are relayed to the cerebral cortex. The cerebral cortex perceives pain impulses, so it is then that the person has conscious awareness of pain. Figure 7.2 illustrates this process.

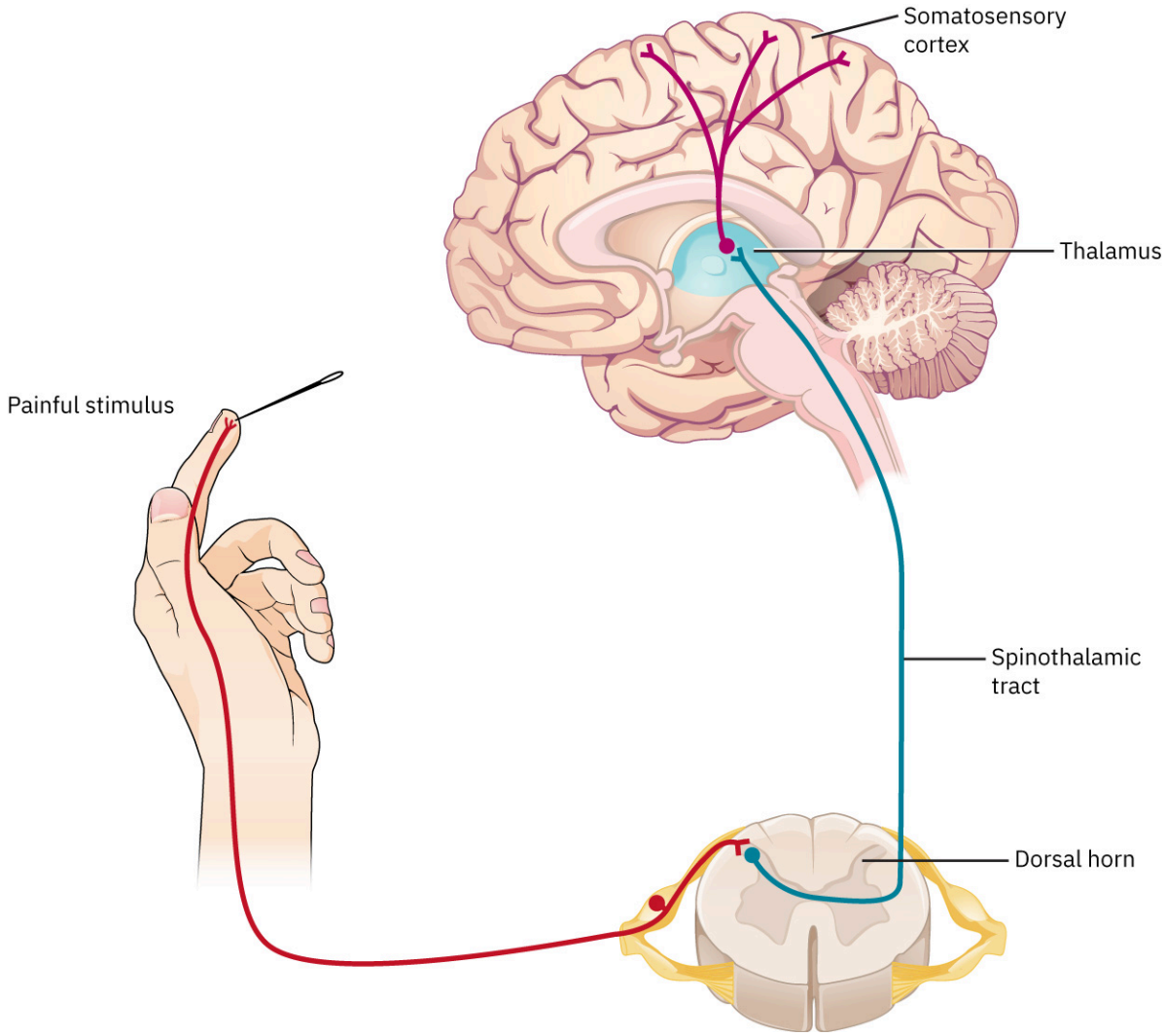

FIGURE 7.2 Through nociception, a noxious stimulus, or pain signal, is transmitted from the nociceptors to the spinal cord and then to the brain. (credit: modification of work from *Psychology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Types of Pain and Their Causes

Pain can be a normal response to an illness or injury and may not require medical treatment. This type of pain may be referred to as **normal pain**, which is of the severity and duration that you would expect to experience according to the cause of the pain. Examples of normal pain may be a skinned knee, minor burn, pulled muscle, or tension headache, or even more severe such as the pain of a sprained ankle, broken bone, labor and delivery, or recovery from surgery. Although medical treatment may be necessary to treat the underlying problem, the associated pain typically does not warrant further medical treatment. On the contrary, **abnormal pain** moves beyond the expected severity and duration expected from the cause of the pain and may require additional medical treatment. Examples of abnormal pain may be fibromyalgia, neuropathic pain, chronic back pain, and migraines, which are complex pain conditions characterized by chronic pain with varying intensity.

There are several different types of pain, each with its own indications for treatment and management. Pain may be characterized according to onset and duration, such as acute, chronic, or breakthrough. Pain may also be categorized as neuropathic or nociceptive, according to the type of damage that causes it. The types of pain are not isolated; sources of pain may fall into more than one of these categories. It is important to identify the type of pain in order to develop an individualized plan of care to treat and manage it.

Acute Pain

When pain is short in duration, typically lasting from minutes up to three to six months (depending upon the reference source), it is considered **acute pain**. It comes on suddenly and tends to be associated with a specific soft-

tissue injury, such an ankle sprain, or a temporary illness, such as gastritis. This type of pain may be sharp, throbbing, burning, stabbing, or tingling; it may manifest as weakness or numbness. Acute pain typically produces a physiological response resulting in vital sign changes, such as increased pulse, respirations, and blood pressure. Generally, once the injury heals or illness subsides, the pain subsides as well. Examples of acute pain include pain that results from surgery, cuts, burns, labor and delivery, and broken bones.

Nurses can identify acute pain by assessing the symptoms, intensity, and location of the pain, as well as the associated injury or illness. Blood tests, x-rays, computed tomography (CT scans), magnetic resonance imaging (MRIs), ultrasounds, dye-injection studies, and nerve conduction studies may also be helpful for diagnostic testing. Acute pain may be treated with rest, heat or ice, anti-inflammatory medications, physical therapy, exercise, stress reduction, bioelectric therapy (electrical impulses used to stimulate nerves and muscles), muscle relaxants, and short-term use of narcotics (International Association for the Study of Pain, 2021).

Do not ignore acute pain. If left untreated, acute pain may turn into chronic pain. For example, a broken bone that is left untreated may result in the bone not healing, leading to worsening pain over time. Acute pain may also turn into chronic pain when repeated or continuous nerve stimulation alters the pain pathways in the central nervous system. For example, repetitive knee injuries may result in subsequent arthritis over time.

Chronic Pain

By contrast, **chronic pain** is longer in duration, typically identified as pain lasting longer than six months. It often results from health conditions, such as arthritis, fibromyalgia, cancer, diabetes, and musculoskeletal deformities. Other causes of chronic pain include normal aging, wear and tear on bones and joints, nerve damage, and injuries that fail to heal properly. Chronic pain does not typically result in vital sign changes because the body has adjusted to the new normal of chronic pain.

Chronic pain may be categorized as constant or intermittent. Constant pain is continuous, though the intensity of the pain may vary at times. Back injuries, for instance, may result in chronic pain; the pain may worsen or lessen with certain movements, but it is constant. Intermittent pain comes and goes. Migraines, for example, may be considered chronic pain if the person has experienced them over a time period longer than three months; the migraines themselves come and go, however, so they are considered intermittent.

Chronic pain may alter in severity, depending on the day. Some days the pain may be mild or nonexistent, and other days the pain may be severe and debilitating. Due to its chronic nature, this pain may considerably affect the quality of one's life. It can have physical effects, such as tense muscles, limited mobility, a lack of energy, and changes in appetite. It may also cause emotional effects, such as depression, anger, anxiety, and fear of reinjury. When managing chronic pain, it is important to assess one's ability to perform activities of daily living, as well as assess for signs of depression and anxiety. Early intervention is key to preserving quality of life and mental well-being.

Breakthrough Pain

A sudden increase in pain that lasts for a short time is called **breakthrough pain**. It may be caused by stress, illness, or activity, by the wearing off of pain medicine, or for no known reason. Breakthrough pain may occur with acute or chronic pain. Acute surgical pain, for instance, may be well controlled with oral analgesics, but the patient may experience a sudden increase in pain after physical therapy exercises that result in the need for additional doses of pain medications between the regular doses of oral analgesics. In contrast, a patient diagnosed with rheumatoid arthritis may experience chronic pain that is well controlled with the patient's regular pain medication regimen; a flare-up of pain may require additional therapeutic medications to be added to the regimen until the breakthrough pain subsides.

Neuropathic Pain

Damage to nerves or other parts of the nervous system can result in **neuropathic pain**. It may be characterized as shooting, stabbing, sharp, or burning pain. Some people may even describe the pain as an electrical shock or say it feels like "pins and needles." Common causes of neuropathic pain include cancer, stroke, limb amputation, radiation, chemotherapy, and diabetes.

Neuropathic pain is a type of chronic pain that can be so severe that it becomes debilitating. It may interfere with the ability to perform everyday tasks and be severe even with normal movement. As a result, the person may experience mobility issues. Neuropathic pain may also affect sensitivity: for example, it can interfere with a person's

ability to feel hot and cold sensations, which may result in injury. The person may touch a hot pan, not be able to sense that it is hot, and end up with severe burns to their fingers.

Following an amputation, patients may experience a type of neuropathic pain known as **phantom pain** in which the patient perceives the pain to be coming from the missing body part. Approximately 80 percent of patients who undergo an amputation will experience phantom pain (Cleveland Clinic, 2021). Phantom pain is caused by the brain misinterpreting the pain signals, but the pain is real. It may last for seconds, hours, days, or longer, and may be described as burning, aching, pinching, itching, tingling, shooting, stabbing, throbbing, or twisting. Diagnose phantom pain by conducting a physical exam and ruling out other medical causes, such as infections.

Nociceptive Pain

Pain caused by damage to the body tissue, typically from injury to joints, muscles, skin, tendons, or bones, is called **nociceptive pain**. It is often described as sharp, achy, or throbbing. Nociceptive pain may be either acute or chronic. For example, a scrape to the knee, a twisted ankle, or a blow to the head may be characterized as acute nociceptive pain. If the blow to the head were to result in subsequent migraines lasting longer than three months, it would then be characterized as chronic nociceptive pain.

There are two types of nociceptive pain. The first, **somatic pain**, is experienced in the muscles, skin, or bone. This pain is focused on a specific area of the body and is typically more intense than visceral pain. It is often characterized as cramping, aching, or gnawing. Examples include pain resulting from headaches, the motion of injured limbs, or cuts in the skin. The other type of pain, **visceral pain**, is experienced in the internal organs; the exact location may be difficult to identify. Visceral pain is oftentimes described as aching, cramping, or as pressure in the body. Examples include pain caused by endometriosis, bladder infection, and irritable bowel syndrome. (Table 7.1) displays the defining characteristics of nociceptive and neuropathic pain.

Nociceptive Pain		Neuropathic Pain
Somatic Pain	**Visceral Pain**	
Arises from the muscles, skin, or bone	Arises from the internal organs	Arises from damage to the nervous system
Characterized as cramping, aching, gnawing	Characterized as achy, pressure, cramping	Characterized as shooting, stabbing, sharp, burning, electric-like sensation, “pins and needles”
Examples: infection, postoperative, fracture	Examples: endometriosis, irritable bowel syndrome, pancreatitis	Examples: neuropathy, phantom limb pain, shingles

TABLE 7.1 Defining Characteristics of Nociceptive and Neuropathic Pain

Referred Pain

When the pain in one part of the body is caused by pain in a different location in the body, it is considered referred pain. Referred pain can happen if the brain incidentally sends a pain signal to a different part of the body. Although **referred pain** may be felt anywhere, areas such as the shoulders, neck, back, teeth, and jaws are common sites of referred pain. Referred pain is typically the result of an overlapping dermatome, specific regions of the skin that connect to a single spinal nerve root. Due to the shared neural pathways, the individual may feel the pain in a different portion of the dermatome supplied by the same nerve root. For example, a person having a heart attack may experience shoulder pain, whereas pain in the lower back may be caused by kidney pain.

7.2 Pain Assessment

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss key elements of assessing a patient's pain
- Relate principles of pain assessment to pain reassessment after evaluation

According to the American Pain Society, pain is the fifth vital sign (Department of Veterans Affairs, 2000). Just as blood pressure, heart rate, respirations, and temperature inform the nurse of the patient's condition, so does pain. Pain assessments should be performed routinely to allow for better pain management by developing a treatment plan that meets the individual needs of the patient.

Performing a Pain Assessment

Perform pain assessments on a regular basis, before and after procedures, during routine checkups, and when a patient reports pain. Prior to administering pain medication, nurses must perform a thorough pain assessment. They must then reassess the pain at least fifteen minutes after administering the medication to evaluate effectiveness. Conducting a pain assessment is a multifactorial process that involves gathering several different sources of information. A thorough pain assessment identifies the patient's risks for pain, assesses the pain using an approved pain scale, determines the classification of pain (nociceptive, neuropathic, referred, somatic, visceral, phantom), determines if the pain is acute or chronic, and assesses the patient's previous response to pharmacological interventions and analgesics, noting any adverse reactions. During a pain assessment, the patient should also be assessed for physical, behavioral, and emotional signs of pain, such as confusion, diaphoresis, moaning, decreased activity, irritability, guarding, grimacing, clenched teeth, muscle tension, depression, and insomnia. These cues are important because they may not align with the results obtained by a pain screening tool. By combining several different ways of assessing pain, the nurse can better understand and manage a patient's pain experience and determine next steps when discrepancies in pain assessments arise.

CULTURAL CONTEXT

Cultural Perspectives of Pain

Culture is directly related to the physical and emotional expression of pain. Some cultures, such as those based in east Asia, place great value on self-discipline and control. Persons with these backgrounds may be more stoic, choosing to bear their pain and withdraw socially rather than express their discomfort. Even when experiencing severe pain, their facial expression may be neutral. Other cultures, such as those with Middle Eastern or Mediterranean roots, may place greater value in the expression of pain; people with these backgrounds may want others around them when they are in pain (Givler et al., 2023). Additionally, there are myths associated with certain cultures an pain. For example, studies have shown that providers are less likely to provide pain medication for Black patients (Sabin, 2020).

Despite these examples, it is important not to generalize about someone's pain based upon their culture alone. Instead, nurses must understand how a patient's culture may affect pain and use this information to create an individualized plan to best meet their individual needs.

Mnemonics for Assessment

Nurses often use mnemonics to remember standardized questions for conducting a comprehensive pain assessment. Although there may be a variety of mnemonics in use, three of the most common mnemonics are:

- COLDSPA
- OLDCARTES
- PQRSTU

The letters in each mnemonic stand for important categories of information relevant to a patient's pain experience. Nurses may ask any number of questions to obtain information for each category. Table 7.2 lists questions that can be used to assess pain using the COLDSPA mnemonic.

COLDSPA	Questions to Ask
C: Character	What does the pain feel like? Does it feel like burning, stabbing, aching, dull, throbbing, etc.?
O: Onset	When did the pain start? What were you doing when the pain started?
L: Location	Where do you feel the pain? Does it move around or radiate elsewhere? Can you point to where it hurts?
D: Duration	How long has the pain lasted? Is the pain constant or does it come and go? If the pain is intermittent, when does it occur?
S: Severity	How would you rate your pain on a scale of 0 to 10, with 0 being no pain and 10 being the worst pain you've ever experienced? How much does it bother you?
P: Pattern	What makes your pain feel better? What makes your pain worse? Does the pain increase with movement, certain positions, activity, or eating?
A: Associated factors	What do you think is causing the pain? What other symptoms occur with the pain? How does the pain affect you?

TABLE 7.2 COLDSPA Assessment

The OLDCARTES mnemonic consists of similar categories as well as specific prompts related to pain treatment. Table 7.3 lists questions that can be used to assess pain using the OLDCARTES mnemonic.

OLDCARTES	Questions to Ask
O: Onset	When did the pain start? Can you recall any specific incident or event that caused the pain to begin?
L: Location	Where is the pain located? Can you point to where it hurts?
D: Duration	How long has the pain been bothering you? Is the pain continuous, or does it come and go?
C: Character	What does the pain feel like? Does it feel like burning, stabbing, aching, dull, throbbing, etc.?
A: Aggravating factors	What makes the pain worse? Are there any activities, movements, or conditions that make the pain worse?
R: Radiating	Does the pain travel to other parts of your body? Can you describe where the pain spreads to?

TABLE 7.3 OLDCARTES Assessment

OLDCARTES	Questions to Ask
T: Treatment	What has been done to make the pain better and has it been helpful?
E: Effect	How does the pain affect your daily activities and quality of life?
S: Severity	On a scale from 0 to 10, with 0 being no pain and 10 being the worst pain imaginable, how would you rate your pain?

TABLE 7.3 OLDCARTES Assessment

The PQRSTU mnemonic uses fewer letters by combining several categories. Table 7.4 lists questions that can be used to assess pain using the PQRSTU mnemonic.

PQRSTU	Questions to Ask
P: Provocation/ Palliation	What makes your pain worse? What makes your pain feel better?
Q: Quality	What does the pain feel like? Note: You can provide suggestions for pain characteristics such as “aching,” “stabbing,” or “burning.”
R: Region/ Radiation	Where exactly do you feel the pain? Does it move around or radiate elsewhere? Can you point to where it hurts?
S: Severity	How would you rate your pain on a scale of 0 to 10, with 0 being no pain and 10 being the worst pain you’ve ever experienced?
T: Timing/ Treatment	When did the pain start? What were you doing when the pain started? Is the pain constant or does it come and go? If the pain is intermittent, when does it occur? How long does the pain last? Have you taken anything to help relieve the pain?
U: Understanding	What do you think is causing the pain?

TABLE 7.4 PQRSTU Assessment

Regardless of the pain assessment framework used, it is important to use open-ended questions that allow the patient to describe the pain in their own words. Closed-ended questions result in “yes” or “no” responses and fail to capture a comprehensive description of the pain. It is also important to follow up on the patient’s initial responses by asking clarifying questions and to continue asking questions until you have a clear enough understanding of the pain to develop and implement an individualized pain treatment plan. In doing so, the nurse should collaborate with the patient to establish reasonable pain goals that are fluid over time and reflective of the patient’s current condition.

Pain Is Subjective

Given that pain is invisible and everyone’s body is different, every person’s response to pain will be different. Even with the same stimuli, the perception of pain will vary from person to person and cannot be generalized across persons. For example, some patients may experience severe pain when receiving injections, whereas others may feel no pain at all. Consequently, nurses must consider pain to be whatever the patient says it is. Table 7.5 displays

the biological, psychological, and social factors that affect the perception of pain. Nurses must consider these factors when assessing and treating pain.

Category	Factors
Biological	• Nociception • Brain function • Source of pain • Illness • Medical diagnosis • Age • Injury, past or present • Genetic sensitivity • Hormones • Inflammation • Obesity • Cognitive function
Psychological	• Mood/affect • Fatigue • Stress • Coping • Trauma • Sleep • Fear • Anxiety • Developmental stage • Meaning of pain • Memory • Attitude • Beliefs • Emotional status • Expectations
Social	• Culture • Values • Economic status • Environment • Social support • Coping mechanisms • Spirituality • Ethnicity • Education

TABLE 7.5 Factors Affecting the Perception of Pain

REAL RN STORIES

Nurse: Kevin, BSN
Years in Practice: Twelve
Clinical Setting: Medical-surgical unit in a rural hospital

Geographic Location: Rural Alabama

The community in which our hospital is located experiences a high rate of homelessness, higher than the average rate in the United States. During the cold winter months, we typically see an increase in persons without housing seeking care in the emergency department (ED).

It was a cold winter night in December when I received a phone call from a nurse in the ED that I was getting a new patient. The patient was a 46-year-old female who was without housing and complaining of back pain. The ED nurse mentioned the patient was a "frequent flier" and a "pain seeker." The nurse didn't know why the patient was being admitted other than "to have a warm place to sleep for the night." The nurse reported that the patient had been given a heat pack but no pain medications. The nurse went on to mention the patient was seen in the ED one week prior, testing was done at that time, and no source of pain was found.

Upon arrival to the unit, the patient was displaying physical signs of pain, such as rocking back and forth, and stated she was in pain. A comprehensive pain assessment was performed, with the patient rating the pain as a 10/10 using the numerical rating scale. I felt uncertain how to proceed in that moment. My assessment told me the patient was in pain, but given the report from the ED nurse and noting the patient's frequency of ED visits, I began to wonder if the patient really was in pain or if they were just seeking pain medications and a warm place to sleep.

I continued to ask the patient questions to gain a better understanding of the pain. During the assessment, the patient asked to use the restroom. It was at that time that I noted blood in the urine. I asked several follow-up questions and discovered the patient had been feeling a burning sensation with urination. Realizing the cues were signs of a possible kidney stone or kidney infection, I provided the patient with pain medications and notified the provider. The patient ended up having a kidney stone, which was treated. Once the problem was resolved, the patient did not complain of further pain.

Looking back on the situation, I should have recalled that as a nurse, I must be nonjudgmental and recognize that pain is subjective and whatever the patient says it is. The patient was demonstrating physical signs of pain and was sufficiently cognitively aware to provide a pain score. I am glad I decided to ask additional questions to probe the patient a bit further. Had I not done this, I wonder if the patient's underlying condition would have been identified and treated. All patients have a right to adequate pain control, which starts with believing what the patient says they are experiencing.

Pain Scales

A key factor when assessing pain is to determine the severity of the pain. Because nurses cannot test pain objectively to determine what someone is experiencing, providers use pain scales to gain a concrete understanding of a patient's pain. These tools may also be used to establish a reasonable pain goal the patient would like to reach. Although nearly all patients would like to have a pain goal of 0, this may not be reasonable for a given individual. For example, someone who just had surgery should expect to have pain for at least several days, and possibly longer.

Nurses have the option of using several standardized pain scales. The most common is the **numerical rating scale (NRS)**. When using this scale, patients are asked to rate their pain between 0 and 10, with 0 being no pain and 10 being the worst pain ever experienced. Typically, a pain score of 0 means no pain, a score of 1 to 3 is mild pain, a score of 4 to 6 is moderate pain, a score of 7 to 9 is severe pain, and a score of 10 is unbearable pain. Severity ratings may vary according to institutional policy. Although simple and easy to use, this pain scale cannot be used for children or others who cannot quantify the severity of pain. As such, these populations require alternative pain scales, such as the FACES scale, FLACC scale, PAINAD scale, behavioral pain scale (BPS), or critical-care pain observation tool (CPOT).

LINK TO LEARNING

The University of Florida Health has created a web page that links to many different pain assessment tools (https://openstax.org/r/77PainAssmtTool) as part of their Pain Assessment and Management Initiative.

The **FACES scale** is a visual tool for assessing pain in children ages 3 and older and others who cannot use a

numerical scale. To use the FACES scale, first explain to the patient that each face represents a person who has no pain (or "hurt"), some pain, or a lot of pain: for example, "Face 0 doesn't hurt at all. Face 2 hurts just a little. Face 4 hurts a little more. Face 6 hurts even more. Face 8 hurts a whole lot. Face 10 hurts as much as you can imagine, although you do not have to be crying to have this worst pain." Ask the person to choose the face that best represents the pain they are feeling. Although simple to perform, the results are not always reliable, and additional assessments may help to determine the severity of the patient's pain.

The **FLACC scale** is used to assess pain in children between the ages of 2 months and 7 years, as well as those unable to verbally communicate. This scale has five criteria: face, legs, activity, cry, and consolability. Based on their observations of the patient, the provider assigns each of the five criteria a score of 0, 1, or 2. The provider then adds the scores of each of the five criteria to calculate the overall pain score. The overall total will be between 0 and 10, with 0 being no pain and 10 being severe pain.

The **pain assessment in advanced dementia (PAINAD) scale** is used to assess pain in patients with Alzheimer disease and advanced dementia. This scale has five criteria: breathing independent of vocalization, negative vocalization, facial expression, body language, and consolability. Similar to the FLACC scale, each of the five criteria in the PAINAD scale are assigned a score of 0, 1, or 2. The provider observes the patient, assigns a score for each criterion, and adds the scores. The total pain score will be between 0 and 10, with 0 being no pain and 10 being severe pain. Like FLACC, the PAINAD scale is simple, valid, and reliable, but it may not always result in the most accurate pain assessment, because it requires the nurse to calculate the score based upon observed patient behaviors rather than the patient's subjective pain rating.

The **behavioral pain scale (BPS)** is a tool used to assess and quantify pain in acute sedated ventilated patients in intensive care units (ICUs). This scale relies on the observation of facial expressions, upper limb body movements, and compliance with mechanical ventilation. BPS scores range from 3 (no pain) to 12 (maximum pain).

The **critical-care pain observation tool (CPOT)** is another standardized assessment tool used in critical-care settings to evaluate pain in critically ill patients who are unable to communicate their pain. The CPOT measures pain through the observation of four behavioral categories: facial expressions, body movements, muscle tension, and compliance with the ventilator (for intubated patients) or verbalization (for extubated patients). CPOT scores range from 0 (no pain) to 8 (maximum pain).

Pain Assessment for Older Adults

In general, persistent pain has been related to depression, anxiety, decreased socialization, sleep disturbances, and slowed mobility. It is therefore crucial that nurses adequately assess and treat pain to maintain the health, well-being, and functional status of older patients, who are more likely to experience pain yet less likely to report being in pain. This is partly because both providers and patients may be inclined to dismiss pain as a normal part of aging. There are also valid concerns about the risks of pain medications leading to opioid dependence, as well as a lack of routine pain assessments that are comprehensive in nature. All these factors have resulted in undertreatment of pain in the older adult population.

A multimodal approach to assessing pain, both by observing physical cues and utilizing tools such as the FACES or PAINAD scales, is essential for treating older adults. If the patient is cognitively impaired or unable to communicate, the nurse should rely heavily on any physical cues noted and treat the patient accordingly.

CLINICAL SAFETY AND PROCEDURES (QSEN)

Pain Assessment Checklist

Disclaimer: Always follow the institution's policy for pain assessment.

Special considerations:

- Provide developmentally and culturally appropriate education based on the needs of the individual.
- Explain to the patient and family that pain control is the patient's right.
- Encourage questions, and answer them as they arise.

Steps	Additional Information
1. Ensure hygiene.	• Performing hand hygiene and donning appropriate personal protective equipment reduces the spread of microorganisms.
2. Introduce yourself.	• Patients have a right to know who is providing care to them.
3. Verify patient identity.	• Verify patient identity using two identifiers, such as name and date of birth.
4. Assess risks for pain.	• Consider factors, such as if the patient has recently undergone surgery or an invasive procedure, conditions that are likely to cause pain (e.g., cancer, sickle cell anemia), anxiety, inability to communicate, cognitive impairments, or advanced age.
5. Assess pain using a pain scale.	• Use scale appropriate for the patient's age and cognitive level. • Consider age- and cultural-related factors that may prohibit patient from reporting pain.
6. Establish a pain goal with the patient.	• Using the same pain scale, ask the patient to set a reasonable pain goal.
7. Determine the classification of pain.	• Identify if the pain is nociceptive or neuropathic.
8. Determine whether pain is acute or chronic.	• Determine how long the pain has been present. Typically, chronic pain is pain that has lasted longer than six months.
9. Assess response to previous pharmacologic interventions, including analgesics.	• How have other medications affected sleeping, eating, vital signs? • Has the patient experienced unwanted symptoms with medications in the past, such as itching, nausea, or vomiting?
10. Assess the pain site.	• Inspect: Do you notice any swelling, draining, bruising, lumps, or other discolorations? • Palpate: Are there painful areas, changes in body temperature, or evidence of altered sensation? • Assess range of motion to determine effect on joints. • Perform percussion and auscultation to determine potential cause of pain.
11. Assess for physical, behavioral, and emotional signs of pain.	• Look for signs, such as moaning, crying, grimacing, clenched teeth, irritability, confusion, diaphoresis, guarding, muscle tension, restlessness, fatigue, insomnia, depression, abnormal gait, decreased activity, or social withdrawal.
12. Assess characteristics of pain.	• Use COLDSPA, OLDCARTES, or PQRSTU mnemonics.
13. Assess patient's preferences in pain management.	• Consider cultural factors that may affect pain management. • Identify preferences in nonpharmacological supportive therapies.

Reassessment after Intervention

Pain should always be reassessed after implementing an intervention to determine the effectiveness of the intervention in reducing the pain. Typically, pain should be reassessed within one hour of administering oral medications and within fifteen to thirty minutes of administering intravenous medications, depending upon institutional policy. Reassess pain utilizing the same pain scale as the initial pain assessment. If the patient's pain has not decreased to a level equivalent to their established pain goal, discuss further interventions. These interventions may include additional medications or nonpharmacological modalities, such as heat, ice, music, and repositioning. Intervention (both pharmacological and/or nonpharmacological) and reassessment are required until achieving the patient's optimal pain goal. Chart all reassessments and interventions in the medical record.

READ THE ELECTRONIC HEALTH RECORD

Documenting Pain Assessments

The following is a sample of nursing documentation within an electronical health record (EHR) for pain management. The patient is a 42-year-old male who experienced a stroke. He is NPO because he has swallowing difficulties and has impaired balance, so he cannot ambulate without the assistance of two people. He has expressive aphasia, so the words he says are not the words he means. His last bowel movement was three days ago.

	14:05	**14:45**	**16:10**	**19:15**	**20:10**	**21:25**
Vital Signs						
Temp	98.2°F					98.4°F
Heart rate	88					78
Resp rate	18					18
BP	138/86					128/78
SpO_2	96 percent					97 percent
Pain Assessment						
Pain scale		Numerical	Numerical	Numerical	Numerical	
Pain goal		4	4	4		
Pain score		7	6	6		
Pain description		Achy	Achy	Achy	Achy	
Pain location		Stomach	Stomach	Stomach	Stomach	
Pain interventions		Medication (see MAR)		Medicated (see MAR)	Repositioned	

1. What information on the EHR concerns you?

2. What information is documented incorrectly?

7.3 Pharmacological Pain Management

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Differentiate among types of pharmacological methods of pain management
- Describe the nurse's role in educating patients about pharmacological pain management therapies

Pain management can involve pharmacological and nonpharmacological therapies. Therapy that involves drugs or medications is called **pharmacological therapy**. This section explores pharmacological methods for pain management and the nurse's role in educating patients on pharmacological pain management therapies.

Types of Pharmacological Pain Management

A pain medication may be classified as an **analgesic**, a medication used to prevent or treat pain, or an **adjuvant**, a medication that has an independent analgesic effect but also an additive analgesic property when administered with an opioid; an adjuvant is also called a **coanalgesic**. Examples of adjuvants are antidepressants and anticonvulsants. They are used for depression and seizure control, respectively, but are also administered to enhance the effects of pain medications. Analgesics may be further classified as opioids or nonopioids. An **opioid** is a class of drugs derived from opium, a chemical sourced from poppy plants. A **nonopioid** is a medication that is not an opioid.

When administering analgesics, start with the medication that has the fewest side effects, in the smallest dose possible, via the least invasive route. The World Health Organization (WHO) developed a pain ladder (Figure 7.3) that was originally used to guide pain control for cancer patients; it applies to all types of pain, however, and has since been expanded to distinguish between increasing and decreasing pain intensity. Nonopioids should typically be the first choice to control pain, because they typically have fewer side effects than opioids and are less likely to result in addiction. If pain persists or increases, then opioids may be added as additional therapies in combination with nonopioids and adjuvant therapies. For pain that is severe and expected to decrease over time, opioids, nonopioids, and adjuvants may be given first, with adjuvants and opioids being removed from the regimen over time so the patient is eventually taking just the nonopioid medications.

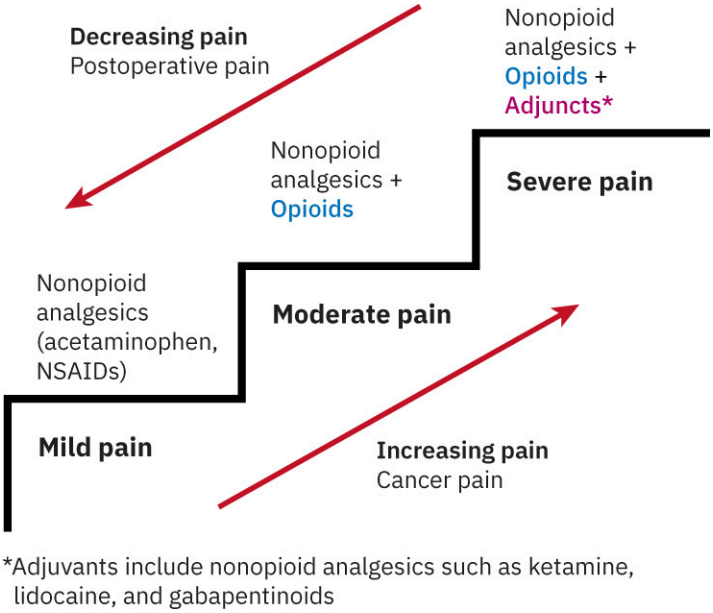

FIGURE 7.3 The WHO pain ladder is a guide for using pain medications responsibly. (credit: modification of "The World Health Organization (WHO) pain ladder modified for Acute Pain Management." by Gai, Nan & Naser, Basem & Hanley, Jacqueline & Peliowski, Arie & Hayes, Jason & Aoyama, Kazuyoshi/*Journal of Anesthesia*, CC BY 4.0)

INTERDISCIPLINARY PLAN OF CARE

Pain Management from a Physical Therapy Perspective

Physical therapy (PT) is a key intervention for physical rehabilitation, but patients often report an increase in pain severity during their therapy sessions. To maximize the patient's participation in physical therapy exercises, pharmacological pain management therapies may be administered thirty to sixty minutes before the therapy session. Physical therapists will often notify the patient's nurse of an upcoming session and request the pain be premedicated prior to treatment. The therapy session will then begin thirty to sixty minutes later once the pain medication has taken effect.

Analgesic medications, including opioids and nonopioids, can prevent or treat pain. Nonopioids typically treat mild to moderate pain, and patients tolerate them well. Opioids are used to treat moderate to severe pain.

Analgesic Medications: Nonopioids

Nonopioid analgesics include acetaminophen and nonsteroidal anti-inflammatory drugs (NSAIDs). Acetaminophen is used to treat mild pain and is typically safe for all age groups. Because it may be administered via several routes, including orally, rectally, and intravenously, it may be a good choice for those unable to take oral medications. Use it sparingly in patients with liver failure, because hepatotoxicity (severe liver damage) is a potential side effect. Thus, it is important to carefully monitor the daily intake of acetaminophen. Older adults should take no more than 3,200 mg in a twenty-four-hour time frame, whereas healthy younger adults should take no more than 4,000 mg; patients with alcohol use disorder should take no more than 2,000 mg. It is important to include all sources of acetaminophen in the daily totals, including amounts of the medication found in combination medications. For example, Percocet 5/325 contains 5 mg of oxycodone and 325 mg of acetaminophen. If the patient were to take one tablet of Percocet, the 325 mg of acetaminophen would count toward their daily intake of acetaminophen. It is also important to ensure that combination medications are not administered too close to another time for administering acetaminophen. For example, if 500 mg of acetaminophen is ordered every four to six hours for fever and Percocet 5/325 is ordered every four to six hours for pain, the nurse must recognize that both medications contain acetaminophen and carefully consider how much acetaminophen is administered within the four-to-six-hour time frame, as well as be aware of the total dosage amount of acetaminophen administered within the twenty-four-hour period.

Nonsteroidal anti-inflammatories treat mild to moderate pain or inflammation; they may also be used in combination with opioids to treat severe pain. Examples of NSAIDs include ibuprofen, naproxen, and ketorolac. Ibuprofen is typically prescribed every six to eight hours and is safe for individuals 6 months of age and older. Naproxen is typically prescribed two to three times per day and is longer-acting than ibuprofen. Ketorolac is used for short-term treatment (up to five days) of moderate to severe pain in adults. It is the last line of nonopioids before opioids are prescribed and can be used to treat breakthrough pain for patients already taking opioids. Use a reduced dose of ketorolac for patients aged 65 and older because of the risks of stomach or intestinal problems; swelling of the face, feet, or lower legs; and sudden decrease in urine production. Side effects of NSAIDs can include dyspepsia, nausea, and vomiting. To reduce the risk of these side effects occurring, administer NSAIDs with food. Most NSAIDs also increase the risk of heart attack, stroke, and heart failure, particularly if taken in large doses or over prolonged periods of time, except for aspirin, which in low doses can decrease the risk of a second heart attack in people who have already had one. For some people, NSAIDs may also cause gastrointestinal bleeding, particularly if administered in combination with warfarin or corticosteroids, and renal failure.

LIFE-STAGE CONTEXT

Use of NSAIDs and Acetaminophen in Older Adults

Use NSAIDs and acetaminophen cautiously in older adults. These patients may have difficulty with the first-pass effect in the liver and are slower metabolizers than younger patients, putting them at risk for greater side effects and adverse effects. Adverse reactions associated with these analgesic medications include gastrointestinal,

cardiovascular, renal, and hematologic side effects. Prescribing these medications to older adults requires consideration of individual patient risk factors, benefits and risks of the medication, and patient education. In addition, these patients should be carefully monitored for effectiveness and side effects.

Analgesic Medications: Opioids

Opioids treat moderate to severe pain by blocking the release of neurotransmitters involved in sending pain signals. Opioids may be administered via a variety of routes, including oral, intramuscular, intravenous, subcutaneous, rectal, and transdermal. Typically, oral opioids, such as codeine, hydrocodone, and oxycodone, are used to treat moderate pain. Stronger opioids, such as fentanyl, hydromorphone, and morphine, may be used to treat more severe pain. Morphine is commonly used for cancer and end-of-life pain because it is not associated with a **ceiling effect**, the point at which the effect of a drug plateaus, so that increasing the dose will not increase the effect. Because morphine does not have a ceiling effect, increasing the dose will result in an increased effect of the medication.

Although opioids are very effective at managing pain, they can be highly addictive and must be used with caution. Of the potential adverse effects of opioids, the most serious is respiratory depression. Monitor patients receiving opioids for decreased respiratory rate, oxygen saturation, and heart rate. Patients at greatest risk for respiratory depression are those taking opioids for the first time, people receiving an increased dose of opioids, or individuals taking benzodiazepines or other sedatives, including alcohol, concurrently with opioids. Opioid-induced respiratory depression is treated with naloxone Figure 7.4, which immediately reverses all analgesic effects.

FIGURE 7.4 Naloxone comes in a variety of preparations, including nasal spray (pictured here), auto-injector, and injectable. (credit: "Flieger des 178. Flügels erhielten Nalaxone (Narcan)" by "Zusammenfassung"/U.S. National Archives & DVIDS, Public Domain)

LINK TO LEARNING

The American Medical Association has created a video that demonstrates how to administer naloxone (https://openstax.org/r/77UseOfNaloxone) to a patient.

Monitor patients taking opioids for less severe side effects as well, such as constipation, nausea and vomiting, urinary retention, and itching. Opioids slow peristalsis and increase reabsorption of fluid into the large intestines, thereby slowing the passing of stool and removing the fluid from the stool so that it becomes concrete-like. It is important for the nurse to assess bowel functioning and encourage fluid and fiber intake and ambulation throughout the course of opioid treatments. The provider will also typically prescribe a bowel management program that includes a stool softener (such as docusate) and a stimulant laxative (such as sennoside, bisacodyl, or milk of

magnesia). If patients experience nausea and vomiting, antiemetics (such as prochlorperazine or ondansetron) may be prescribed. If patients experience urinary retention, they may require urinary catheterization, but this should not be used long-term. Antihistamines (such as diphenhydramine) may treat itching, but they may cause drowsiness and exacerbate the potential for opioid-induced respiratory depression.

The concept of **patient-controlled analgesia (PCA)** entails the patient self-administering opioid medications—including morphine, hydromorphone, and fentanyl—using a programmed pump. The medication syringe is locked inside a computerized pump that is attached to the patient's intravenous (IV) line. The lock ensures the medication cannot be accessed or tampered with. The programming of the pump is also locked to ensure the medication is infused at the intended rate and volume.

The patient self-administers doses of the medication on an as-needed basis by pressing a button. The patient may deliver a dose of medication according to a preset number of minutes or doses per hour (lockout interval). If these criteria are met, the PCA button lights up, signaling to the patient that they can administer a dose when needed. If the button is not lit up, the patient can still press it, but a dose of the medication will not be delivered. Some pumps deliver a continuous amount of medication, with the patient able to self-deliver additional doses as needed. Additionally, the provider may order a loading dose, or bolus, administered during initiation of the PCA.

PCAs may only be used for patients who are alert, oriented, and can independently press the button. Because small doses of opioids are administered frequently, it is important to monitor patients for oversedation and respiratory depression. Education for patients and their visitors is an important part of using a PCA. To reduce the risk of these adverse events, the patient and all caregivers should understand that no one should press the PCA button except for the patient. Nurses should also ensure that the PCA button and call light are easily within the patient's reach, along with any other interventions designated by the institution for patients who have a high fall risk (such as bed in low position, bed alarm on, high-fall-risk armband, red socks), because patients on PCAs are at a high risk for falling.

Considering the potential for harm if a medication error were to occur with a PCA, both the incoming and outgoing nurses during shift change should confirm pump settings. Each nurse should independently double-check to ensure the correct drug, concentration, doses (loading dose, PCA demand dose, continuous dose), and lockout interval. Two nurses are also needed when providing a bolus, changing any of the settings, and replacing the medication syringe to double-check for errors.

When a patient is on a PCA, it is important to monitor their vital signs to identify potential signs of respiratory depression, such as decreased respiratory rate, oxygen saturation, and heart rate. The nurse should follow their organization's protocols for administering PCA medications, including frequency of vital signs. Typically, baseline vital signs should be taken prior to beginning the PCA, for a certain period of time after beginning the administration, and then every two hours for the duration of the PCA. The nurse should also perform a pain and sedation assessment using scales, such as the Richmond agitation sedation scale (RASS) or the Pasero opioid-induced sedation scale. Additionally, the volume infused should be captured as intake fluid, according to the protocols.

LINK TO LEARNING

Visit this site to see a PCA documentation checklist (https://openstax.org/r/77PCSdocChkLst) from Kaweah Health. Nurses are responsible for documenting PCA use.

Prior to initiating a PCA, document the patient's vital signs, PCA settings, and dual verification of the initial setup. Typically, the patient's pain level, alertness, respiratory rate, and oxygen saturation will be monitored every fifteen minutes after the initial setup, then every hour for four hours, followed by every two hours for the duration of the PCA; however, always follow the frequency of monitoring established in the institutional policy. The nurse must also document the volume of medication administered, which may be documented every four hours, at the end of every shift, or according to the institutional policy. The medication administered via the PCA is generally an opioid or narcotic, so it is the responsibility of the nurse to account for the amount used and correctly dispose if necessary.

LINK TO LEARNING

Watch this video for a step-by-step demonstration of how to set up a PCA (https://openstax.org/r/77PCSsetup) on the Alaris PCA pump module.

Coanalgesic Medications

Coanalgesics are medications that have analgesic effects but their primary indication is not pain relief. For example, antidepressants are used to treat depression but they may also be used to treat chronic pain and pain-related symptoms, such as sleep problems and muscle spasms. Anxiolytics are primarily used to treat anxiety, but they may also treat chronic pain and pain-related anxiety and help to relax muscles. Anticonvulsants are used to treat seizures because they block pain receptors, but they may also be used to treat certain types of neuropathic pain. Corticosteroids are used to reduce inflammation, but they also reduce neuropathic pain by lessening signals from injured nerves.

Nursing Responsibility for Patient Education

It is the nurse's responsibility to properly educate patients on pharmacological pain interventions. Education should be culturally sensitive and linguistically appropriate for the patient. When providing culturally sensitive and linguistically appropriate education, nurses help the patient to understand the treatment plan, improve adherence to the plan, alleviate fears, set realistic expectations, discuss concerns, and build a relationship based on mutual respect—all of which will improve health, well-being, and patient outcomes.

Education should begin at treatment initiation and continue throughout the course of therapy. To be most effective, the approach should be tailored to the individual patient's needs. Consider the primary language spoken by the patient, as well as the patient's culture, age, cognitive function, and health literacy level. It is important to use simple language, define technical terms, ask open-ended questions, and provide visual materials, such as demonstrations, videos, pictures, or handouts.

Patients should be informed that pain management is a patient right. It is important to stay ahead of the pain by not waiting until the pain is severe before taking medications. Once the pain becomes severe, it will be much more difficult to control the pain and may require stronger pain medications to manage the pain. The nurse should also help patients understand the typical progression of pain medications according to the pain ladder. It is important for the patient to understand the need for starting with nonopioids before adding opioids and finally adjuvants to the pain medication regime. Patients with acute pain that is severe in nature, such as surgical pain, should know that opioids may be used to treat the initial pain but that the goal is to transition from intravenous opioids to oral opioids and eventually to nonopioids.

Patients should also be instructed of the need to use the smallest dose possible to achieve the intended pain goal. For example, if the provider has ordered one to two tablets every four to six hours upon discharge, then best practice is to advise the patient to start with one tablet, reassess their pain, and then take the other tablet if needed. It is much easier to add more pain medication, as needed. Patients should be told not to take more than the prescribed dose, as well as the risks of doing so.

LINK TO LEARNING

Read this position statement on the ethical responsibility to manage pain and the suffering it causes (https://openstax.org/r/77PainEthics) from the American Nurses Association.

The first time a medication is administered, the patient should be educated on the medication name, dose, route, and frequency at which they should take the medication. It is important to note if the medication should be taken at a certain time of day, if they should take the medication with food, and any other instructions for administering the medication. It is also important to review how to store the medication, including how to keep medications safely away from children by keeping them out of reach or locked up.

Any time a medication is given, patients should be educated on the potential medication side effects, as well as when to report side effects. With opioids, instruct patients on the risks for constipation, respiratory depression, and addiction. It is important for the patient to understand that the medication may make them drowsy. They should be told not to drink alcohol, drive or operate heavy machinery, or take medications that the prescriber is not aware of while taking opioid medications.

Patients will sometimes have misconceptions about pain management that need to be addressed. It is important to assess the patient's understanding of pain management and to address any misconceptions. For instance, a patient may not want to take opioids for fear of becoming dependent on them. Although it is true that opioids may lead to dependency with long-term use, it is important for the patient to understand the benefits of short-term use and the plan that will be followed to ensure they are tapered off opioids as quickly as possible.

7.4 Nonpharmacological Pain Management

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Describe different types of nonpharmacological pain treatment and their effectiveness
- Analyze the nurse's role in pain management using nonpharmacological methods
- Describe the nurse's role in educating patients about nonpharmacological pain management therapies

Nonpharmacological interventions can be used with or without pharmacologic interventions. They often provide tremendous benefits to the patient, who can choose from a variety of techniques based on what best fits their needs and goals. Like all treatments, nonpharmacological interventions should be documented in the plan of care and their effectiveness evaluated in terms of their ability to meet the patient's goals for pain relief.

Nonpharmacological Pain Management

Nonpharmacological pain management techniques may be categorized as complementary or alternative medicine. Although these terms are sometimes used interchangeably, there is a distinct difference. A therapy that is used in combination with pharmacological pain management is called a **complementary therapy**, whereas one used in place of pharmacological pain management is called an **alternative therapy**.

Physical Modifications

Physical interventions include techniques such as rest, compression, elevation, and thermotherapy. Slight adjustments to the patient's environment may also alter the patient's response to pain. For example, adjusting the temperature in the room—making it warmer or cooler—may cause the patient to feel more comfortable. Other strategies include dimming the lights, reducing loud noises, and closing the patient's door.

To provide the opportunity for rest, consider clustering care (planning to include care tasks in as few visits as possible) to reduce unnecessary interruptions. Rest is important whether the pain is caused by illness or injury, as it allows the body to focus on healing. As much as possible, patients should avoid moving the injured body part, keeping weight off it, and using assistive devices, such as canes, crutches, splints, braces, or wheelchairs. Nurses can also support an injury by tightly wrapping the area in a compression bandage such as an ACE wrap. When using a compression bandage, the nurse must carefully assess the area to ensure proper blood flow to the extremity.

A treatment called **thermotherapy** is the application of heat or cold to alter the cutaneous, intra-articular, and core temperatures of soft tissues. Hot and cold therapies are one of the most commonly used nonpharmacological strategies for managing pain. Heat decreases pain by increasing blood flow through vasodilation, which promotes relaxation and alleviates muscle stiffness or chronic pain. Heat may be applied for five to twenty minutes at a time. Heat can be beneficial for chronic or ongoing issues, such as chronic back pain, muscle stiffness, and menstrual cramps. Cold decreases pain by reducing the blood flow through vasoconstriction; it also numbs nerve sensations. Cold should be applied for no longer than twenty minutes at a time. Cold is frequently given first after an injury to decrease inflammation, which will help decrease pain. It can be beneficial for various types of acute injuries, such as sprains and strains. Later heat may be applied to increase circulation, which then helps deliver oxygen and nutrients for healing. Heat and ice should never be directly applied to the skin. The nurse should routinely examine the site to assess for potential skin burns.

A combination of these strategies may be used to control pain for mild to moderate injuries, such as sprains, strains,

and bruises. A combination referred to as RICE, stands for rest, ice, compression, and elevation. RICE is most effective when implemented immediately following an injury, and for the twenty-four to forty-eight hours that follow, to decreased inflammation, pain, and risk for further injury. After the first forty-eight hours, the goals of care often shift from reducing inflammation and further injury, to supporting tissue healing and rehabilitation, while managing any residual pain or discomfort. Therefore, the use of RICE may be modified or reduced after the first forty-eight hours to support the patient's healing and mobility progress.

Mind-Body Therapies

Mind-body therapies take advantage of the fact that although pain begins in the body, it is perceived in the mind. One simple way to keep the patient's mind off their pain is to distract them, for example, by watching TV, playing games, reading, coloring, dancing, or telling jokes. Research has also shown that virtual reality may ease pain, particularly in pediatric patients (Tas et al., 2022; Teh et al., 2024). This technique allows patients to fully immerse themselves in a computer-generated, 3-D, virtual environment and engage in games and other methods of entertainment. Another approach to mind-body therapy is through **cognitive behavioral therapy (CBT)** in which individuals are taught how to manage and cope with pain more effectively by changing their negative thought pattern, identifying and reducing stressors that exacerbate pain perception, and focusing on adapting to pain in situations when pain cannot be eliminated.

Relaxation therapies may also be used for pain management. Activities that promote relaxation can be as simple as listening to music, praying, or breathing rhythmically, but more involved techniques are also available. For example, patients may be guided to create positive **guided imagery**, pleasant images in the mind, such as relaxing on a beach or strolling through a forest; to engage in **meditation**, the practice of breathing and repeating certain sounds or words, such as "om" or "gratitude," to put the mind at ease; to practice **mindfulness**, focusing on the present moment to create awareness of thoughts, feelings, the body, and the environment; to participate in **hypnosis**, the creation of a trance-like state to enhance awareness of feelings, thoughts, and sensations; or to engage in **animal-assisted therapy**, using animals to reduce pain, anxiety, and depression.

Movement is also an important consideration for reducing pain stimuli. Stretching and strengthening routines, **therapeutic exercise**, can help to improve muscle strength and flexibility, reduce joint stiffness, and enhance range of motion. Patients can restore functional ability and quality of life through **physical therapy**, manipulating joints and soft tissues in a manner that is tailored to the individual's specific needs. Certain movements can also help to decrease pain and promote relaxation. For example, **tai chi** is a practice that combines exercise and meditation through slow body movement and controlled breathing, and **yoga** is the practice of using specific stretches, poses, meditation, and controlled breathing to balance the mind and body (Figure 7.5).

FIGURE 7.5 Tai chi and yoga are practiced by many different people for a variety of reasons, including to help manage pain. (credit: "Hatha yoga in Japanese @ Semperviva" by "GoToVan"/Flickr, CC BY 2.0)

Natural Therapies

Natural products are those found in nature rather than synthesized by humans in a lab. They include herbs, vitamins, and other dietary supplements. All these remedies may add small amounts of necessary nutrients to the body, though they are not regulated by the Food and Drug Administration (FDA) for safety and effectiveness.

The inhalation or dermal application of essential oils—**aromatherapy**—is another strategy that can be used for nonpharmacological pain management. Essential oils are extracted from flowers, fruits, leaves, or seeds; they capture the smell of the plants from which they are derived. Studies have shown aromatherapy can be used not only to manage pain but also to reduce anxiety, calm stress, boost immunity, and improve sleep quality (Tanvisut et al., 2018; Gong et al., 2020). Essential oils linked to pain relief include lavender, rose, peppermint, eucalyptus, and chamomile.

LINK TO LEARNING

The National Institutes of Health has created fact sheets about herbal remedies (https://openstax.org/r/77HerbalRemedy) that identify their potential uses, side effects, cautions for use, and interactions with other drugs.

Certain diets, such as vegan or Mediterranean, have been shown to decrease inflammation in the body (Schieber & Mank, 2023). Research shows that anti-inflammatory diets can be particularly helpful for those with fibromyalgia and chronic pain. Anti-inflammatory diets typically recommend consuming numerous servings of vegetables, limiting dairy, refraining from simple carbohydrates with refined sugar, opting for whole grains, limiting red meat, and choosing lean proteins, such as fish, tofu, and legumes.

Manipulative Practices

Some pain can be relieved by physically working on or manipulating the body. For example, **massage** involves manipulating soft tissues to relieve tension, promote relaxation, and reduce pain. It may help to relieve lower back, neck, shoulder, cancer, arthritic, headache, and fibromyalgia pain. Due to the risk of injury if not performed correctly, massage should only be performed by trained individuals. It should be used with caution in patients on blood thinners or with wounds, fractures, blood clots, infection, or weakened bones.

Other types of manipulative practices include chiropractic therapy and reflexology. The practice that manipulates

the spine, joints, and skeletal system is **chiropractic therapy**. The type of massage applied to specific pressure points aligned with the body in the hands and feet is called **reflexology**.

Energy Healing

Energy healing is used to balance the flow of energy within the patient. Although considered an alternative therapy, there is anecdotal evidence to support its effectiveness, along with a growing scientific body of evidence exploring the clinical effectiveness of these therapies. One technique, **reiki**, entails one person placing their hands lightly on and above another person, with the intention of guiding energy throughout that person's body. Therapeutic touch also involves gently touching a person's body in order to affect its energy fields. Magnet therapy utilizes magnets on the body to reduce pain. Though there is limited evidence supporting the use of magnet therapy, it is thought to influence blood flow by attracting or repelling red blood cells, which could improve oxygenation and nutrient delivery and, in turn, promote healing and reduce pain. It is also thought that magnets could have an anti-inflammatory effect by affecting the ion channels in cell membranes and influence the perception of pain by altering the electrical activity in the nervous system.

A popular technique, **acupuncture** (Figure 7.6) is performed by inserting thin steel needles into the skin to stimulate specific points throughout the body. It is a traditional Chinese medicine that is used to rebalance the body's energy and prompt the body to release natural chemicals to relieve the body of pain. Acupuncture is commonly used to relieve chronic pain resulting from arthritis; back, neck, knee, and muscle pain; headaches and migraines; menstrual cramps; sports injuries; and nerve discomfort. It is not recommended for those with pacemakers, those taking blood thinners, or those who are pregnant.

FIGURE 7.6 Acupuncture is a traditional complementary therapy with Chinese origins that involves inserting small needles into the skin to stimulate specific parts of the body and its neural network. (credit: "A patient with acupuncture moxibustion in Nelson, New Zealand" by "Wonderlane"/Flickr, CC BY 2.0)

Electrical Stimulation

Another type of nonpharmacological pain management is **transcutaneous electrical nerve stimulation (TENS) therapy** (Figure 7.7), which delivers low-voltage electrical current to reduce pain. TENS therapies block or change the patient's perception of pain. Electrodes are placed on the body at or near where the relevant nerves are located. The electrodes are connected to a battery-powered device that delivers the electrical current. TENS therapy has been shown to relieve pain associated with osteoarthritis, fibromyalgia, labor pains, and diabetes-related neuropathy (Njogu et al., 2021; Wu et al., 2022). TENS therapy should not be used for those with an implantable device; those who have cancer, epilepsy, deep vein thrombosis, or hemorrhaging; or those who are pregnant.

FIGURE 7.7 TENS therapy is a method of pain relief involving the use of a mild electrical current. (credit: "January 18, 2014" by "osseous"/Flickr, CC BY 2.0)

Effectiveness of Nonpharmacological Pain Treatment

Although some nonpharmacological therapies have been scientifically proven to be effective in managing pain, it is important to note that some of these therapies are based on anecdotal evidence of effectiveness and lack scientific research to support their effectiveness (Vickers et al., 2017; Hilton et al., 2017; Thorn et al., 2011; Daily et al., 2016; Yuan et al., 2015). Plus, each patient's response to nonpharmacological therapies is unique. Nonpharmacological pain therapies may be extremely beneficial in reducing pain for some patients and ineffective in others. Effectiveness may also vary according to the type of therapy used. For example, one person may find massage useful at reducing back pain but acupuncture to be ineffective.

When formulating a pain management plan, it is important to meet the needs of the individual patient. For some, nonpharmacological therapies alone may manage the pain. Others may require pharmacological therapies or a combination of pharmacological and nonpharmacological. It is important to consider the risks and benefits of trying a nonpharmacological intervention to assess its effectiveness in managing pain versus not trying the therapy. Unless it will negatively affect the patient, it is generally acceptable to try different nonpharmacological therapies to see what works for the individual. Sometimes, this may even mean implementing several nonpharmacological interventions to serve as complementary therapies to each other.

CLINICAL JUDGMENT MEASUREMENT MODEL

Evaluating Outcomes: Exploring the Use of Nonpharmacological Approaches to Pain Management

The nurse notices an older adult patient grimacing and moaning. Upon recognizing the cues, the nurse completes a comprehensive pain assessment utilizing the PQRSTU mnemonic for pain assessment and determines the patient is experiencing pain (analyze cues). The nurse considers whether to administer pharmacological and/or nonpharmacological therapies (generate solutions). Understanding the risks associated with older adults taking analgesics, the nurse decides to start with nonpharmacological interventions first and repositions the patient (take action). Upon reassessment, the nurse notes the patient is resting comfortably, sleeping, and does not appear to be in pain (evaluating the outcome).

The Nurse's Role in Nonpharmacological Pain Treatment

The nurse's role in nonpharmacological pain treatment is to generate ideas about which therapies may be beneficial to the patient, implement the interventions, and then assess the effectiveness of the interventions. The nurse must first assess whether nonpharmacological treatments would be beneficial according to the patient's condition, as well as assess the patient's preferences for treatment. Just like treatments utilizing medications, nonpharmacological treatments should be reassessed within a reasonable time frame, and the patient's response to the intervention should be documented in the medical record. If the patient has not reached their identified pain goal, the nurse may then consider additional therapies to add to the treatment plan, followed by reassessment and documentation of the reassessment.

Collaboration between the provider and the patient is key. The nurse acts as a liaison between the provider and the patient to advocate for the most optimal therapeutic plan for pain control. There may also be times when the nurse must advocate for better pain control. For example, the nurse may need to discuss benefits of nonpharmacological interventions with some patients, whereas other patients may need to consider adding pharmacological interventions as complementary therapy. Although the ultimate treatment decision is up to the patient, collaborative discussions provide the patient with the necessary information to make an informed decision about their plan of care.

Patient Education

Complementary therapies deemed safe for healthy patients may not be safe for patients with certain medical conditions. It is important to instruct patients to discuss complementary therapies with their provider before initiating them. The provider will assist with decision-making to determine if the therapy is appropriate given the patient's condition and any other therapies they are currently receiving. Similarly, patients who opt for alternative therapies should be instructed to discuss the possible benefits and harms caused by initiating the alternative therapy versus using a pharmacological therapy. Patients should be informed to never stop taking their prescribed medications without first discussing their plan of care with their provider.

When completing medical histories, it is important to ask the patient about any dietary, herbal, or supplemental products they may be taking and to explain why it is important to add all such usages to their medication history. Patients should also be instructed to consult with their provider before beginning use of a supplemental product. Remind patients that a product labeled "natural" is not necessarily safe. For example, St. John's wart may interact with certain drugs, making them less effective. Taking vitamin K supplements with warfarin may reduce the effectiveness of the medication in thinning the blood.

7.5 Substance Use Disorder

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Define substance use disorder (SUD)
- Identify measures for SUD prevention
- Discuss pain management strategies for patients with SUD

According to the Centers for Disease Control and Prevention (CDC) (2023), one in seven Americans reports experiencing a substance use disorder. It can happen to anyone and is not associated with a single driving factor. This section will define what a substance use disorder is, what preventative measures can be taken, and how to manage pain for those with these disorders. Emphasis throughout this section will be placed on opioids but similar measures apply with other substances as well.

What Is Substance Use Disorder?

A **substance use disorder (SUD)** is the disorder that occurs when the repeated use of alcohol and/or other drugs significantly impairs a person's health and results in an inability for them to meet major responsibilities at work, school, or home (Substance Abuse and Mental Health Services Administration, 2022). SUDs can occur with various drugs, including alcohol, cannabis, hallucinogens, inhalants, opioids, sedatives, hypnotics, anxiolytics, stimulants, and tobacco. SUD can be classified as mild, moderate, or severe.

The most severe form of SUD, **addiction**, happens when there is continued use of the substance despite negative consequences. It is important to note that addiction is a medical disease and not a description of someone's character. As such, persons with SUDs should not be referred to as abusers, addicts, alcoholics, or medication seekers, because these terms are negative and stigmatizing. Stigma associated with SUDs can be isolating and demoralizing, and it can hinder persons from seeking treatment. To reduce the stigma, instead focus on the medical diagnosis and specific SUD at hand.

Although SUD is defined as a chronic, treatable disease, recovering from an SUD can be difficult. Most persons with an SUD cannot simply stop taking the problematic drug, because changes to their usage can result in devastating withdrawal symptoms. In some cases, a different drug can be substituted to help wean the patient off the problematic one; these include methadone, buprenorphine, and naltrexone, all of which are used to treat patients addicted to stronger opioids. Patients may also participate in programs, such as twelve-step facilitation therapy, outpatient counseling to understand addiction and triggers, or inpatient rehabilitation at a full-time facility that provides a supportive environment for recovery without distractions or temptations. Providers use evidence-based guidelines to select a treatment plan that best meets the clinical needs of the patient.

Use of pain medications, particularly opioids, has the potential to become a SUD. One SUD, **opioid use disorder (OUD)**, is caused by a problematic pattern of opioid use. Because opioids activate the release of endorphins in the brain, resulting in feelings of pleasure, they are highly addictive. Unlike other causes of SUD, OUD is typically associated with a higher risk of physical **dependence**, which is when the person feels like they cannot function without the use of the substance. Dependence is not to be confused with **tolerance**, which is when the body requires more of a drug over time to achieve the same level of pain relief. If someone who is dependent on a drug reduces their dosage or stops taking it altogether, withdrawal symptoms will occur. Symptoms of **withdrawal** include sweating, confusion, enlarged pupils, loss of appetite, diarrhea, vomiting, cramps, tremors, yawning, and flu-like symptoms.

SUD has become a grave concern within the United States. According to the CDC (2023), approximately 1.6 million people in the United States suffer from OUD. Often, OUD results in opioid overdose. The frequency of drug overdose deaths increased by 30 percent from 2019 to 2020, with nearly 75 percent of drug overdose deaths involving an opioid (CDC, 2022a). It is estimated that 187 people die every day from opioid overdoses (CDC, 2022a). Considering the frequency of opioid deaths, the U.S. government declared the opioid crisis to be an epidemic and public health emergency in 2017 (Centers for Medicare & Medicaid Services, 2022). The severity of the opioid epidemic is illustrated by the data captured in Figure 7.8.

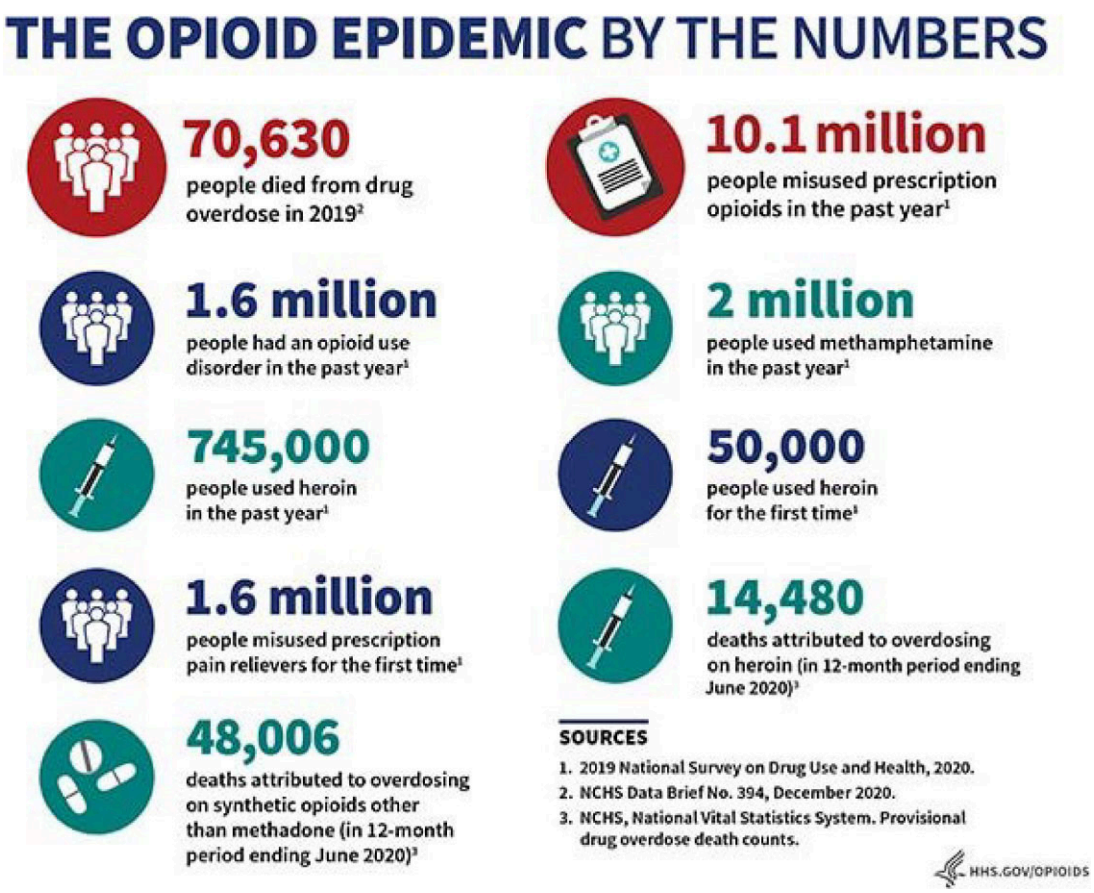

FIGURE 7.8 These data, from 2019 to 2020, show the number of people in the United States affected in different ways by the opioid epidemic. (credit: "Opioids by the Numbers" by U.S. Department of Health and Human Services/U.S. Department of Health and Human Services, Public Domain)

Preventing SUD and Addiction

Prevention is critical for reducing the prevalence of SUDs and addiction. The most effective way to prevent OUD is to reduce the frequency of prescribing opioids; if opioids are not prescribed, then they are much less likely to cause addiction. Education and awareness around the harms of substance use is also critical to gain the support of friends, families, and communities. People also need to be educated about ways to safely store and dispose of opioids.

The 2022 CDC Clinical Practice Guideline for Prescribing Opioids for Pain recommends providers review a patient's history of controlled substance prescriptions prior to prescribing opioids (CDC, 2022b). To do so, the provider can view the patient's history of prescribed opioid use via a prescription drug monitoring program (PDMP), an electronic database that tracks controlled substance prescriptions. PDMPs also inform providers of any other medications that a patient is taking that may place the patient at risk for overdose from an opioid. PDMPs can be very beneficial when the patient is transitioning to a new provider or the patient's medication history is unavailable. The PDMP should be checked prior to prescribing opioids and at least every three months when continuing opioid therapy.

LINK TO LEARNING

States have the primary responsibility to regulate and enforce prescription drug practices. The CDC's Public Health Law Program (https://openstax.org/r/77DrugMisuse) provides resources and legal developments regarding state laws on prescription drug misuse and abuse.

Managing Pain in Patients with SUD

Managing pain in patients with SUD can be tricky. All patients, regardless of whether they have an SUD, have the right to be treated with respect and to have their pain managed adequately. Each condition, both pain and SUD,

requires a multifactorial, patient-centered approach that may involve both pharmacological and nonpharmacological interventions. The SUD and the cause of the pain should be treated independently.

For patients with an OUD, maximize nonpharmacological therapies and nonopioid medications prior to treating the pain with opioids. Examples of nonpharmacological therapies that may be effective include therapeutic exercise, physical therapy, and CBT, as well as complementary and alternative medicines. Examples of nonopioid medications that may be used include NSAIDs, topical analgesics, and adjuvant medications, such as serotonin-norepinephrine reuptake inhibitors, tricyclic antidepressants, and antipsychotics.

If pain levels necessitate opioid use, then do not withhold opioids from a patient with an OUD. Just as for any patient, it is important to establish shared goals and known risks, form a treatment agreement, and ensure close monitoring with routine follow-up visits to reassess pain. Opioid doses should be titrated by starting with a low dose and increasing the dose slowly, as needed. Treatment agreements outline the course of action for the treatment, as mutually agreed upon by the patient and the provider. As always, the patient should be an active participant in the collaborative approach to determine a treatment plan that meets the needs of the individual. A sample treatment agreement is shown in Figure 7.9.

Rx Pain Medications

KNOW THE OPTIONS • GET THE FACTS

Prescription Drug Monitoring Programs (PDMPs)

PDMPs are a promising tool for curbing the misuse of prescription opioids.

Q: What Is a PDMP?

A: PDMPs are state-run electronic databases that collect patient-controlled substance prescription information submitted by dispensers. Although each state PDMP is governed by its own laws, many states are working toward interstate PDMP data sharing to allow users to access data across state lines.

Q: Why Are PDMPs Used?

A: PDMP information is a resource for health care providers and may help:

- Avoid duplicative therapy;
- Identify negative drug interactions;
- Prevent substance misuse or death; and
- Identify individuals who may need treatment.

Q: What About Patient Privacy?

A: When accessing a patient record through a PDMP, health care providers must abide by state and federal regulations for privacy. Although the details vary by state, health care providers are usually able to consult with other health care providers directly involved in a patient's care in order to ensure appropriate and adequate care. Check local laws for the most up-to-date information.

Use the following links for more details about your state's PDMP and safe, effective pain management:

- Register and Access Your State's PDMP: ***http://www.pdmpassist.org/contact/***
- State PDMP Contact List: ***http://www.pdmpassist.org/node/400***
- State PDMP Websites: ***http://www.pdmpassist.org/content/state-pdmp-websites***
- Centers for Disease Control and Prevention (CDC) Guideline for Prescribing Opioids for Chronic Pain: ***http://www.cdc.gov/drugoverdose/prescribing/guideline.html***
- National Alliance for Model State Drug Laws (NAMSDL): ***http://www.namsdl.org/prescription-monitoring-programs.cfm***

Sources Consulted

- Office of National Drug Control Policy. (2011). Prescription drug monitoring programs. Retrieved from ***https://obamawhitehouse.archives.gov/sites/default/files/ondcp/Fact_Sheets/pdmp_fact_sheet_4-8-11.pdf***

NEED HELP?

If a patient is misusing opioids or has other substance misuse issues, refer them to a Medication-Assisted Treatment program in your area or the Substance Abuse and Mental Health Services Administration's (SAMHSA) National Helpline. Call **1–800–662–HELP (4357)** for 24-hour free and confidential treatment referral and information about mental and/or substance use disorders, prevention, and recovery in English and Spanish, or visit ***www.samhsa.gov/find-help***.

SMA-17-5053-8

SAMHSA

CDC

FIGURE 7.9 A pain medication treatment agreement establishes clear guidelines and expectations for the safe and responsible use of prescription pain medications. (credit: " Rx Pain Medications KNOW THE OPTIONS • GET THE FACTS" by Substance Abuse and Mental Health Services Administration/helpandhopewv.org, Public Domain)

Summary

7.1 Concepts and Causes of Pain

- Pain is an uncomfortable or unpleasant sensation that signifies injury or illness. Pain is caused by receptors in the body sending a signal to the brain to let an individual know that they are in pain.
- Pain is whatever the person says it is, when they say it occurs.
- Pain may be characterized as acute, chronic, or breakthrough according to its onset and duration. Acute pain lasts up to three to six months, chronic pain lasts longer than six months, and breakthrough pain is a sudden onset of pain lasting for a short period of time.
- Pain may also be characterized as neuropathic or nociceptive according to the type of damage that causes it. Neuropathic pain is caused by damage to nerves or other parts of the nervous system, whereas nociceptive pain is caused by damage to the body tissue.
- Pain may also be referred, which means that pain in one part of the body may be felt as pain in another part of the body.

7.2 Pain Assessment

- Pain is often considered the fifth vital sign, and pain assessments should be performed routinely to allow for better pain management by developing a treatment plan that meets the individual needs of the patient.
- Nurses should assess for the risks for pain, as well as its type, character, onset, location, duration, severity, pattern, and associated factors.
- The severity of pain may be assessed using a variety of tools, including the numerical rating scale, FACES scale, FLACC scale, PAINAD scale, behavioral pain scale, or CPOT. It is important to utilize the most appropriate pain scale according to the patient's age and condition.
- Nurses must remember that pain is subjective and whatever the patient says it is, whenever the patient says it is.
- Pain should be reassessed within one hour of intervention, or within fifteen to thirty minutes for intravenous interventions, according to institutional policy. Additional interventions (pharmacological and/or nonpharmacological) and pain reassessments are warranted until the severity of the pain reaches the pain goal identified by the patient.

7.3 Pharmacological Pain Management

- Pharmacological methods of pain management include opioids, nonopioids, and adjuvant medications.
- Nonopioids, such as acetaminophen and NSAIDs, are typically administered as a first-line defense for mild to moderate pain.
- Opioids may be administered for moderate to severe pain, but the patient should be carefully monitored for respiratory depression and addiction.
- Coanalgesics, or adjuvants, are not intended to treat pain but they produce an analgesic effect that can be used to help manage pain.
- It is the nurse's responsibility to provide education related to pharmacological pain management therapies in a manner that is culturally and linguistically appropriate for the patient. Patients should be educated on their right to adequate pain management, general medication information, potential side effects, expectations for pain management regimens, and safe medication storage. Nurses should also be prepared to dispute myths associated with pain medications.

7.4 Nonpharmacological Pain Management

- Nonpharmacological pain treatments are interventions that can be used to complement pain medications or as alternatives to medications. Examples of nonpharmacological interventions include cold and heat therapy, alterations of environmental stimuli, rest, TENS therapy, massage, and acupuncture.
- The nurse is responsible for assessing the need for nonpharmacological pain interventions, discussing the options with the patient, implementing the interventions, and evaluating the effectiveness of the interventions. Use of nonpharmacological methods should be a collaborative effort between the patient and the care team.
- The nurse should educate the patient on potential risks and benefits of treatments and inform the patient to

discuss use of any nonpharmacological interventions with their provider.

7.5 Substance Use Disorder

- A substance use disorder (SUD) is a disorder that occurs when the repeated use of alcohol and/or other drugs significantly impairs a person's health and results in an inability for them to meet major responsibilities at work, school, or home.
- SUDs are chronic diseases that may be treated with medications to avoid withdrawal; common treatments also include therapy and rehabilitation.
- The best way to prevent opioid use disorders (OUDs) is to reduce the frequency of opioid prescriptions.
- Other strategies to prevent OUDs include education regarding awareness of the harms of opioid misuse and methods for safely storing and disposing of opioids.
- Prescription drug monitoring programs also play an important role in preventing OUDs.
- Pain and SUDs should be treated independently using a patient-centered approach that may involve both pharmacological and nonpharmacological interventions. Sources of nonpharmacological therapies and nonopioid medications should be maximized prior to treating the pain with opioids; however, there may be times when opioids are required.

Key Terms

abnormal pain pain that moves beyond the expected severity and duration and may require additional medical treatment
acupuncture pain management technique that includes the insertion of thin steel needles into the skin to stimulate specific points throughout the body
acute pain short-term pain, typically lasting from minutes to up to three to six months
addiction most severe form of SUD, in which there is continued use of the substance despite negative consequences
adjuvant (also, **coanalgesic**) medication that has an independent effect and also additive analgesic properties when administered with opioids
alternative therapy treatment used in place of pharmacological pain management
analgesic medication used to prevent or treat pain
animal-assisted therapy treatment that utilizes animals to reduce pain, anxiety, or depression
aromatherapy inhalation or dermal application of essential oils
behavioral pain scale (BPS) tool used to assess and quantify pain in acute sedated ventilated patients in intensive care units (ICUs)
breakthrough pain sudden increase in pain that lasts for a short time
ceiling effect point at which the effect of a drug plateaus, so that increasing the dose will not increase the effect
chiropractic therapy pain management technique that manipulates the spine, joints, and skeletal system
chronic pain pain lasting longer than six months
coanalgesic (also, **adjuvant**) medication that has an independent effect and also additive analgesic properties when administered with opioids
cognitive behavioral therapy (CBT) psychological treatment in which patients are taught how to manage and cope with pain more effectively by changing their negative thought pattern, identifying and reducing stressors that exacerbate pain perception, and focusing on adapting to pain in situations when pain cannot be eliminated
complementary therapy treatment used in combination with pharmacological pain management
critical-care pain observation tool (CPOT) standardized assessment tool used in critical-care settings to evaluate pain in critically ill patients who are unable to communicate their pain
dependence inability to function without the use of a substance
FACES scale visual tool for assessing pain with children and others who cannot quantify the severity of their pain on a numerical scale
FLACC scale pain scale used to assess pain in children between the ages of 2 months and 7 years, as well as those unable to verbally communicate
guided imagery positive, relaxing images created in the mind
hypnosis creation of a trance-like state to enhance awareness of feelings, thoughts, and sensations
massage pain management technique that manipulates the soft tissues of the body to relieve tension and create

relaxation

meditation practice of breathing and repeating certain words to reduce stress and put the mind at ease

mindfulness practice of focusing on the present moment to create awareness of thoughts, feelings, the body, and the environment

neuropathic pain pain caused by damage to nerves or other parts of the nervous system

nociceptive pain pain caused by damage to body tissue

nociceptor type of sensory receptor that responds to potentially damaging stimuli by sending nerve signals to the spinal cord and brain

nonopioid medication that is not an opioid

normal pain pain of the expected severity and duration, according to its cause

numerical rating scale (NRS) pain scale that rates pain on a scale of 0 to 10

opioid class of drug derived from opium, a chemical sourced from poppy plants

opioid use disorder (OUD) type of SUD caused by a problematic pattern of opioid use leading to physical dependence

pain uncomfortable or unpleasant sensation that typically signifies injury or illness

pain assessment in advanced dementia (PAINAD) scale pain scale used to assess pain in patients with advanced dementia

patient-controlled analgesia (PCA) practice of allowing the patient to self-administer opioid medications using a programmed pump

phantom pain pain perceived to be coming from a missing body part

pharmacological therapy treatment that involves drugs or medications

physical therapy manipulation of joints and soft tissues to restore functional ability and quality of life

referred pain pain in one part of the body that is caused by pain in a different location of the body

reflexology pain management technique that applies massage to specific pressure points aligned with the body in the hands and feet

reiki pain management technique in which one person uses lightly placed hands to guide energy throughout another person's body

somatic pain pain experienced in the muscles, skin, or bone

substance use disorder (SUD) disorder that occurs when the repeated use of alcohol and/or other drugs significantly impairs a person's health and results in an inability for them to meet major responsibilities at work, school, or home

tai chi practice that combines exercise and meditation with slow body movement and controlled breathing

therapeutic exercise stretching and strengthening routines that can help to improve muscle strength and flexibility, reduce joint stiffness, and enhance range of motion

thermotherapy application of heat or cold to alter the cutaneous, intra-articular, and core temperatures of soft tissues

tolerance state of requiring more of a drug over time to achieve the same level of pain relief

transcutaneous electrical nerve stimulation (TENS) therapy treatment that delivers low-voltage electrical current to reduce pain

visceral pain pain experienced in the internal organs

withdrawal physical and mental symptoms experienced when a person suddenly stops or decreases the use of an addictive substance

yoga practice of using specific stretches, poses, meditation, and controlled breathing to balance the mind and body

Assessments

Review Questions

1. The nurse is precepting a newly graduated nurse. What is an example of a statement by the new nurse that demonstrates an accurate understanding of pain?

a. "I had my gall bladder out last year and know exactly how you feel."
b. "Patients with neuropathic pain are at risk for developing depression."
c. "Phantom pain may occur after an amputation; however, it is not real pain."

d. "Visceral pain is caused by muscle pain."

2. A patient complains of having experienced back pain for the past two months. The pain is described as sharp, achy, and throbbing that comes and goes. What type of pain is the patient experiencing?
   a. acute, nociceptive
   b. acute, neuropathic
   c. chronic, nociceptive
   d. chronic, neuropathic

3. The nurse is caring for a patient who complains of lower back pain following a kidney infection. What type of pain is the patient experiencing?
   a. breakthrough pain
   b. referred pain
   c. nociceptive pain
   d. phantom pain

4. The nurse is caring for an 8-year-old male who rates his pain as 7/10 on the numerical rating scale. The patient is laughing, playing video games, and showing no physical signs of pain. What is the priority intervention to assess the patient's pain?
   a. Ask clarifying questions to further assess the patient's pain.
   b. Assess the patient's vital signs.
   c. Leave the patient alone to continue playing video games.
   d. Turn the video game off and instruct the patient to rest.

5. The nurse is caring for a patient with Alzheimer disease who has a broken bone. What pain assessment scale is most appropriate for evaluating the patient's pain?
   a. FACES scale
   b. FLACC scale
   c. numerical rating scale
   d. PAINAD scale

6. The nurse is precepting a newly graduated nurse. What is an example of a statement by the new graduate nurse that warrants further education?
   a. "Pain should be reassessed and addressed with additional interventions until the patient's pain goal is reached."
   b. "The numerical rating scale should be used with young children due to its simplicity."
   c. "The FLACC scale assesses five criteria: face, legs, activity, cry, and consolability."
   d. "The FACES scale is not always reliable and should be used in combination with additional pain assessments."

7. The nurse is assessing a patient's pain. What is the most reliable factor for determining if the patient is in pain?
   a. physical signs, such as clinched teeth and grimacing
   b. a history of recent illness or injury
   c. altered vital signs
   d. the patient's own reports of being in pain

8. What pain medications should a patient with liver failure avoid taking?
   a. acetaminophen
   b. hydrocodone
   c. ketorolac
   d. NSAIDs

9. The nurse is educating a patient on the use of a PCA. What statement made by the patient indicates the nurse's teaching was effective?
    a. "I will not need any other pain medications while I am on the PCA."
    b. "I can self-administer the pain medications as often as I need to."
    c. "I can have my spouse push the button if I am asleep."
    d. "The pump is programmed to keep me from getting too much pain medication."

10. The nurse is caring for a patient experiencing postsurgical abdominal pain. What information is important to tell the patient about effective pain management?
    a. "Nonopioids alone will be able to effectively manage your pain."
    b. "To prevent overdose, wait until your pain is moderate before taking pain medications."
    c. "Take pain medications after walking to decrease the risk of falling."
    d. "We will work together to create a regular schedule for pain medication administration."

11. The nurse is considering potential nonpharmacological interventions to manage a patient's pain. What statement demonstrates an accurate understanding of nonpharmacological pain management?
    a. "Producers of dietary supplements must demonstrate their safety and efficacy."
    b. "Reiki applies massage to specific pressure points in the hands and feet."
    c. "Patients should remove clothing before applying heat therapy."
    d. "Tai chi promotes relaxation through body movement and controlled breathing."

12. The nurse is caring for a patient who is in labor. The patient refuses pain medications and wants to control the pain using nonpharmacological interventions. What nonpharmacological intervention would be appropriate for the patient to consider?
    a. acupuncture
    b. herbal supplements
    c. guided imagery
    d. TENS therapy

13. What is an example of a statement that demonstrates an accurate understanding of treating pain for those with SUDs?
    a. "Opioids should never be prescribed to patients with an SUD."
    b. "Treating the patient's pain will resolve the SUD."
    c. "The SUD and the cause of the pain should be treated independently."
    d. "The pain will be resolved once the patient completes rehab."

14. The nurse is monitoring a patient for signs of withdrawal. What symptom is associated with withdrawal?
    a. increased appetite
    b. increased energy
    c. constricted pupils
    d. yawning

Check Your Understanding Questions

1. Describe the physiological process that causes pain.
2. What is referred pain?
3. Within what time frame should pain be reassessed?
4. What are adjuvant medications?
5. According to the WHO pain ladder, what types of medications are intended for mild pain? moderate pain? severe pain?
6. Why would a massage not be recommended for someone on warfarin?

Reflection Questions

1. Why does pain potentially alter vital signs?
2. What would you do if data from the pain scale and physical assessment are not aligned for a patient?
3. What is the difference between dependence, tolerance, SUD, and addiction?

What Should the Nurse Do?

The nurse is caring for a 67-year-old female on postoperative day one following an abdominal hysterectomy. The patient appears in physical distress and reports her pain to be 10/10 using the numerical scale. The patient declines pain medication for fear of "becoming addicted."

1. What should the nurse do?
2. What are some possible nonpharmacological pain interventions that could be implemented?
3. What are the risks of ineffective pain management?

Competency-Based Assessments

1. Test your ability to state by memory the steps of how to conduct a comprehensive pain assessment.
2. Write an outline for how you would educate a patient on PCA therapy.
3. Identify three nonpharmacological interventions that may be used to manage pain and write a script for how you would educate a patient on the interventions.
4. Create an infographic to educate patients about prevention of SUDs.

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CHAPTER 8
Stress and Stress-Related Disorders

FIGURE 8.1 People, and especially nurses, are often exposed to emotionally charged situations, long working hours, high workloads, and the need to manage complex medical conditions. As a result, they experience various sources of stress that can affect their physical and mental well-being. (credit: modification of "Stressed?" by aaayyymm eeelectriik/Flickr, CC-BY 2.0)

CHAPTER OUTLINE

INTRODUCTION Stress. For most people, stress can come from all aspects of life—disagreements with friends or

loved ones, deadlines at school or work, illnesses, obligations to a team or community—any situation that involves uncertainty and the potential for a negative outcome can stress out the people involved.

Of course, the experience of being a nursing student, however rewarding it may ultimately be, can also cause great stress. Often the complicated process necessary to be accepted into nursing school, from completing applications and interviews to securing finances and basic logistics, is very stressful. And once classes begin, there are books to read, tests to pass, reports to write, and, most importantly, people to help. As a nursing student, you'll learn about the causes of stress and the physiological responses to it, and information that will help you better manage your own stress and assist your future patients as they adapt and heal after illnesses and injuries. Knowing about the physical and emotional components of stress can help you be a more effective nurse.

8.1 Homeostasis, Stress, and Adaptation

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Define homeostasis as it relates to stress.
- Identify fundamental concepts of stress.
- Identify and explain fundamental concepts of adaptation.

The human body has a remarkable ability to adapt. It is dynamic and ever-changing as it responds to internal and external stimuli and triggers in the environment. These stimuli may be the malfunction of a body system or organ, or an external factor such as a job loss or death of a family member.

Many body systems work together to maintain stability. When one malfunctions, stress is created on other systems. As a nurse, it is important to understand the relationships between these systems.

Fundamental Concepts of Homeostasis

The process of adjusting to the environment as conditions change, either suddenly or over time, is called **adaptation**. Through these adjustments, the body attempts to keep all its systems in a state of balance, or **homeostasis**, that is conducive to life (Venes, 2017). To maintain homeostasis, the body relies on biological, chemical, and fluid processes that occur autonomically in response to change (Venes, 2017). When the body cannot maintain homeostasis, it experiences illness or disease, and, eventually, death. Even when injury, illness, or disease is present, the body still attempts to find balance. It uses all its systems to regain that balance until it either overcomes the injury or illness or perishes.

An example of homeostasis is the body's attempt to regulate its temperature within the normal range so all cells, tissues, and systems can optimally perform their normal functions. The body is like a thermostat set to maintain an ideal temperature in a house. When the temperature rises, the air conditioner turns on to cool off the house; if the house cools below the established set point, the heater turns on until the air is sufficiently warm. Similarly, if the body overheats, it may generate perspiration to cool down; if its temperature drops too low, the body may begin shivering to generate sufficient heat.

Body Systems and their Effects on Homeostasis

Although body systems may seem like segmented pieces of the whole body, they are completely interdependent and respond to each other in a holistic manner through the process of adaptation. For example, the respiratory and renal systems interact to keep the blood pH in the normal range of 7.35 to 7.45. Carbon dioxide, which affects the acid level in the blood, is controlled by the respiratory system, whereas bicarbonate, which controls alkalinity, is controlled by the kidneys. The lungs may breathe faster or slower to exhale or retain carbon dioxide, and the kidneys may excrete or hold onto bicarbonate in respnse; the perfect interplay of these systems helps maintain homeostasis, allowing optimal functioning of the blood as it courses through the body.

Each body system performs its own inherent functions but, at the same time, affects other systems. The brain is known as the master controller for the entire body, but there are many backup systems throughout the body to help. For example, the medulla oblongata in the brainstem helps control vital signs such as breathing, pulse, temperature, and respiratory rate; the carotid arteries and the kidneys contain chemoreceptors (which measure chemicals) and baroreceptors (which measure pressure) to help regulate blood pressure. Table 8.1 briefly summarizes the main functions of different body parts and systems in maintaining homeostasis.

Body System	Function
Brain	Responds to emotions, sensory input, and internal and environmental triggers
Integumentary	Controls body temperature, absorbs vitamin D, stores hormones, and protects the body from external damage
Respiratory	Controls respiratory rate and the exchange of oxygen and carbon dioxide
Cardiovascular	Controls blood pressure and volume, and transports essential nutrients, gases, electrolytes, and hormones to the various cells within the body
Gastrointestinal	Transports, digests, absorbs, and excretes nutrients
Musculoskeletal	Enables body movement and creates blood elements
Renal	Filters, reabsorbs, and excretes fluids and electrolytes
Reproductive	Creates and maintains sex hormones and physical sex characteristics
Endocrine	Responds to changes in body chemistry through positive and negative feedback by increasing or decreasing hormones
Hematopoietic	Stimulates red blood cells, white blood cells, and platelets in the blood
Immune	Responds to antigens and activates the body's immune response

TABLE 8.1 Control of Homeostasis

Although there are medical specialists who focus on just one body system, such as cardiologists for the heart or endocrinologists for hormones, nurses practice with a holistic approach to client health. In your practice, you will need to understand the processes that each system uses to maintain homeostasis. Therefore, each system and its main disorders will be explored in greater detail in later chapters of this textbook.

Fundamental Concepts of Stress

We define **stress** as any disruption to the body's normal state. It can be physical, biological, emotional, or psychological. Stress exists from the moment a person is born, as the baby feels the stress of leaving the comfort and warmth of their mother's womb and entering a cold, unfamiliar world. Because stress is universal, it is considered a normal physiological process as the body adjusts to change and attempts to restore homeostasis. Some stress actually triggers the body to breathe, since the atmospheric air pressure around us is not the same as the pressure in our lungs. The difference in air pressure puts stress on the body, causing the diaphragm to contract. This, in turn, makes our chest expand, and we inhale through our nose, mouth, trachea, bronchioles, and alveoli.

As this example shows, stress can have positive effects. A **positive stress** is when a stressful event produces healthful outcomes such as breathing, which provides us the oxygen our bodies need to live. The stress of exercise is also positive, resulting in increased muscle strength and cardiovascular health. However, most people probably associate stress mainly with negative effects. A **negative stress**, also called distress, is when a stressful event produces unhealthful outcomes, such as illness or disease (Lazarus & Folkman, 1984).

Stressors

A **stressor** is an event or stimulus that activates an individual's stress response (Centre for Studies on Human Stress, n.d.). Even though all people experience stress, the experience itself is highly individualized and varies from one person to another. Several factors affect a person's response to a stressor, including their physical and emotional states. A person's intellectual understanding of a stressor also matters. Under most circumstances, a

person may be able to handle an exposure to a seasonal virus. Their body quickly fights off the infection, and they experience few, if any, symptoms of illness. However, suppose they encounter the same virus during a physically or emotionally challenging time. A person may struggle to fight off a virus if there are additional stressors taxing the immune system. For example, if the person lost a job or is not getting adequate sleep or nutrition, the body may be weaker against a physical stressor such as a virus. This example explains why someone who is already sick generally should not be given a vaccine: their body is in a weakened state and may struggle to adapt to additional stressors.

In a recent poll, 73 percent of respondents identified financial concerns as their primary stressor (White, 2023). Some other common stressors people experience include environmental stressors (e.g., living environment; politics); lifestyle stressors (e.g., work; relationships; recreational choices); major life event stressors (e.g., childbirth; marriage; death; new job); organizational stressors (e.g., daily routines or lack thereof); physiological stressors (e.g., pregnancy, illness).

REAL RN STORIES

Nurse: AJ
Setting: Intensive Care Unit
Location: Las Vegas, NV

During the worldwide COVID-19 pandemic, many nurses experienced levels of stress they had never experienced before. Nurses work in stressful environments ordinarily, but they have been trained to adapt as they focus on helping their clients. What was unexpected during the pandemic were the emotional and physical stressors caused by higher patient loads, lack of personal protective equipment, lack of control in their environment, and the anxiety and fear of bringing the deadly virus home to their own loved ones.

"I thought I was a good nurse, but the COVID-19 pandemic pushed me and my nursing team to new lows," says AJ. "We worked despite our own fears as we saw the fear in the faces of our own patients restricted to isolation away from their families while they were intubated and dying. I have never been so stressed out before in my life. We soon realized we had to apply all those stress reduction strategies we learned in nursing school to ourselves, and it helped."

Fundamental Concepts of Adaptation

A crucial part of adaptation is the ability to cope with stressors to decrease negative stress. A person's coping ability depends on multiple variables, including their mental and physical abilities (Segerstrom & Miller, 2017).

Behavioral approaches to coping with stress are called **adaptive behaviors**. There are two opposite approaches: positive adaptive behaviors and **maladaptive behaviors**. Both may reduce stress, but **maladaptive coping** creates additional negative outcomes. An example is dealing with emotional stress by overusing alcohol, which may result in social distress, financial problems, and alcoholism leading to physical illness. Other maladaptive behaviors include pulling out one's hair and cutting oneself; again, these behaviors may relieve stress in the short term but they cause physical harm to the stressed individual and are often signs of underlying psychological problems.

Nurses are in a position to assess adaptation to stress in their patients and educate them on positive adaptive behaviors. For example, a nurse might teach a patient with chronic obstructive pulmonary disease to use pursed-lip breathing to release more carbon dioxide trapped in the lungs.

Stress Adaptation Model

The **Stress Adaptation Model** is based on the work of Dr. Hans Seyle, who declared that stress affects overall health. According to Seyle, stress and health are biochemically linked, and chronic stress creates physiological illness when the endocrine system is exhausted. He recognized similar responses by all people when they perceived stress, thus he named it the General Adaptation Syndrome (Selye, 1965). He recognized that when an event is new, unpredictable, a threat to self, or creates a sense of lack of control for the person, the individual will experience stress. The response by any individual experiencing stress passes through three stages: (1) the alarm reaction, (2) resistance, and (3) exhaustion if the stressor continues unresolved. Each of these will be explored in more detail,

because nurses must be able to assess physical and emotional responses to stress in their patients.

8.2 Causes and Types of Stress

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Define stress and stressors
- Identify physical, physiological, and psychological stressors
- Differentiate between internal and external stressors
- Distinguish between acute and chronic stressors

Stress is a normal part of life. Nurses need to understand the types of stressors, how people define stress, and how to distinguish between internal, external, acute, and chronic stressors for their patients. They must apply concepts of stress management to help patients and their families, as well as to help themselves.

Dimension of Stress and Stressors

Recall that different people may experience the same stressor in different ways and that an individual's experience of a stressor is influenced by a variety of physical, psychological, and emotional factors. Furthermore, people experience stress along a continuum, ranging from mildly stressful events to severely alarming or even life-threatening ones. A familiar mild stressor is an alarm clock in the morning: the sound disrupts our sleep, waking us up and forcing us out of bed. At the other extreme of the stress continuum, consider a car accident that leaves the driver pinned beneath a vehicle and a loved one looking on. The stress resulting from such an event can cause surprising physical changes. For example, the onlooker may experience a temporary surge of strength that allows them to lift the car off their loved one.

The stress continuum encompasses responses to many types of stressors, which may be categorized in different ways: internal or external, physical or psychosocial, acute or chronic (National Institute of Mental Health, 2023). An **acute stress** is short term, compared with **chronic stress**, which lasts longer than several months. Internal stress may be caused by a physical disorder within the body in contrast to an external stress outside the body. A **physical stress** can affect the body both internally and externally. A psychosocial stress is generally a disruption in the person's mental health and well-being.

Internal and External Stressors

Recall that a stressor is an event or stimulus that activates an individual's stress response. A stressor may come from within or outside of the body. Internal stressors generally come from a person's mental interpretation of an event or stimulus, and they can vary largely among people depending on their age, sex, experience, values, cultural and religious beliefs, and even resources available to deal with the stressor. Consider how two nursing students might respond to an upcoming exam. One student might feel a lot of anxiety and have difficulty studying, whereas another student might approach the exam confidently as one step closer to graduating as a nurse. The stressor is the same, but the individual's interpretation of it can create a negative experience for one student compared with an energizing experience for the other student.

External stressors are events and circumstances that come from outside sources rather than mental or emotional processes. A common example of an external stressor that nurses see in their patients is the physical stress of an infection or injury. Another example is a full bladder that the patient cannot empty on their own. Regardless of the stressor, nurses focus on eliminating and treating it through medication administration and nursing interventions. In the case of an illness, this might involve antibiotics or surgery; in the case of a full bladder, the nurse might place a urinary catheter in the patient.

Physical and Psychosocial Stressors

Physical stress involves measurable disruption to the body, and it is often the focus of many patients whom nurses see in medical clinics or hospitals. Physical stress may be due to factors such as infections, trauma, and external exposure to pathogens. A large percentage of the work nurses do is to care for the physical needs of patients as medical providers prescribe the plan of medical treatment for physical stressors.

It is important for the nurse to recognize physical manifestations of stress, which include activation of the **sympathetic nervous system**, which controls many automatic body functions, such as heart rate, blood pressure,

and perspiration.

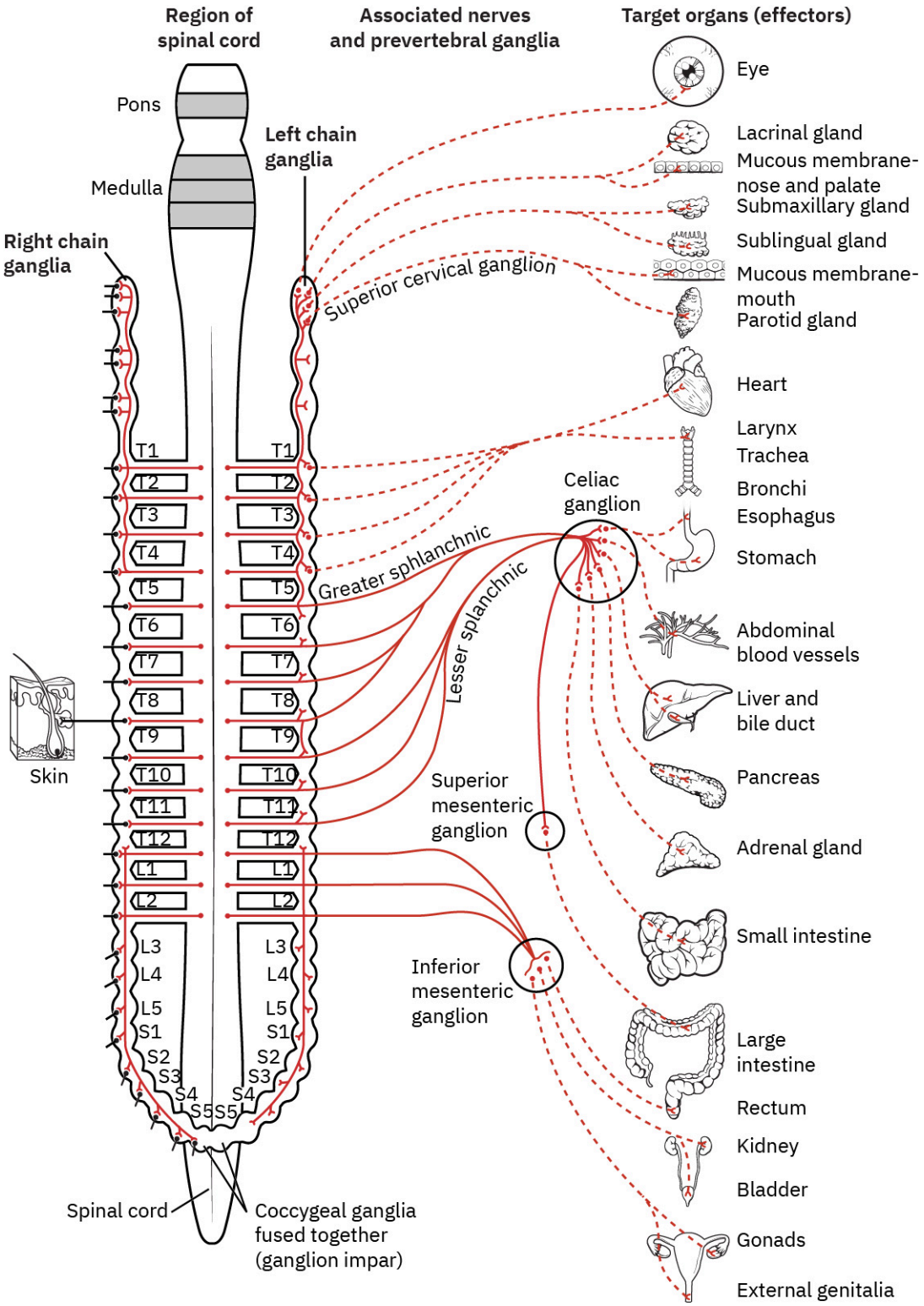

FIGURE 8.2 Activation of the sympathetic nervous system during stress can affect several body organs. Psychological and psychosocial stressors can also manifest in physical signs and symptoms of stress. As a nurse completes a head-to-toe assessment, each body system can manifest signs and symptoms when the person is under stress. (credit: modification of work from *Anatomy and Physiology 2e*. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Physical stress includes any external or internal condition that disrupts normal cellular function, such as temperature change, poor nutrition, hemorrhage, or dehydration (Freedland et al., 2023). The disruption produces

physical manifestations as the body attempts to restore homeostasis. An interesting example is a condition seen in patients with spinal cord injury patients: **autonomic dysreflexia**, in which the body tries to rid itself of a stressor that the brain cannot recognize (McCarty, 2016).

LINK TO LEARNING

Watch this video to learn more about causes and effects of autonomic dysreflexia (https://openstax.org/r/77dysreflexia) as well as assessments and interventions.

The mental and emotional response to stress is referred to as **psychosocial stress**. For example, consider how two people may respond to the loss of a job. For some people, a layoff or getting fired is viewed as a personal failure. They may lose confidence in themselves and even develop symptoms of depression. Over time, these deep emotions can lead to physical distress. But for someone else, losing a job can be a "blessing in disguise" that gives them the opportunity to follow a different path, perhaps pursuing a dream career or going back to school. In both situations, the external stressor is the same—it's the personal interpretation and experience of psychosocial stress that make the difference.

Factors that influence psychosocial stress include age, gender, culture, religion, family support, and access to economic resources. For example, an event that causes an adult great stress, such as a family reunion, may not bother a child, who does not realize the event's significance. Stress that is devastating to someone with a certain cultural background may not affect someone with a different background. The sound of a shotgun may be distressful to a member of the military who has experienced warfare, because the sound may trigger symptoms of post-traumatic stress disorder (PTSD); however, members of the general public may mistake a gunshot for an unthreatening popping sound, like the backfire of a car exhaust, and scarcely notice.

LIFE-STAGE CONTEXT

Effects of Age on Stress

An individual's response to a stressful event includes the important variables of gender, culture, and age. Children, for example, are at increased risk for stress because their coping skills may be underdeveloped. They may not have the vocabulary or understanding of their own feelings to be able to express and explain their stressors. Children may also not be able to regulate their emotions and may react impulsively because they have not developed coping skills. However, children are generally resilient and adaptable, especially with support from caregivers.

Older adults are at increased risk for stress due to cognitive changes that may lead to slower processing or memory issues. Although stress may make these cognitive challenges worse, their life experiences may help them deal with stressful situations. Health problems may increase an older adult's stress but may also affect their ability to remain independent, which can further increase stress and thereby exacerbate health problems. Declining mobility and physical health can make adapting to stress more difficult.

Although stress can affect children and older adults in different ways, the nurse can encourage patients of all ages to establish or rely on an existing support system to help improve their abilities to cope.

Acute and Chronic Stressors

In medicine, the terms acute and chronic are used to describe the time frame of symptoms or conditions. Stressors that generally appear suddenly and may cause severe distress, but whose symptoms may last only several minutes, hours, or days are **acute stressors**. For example, someone working outside in the heat may begin to become dehydrated, but they can relieve this stress by cooling off and drinking water. On the other hand, **chronic stressors** are long-term experiences; they produce symptoms that may last weeks, months, or even years. For example, a stroke may leave a person with hemiparesis (one-sided paralysis) that lingers for years.

Sometimes acute and chronic stressors can occur at the same time. For instance, someone who is struggling with a chronic condition of cancer may have an acute stress after breaking an arm or developing a viral sinus infection. A careful nursing assessment includes the ability to assess and treat both kinds of stress. If an acute stress is not

treated effectively and in a timely manner, it may progress to become a chronic condition (e.g., an untreated foot infection may progress to gangrene).

8.3 Stress and Disease

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss stress as a response
- Define stress as a transaction
- Identify how stress acts as a stimulus for disease
- Provide examples of disease processes where stress was a stimulus

Stress is a dynamic process, which means it changes and is influenced by various factors. It is the characteristic response to stressors or stimuli, and if not responded to in a healthy manner, can lead to disease. Nurses need to recognize the clinical manifestations of stress as a response to stressors and the variation in our responses to stress. How we respond to stress depends on many factors, and this known as the transactional model of stress. If the response to stress is negative and does not allow a return to homeostasis, disease may occur.

Stress as a Response

Stress is generally considered an event or factor that acts on a person, but it can be both the stimulus itself and the cluster of clinical manifestations experienced as a result of the stress (MedlinePlus, 2022). For example, a patient may experience stress from an illness but then demonstrate manifestations of the response to stress as hypertension, tachycardia, diaphoresis, and other sympathetic system responses. Stress can be a response to a stressor (the stress response). When a patient is exposed to an external stressor such as a pathogen, the body responds with the inflammatory response, which stresses the body toward recovery to fight the infection. The response itself may cause disease if it does not help the body recover homeostasis.

Stress as a Transaction

The **Stress Transactional Model**, originated by psychologists Lazarus and Folkman (1984) and shown in Figure 8.3, states the response to stress as a transaction considers the various factors that affect a person's response to stress. These factors include those that are personal, social, environmental, spiritual, and cultural, as well as emotional intelligence level and even educational level. An example of the variation among responses based on the transaction of these factors could be the difference between two people who spill a cup of juice. One person may consider it an annoyance and then clean it up and move forward in their day, whereas another person may become very upset and let the event destroy the entire day. The factors that came into play for the different responses may have been the age, sex, emotional level, and even the economic level of the two individuals. These are the factors that need to be considered by nurses when assessing stress levels and responses of their patients.

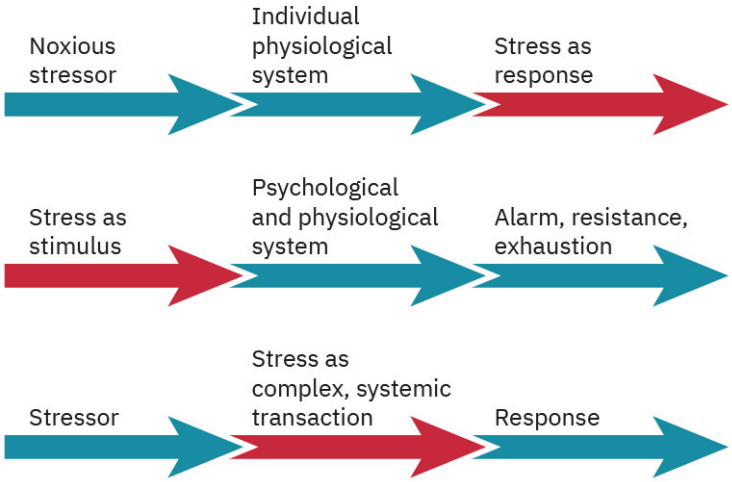

FIGURE 8.3 The Stress Transactional Model considers the effects of personal, social, environmental, spiritual, and cultural factors, as well as emotional intelligence level and even educational level as factors that affect a person's response to stress. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Stress as a Stimulus for Disease

Stress is a very common factor that leads to disease. Disease is defined as a disorder of the structure or function of the body (Merriam-Webster Dictionary, 2022). A stressor often contributes to the disorder of normal function. When homeostasis is disrupted, the body will either respond in a healthy manner to recover from the stressor, or not. For example, when a body builder stresses muscles with heavy weights and exercise, the muscle tissues may be broken down by the stress, leading to weakness. However, when the body can recover and rebuild the torn muscle, the result is a stronger and bigger muscle. When the body cannot recover and adapt to a stressor, it may further deteriorate, and result in disease.

Stress can then be a stimulus toward disease. For example, when a person is confronted by antigens and pathogens, the stress response results in efforts to protect the body. The stress can create disease if the body is unable to fight it. An extreme example is when a patient first encounters a pathogen: without successful recovery, infection by the pathogen may lead to a further stressor known as sepsis. Conditions that correlate stress-related disorders and disease include the following (Fulda et al., 2010):

- acne
- Alzheimer disease
- anxiety disorders
- asthma
- autoimmune disorders
- back and neck pain
- cardiac dysrhythmias
- coronary heart disease
- depression, anxiety, and panic attacks
- diabetes
- dysmenorrhea
- dyspepsia (indigestion)
- eating disorders
- eczema
- erectile dysfunction
- fatigue
- fibromyalgia
- headaches
- hypertension
- immunodeficiency
- insomnia
- irritable bowel syndrome and other gastrointestinal symptoms
- insomnia and sleep disturbances
- obesity
- poor wound healing
- stroke

8.4 Physiological Response

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Understand the brain's physiological adaptation and response to stress
- Differentiate the sympathetic versus parasympathetic nervous system response
- Explain the theory of adaptation
- Discuss the nurse's role in identifying indicators of stress in a patient

The physiological response to stress includes each body system's attempt to adapt to stressors. Activation of the sympathetic nervous system is the hallmark response to stress. Involvement of all body systems when the sympathetic nervous system is activated is the goal of adapting to the stressor. The nurse plays an important role in identifying factors that contribute to stress, the patient's response to stress, and intervening to help restore balance

to the patient.

Physiological Adaptation and Response

The body's key adaptation response to stress is activation of the sympathetic nervous system, known as the fight-flight-freeze system. It activates all body systems to be prepared to fight or flee against the stressor. The classic scenario is a threat of attack, so the body is primed for defense. Muscles are tensed, pupils are dilated to see wide and clearly, lungs are open to suck in all oxygen possible, and blood is shunted away from the gut so it can be sent to the brain and muscles. In completing a physical examination of a patient in stress, many hallmark clinical manifestations will reveal activation of the sympathetic nervous system. This stress response is useful for acute and immediate stress but is not meant for chronic stress. The wear and tear of the body in constant stress exhausts the body and may end in collapse.

Patients who are chronically stressed with work or life's demands may find their other body systems become depleted as hormones and chemicals being exchanged in the hypothalamus and pituitary initiate the stress response throughout the body (Welt, 2023). For example, the body of a person with untreated sleep apnea is chronically stressed due to the lack of adequate oxygen during sleep. As a result, the patient is always in fight-or-flight mode, even when at rest. Some conditions that could easily be managed can be exacerbated by chronic stress as the body diminishes its resources and ability to adapt. Many times, this is the condition in which nurses see patients: their body's ability to adapt has decreased.

Interpretation by the Brain

The human mind responds to signals and messages that are sent through various hormones and chemicals, all trying to maintain or restore balance in the brain. The complex process responds to perceived stress or threats with a sympathetic fight, flight, or freeze behavior—even if the threat is actually quite irrational. This is why a person may know, logically, that it is extremely unlikely that the elevator they are riding in will crash, yet they still experience full-blown panic attacks at the mere suggestion of taking the elevator in their building. In those moments, they will feel the rush of rising blood pressure, their heart will race, they will feel as though they cannot catch their breath—they may hyperventilate. This response looks and feels as though the body is getting ready to defend itself or flee from some major attack. And the brain interprets that stress as a threat and responds as it should, even if the treat is not much of an actual threat at all in reality.

Cognitive behavior therapy and other psychotherapies focus on controlling the brain's interpretation of stressful events by controlling thoughts. Nurses can help decrease a patient's sympathetic response by role modeling breathing techniques and reorienting the patient to reality.

Sympathetic Nervous System Response

The sympathetic nervous system is part of the autonomic, or involuntary, system that affects organs, in opposition to the **parasympathetic nervous system** (Figure 8.4). Whereas the parasympathetic system is known as the "rest and digest" or "feed and breed" response, the sympathetic system is primed for fight-flight-freeze activities for the body under stress. The common phrase "fight or flight" was altered in 2015, with "freeze" added as a possible response after studying the impacts of traumatic and adverse events on sexual assault victims, plane or car crash victims, soldiers who had been in battle, and people attacked by animals. (Kozlowska et al., 2015). They could neither fight nor flee and literally became immobile (frozen) with fear.

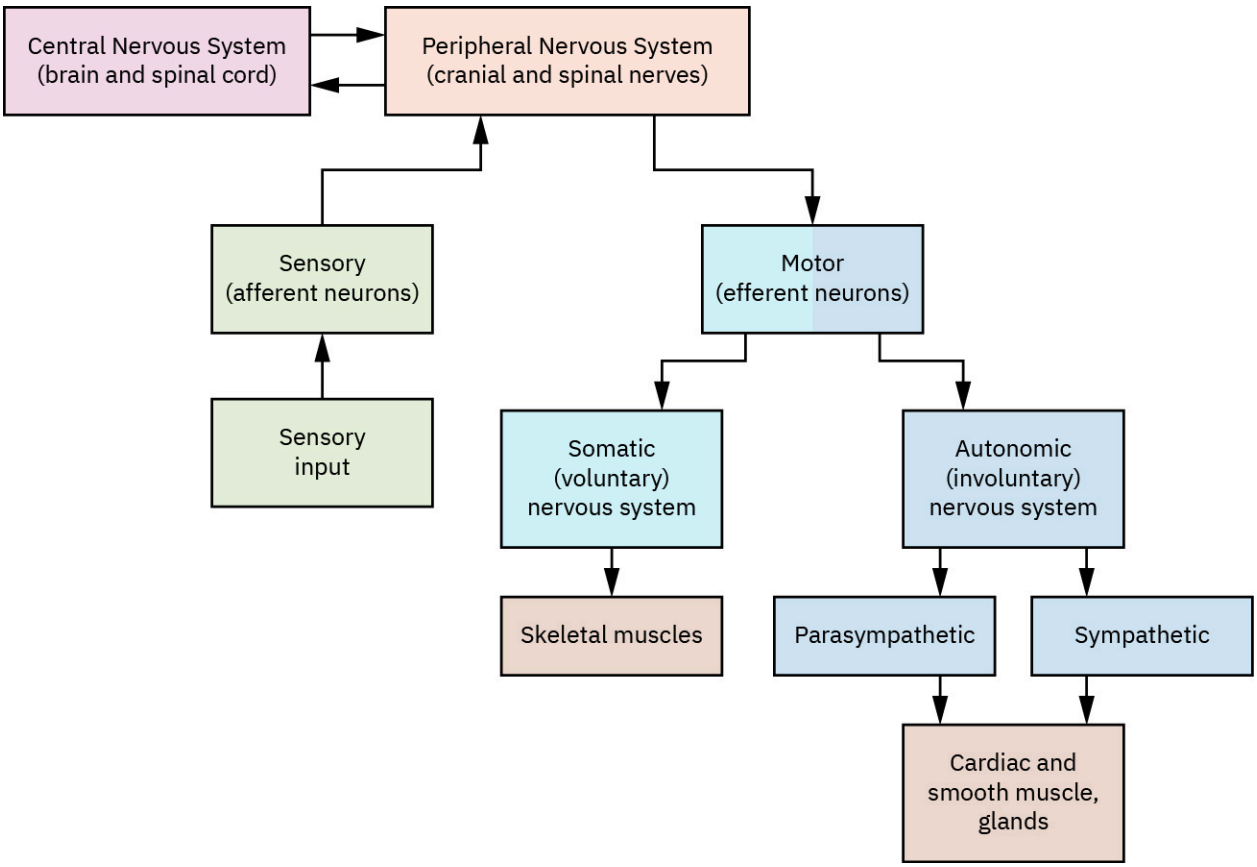

FIGURE 8.4 The sympathetic and parasympathetic nervous systems are parts of the autonomic nervous system. They regulate the functioning of glands and cardiac and smooth muscle. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

The sympathetic nervous system activates body organs to prepare for a response to an assault. Pupils dilate, muscles become tense and engorged with needed oxygen rich blood, glucose levels are elevated by the adrenal glands and liver for energy, lungs and airways dilate, and blood from the gastrointestinal system is shunted to more vital organs. The result is elevated blood pressure to support activity to fight the stressor. If the sympathetic nervous system remains activated for a long time, it results in constipation, chronic hyperglycemia, decreased immune response, and overall body fatigue. People with chronic stress, therefore, may develop chronic disease such as hypertension, hyperglycemia, poor nutritional absorption, and ulcers (Sheng et al., 2021).

Recognize that medications and substances can trigger a sympathomimetic response, such as caffeine consumption and cocaine. Excessive use of these substances can create stress on the heart. Some medications are used purposefully to stimulate the sympathetic response (also called adrenergic response), such as medications used for a nonstress test or epinephrine used to treat a cardiac arrest.

Hypothalamic-Pituitary Axis Response

A complex system that helps the brain respond to stress is the **hypothalamic-pituitary axis (HPA)**. Through a neuroendocrine mechanism, messages from hormones in the blood (the endocrine component) and the nervous system (the neurological component) pass through the hypothalamus and pituitary gland in the brain. These messages are mediated by the brain to regulate metabolism, the immune response, body temperature, body fluids balance, and the **autonomic nervous system**. Known as the control center for hormones, the hypothalamus receives messages from the body's organs and then sends signals to the pituitary. The pituitary, which is further divided into anterior and posterior compartments, emits the appropriate hormones to the body to respond to internal and external environmental signals (Welt, 2023).

One key hormone that is activated by the HPA is glucocorticoid-releasing factor, which, in turn, stimulates the adrenal cortex to release cortisol and other glucocorticoids. A main function of **cortisol**, also known as the stress hormone, is to elevate the blood glucose level; glucose is needed to supply muscles for the flight-fight-freeze response of stress. Short-term elevation of the cortisol level allows the body to have the energy it needs; however,

long-term release of cortisol can create chronic hyperglycemia and its associated complications.

Sympathetic-Adrenal-Medullary Response

In response to chemical and hormonal signals from the HPA, the adrenal glands, which sit on top of each kidney, create, and excrete chemicals known as catecholamines that respond to the sympathetic nervous system. Commonly known as adrenaline, the adrenal medulla makes epinephrine and norepinephrine, which activate sympathetic nervous system responses, including tachycardia and vasoconstriction, to elevate blood pressure. Additionally, corticosteroids are released from the adrenal cortex on the outer layer of the adrenal glands, which increases blood glucose levels, contributing to the needed energy demands of a sympathetic response. The body is well designed with feedback loops to send signals from organs to the brain and back to respond as needed to regulate homeostasis.

Autonomic Nervous System/Immune Response

Thankfully, the autonomic nervous system does not require conscious activation of any of its functions; it responds automatically. However, some functions can be affected by conscious thought. For example, some people learn to lower their own blood pressure and heart rate by meditating and or using calm breathing techniques. Another system affected by the autonomic system is the immune system, which helps fight antigens and pathogens. An **antigen** is something that generates an antibody response—hence, the term "anti-gen."

In addition to elevating glucose levels, cortisol decreases the function of lymphocytes, one of the types of white blood cells that directly fight pathogens. Therefore, long-term stress can decrease the effectiveness of the immune system and put someone at risk for infection because the body may not be able to fight off infections.

READ THE ELECTRONIC HEALTH RECORD

Uncontrolled Diabetes and Stress

You, the nurse, are reviewing morning laboratory text results of a patient who has been hospitalized for uncontrolled diabetes and is now in diabetic ketoacidosis.

Laboratory Test	Normal Range	Patient's Laboratory Test Values
Fasting glucose, mg/dL	70–100	254
White blood cells, mL	5,000–10,000	15,000
Red blood cells, million/μL	3.8–5.8	5.2
Sodium, mg/dL	135–145	156
Urine ketones	Negative	Present

1. Analyze the patient's laboratory values and explain how each result reflects the physiological response to diabetic ketoacidosis and the stress on the body.
2. Evaluate the significance of the elevated white blood cell count in the context of diabetic ketoacidosis. Discuss potential reasons for the poor response by leukocytes in this patient and the implications for patient care.
3. Prioritize the nursing interventions based on the patient's laboratory results. Discuss which abnormalities require immediate attention and how they contribute to the management of diabetic ketoacidosis.

Theory of Adaptation

Hans Seyle, the founder of Stress Theory, introduced the concept of adaptation in his work on stress. As a physician, he noticed that patients who experienced mental or physical stress and were able to adapt to the stressor in a

positive way were able to recover, whereas those who could not adapt and adjust to a stressor deteriorated.

Medical treatments are used to intervene and help the body adapt, but individual qualities and abilities of each patient influence the success or failure of treatment. For example, a patient who has substance use disorder with alcohol may not have the liver capacity to rebound from a gallbladder attack, because the liver cannot respond correctly under the additional stressor.

General Adaptation Syndrome

The **General Adaptation Syndrome** is a process comprising three distinct physiological stages the body passes through when experiencing stress. As shown in Figure 8.5, the first stage is alarm, followed by resistance, and, finally, exhaustion. First described in a medical journal in 1936, Dr. Seyle identified that when a toxin is introduced into the body, predicted sympathetic nervous system physical responses were seen in laboratory rats and, later, in clinical patients.

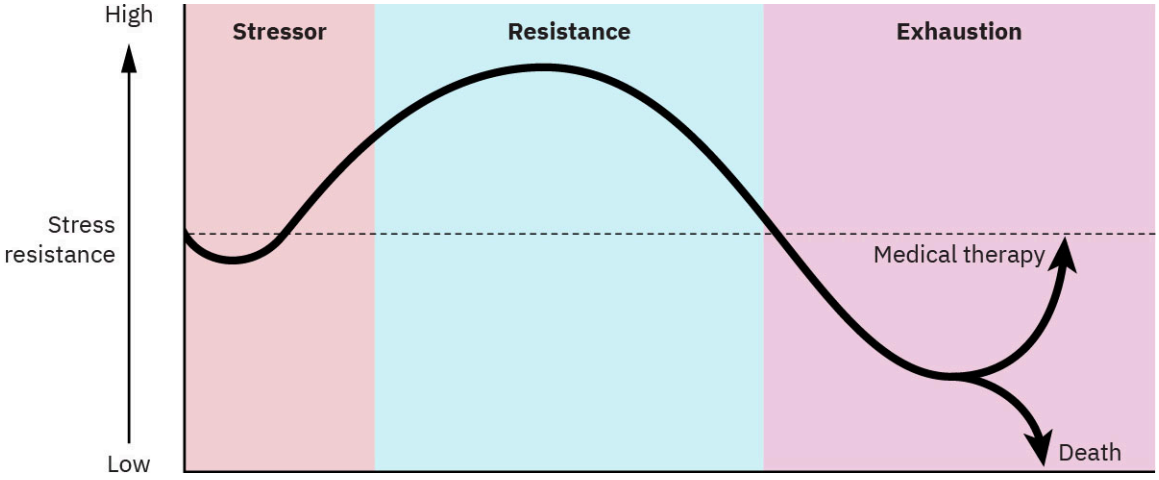

FIGURE 8.5 The three phases of the General Adaptation Syndrome are alarm, resistance, and exhaustion. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

The first alarm stage is characterized by the classic sympathetic nervous system responses to ready the body for fight or flight. Dr. Seyle also noticed the increase in corticosteroid levels during the alarm phase, with a resulting decrease in ability to fight the infection. Interestingly, an enlargement of the adrenal glands was also noticed that was due to the increased released of adrenal hormones during the alarm stage. If the stressor continues, yet the body can resist and adapt, these symptoms decline, but if the stressor continues and the body is unable to adapt, the body becomes exhausted. Prolonged exposure to the stressor or toxin can result in exhaustion or death if the body cannot adapt.

Local Adaptation Syndrome

Systemic stress has been discussed; it results in an overall sympathetic response of the body. In contrast, **local adaptation syndrome** is when the body responds only locally to an external stressor such as a wound, which may result in only a local response of the nearby tissues and circulation. The inflammatory response is the first physical response to injury or a pathogen. Blood vessels begin to dilate in an attempt to increase the flow of red and white blood cells and platelets to the area. Ideally, white blood cells will attack the pathogen, red blood cells will deliver needed oxygen to damaged tissue, and the platelets begin their clotting cascade to close off any wound. Depending on the size of the wound, tissues can then move through the healing process. Although the local area may go through the similar alarm, resistance, and exhaustion stages, these occur on a much smaller scale and do not affect blood sugar levels, overall white blood cell decline, or other sympathetic responses.

The concept of local adaptation is important for nurses to understand specifically for wound and tissue healing. Nurses can help tissues heal by improving the patient's nutrition with adequate fluids and protein and also intervening with cold packs, pressure, and elevation to local sites of injury that naturally respond to the stressful injury with tissue swelling from the initial inflammatory response.

Indicators of Stress

One major tool nurses use during a patient assessment is vital signs. Also, a full head-to-toe physical assessment is

required for a nurse to properly provide care for a patient, especially during a stressful event. As outlined previously, each body system can reveal physical signs of stress. For example, hair loss may be due to alopecia or aging but can also be seen in someone who is pulling their hair due to stress. Short, irregular nails can also indicate nervous nail biting. The astute nurse needs to pay attention to signs the body gives regarding stress. The following are physical signs of stress:

- acne
- blurred eyesight or sore eyes
- chest pains
- constipation or diarrhea
- difficulty breathing
- fatigue
- headaches
- high blood pressure
- indigestion or heartburn.
- menstrual cycle changes
- muscle aches
- panic attacks
- picking at nails, skin, or hair
- poor concentration
- sleep problems
- sweating
- teeth grinding
- weight loss or gain

8.5 Psychological Response

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Define the appraisal of a stressful event
- Explain how one may cope with a stressful event
- Discuss the effects stress has on one's psychological, behavioral, and cognitive functions

Nurses must recognize the psychological response to stress to better assess, evaluate, and create a care plan to help the patient. Using the clinical judgment measurement model, the nurse can assist the patient who is experiencing a stressful event achieve optimal outcomes.

Appraisal of Stressful Event

Psychological stress is the neurological response to experiencing a stressor or event, and the distress that results when the stress exceeds one's ability to adapt and cope. An important factor in appraising a stressful event is the mental and emotional interpretation of the event. Although the work of Hans Selye outlines a predicated response to stress, more modern research reveals there is still much variation due to differences among people's interpretation of stress.

Evaluating a stressful event first requires asking the person what they find stressful about the event. How someone perceives reality becomes their reality, which may be very different from that of another person. Their cognitive appraisal of the stress matters, even if it appears unreasonable or illogical to another person. Lazarus and Folkman added to the contemporary view of stress and coping with their transactional theory (Lazarus & Folkman, 1984). The ability to adapt to a stress is called **coping**, and is contingent upon the person's view of the level of threat, resources available, and ability to overcome the stress. If there is a match between the threat level and the perceived ability to overcome or address the threat, coping can be effective.

Coping with a Stressful Event

Coping is on a continuum from poor management to successful and effective management of a stress. The concepts of stress and coping apply to individuals, families, and communities. Coping abilities become part of the stressful

experience and can either decrease or worsen the stress. Although humans have great ability to cope, there can be a limitation to what a person can cope with. One stressful event may become a mere nuisance, but when grouped together or in a string of stressful events, however, such a situation may lead to a person's inability to cope effectively. For example, an acute illness such as a cold or pneumonia may become a bother to a person but is very manageable. If that simple event is coupled with inability to pay for medical care, lack of resources to travel to the doctor, and income lost due to missing work, it can become quite difficult and unmanageable. Nurses need to be aware of additional stressors in a patient's life beyond the present chief complaint or reason they are hospitalized, because it is rarely associated with a single event.

Coping may be adaptive or maladaptive (Centre for Studies on Human Stress, n.d.). Adaptive coping is the ability to navigate and manage a stressful event in socially acceptable ways and with positive outcomes. For example, seeking medical attention or psychiatric counseling demonstrates a thoughtful and responsible behavior to address a problem. Maladaptive behaviors do decrease stress but generally produce negative outcomes and may add problems to the situation. An example is someone who drinks alcohol or takes illicit drugs to cope with a poor marriage or loss of a job. The maladaptive behavior does not solve the problem—often it only masks it and can cause additional distress. Even if maladaptive behaviors sound illogical, people still use them because they can decrease initial distress, such as smoking or taking sedatives to numb emotions and problems.

Effects of Stress

Effects of stress can be neutral, positive, or negative. Stress has been shown to initiate and encourage growth, but it can also stunt growth and disable a person. The difference is in the amount, type, and interpretation of that stress, and the person's access to resources. In the role of a nurse, physical and psychological effects of stress must be assessed. The physical examination can help the nurse identify physical and emotional effects of stress, as outlined earlier.

Normal physiological processes are activated by stress and, if coping is intact and resources are available, the stressor becomes neutral. Navigating traffic on your way to work or school can be a neutral stressor. If, however, your car is unreliable, traffic is heavy, and you are late to class, the same stressor of traffic can become negative and cause distress. The same stressful event of navigating traffic could become a positive experience if the ride is shared with someone engaging and the conversations in the car are enjoyable.

The effects or consequences of stress affect all body systems (Abdulkaleq et al., 2018). It is within the scope of the nurse to evaluate the physical and emotional effects of stress.

Psychological Stress

In the medical profession, nurses focus on physical stressors that cause illness or injury; however, psychological and emotional stressors may be more common among the public. According to the results of an American Psychological Association 2022 survey of people in the United States, the most common causes of stress included the future of America (63%), finances (62%), work (61%), politics (57%), violence and crime (51%), and negative racial climate (62%) (American Psychological Association 2022). Worry and stress about life is part of our human daily experience. Psychological signs and symptoms of stress include the following:

- anger and irritability
- anxiety
- depression
- disinterest
- dizziness
- loneliness
- loss of concentration and memory recall
- restlessness
- tension
- sense of dread
- sexual problems
- withdrawnness
- worriedness

Variations in stress and coping are seen across the lifespan for all age groups as their cognitive, physical, and emotional resilience change. Inquiring about the person's interpretation of a stressful event is helpful in identifying where they are emotional and mentally. Taking the time to assess and question a patient about their biggest concern may even reveal their truest concern. For example, a person who is brought to the emergency department after a house fire would be expected to be concerned about their physical belongings and devastation to their home, but when questioned, the biggest concern for the patient may be the safety of their pet cat and not the physical belongings. Efforts could then be made with social services or the fire department to locate the pet.

LINK TO LEARNING

Watch this video about stress as a psychological process (https://openstax.org/r/77stress) from the Psychology Concepts series.

Behavioral Responses to Stress

Cognitive behavior therapy considers the very real triangular relationship among thoughts, emotions, and behaviors. Thoughts about stressful events create emotions, which, in turn, are the catalyst for behavior. When negative thoughts exist, negative emotions are stirred, including anger, depression, loneliness, and hopelessness, which can lead to maladaptive behaviors. For example, a nursing student experiences an external stressor of failing an exam, which could lead to thoughts of feeling dumb and worthless, which can lead to self-loathing or anger, which could lead to destructive behaviors such as excessive alcohol intake to drown out the negative thoughts or social withdrawal. Negative behaviors can be traced back to negative thoughts and emotions. Challenging negative thoughts is at the core of CBT. When someone is under stress and behaving in ways unlike their usual self, it is generally negative thoughts and emotions about the stressor that create the maladaptive behavior. Negative coping responses include the following:

- aggressive behavior
- chewing one's fingernails
- criticizing oneself (negative self-talk)
- eating too much or too little
- excessive alcohol intake
- illicit drug use
- reckless driving
- self-mutilation (e.g., cutting oneself, pulling hair)
- sleeping excessively
- smoking or chewing tobacco.
- violence toward self or others
- withdrawal from friends or family

Behaviors that are threats to someone's health can reveal the person is under stress. These behaviors include

- arguing
- avoiding tasks
- changes in appetite
- difficulty completing work or tasks
- excessive drug use
- irrational behavior
- irritability
- lack of self-care
- nervous behaviors (e.g., fidgeting, nail biting, pacing)
- not attending school or work as usual
- outbursts of emotions (e.g., anger, crying
- tardiness

Positive behaviors can also be traced back to positive thoughts and emotions. A nurse can help the patient explore

their thoughts about the stressor to identify their reality or falsehood. Ideally, nurses can help the patient see positive sides of a stressor, without being overly optimistic. Strategies to deal with stress in a positive manner are discussed later in this chapter.

Cognitive Effects of Stress

Humans are often more deeply rooted in feeling than in thought, and they tend to be more emotional than logical beings. Stress can make it all the more difficult to think clearly and rationally about a problem. Even when a person is able to rationally determine that a stressor is not one that should, logically, be a source of stress, it does not mean that they will cease to be stressed out about it. Like physical and psychological stresses, the effect of stress on cognitive abilities can be neutral, positive, or negative. An example of positive effects of stress on cognition is the stress nursing students feel when learning new content or with exam deadlines and clinical duties. The positive stress of learning and meeting high expectations can help someone get organized and feel energized as they push themselves to attain higher achievements and abilities. Unfortunately, stress can also create a negative impact on cognition when the stress level is too high and irrational and cloudy thinking results.

High stress levels can have a negative effect on the brain's ability to process information, rationalize it, and make decisions based on it. For example, a patient who has recently been diagnosed with a terminal illness must make decisions about their care as well as consider the needs of their loved ones after their ensuing death. Nurses need to be able to recognize the stress that patients and their family members will be under during a hospitalization. Everyone involved in a patient's care is asked to take in and process a lot of new information and often need to make important decisions about life and death. It can be useful to give patients and family members written materials that give them clear information to guide discussions and decisions. In times of stress, the ability to mentally process is often lacking or lagging. It's ironic, but when the sympathetic nervous system is activated during the first alarm stage of stress, cognition can get a lot sharper. However when stress becomes chronic, cognition starts to decline. Nurses also need to think about the importance of compassion and patience during these critical and challenging times.

Nursing is stressful, too, and one way to help nurses maintain clear cognition when providing quality patient care is following the Quality and Safety Education for Nurses (QSEN) competencies.

CLINICAL SAFETY AND PROCEDURES (QSEN)

QSEN Competency: Patient-Centered Care

Definition: Providing responsive care that respects individual patient preferences, needs, and values and uses those factors for clinical decision-making

Knowledge: Recognizing and appreciating the diverse factors that influence a patient's experience of stress, including cultural, socioeconomic, and environmental factors

Skill: The nurse will

- assess and evaluate physical manifestations of stress in clients.
- educate clients about positive adaptive behaviors for stress adaptation.
- recognize the individuality of a patient's stress response.
- use effective communication techniques to establish rapport and trust with patients.
- use active listening skills to understand the patient's unique stressors and concerns.
- collaborate with the patient to develop personalized stress management plans tailored to their individual needs and preferences.
- provide empathetic support and encouragement to empower patients to cope with stressors effectively.
- continuously reassess and adjust interventions based on the patient's response and evolving needs throughout their health care journey.

8.6 Inflammation: Cellular Response to Stress

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Identify the cellular continuum of function
- Differentiate between the positive and negative cellular feedback responses
- Discuss the types of inflammation and systemic response
- Identify causes of cellular injury
- Discuss the various causes for cellular injury

The body responds to stress at the cellular level, and the responses affect surrounding cells, tissues, organs, systems, and, eventually, the entire body. Understanding the body's cellular response to stress will help the nurse recognize the physical effects and how pharmacological interventions can help.

Cellular Continuum of Function

The cellular stress response is a cascade of chemical and hormonal signals that activate cellular products needed to re-establish homeostasis. One example is the activation of a type of protein called heat-shock protein to respond to changes in temperature, low pH, or low oxygen level (Fulda, 2010). Cells can respond in adaptative ways to stress or even through **apoptosis**, which is cell destruction to eliminate a stressor to the system. The process by which a cell experiences stress by either dying or becoming more resilient depends on various factors, including toxicity of the stressor, cell strength, duration of the stress, and age of the cell, among others.

Each cell in the body is programmed to live a certain length of time and then die; this is known as programmed death (Fulda, 2010). Cells can die by programmed death such as apoptosis, necrosis, or autophagic cell death. The cell recycles select parts of itself, in a process called **autophagy** (self-eating), to maintain cellular balance. An example would be self-destruction of red blood cells after 120 days, when they pass through the spleen and the iron portion is recycled for the next generation of red blood cells. Without apoptosis and autophagy, the body would not be able to clean up degraded cells. The interplay of genetics and environmental factors can affect the timeline of life for the cell. Stress is a large factor in potential early destruction of a cell. Stress on a cell can also create positive outcomes or negative results. Stressing the muscle fiber cells can increase elasticity and strength or tear and break them down, depending on various external factors.

A cell will respond to an initial exposure to a stressor, just as in the Generalized Adaptation Syndrome, with an alarm stage of activation of pathways to survive. However, if resources such as nutrition, oxygen, or fluids are not adequate, the cell will not survive. Initial responses to cellular stress include production of needed proteins to repair damage from a stressor, as in the case of wound injury.

Control of the Steady State

The adaptive ability of a cell will determine its fate after experiencing stress. An example of the impact of various factors upon a cell to adapt is the effect of exercise on the telomeres within a cell. The distinct structures at the end of a strand of a chromosome within the cell are called **telomeres**. They have been likened to the plastic caps at the end of a shoelace. Telomeres have repeated sequences of DNA, and every time the cell divides, the telomeres shorten until they eventually become so short, the cells dies. This reveals one of the ways a cell is programmed to die. Studies show that exercise strengthens the telomeres, extending their lifespan, whereas poor nutrition and stress weaken them (Shammas, 2011). Research on cell death has been conducted regarding cancer and chronic degenerative conditions such as Parkinson's disease and Alzheimer's disease.

Each cell works to maintain homeostasis and balance throughout stress states by adjusting protein and enzyme production and adapting the functions that affect the tissue and the organ comprising the tissue. Control of the steady state is the quest. Biological homeostasis is achieved by establishing an internal stability for the cell and adapting to demands of the external environment. The body accomplishes balance through regulatory processes known as positive and negative feedback.

Positive Feedback

The method the body uses to enhance a desired outcome by amplifying chemical or hormonal messages to the organs of influence is called **positive feedback**. An example of positive feedback is seen during labor and delivery.

The release of oxytocin from the posterior pituitary gland stimulates uterine contractions during labor, with the desired outcome of the delivery of the baby.

During cellular stress, positive feedback may promote cellular death to minimize oxygen and nutrition demands on the body, such as occurs with weight loss during times of scarcity. More commonly used throughout the body, however, is negative feedback.

Negative Feedback

The feedback loop of communication of hormones and chemicals in the body to decrease a desired output is called **negative feedback**. An example is when the body tries to reach a balance by releasing insulin when the glucose level in the blood is high. When blood glucose levels drop with the help of insulin secretion from the pancreas, then the signaling changes to stop releasing insulin so glucose levels do not fall too much. When glucose levels drop during fasting or sleep, the negative feedback loop then sends chemical messengers to the liver to break down glycogen, which is stored glucose, where it can then elevate blood sugar levels to the normal range. It is a constant balance and exchange of signals all with the goal of maintaining a stable internal environment.

Remarkably, the negative and positive feedback loops occur automatically. When body temperature rises, the negative feedback system in chemoreceptor sites of the thyroid and brain sense a higher-than-desired temperature, which triggers the action of sweating in the skin. Each body system works together to achieve balance in an ever-changing milieu.

Cellular Adaptation and Response

One powerful adaptation at the cellular level includes the inflammatory response, which is triggered by a stressor, pathogen, or antigen from inside or outside of the body. When a stressor is identified by chemicals and T cells in the blood, additional chemicals, called cytokines (e.g., histamine), are released to notify the surrounding area that an antigen is present. Mast cells release chemicals, which stimulate vasodilation and increase movement of white blood cells to the area. It is as if the immune system is alerting the body's military troops about an invasion and, through this chemical communication, vasodilation allows more troops to enter the battlefield. This cellular adaptation is a remarkable and quite sophisticated way to respond to threats.

Generally, inflammation is a helpful response to allergens and pathogens, but it can cause problems when the body attacks itself in a process called autoimmune hypersensitivity. Hypersensitivity is when the body's response is overreacting and causes additional and unwanted problems for the body such as autoimmune diseases like type 1 diabetes, lupus, multiple sclerosis, Hashimoto's thyroiditis, and others.

Types of Inflammation

Inflammation is a large factor that is both a stressor and response to stress. It can be either acute or chronic. An acute response is appropriate against a pathogen or antigen but can become detrimental when it continues for days, weeks, and even years. Acute inflammation will occur when there is a break in the skin, or even during hay fever season, but when it is chronic, it can become a devastating stressor to the body when nutrients and energy become depleted. People with chronic allergies experience lasting symptoms of physical stress, such as constant itching eyes, runny nose, skin inflammation, and emotional stress. Medications such as antihistamines can stop the inflammatory response and clinical symptoms.

LINK TO LEARNING

View this video to learn about the inflammatory response (https://openstax.org/r/77inflammatory) from Alila Medical Media.

A topic of popular interest is irritable gut syndrome, also known as leaky gut. The hypothesis is that certain foods and environmental triggers weaken the immune system, which is largely housed in the gastrointestinal tract. Bloating, fungal growth, brain fog, fatigue, and lethargy result when the gut is unable to fight these allergens. People who experience celiac disease or have a gluten allergy are familiar with the gastrointestinal bloating and distress from eating a food they are allergic to. The body identifies the food as an antigen, which results in uncomfortable inflammation of the gut.

The term **chronic inflammatory response syndrome (CIRS)** refers to conditions of chronic stress caused by chronic inflammation in the body. Other chronic conditions are now also being linked to an inflammatory response gone awry, such as in Alzheimer's disease or dementia due to inflammation in the brain (Kinney et. al., 2018).

Systemic Response to Inflammation

Inflammation is often local, due to a physical injury to the body's protective skin, but it can also be systemic when the body attempts to protect itself inside. When the inflammatory response becomes systemic, the body can experience great stress as it struggles to restore stability. Systemic inflammation can occur with generalized infections in the blood or with trauma. Conditions that cause any type of shock, such as anaphylactic, neurogenic, sepsis, or cardiogenic shock, can result in massive circulatory vasodilation and cause hypotension that threatens adequate perfusion to tissues.

Massive vasodilation, hypotension, tachycardia, and tachypnea, in response to infection and autoimmune disorders or burns, is referred to as **systemic inflammatory response syndrome (SIRS)**. It can be fatal if the body cannot overcome the extreme inflammatory response. What begins as the body's attempt to protect itself becomes systemic and affects all body systems, which may not be able to accommodate the widespread reaction.

LINK TO LEARNING

This video discusses SIRS criteria (https://openstax.org/r/77sirscriteria) and presents an example case for analysis.

Chemical Mediators

The **inflammatory response** is a complex process that involves many chemicals. The chemicals work in a cascading manner. Mediators of inflammation include leukotrienes, prostaglandins, vasoactive peptides known as kinins, phospholipids to activate clotting, and cytokines. Each chemical sends signals of stress in the development of the inflammatory response. The inflammatory response may be triggered by bacteria, pathogens, trauma, toxins, heat, or other noxious events. Histamine, bradykinin, and prostaglandins cause vasodilation, which allows fluids to flood the bloodstream, which cause swelling. The classic signs of inflammation are rubor (redness), pallor (blanching caused by swelling tissue), dolor (pain caused by inflamed tissue pressing against nerves), tumor (swelling), and calor (heat). Loss of function can also result when tissues swell, making mobility of the affected area unstable or painful, such as a swollen ankle after injury.

Pharmacological interventions target one or more of the signs of inflammation. Anti-inflammatories decrease swelling and block prostaglandins. Fever reducers act to decrease the fever within the tissues. Pain medications act to numb the pain receptors at the tissue site and block activation of nociceptors, which detect noxious stimuli. The inflammatory mediators of pain include prostaglandins, pro-inflammatory cytokines, and chemokines, which nonsteroidal inflammatory drugs and even some narcotics act upon.

Cellular Injury

The cascade of activating chemicals protects the body against further injury; however, depending on the severity of the stressor, this activity may exhaust the cell's ability to respond to and repair injury. As seen in the General Adaptation Syndrome, cells respond first in the acute stage with alarm and the inflammatory response, but if cells cannot overcome the insult to the body, efforts to adapt may lead to exhaustion. Large injuries seen in trauma and burns that destroy high volumes of cellular tissues may cause permanent damage.

Laboratory tests are used to help monitor the body's ability to respond, adapt, and overcome a physical stressor. Common laboratory tests for this purpose include measuring levels of lactate, blood urea nitrogen (BUN), and creatinine; a hemogram, which looks at red cells, white cells, and platelets; and end products of metabolism found in the urine, such as protein. When the body's muscles break down due to a stressor in a trauma or even a rigorous athletic event, high levels of proteins such as creatine kinase or creatine phosphokinase in both the blood and urine can reveal **rhabdomyolysis**, or massive destruction of muscle and the resultant increase in byproducts of muscle breakdown in the blood.

Managing inflammation is one process nurses can help with by administering medications as ordered and promoting a decrease in tissue swelling by applying cold compresses and elevating the inflamed area, if possible. Decreasing

cellular injury after a physical stressor can be managed with the actions abbreviated in the word PRICE: pain reduction, rest, ice, compression, and elevation. Additionally, nurses promote the patient's nutrition to support the energy of cells toward recovery.

Nutritional Imbalance

All the efforts to respond to a physical stressor, including the inflammatory response, require energy from the cells. Supporting the cells with adequate oxygenation and nutrition can increase the cells' ability to function and recover. Cells that are well hydrated and nourished have a better chance of being able to adapt to stress. Cells that are deprived of needed oxygen, fluids, and nutrition will not adapt well and may fail.

The core nutritional fuels for the body are carbohydrates, fats, and proteins. All are needed for cellular growth and recovery. Cells prefer carbohydrates as a fast-acting fuel to burn for adenosine triphosphate production but can use fats and proteins in the absence of carbohydrates or insulin, which allows glucose, as the simplest form of carbohydrate, to enter the cell. When the body uses fats or proteins as alternate energy sources, a negative byproduct is ketone bodies, which create an acidic environment for the cells. A balance of the macronutrients (carbohydrates, fats, and proteins) and micronutrients (vitamins and minerals) is needed for ideal cellular function. Hydration without added artificial flavorings, chemicals, excess calories, or caffeine is what cells need to function.

When cells have an imbalance of nutrients, cells die. Starvation at the cellular level is not conducive to good function or recovery from stress. Without adequate nutrients, red blood cells, white blood cells, chemical mediators, and platelets cannot be made, all of which are part of the inflammatory process. Without the inflammatory process, which includes the immune system's response, the body cannot adequately protect itself.

Hypoxia

A major purpose of the inflammatory process is to deliver oxygen to the site of injury or invasion. Vasodilation enlarges the area where red blood cells can flood the tissue area, delivering needed oxygen. All cells need oxygen to complete their internal metabolic processes, including the production of proteins, enzymes, and chemicals. Some cells may function through anaerobic processes, yet oxygen is needed for ideal functioning in the majority of the body's cells. The inflammatory process assists the body with the delivery of oxygen.

Physical Influences

There are many physical factors that influence the inflammatory response. These can include disruptions in the ability of the blood vessels to dilate or insufficient oxygen-carrying capacity of the red blood cells. If the body cannot deliver oxygen due to a blockage (ischemia); decrease in blood pressure, which pushes oxygen across cellular membranes (seen in shock or sepsis); or inadequate red blood cell count, seen in anemia or hemorrhage, cells will die.

An example of a physical influence that can affect the normal, well-intended inflammatory response is an injury to the brain, where normal swelling can cause increased cranial pressure. As the brain tissue swells, it has nowhere to expand in the hard, skull-encased area, and the swelling tissue pushes back on itself, possibly causing the brain to herniate through the spinal cord, which can cause death of the brain. Another example is when a bone is fractured with no break in the skin and then put in a closed cast before swelling has subsided. Again, because the inflammation has nowhere to expand, the tissue pushes back on itself, causing damage within, known as compartment syndrome. The medical remedy for these two examples is to surgically open the area to allow for tissue expansion. Casts are generally not placed until swelling has gone down; an open split is placed initially instead.

Temperature

The word inflammation is derived from the Latin word *inflammare*, which means to burn, and indicates the identification, even in ancient time, of a key feature of the inflammatory response to injury or infection. The body strives to keep the body in an ideal temperature range throughout the organs; this process is called thermoregulation. Using negative feedback, the body has a desired set point and senses variations in that temperature by chemoreceptors. If the body temperature elevates, sweating is elicited to decrease the core temperature. If the body temperature decreases below the set point, then muscles contract to shiver and stimulate heat production. All these adjustments are done autonomically.

During the inflammatory process, local temperature increases due to the increase in circulation to the body region

affected. Elevating the temperature is also a chemical attack to create an unsuitable environment for the survival of pathogens. When the body experiences SIRS, the temperature of the entire body increases, which can be uncomfortable to the individual and, in a hospital setting, is managed by antipyretics. In other medical naturopathic traditions, such as Indian Ayurvedic medicine, American Indian medicine, and traditional Chinese medicine, the fever from inflammation or illness is actually promoted because its effects help destroy pathogens that may be causing the illness. In Western medicine, fever is usually addressed quickly to promote patient comfort and rest.

Radiation

Radiation is both a promoter of injury and remedy for many cancerous conditions. Radiation, which, ironically, is **carcinogenic**, or cancer causing, is also used as a treatment for cancer. The etiology of its use is found in the physiological effects of radiation at the cellular level. Radiation can cause mutations in chromosomes during mitosis, damaging cells and their byproducts. It has the power to change the expression of genes, which is why it is used in cancer tumors. Radiation can be used to destroy undesirable tumor cells because it disrupts normal tumor cell growth. Fast-growing cells are most affected by radiation; unfortunately, that means noncancerous cells are also destroyed, such as hair cells and gastrointestinal lining cells, causing hair loss and nausea and vomiting, respectively.

Radiation-damaged tissues result in inflammation similar to the response seen after an attack by a pathogen, which is why oncologists limit radiation exposure (Schaue et al., 2015). The damaged tissue recovers with time as the body's regulatory mechanisms respond to remodel the skin and tissue for normal wound healing. Although radiation treatment has the goal to narrowly target the desired cancerous tissue area, the wide response of inflammation expands beyond the initial radiation border, and a wider range of tissue is negatively affected. A careful nursing assessment is needed to assess for peripheral tissue damage and intervene to promote comfort to aid the body's inflammatory response.

Trauma

Trauma, just like pathogens or radiation, will trigger the inflammatory response for protection. Any physical, emotional, or sexual trauma causes stress to the body. Traumatic injury produces excessive release of proinflammatory mediators, which activate vasodilation, white blood cell attraction to the area, and chemical release of histamine, cytokines, and prostaglandins.

In addition to stabilizing injured body appendages or bones and working toward hemodynamic and respiratory stabilization from a trauma, medical interventions address the increase in tissue swelling, fever, and pain. Generally, in a trauma with a fracture, the bones can only be stabilized initially with an open splint, rather than a closed cast, to allow for the inflammation to subside. Pain control, rest, elevation, and compression are common approaches to help decrease the inflammation in the acute phase. For massive systemic trauma, the inflammatory response also reacts systemically, leading to massive vasodilation, hemodynamic instability, and SIRS, often causing death.

Chemical Influence

In addition to the chemicals released during the inflammatory response, such as histamine and cytokines, the sympathetic nervous system prompts release of epinephrine and norepinephrine during stress, which further creates a demand on the cardiovascular and respiratory systems. The main chemical mediators during inflammation include (1) vasodilator stimulators such as histamine and serotonin, (2) peptides such as bradykinin, and (3) eicosanoids such as thromboxanes, leukotrienes, and prostaglandins (Abdulkhaleq et al., 2018). Additional chemicals released from the kidneys or electrolytes in the blood affect the inflammatory response and stress response.

Macrophages, neutrophils, and lymphocytes are drawn to the site of an injury within minutes as chemicals released from mast cells lining the site of injury are broken open and released due to the injury. Histamine, prostaglandins, leukotrienes, free radicals, serotonin, and even oxygen continue to promote a chain of organized responses that have cellular and vascular effects, which contribute to the inflammatory process. The inflammatory response also includes pyrogens (which initiate fever); interferons; plasma proteins, such as complement; and kinins that produce clotting as needed. After basic neutrophils and leukocytes are attracted to the area of injury, white blood cells further differentiate bringing helper T cells to the area to target antigens. It is as if the helper T cells are paint ball players that tag the offending pathogen with a marker protein so the white blood cells can recognize the enemy and engulf and destroy them through phagocytosis.

In modern medicine, counter-attacking chemicals are used in pharmaceuticals to decrease the innate chemical reactions of the body, such as antihistamines, antipyretics, and antibiotics. External chemicals, however, can be noxious to the body and trigger an inflammatory response. Air pollutants like car exhaust and smoke, and synthetic chemicals in beauty and cleaning products can be stressful to the body and trigger the body's allergic response. Sneezing, coughing, choking, wheezing, and runny eyes are results of the body's attempt to get rid of the irritant. Even chemicals in food products can stimulate an allergic reaction, which is seen in those with food allergies including gluten and food dyes.

Infection or Infectious Influence

A common cause of stress that triggers the inflammatory response is entry of pathogens into the body, including viruses, bacteria, and fungi. The body recognizes these protein-enveloped entities and cells as foreign, which then triggers the immune and inflammatory responses. Depending on the location and volume of pathogen, the body may be triggered to a localized or a systemic inflammatory response. If a pathogen enters the skin from a scratch or small wound, the inflammatory response is localized and easy to treat. Localized redness, heat from the site, swelling, and pain may result. If, however, a pathogen enters through the respiratory system, such as a flu virus, or gastrointestinal system, then a systemic reaction will follow because the larger body system affected.

Treatment for an infectious agent is focused on medications to treat the offending pathogen and commonly includes antibiotics, antivirals, or antifungals. Additionally, systemic medications are given, such as antipyretics for the comfort of the patient. Choosing the correct antimicrobial medication is, of course, key to success because the medication must be able to effectively kill the pathogen. Nurses will respond to orders that require a culture of the tissue, blood, secretion, or urine to identify the organism and its responsiveness to the right medication. Then, nurses will administer the prescribed antimicrobial at the correct times to maximize therapeutic response. With the decline in the pathogen population as a result of the correct pharmacological treatment, the inflammatory response also decreases, and the alarm stage of physical stress can end.

Immune Response

The immune system is a brilliant, complicated, and impressive system that is often not given adequate recognition because it is not as tangible as the other systems of the body taught in an anatomy class. The immune system can be divided into the innate and adaptive divisions. The innate division includes the first physical barriers to prevent infection or assault on the body such as the skin, mucus membranes, and higher acid levels in the stomach and vagina. The physical barriers are the first wall against pathogens and include larger mast cells that line tissues and organs, such as the endothelial lining in the stomach, respiratory tract, gastrointestinal tract, vagina, mouth, eyes, and nose. As discussed, if an injury occurs that breaks the cellular barrier, the mast cells are broken open, releasing histamine, which serves as a megaphone to call the immune system's attention to the area. Vasodilation and increased numbers of red blood cells, white blood cells, and platelets rush to the area.

The adaptive division of the immune system then takes over, using chemical mediators to mark the pathogens so immunoglobulins can identify the offending agents and destroy them. Memory T cells are formed to remember the unique protein structure of the pathogen to be ready for any future assault by creating an immunity to it. Young children who have not been exposed to common pathogens rely on the thymus gland in the center of the chest to create immunoglobulins, but after receiving vaccines and exposure experiences, their body becomes more mature and they can then rely on developed T cells and antibodies in the adaptive immune system.

LINK TO LEARNING

Watch this video about the immune system's response (https://openstax.org/r/77infection) to bacterial infection.

Genetic Influence

The age-old question of nurture versus nature continues to be asked about development of diseases. Both genetic and environmental factors influence an individual's ability to respond to stress, injury, and infection effectively. It is true that some genetic factors result in a disadvantage in fighting stress and disease, such as in patients with congenital conditions like cerebral palsy and cystic fibrosis, but most individuals can strengthen or weaken their body's resilience and adaptation by their life choices.

One analogy is that your genetics may be like a loaded gun, but your behaviors of nutrition, sleep, hydration, exercise, avoidance of toxins, and overall healthy behaviors, or lack of them, are what aim the trigger toward or away from disease. Stress can activate or mutate cells at the chromosome level. Chronic stress causes strain, and as has been discussed in this module on inflammation, causes additional potential problems for and demands on the body. Genetic mutations occur when there is damage to DNA; as cells containing damaged DNA replicate, so do the errors, furthering the incorrect or damaged coding for the cells, tissues, and body organs. Although nurses may not be involved in genetic counseling, they are involved in patient education about healthy lifestyles, which has a powerful impact at the genetic level.

Cellular Healing

When cells are damaged, the body automatically moves quickly into recovery and repair through the inflammatory response. Oxygen and nutrients are brought to the damaged tissues and cells to help with restoration. Variations in healing time and ability, again, are affects by genetics; available resources, including nutritional support; and the mental health of the individual. General wound healing takes 14–21 days, but individual cells may heal more quickly with sufficient support.

Nurses can aid healing at the cellular level by providing the patient nutrition, hydration, adequate sleep, and mental health support. Nurses can help teach their patients to honor their body and make decisions that demonstrate respect for their body. Florence Nightingale, known as the mother of modern nursing, emphasized the importance of environmental cleanliness, air, water, and support to help a person heal from injury, infection, or disease. Even before germ theory emerged, she understood the relationship between an external supportive environment and the internal environment of the body to heal.

Cellular Regeneration

Cellular regeneration is the ability of the body to restore damaged or destroyed cells, tissues, and organs to full function. All cells within the body replicate and regenerate based on the type of cell they are and tissues they create. Nerve cells have a slower rate of regeneration; however; in recent studies, nerve cells have been seen to regenerate in areas where this has not been seen before. Patients with spinal cord injury or stroke have had amazing recoveries. Unfortunately, there are so many complicated variables that not all patients experience recovery success.

Beginning with the inflammatory response, cells can begin to regenerate after injury or antigen exposure as blood delivers oxygen and nutrition to damaged cells and tissue. The ability to regenerate depends on the existing health of the cell and organism. Documented methods that stimulate cellular regeneration include intermittent fasting; caloric restriction; reduction in triglyceride levels; decreasing sugar and alcohol consumption; stem cell supplementation; vitamin C, vitamin E, beta-carotenes, and lutein consumption; and supporting healthy inflammatory pathways. Foods high in healing nutrients include cruciferous vegetables like cauliflower, broccoli, kale, cabbage, bok choy, and brussels sprouts. Nurses can help monitor these factors and offer patient education on healing methods.

Cellular Replacement

Cellular replacement is the process of replacing an aging cell with a newer, identical cell. The human body experiences cell growth and destruction every day. Each time a cell divides, the cell duplicates its genetic material; however, the telomeres in each cell become a little shorter until they are depleted, and the cell eventually dies. When the cells die, another generation of cells is formed to replace the old one. Cell death can be accelerated or delayed by health and behavior choices. Accidents, illness, and injury can speed up cell death, and positive supportive behaviors and choices can extend telomere length and life.

Each specific cell type in the body has an established cellular replacement time frame. For example, skin cells in the outer epidermis are constantly being replaced by younger cells developed in the lower basal area. When a person repeatedly sunburns, those immature cells may not be ready to replace the older cells on the epidermis. The body rushes to repair the exfoliated surface cells, but in the hurry, the basal area may produce immature cells, which are prone to DNA mutations, leading to skin cancer. It is as if a person becomes in a rush to make paper copies and the copy machine is forced to speed up, making errors more frequently.

Cells are replaced throughout the entire human body every 7–10 years. White blood cells replace themselves within 2–5 days, red blood cells every 120 days, and skin every several days. Studies show that cells stop dividing after 50

or so divisions, leading to aging and eventual death.

The quest for youth and eternal life still is an unsolved mystery; in the meantime, nurses can help patients improve the length of their life by practicing healthy behaviors and learning to manage their own stress more effectively.

8.7 Role of Stress in Family Health

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Describe the impact of stress in family health
- Discuss nursing implications in supporting family-centered care
- Identify means of social support for patients and family dynamics

Families matter. The term **family health** is the acknowledgement that the family as a unique entity also has a health status from healthy to diseased and troubled. Risk factors of stress affect people differently at different ages. Each person experiences common stressors unique to their age. Incorporating the individual patient as part of a whole unique family system can increase positive outcomes. The entire care team plays a role in acknowledging the patient's impact on their family during a hospitalization.

Impact of Family Health

Stress is generally discussed in terms of its impact upon an individual; however, the health and stress level of one family member will affect the family. The family itself is a unique entity and can also experience stress. For example, when a family moves from one house to another location, or a primary breadwinner loses a job, those stressors affect the health of the family as a unit. All families experience stress differently due to the makeup of the individuals and the stress management skills of the family members. Families who have been dysfunctional for generations may continue to see poor stress management skills unless the chain of behaviors can be broken. The same main categories that affect individual stress can affect the family as a whole and include demands, control, support, relationships, roles, and change. Common causes of family stress include

- birth of a child
- change in family housing.
- confusion in roles of family members
- death of a loved one
- divorce, marital problems, and separation
- financial burdens and insufficient funds
- overloaded schedules
- parenting and child discipline
- serious mental or physical illness of one family member
- work-life balance

Some of the most common reactions to stress that frequently are dramatized in Hollywood movies and can commonly be seen in a family unit include

- arguments fighting, and other poor communication
- dependence on and excessive use of food, alcohol, and other addictive substances
- fatigue and disconnection due to exhaustion
- financial difficulties
- inability to provide essential necessities of life for the family
- poor completion of roles and family duties
- withdrawal by family members

When a family unit is under stress, individual members suffer and can go on to develop other negative physical and emotional manifestations of stress. Nurses can acknowledge the impact a patient's stress may have on the family unit. Allowing and inviting family members to visiting hours and being a part of the healing process demonstrate advocacy for the family unit.

Promoting Family Health

Family health makes a difference in the effectiveness of how individuals deal with stress. Ideally, family members can go to each other for counsel and comfort. Including family members to patient education or therapy sessions can be positive. Encourage the family to work together to manage the stress. Provide resources to the family and support parents as they strive to be good role models for children on how to deal with stress effectively. Getting other family members involved in supporting a hospitalized family member can create unity.

When families are under stress, they often need a mediator and resources. A mediator is someone to listen, offer counsel, and point the family to resources. Nurses can be a mediator of sorts, but it is not the nurse's responsibility to be a professional marriage and family counselor. Nurses can be a patient and family advocate by providing a family resources and contact information for professional counselors and services in their community.

Communication

Each family has its own communication style; some are healthy, others are strained and troubled. Some families tease and joke playfully, others are sarcastic and hurtful to each other. Most families learn their communication style from the parents of each parent. Generational habits and skills are carried down and perpetuate.

Nurses can help families improve their communication by first assessing the effectiveness of communication through their interactions with family members. A hospital setting often brings together numerous family members who each interact with the patient and relay various information between the conversations. Hospitals have created policies and procedures to identify one key family member as the main contact person for the family. Having just one person to relay information to makes it easier on the hospital staff and prevents distortions of messages among various family members.

Family Education

Patient education is a large role of a nurse that can influence desired outcomes. Including family members in the room for patient education can help promote correctly understood information. Frequently, a nurse must give education to an ill patient who cannot recall the instructions well. Teaching a spouse or other close family member, and writing the information down increase the chance of correct messaging.

Enhance Social Support

Picture a bride and groom as the top centerpiece on a layered wedding cake that represents their marriage. When the couple is under stress, they can topple and fall off the cake; that is, the marriage is damaged. Now picture the concentric layers beneath the top layer that support the bride and groom at the top and make them more stable. A family unit is like that and it needs support, especially during times of stress. Each unique family is part of a larger community that contains resources and support. Unfortunately, in bigger urban areas, many families do not know about all the resources available in their city. Case managers and social workers are valuable team members the nurse can connect with to learn about resources for a patient and family.

Nurses can enhance social support of families by evaluating what services are needed through patient interviewing and communicating with family members. Then, a nurse can show initiative by communicating with the care manager or social worker on their unit or work setting. Language services, financial aid, employment, and medical supply companies are examples of some of the services available. Nursing students also experience stress and need emotional and social support (Labrague et al. 2017).

Nursing Implications

The implications for nurses in helping to strengthen home and family are powerful. What could be disastrous to a family during a family member's hospitalization can become a strength when support by the medical staff and nurses is given. Nurses are the gatekeepers of birth and death and in an important position to provide resources to families at critical points in their life.

How a nurse handles a new birth or the passing of a loved one makes a huge impact on individuals and families. Combining the art and science of nursing is a skill and makes a difference to lives. Providing care in a humane way can help decrease a normally stressful event. Even the birth of a baby is stressful, and a compassionate nurse can assess the needs of the family and make sure not just the physical needs of the baby are met but those of the entire

family. Simple gestures like offering a cup of coffee or juice to a waiting father or family members in a waiting room demonstrate compassion and awareness of others.

Family-Centered Care

Recognizing that the health of the individual affects the health of the family means expanding patient-centered care to the whole family. Inquiring about family members and their needs demonstrates concern and thoughtfulness. The tone of voice, gestures, eye contact, and culturally appropriate care to meet the needs of the family demonstrate family-centered care.

8.8 Pharmacotherapy and Complementary and Alternative Medicine

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Describe pharmacological treatment for stress
- Describe nonpharmacological treatments for stress
- Identify appropriate CAM therapies based on the patient's presentation
- Explain the nurse's role in educating patients on pharmacotherapy and CAM

As established, stress is part of life, but how one responds to stress depends on many factors and individual variables. What makes stress become distress also varies among individuals, their interpretations of stress, and their ability to cope with the stressor and resources available. Pharmacological and nonpharmacological resources are available to help. Nurses must be able to recognize the signs and symptoms of stress and be ready to help. When a nurse recognizes that a patient is experiencing stress or anxiety, they should share that information with the prescriber so pharmacological options can be offered to help the patient. If medications are not available or appropriate, the nurse needs to know about and offer nonpharmacological options. Nurses must be aware of both approaches because there are limitations and different outcomes with each strategy.

Pharmacotherapy and Stress

There is no medication that can cure stress; however, there are medications available to help address the cause of stress, as well as medications to help promote relaxation, allowing for a mind and body reset. Many people need help getting through a stressful event or difficult time, and pharmacological options are available. They help decrease the brain's stimulation of the sympathetic nervous system, which can provide a respite from the barrage of activated stress hormones. Pharmacotherapy is the use of medications to treat a condition or disease. Prescription medications are those ordered by a prescriber, who can be a doctor, nurse practitioner, physician assistant, or dentist. A concern about prescription medication is the patient's compliance with taking the medication as ordered in the correct quantity and prescribed directions. Nonprescription drugs are those available at a store and can be purchased without a doctor's order. The concern about over-the-counter (OTC) drugs is if the medication will be taken correctly as outlined on the medication label. Any medication has the potential for side effects and adverse reactions and requires good patient education.

The classes of medications commonly given for stress include anxiolytics, hypnotics, antidepressants, sedatives, psychotherapeutics, muscle relaxants, antimigraine agents, and narcotic pain medications. The most common drugs given for chronic stress are selective serotonin reuptake inhibitors (SSRIs) and tricyclic antidepressants. The most common overall medications taken OTC for stress are for tension headaches and pain associated with stress.

An interesting new option many Americans have begun to use is medical marijuana. Although federally illegal to purchase and use, the Federal Drug Administration has approved several medications with marijuana components, such as Megace, which is used as an appetite stimulant, and other compounds used for certain types of seizures. Medical marijuana is still a very controversial issue and states have been left to regulate its use. Some states have approved medical marijuana with various mixtures of the active components of tetrahydrocannabinol (THC) and cannabidiol (CBD), and medical marijuana clinics have expanded exponentially across the nation. There is anecdotal evidence that medical marijuana helps treat stress and anxiety disorders.

Anxiety and Depression

A category of medications that can be used successfully for a short time during stress is anxiolytics. The term literally means to lyse (or breakdown) anxiety. They are used commonly in a hospital setting to help patients relax

before a procedure and can also be used for acute episodes of panic. Anxiolytics can be very effective and can administered orally or intravenously. This group of medications helps people relax and even calm down during an acute anxiety or panic attack. To strengthen the effectiveness of this class, the nurse can also provide guided imagery, deep breathing exercises, and anticipatory guidance to help a patient know what to expect, which also can decrease anxiety. The most common anxiolytics include alprazolam (Xanax), chlordiazepoxide (Librium), clonazepam (Klonopin), diazepam (Valium), and lorazepam (Ativan).

Antidepressants can be effective for elevating the baseline mood of a person so they can cope better. Patients need good education about each class of medication because they are not "magic pills" to take away their problems. It is common with many of these classes of medications that the therapeutic level is not reached until 4–6 weeks after the patient begins taking them; at that point, the patient may begin to feel relief and a change in their depressed mood. Making sure patients are aware of that caveat and providing them additional resources to manage stress are key. There are documented genetic variations in the effectiveness of medications within each category. A challenge is that without genetic testing, patients may be given one of the many types of SSRIs available without seeing any improvement until they switch to another medication, which, again, takes an additional 4–6 weeks to evaluate for effectiveness. The most common classes of antidepressants (Saffai, 2022) are SSRIs, serotonin-noradrenaline reuptake inhibitors, noradrenaline and specific serotonergic antidepressants, tricyclic antidepressants, serotonin antagonists and reuptake inhibitors, and monoamine oxidase inhibitors.

Selective serotonin reuptake inhibitors are the most commonly prescribed antidepressants. The top four SSRIs used to treat depression are citalopram (Celexa), escitalopram (Lexapro), fluoxetine (Prozac), and sertraline (Zoloft).

Nurses must be aware of the side effects possible with any class of medication and follow the rights of medication administration: right patient, right medication, right dose, right time, and right dose. With each medication administration, the nurse should also provide correct patient education regarding the medication and possible side effects the patient should alert the nurse about. For instance, a condition the nurse must be aware of when administering SSRIs is serotonin syndrome. This potentially life-threatening condition is caused by an excess of serotonin in the body, typically resulting from the use of certain medications. Symptoms can range from mild to severe and may include agitation, confusion, rapid heart rate, high blood pressure, dilated pupils, muscle rigidity, and tremors. Prompt recognition and management, including discontinuation of the medications and supportive care, are essential to prevent complications. It is important for a nurse to recognize serotonin syndrome because it can rapidly progress to a life-threatening condition if left untreated. Identifying the signs and symptoms early allows for prompt intervention and management to prevent complications such as seizures, coma, and even death

Post-Traumatic Stress Disorder

PTSD was first identified among U.S. veterans who experienced major mental health trauma during wartime. Experiencing any assault or violence has a huge negative impact on any individual. Flashbacks of the trauma can haunt a person and disrupt their ability to move forward in life. According to the Mayo Clinic and VA studies, symptoms include:

- always being on guard for danger
- being easily startled or frightened
- irritability, angry outbursts, or aggressive behavior
- overwhelming guilt or shame
- self-destructive behavior, such as drinking too much or driving too fast
- trouble concentrating
- trouble sleeping

Years later, the same symptoms of PTSD were recognized among rape victims and victims of other personal assault or violence. Pharmacological interventions and counseling have been the mainstay of therapy.

Medical Marijuana

A controversial option that has evolved over the past four decades is the use of marijuana to treat symptoms of stress, anxiety, and chronic pain. The debate continues as medical research studies demonstrate confusing results. Some studies have shown marijuana, which includes both the hallucinogenic ingredient THC and the CBD components, decreases pain, anxiety, and acute stress, whereas other studies have revealed negative complications or no positive results at all. What complicates the use of this product is that it is currently illegal at the federal level,

as is possession of it. Some states, however, have legalized medical marijuana if it is prescribed by a medical professional with prescribing rights (Pacula et al., 2017).

There are many anecdotal stories of the effectiveness of marijuana, which perpetuates its use and popularity among the public. It has become an option for those without medical insurance because it can be purchased even without a medical prescription. A variety of products are available, including flowers and buds of the marijuana plant, as well as capsules, topical patches and gels, edibles, creams, drops, solids, and liquids (Pacula et al., 2017).

Marijuana is available by prescription in the form of Megace and dronabinol, with proven effectiveness seen in preventing certain types of seizures or stimulating appetite in those with poor nutritional intake. There is inconclusive evidence for its use in many other conditions for which people are using it, including amyotrophic lateral sclerosis, bipolar disorder, other psychoses, dystonia, glaucoma, and Huntington's disease.

REAL RN STORIES

Nurse: B.G, NP
Setting: Marijuana Clinic
Location: Utah

I am a family nurse practitioner and now work in a marijuana clinic. At first, I was quite skeptical about the use of marijuana for medical conditions and stress, but over the years I have changed my opinion. I have seen so many people experience relief from pain, stress, and anxiety that didn't receive the relief from other medications or methods. I'm glad it's an available option now.

Federal and Local Marijuana Laws

Since the 1970s, states have pushed against the federal law to prohibit the production, farming, and use of marijuana. Various states have successfully decriminalized medical marijuana growing and distribution. As of February 2022, 37 US states, 3 territories, and the District of Columbia have legalized cannabis. The THC component is the hallucinogenic component, which has not been shown to have any healthful benefits; however, cannabinoid products that contain CBD have shown some benefit.

Nurses need to be well informed about this issue because medical marijuana use has increased and patients want education. When assessing a patient or doing a medication reconciliation, the use of marijuana needs to be addressed without judgment or shame toward the patient.

Overview of Complementary and Alternative Medicine

The term **complementary and alternative medicine (CAM)** refers to health practices that are used that are not within **allopathic** (traditional Western) practice. The term **alternative** means "other" and is used to describe health practices that are other methods not generally taught in Western medicine. Because of the increasing diversity of the US population and the common use of home remedies not prescribed by providers, nurses need to know about CAM. Another term is **integrative medicine**, which means the CAM is used in combination with, rather than instead of, a prescribed order. For example, a client who has hypertension may take his prescribed medication but also drink herbal tea and practice meditation to help decrease blood pressure.

With the increasing use of CAM therapies in the United States, the National Institute of Complementary and Integrative Health was formed to collect research and establish guidelines for its use (National Institute of Complementary and Integrative Health, 2023). A barrier to having ample research is the lack of entities, typically pharmaceutical companies, interested in paying for the research. Without the hope of a monetary profit, pharmaceutical companies do not generally complete expensive research on organic products such as herbs, which are commonly used in CAM therapies.

As shown in Figure 8.6, CAM therapies can be categorized as follows: energy therapies, biologically based practices, manipulative and body-based therapies, mind-body techniques, and whole medical systems.

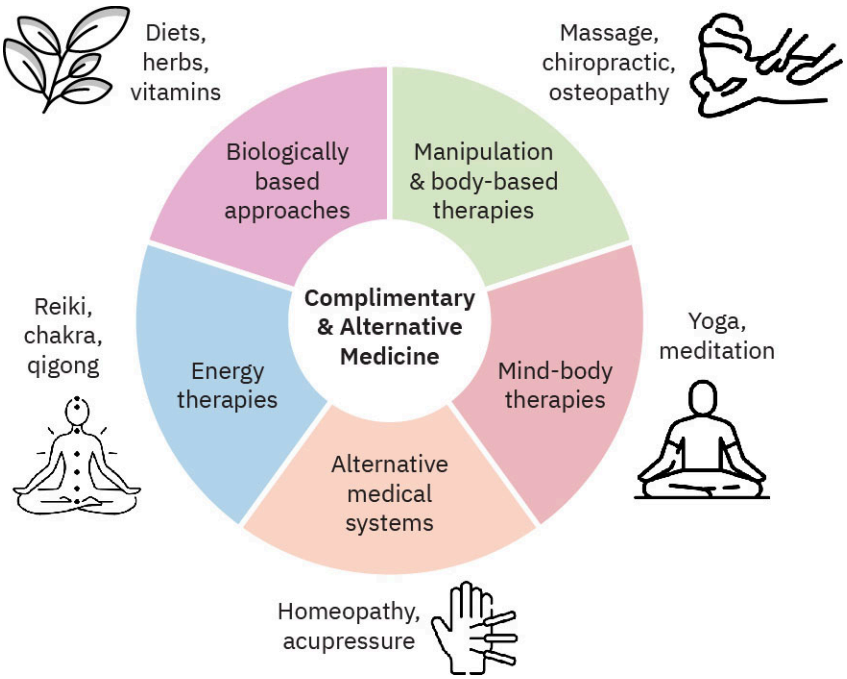

FIGURE 8.6 Complementary and alternative therapies are health practices outside of traditional allopathic medicine. (credit: creazilla.com, CC BY 4.0)

Energy Therapies

The core concept in many complementary and alternative therapies is the belief that energy in the body can be manipulated for healing. The foundation is that illness and disease are caused by a blockage in the body's natural energy flow. Each of the following therapies attempts to restore normal energy flow through different means:

- aromatherapy
- body manipulations
- biological based therapies
- energy therapy
- homeopathy
- herbal remedies
- naturopathy
- nutritional therapies
- whole systems

Energy therapies are the use of any therapy that affects the vital flow of energy through the body. First coined by Franz Mesmer in the 1800s, "mesmerized" was a term used to describe someone who was affected by a change in their energy flow. The concept of energy has been used by medical practitioners of many cultures, including traditional Chinese medicine (TCM), which identifies life energy as *chi*. In ayurvedic medicine, concentrated areas of energy are known as *chakras*. Manipulation of the body through massage and movement is also based on the belief of vital force energy.

More modern forms of energy therapy include red light therapy, which uses infrared or blue lights under which a patient can sit to stimulate circulation and redirect energy. Acupuncture used in TCM attempts to open blocked channels of energy. Reiki and qui gong also originated in TCM traditions and move energy throughout the body by self-movement or having a skilled practitioner move energy above body areas.

Many CAM therapies are based on the belief of vital source energy. Examples include the use of herbal medicine, acupuncture or acupressure, moxibustion, and cupping to help correct imbalances in the biofield of energy in the body to restore health. Without scientific proof, most people have experienced the stress relief that comes from a good massage.

Biologically Based Therapies

Biologically based therapies use herbs, plants, and aromas to bring relief and restore health. Biologically based

therapies include modifying nutrition components, aromatherapy, homeopathy, and naturopathy.

Diets high in certain macro- or micronutrients have been used to decrease the stress response as seen in diets that eliminate known allergens such as gluten, dairy, and eggs. Other forms include consuming certain herbs and vitamins as supplements for the desired outcome.

Aromatherapy in the form of scented candles has been used casually in homes for generations but has now received approval for use in hospital and surgery centers to reduce anxiety and stress. Smell is associated with memories and emotions through the olfactory nerve and can have stimulating or relaxing properties.

Homeopathy was first identified when practitioners took extracts of an active ingredient and administered them in much smaller quantities to provide the desired effects. The concept is that the essence of an herb or plant can be as effective as the entire medicine. Naturopathy is a general category of an approach to health promotion and disease prevention. A naturopath practitioner may use many types of CAM therapy in healing, whereas homeopathy refers to a specific focus on healing with tinctures of plants and herbs.

Manipulative and Body-Based Therapies

A core belief of manipulative and body-based work is to align the body's vital source of energy. Many of the practices focus on realigning the body and organs for the better flow of energy. Massage and chiropractic adjustments are two commonly used therapies. More complex methods are the Feldenkrais method of body alignment.

Whole Medical Systems

Whole medical systems incorporate elements of all these categories and originate from traditional cultural practices for millennia. Such systems include Ayurvedic medicine, Mexican folk medicine, American Indian health practices, and TCM. Most ethnic cultures and peoples around the world have their own versions of folk medicine that have been passed down through family members for centuries.

Studies show that immigrants to the United States may be leery of Western medicine and still prefer to practice their own cultural medicine. Nurses need to be open-minded and ask in a nonjudgmental tone what home remedies patients may be using. Often, the practices can be used with Western medicine, but occasionally there are contraindications, such as the avoidance of ginseng, ginger, and garlic as anticoagulants before surgery. Whole medicine practices may also include prayer, rituals, chanting, and other activities that may be quite helpful to decrease acute stress. These practices may even be used a complement to modern medical practices in the hospital setting if they are not disruptive to the medical and nursing care and do not disturb others.

Mind-Body Therapies

Mind-body therapies focus on calming the mind, which, in turn, can help calm the body. Strategies include mindfulness, meditation, yoga, breathing techniques, and even CBT. Nurses can easily use these strategies and guided imagery with patients who are stressed and anxious in the hospital setting.

Stress Management Techniques

Nursing students would do well to practice these techniques before exams also! Although there is no way to eliminate stress from our lives, we can learn to successfully manage our stress. Lists of strategies can be helpful, but ultimately, they must be individualized to whatever works for the person. The following are some strategies to help decrease stress:

- Avoid drugs and alcohol.
- Eliminate high-sugar and processed foods.
- Enjoy something that is energizing to you.
- Engage with faith-based activities and people.
- Engage in exercise.
- Get a massage.
- Provide self-care with rest and nutrition.
- Schedule time to relax.
- Spend time in healing nature.
- Talk to others.
- Take breaks from watching, reading, or listening to news stories, including social media.

- Do yoga and stretch.

Cognitive Techniques

Because there is such a direct correlation between the mind and body during the stress response, there are many activities that can used to help calm the mind and body. Challenging one's negative thoughts is the beginning of CBT. Thoughts create emotions, which affect behavior. If the thoughts can become controlled, they can help eliminate the anxiety producing physical manifestations of stress. Often asking "what is the worst thing that could happen now" creates introspection and connection with reality that the worst-case scenario is not even realistic. Using cognitive strategies can help decrease stress by controlling the downward spiral of negative and unrealistic thinking.

Physical Techniques

There are many strategies available to use the body to decrease stress. Learning biofeedback through breathing techniques can help decrease blood pressure and heart rate. Using cold compresses to the head, face, and neck can create vasoconstriction and reverse the dilation that occurs during the normal acute inflammatory response or catecholamine response of stress. Because there is such a direct correlation between the mind and body during the stress response, there are many activities that can used to help calm the mind and body. There is a direct correlation between stress in the body and stress in the mind. By learning to relax the body, the mind will follow, and vice versa.

Environmental Techniques

Environmental stimuli can either relax the mind or stimulate it toward stress. Using a calming environment can bring peace to the mind and body. Research has shown that nature is a potent stress reducer and can decrease blood pressure, respirations, and pulse. In our urban settings, people often become disconnected from their physical environment. People may become so accustomed to the noise of traffic and horns and people that they cannot hear the peaceful sounds of birds anymore. A simple action nurses can do is to turn off the noise of a television in a patient's room and allow them to sleep. Many hospitals have a television system in the room that can play nature sounds, which are much more healing than the news. Be aware of the physical environment that may be adding to the stress of a patient and try to exchange it for a peaceful ambience.

Nursing Management

The tasks of nursing management make for busy days and, at times, can be overwhelming. It is human nature to experience stress, but nurses must be cognizant of how their emotional state can influence others. For example, your demeanor as you step into a patient's room can set the tone for the interaction you are about to have. If you are in a hurry and impatient to complete your tasks, the patient will feel that energy and may make them feel as though they are the cause of your stress. It is important to plan your day and go about your work in a well-organized and purposeful way that decreases your stress and helps prevent any stress from being transferred to coworkers and patients.

Promote a Healthy Lifestyle

Nurses are in a unique position to teach healthy lifestyle behaviors to patients. Patients will "hear" your message in your own persona. If you come into a patient's room smelling of smoke or looking disorganized and complaining about not getting a meal break, they will sense your message of healthy living may be hypocrisy. As the saying goes, "the best sermon is your life." Learning about stress in this chapter may be a good opportunity for an assessment of your own stress and management strategies. What is working for you and what is not? Are there lifestyle behaviors you need to make that could decrease your stress? When will you begin? Nursing school is an ideal time to practice stress reduction strategies!

Coping Strategies as Interventions

Interventional strategies to help people cope vary based on what works for them. As a nurse, you can offer patients a list of strategies and help them identify several they are willing to try. Nurses can help the patient identify positive and negative types of coping strategies by asking, "How is that working for you?" If the outcome is negative, the nurse can help strategize about additional methods that could be used.

In a study done with nursing students, origins of stress revealed identified as exams, limited time for family and friends, negative interactions with clinical staff or faculty, work demands, and school-related finances. The study revealed that good coping strategies that helped nursing students included open communication, thinking through

desired outcomes, staying organized, and finding meaning and purpose in the stress (Labrague et al., 2017). Although nursing school is stressful, the desired outcome is graduating as a registered nurse, which is worth it!

Summary

8.1 Homeostasis, Stress, and Adaptation

- Homeostasis is a state of balance in the body. Through continual, often-automatic interactions among body systems, the body attempts to maintain homeostasis as environmental conditions change. Illness and death occur when homeostasis cannot be maintained.
- Stress refers to any disruption to the body's usual state. Stress is a universal part of life, yet individuals may respond differently to the same stressor for a variety of reasons, including physical, emotional, and psychosocial factors.
- Adaptation to stress is needed to maintain homeostasis. Positive adaptive behaviors can restore health, whereas maladaptive behaviors can further increase stress and produce negative outcomes.

8.2 Causes and Types of Stress

- Stressors can be perceived by the body as physical threats to its homeostasis.
- Stressors can be psychosocial, relating to the person's lifestyle, work, relationships, and emotional well-being.
- Stressors can be internal or external in relation to the body.
- Stressors can be short term (acute) or long term (chronic) based on the time frame during which the person experiences the stressor.
- Nurses need to evaluate stressors with the patient to help eliminate and address them.

8.3 Stress and Disease

- Stress can be both the event that activates a stress response and the physical response to a stressor.
- Examples of physical responses to a stressor include infection, trauma, allergic response, and activation of the sympathetic nervous system.
- The interplay of sociocultural, environmental, and mental factors in affecting a person's response to stress is called the Transactional Stress Model.
- Stress can be the cause of disease if not controlled and managed correctly.

8.4 Physiological Response

- The brain's physiological adaptation and response to stress occur through the nervous system.
- Within the autonomic nervous system are two divisions: the sympathetic and parasympathetic nervous systems
- The sympathetic nervous system responds autonomically by activating the body to fight or flee.
- The body attempts to adapt to the demands of stress by each body system.
- The role of the nurse is to identify indicators of physical and emotional stress in a patient.
- Nurses can use vital signs and physical examination findings to evaluate stress in a patient to deliver appropriate care

8.5 Psychological Response

- A stressful event can be neutral, positive, or negative, based on a variety of factors.
- Coping strategies need to be taught across the lifespan.
- The physical, emotional, cognitive, and behavioral effects of stress affect one's health.
- Physical effects of stress can be identified by a nurse during a physical examination.
- Identifying emotional and cognitive effects of stress requires additional interviewing skills by nurses.
- Behavioral effects of stress depend on a person's values, beliefs, age, abilities, thoughts, emotions, and resources.

8.6 Inflammation: Cellular Response to Stress

- Cells function on a continuum of a healthy state contingent on multiple factors that affect cell health.
- The body uses both positive and negative feedback to communicate within all the body systems to produce desired outcomes.
- The inflammatory response is an innate process of protection and attempts to promote recovery from pathogens, injury, or trauma.

- Causes of cellular injury include environmental and genetic factors.
- Cells can be injured as a result of extremes in temperature, poor nutrition, radiation, infections, trauma, and inability to regenerate and repair.

8.7 Role of Stress in Family Health

- Stress affects both the individual and the family unit.
- Family-centered care involves many nursing actions that demonstrate awareness, thoughtfulness, and support.
- Nurses can offer social support for patients and family dynamics.

8.8 Pharmacotherapy and Complementary and Alternative Medicine

- Pharmacological treatment is an option to dealing with stress.
- Nonpharmacological treatments are available options to help people deal with stress.
- Complementary and alternative therapies are viable solutions without negative side effects to help people manage and decrease stress.
- It is in the scope of the nurse to provide patient education about pharmacological and nonpharmacological strategies to address stress.

Key Terms

acute stress short-term bodily disruptions whose signs and symptoms last minutes, hours, or days
acute stressor short-term experience that generally appears suddenly and may cause severe distress, but whose signs and symptoms may last only several minutes, hours, or days
adaptation process of adjusting to the environment as conditions change, either suddenly or over time
adaptive behavior behavior that enables one to decrease distress; may be either positive or negative
allopathic referring to modern Western medicine
alternative referring to health practices that are other methods not generally taught in Western medicine
antigen something that generates an antibody response—hence the term “anti-gen”
apoptosis normal cell death as controlled part of cellular growth and development
autonomic dysreflexia condition seen in patients with spinal cord injury in which the body tries to rid itself of a stressor that the brain cannot recognize
autonomic nervous system division of the peripheral nervous system that responds automatically to chemicals and hormones in the body through sensory and motor neurons
autophagy death of a cell by self-destruction
carcinogenic cancer causing
chronic inflammatory response syndrome (CIRS) conditions of chronic stress caused by chronic inflammation in the body
chronic stress long-term bodily disruptions whose signs and symptoms last weeks, months, or years
chronic stressor long-term experience; it produces stress signs and symptoms that may last weeks, months, or years
complementary and alternative medicine category of nontraditional medicine that explores other modalities to treat the body for healing and wellness
coping ability to adapt and manage a stressful event
cortisol natural hormone emitted from the adrenal cortex, known as the stress hormone, and related to increases in blood glucose and response to the sympathetic nervous system
family health impact of health and illness upon the entire family that may be experienced by one individual in the family
General Adaptation Syndrome theory by Dr. Hans Seyle of the physical stages the body experiences resulting from stress, including alarm, resistance, and exhaustion
homeostasis state of balance in the body
hypothalamic-pituitary axis (HPA) messages from hormones in the blood (the endocrine component) and the nervous system (the neurological component) pass through the hypothalamus and pituitary gland in the brain
inflammatory response initial response of the body to fight against pathogens or insults to the body, beginning with vasodilation to increase oxygen, blood, and antibodies to the area of injury

integrative medicine modalities and practices that are used with modern medicine
local adaptation syndrome localized version of the inflammatory response to stress
maladaptive behavior negative behavior performed to decrease distress
maladaptive coping use of strategies to decrease stress that result in other negative outcomes
negative feedback process of communication within the body to decrease an outcome of the body
negative stress stressful event that produces unhealthful outcomes for the body, such as illness or disease; also causes distress
parasympathetic nervous system one of the two divisions of the autonomic nervous system (aka, the "feed and breed" response); this system prepares the body to rest and digest
physical stress involves measurable disruption to the body
positive feedback communication process within the body to increase a desired outcome in the body
positive stress stressful event that produces healthful outcomes for the body, such as stronger muscles or improved cardiovascular function
psychosocial stress mental and emotional response to stress
rhabdomyolysis massive destruction of muscle and resultant increase in byproducts of breakdown in the blood
stress disruption to the body's usual state
Stress Adaptation Model model of health developed by Hans Seyle in which stress and health are biochemically linked
Stress Transactional Model theory that stress is a transaction and cascade of events that occur in the body in response to a stressor
stressor event or stimulus that activates an individual's stress response
sympathetic nervous system part of the nervous system that controls many of the body's automatic functions, such as heart rate, blood pressure, and perspiration
systemic inflammatory response syndrome (SIRS) serious systemic condition characterized by massive vasodilation, hypotension, tachycardia, and tachypnea, in response to infection and autoimmune disorders or burns.
telomeres distinctive structures at the end of a strand of a chromosome within the cell

Assessments

Review Questions

1. What statement is true regarding homeostasis?
   a. Homeostasis is the body's natural state of balance.
   b. Each body system works independently to maintain homeostasis.
   c. Homeostasis cannot be restored once illness has occurred.
   d. Emotional issues do not impact the homeostasis of the body.

2. The nurse is caring for a client who is admitted with multiple broken ribs sustained in a motor vehicle accident. What is the correct clinical judgement of the nurse for this client?
   a. The client will experience both mental and physical stress.
   b. The client will only experience physical stress.
   c. The patient will not have difficulties healing from the physical stress.
   d. Psychological stress will not be involved for this patient.

3. What is maladaptive behavior?
   a. a balance of body systems
   b. a negative response to stressful event
   c. an event perceived as negative
   d. a model explaining how the body responds to stress

4. What is a true statement about stressors?
   a. All stressors are external.
   b. All stressors are internal.

c. All stressors are interpreted differently based on culture, values, and beliefs.
d. Stressors that are managed quickly are chronic.

5. What is an example of an internal stressor a person may experience is?
a. a viral infection
b. loss of a job
c. emotional turmoil over low self-esteem
d. car accident

6. What is an example that demonstrates an individual experiencing a moderate stressor?
a. a student preparing for final examinations
b. a family experiencing loss of housing from a natural disaster
c. a nurse working in a busy emergency department
d. an individual preparing to move into a new home

7. The nurse is caring for a client who has recently suffered a mental breakdown after her spouse of 55 years died. She smiles and laughs with hospital personnel who come into her room for various activities. What is the best assessment by the nurse?
a. The client clearly has gotten over her emotional stress.
b. Stress is experienced differently by individuals who may manifest their adaptive behaviors differently.
c. The client needs a psychiatric evaluation because her behavior is not appropriate for her grieving and stressful event.
d. No action is needed by the nurse.

8. What is an example of a statement by the student nurse that demonstrates understanding of the Stress Transaction Model?
a. All individuals experience stress the same way.
b. If an individual's stress reaches the exhaustion phase, the client may die.
c. Nurses cannot change the progression of stress for an individual.
d. Nurses can only use medications to intervene in a stressful event.

9. What disease processes can be significantly influenced by stress as a stimulus?
a. musculoskeletal disorders
b. respiratory infections
c. type 2 diabetes
d. renal failure

10. The nurse is preparing a patient for a coronary bypass heart graft surgery. Before handing off the patient to the transport team, the nurse obtains the patient's vital signs and notes an elevated blood pressure and heart rate. What stage of the General Adaptation Syndrome should the nurse suspect the patient is experiencing?
a. exhaustion stage
b. alarm stage
c. resistance stage
d. cardiac decompensation stage

11. The nurse is caring for a client who has been under extreme stress at home and work and comes to the hospital after experiencing a myocardial infarction (heart attack). Upon physical examination, what would the nurse expect to see?
a. relaxed physical appearance
b. regular and stable vital signs
c. disrupted thought processes and anxiety
d. clear communication from the patient

12. What physical manifestations are seen when the sympathetic nervous system is activated during stress?
   a. dilated pupils, constipation, tachypnea, tachycardia
   b. constricted pupils, diarrhea, bradycardia, bradypnea
   c. dilated pupils, warm skin, regular heart rate, hypertension
   d. constricted pupils, increased gastric juices, relaxed breathing

13. The nurse recognizes the patient is experiencing a positive psychological impact when has what sort of reaction?
   a. feeling anxious or depressed
   b. feeling energized and excited
   c. feeling confused and unclear
   d. having no emotions toward the event or stressor

14. The nurse is caring for a patient who is given a new diagnosis of cancer. During the physical assessment, the nurse notices a new bald spot on the patient's head, jagged fingernails, and alcohol on the breath. What is the nurse's best therapeutic response?
   a. "Cancer isn't always fatal. It'll be okay."
   b. "I notice you have been pulling out your hair. Do you think that will help?"
   c. "Do you want me to call your clergyman?"
   d. "I notice some changes in your appearance. Please tell me how you're feeling about your new diagnosis."

15. What statement best aligns with the definition of the appraisal of a stressful event?
   a. the physiological response to stressors in the health care setting
   b. the process of evaluating the significance and potential impact of a stressor on an individual's well-being
   c. the implementation of coping strategies to manage stress in the workplace
   d. the assessment of patient satisfaction with nursing care during stressful situations

16. The nurse is teaching a student nurse about the negative feedback response to stress to stabilize vital signs. What is an example of negative feedback?
   a. Blood pressure is elevated during an infection.
   b. The body works to reduce temperature from overexposure by sweating.
   c. The respiratory rate is increased during sleep.
   d. The level of consciousness is decreased due to head trauma.

17. The nurse is caring for a client who has an infection. What clinical manifestations will the nurse expect to see during the acute phase of the inflammatory response?
   a. cyanosis of the skin, bradycardia, and bradypnea
   b. tachycardia, elevated temperature, possible hypotension
   c. shortness of breath, tachycardia, and low red blood cell count
   d. fewer white blood cells, low lactate level, and high BUN and creatinine levels

18. What cause of cellular injury is most commonly found in clinical practice?
   a. inadequate blood supply
   b. nutrient-deficient diet
   c. regular exercise
   d. chemical exposure

19. How does stress typically affect family health?
   a. Stress has minimal impact on family health.
   b. Stress can lead to improved family communication.
   c. Stress can negatively affect family dynamics and overall well-being.

d. Stress only affects individuals, not families.

20. What is a crucial nursing implication in supporting family-centered care?
a. prioritizing the individual patient needs over family concerns
b. limiting family involvement in care decisions
c. recognizing and respecting the importance of family involvement in patient care
d. avoiding unnecessary communication with family members

21. A patient wants to use a nonpharmacological approach to treat stress. What could the nurse recommend?
a. nonsteroidal anti-inflammatory drugs
b. prescribed narcotics
c. an SSRI antidepressant
d. meditation and focused breathing

22. When administering a new SSRI antidepressant prescription to a patient, what is an important concept to teach the patient about this class of drug?
a. It must be taken with food and water.
b. It may cause nausea and diarrhea.
c. It may take 4 weeks to reach therapeutic level.
d. It cannot be taken with grapefruit juice.

23. The nurse is caring for a patient who is admitted for a head trauma and is not allowed to have narcotics for pain to avoid masking any signs of increasing intracranial pressure. What safe alternatives could the nurse offer to help decreasing pain and stress?
a. breathing techniques and guided imagery
b. morphine given at half dose
c. dilantin as prescribed
d. ventilator support by the respiratory therapist

Check Your Understanding Questions

1. Sarah, a 40-year-old mother of two, has recently been diagnosed with breast cancer. She is undergoing chemotherapy treatments while trying to balance her responsibilities at home and work. Her husband, John, is supportive but struggles to cope with the emotional strain of seeing his wife go through treatment. Their teenage children are also experiencing stress and anxiety about their mother's illness. Describe how stress may affect the health and dynamics of Sarah's family during her cancer treatment.

2. Sophia, a nurse in a community health clinic, is caring for Maria, a single mother of three who has recently been diagnosed with diabetes. Maria is overwhelmed by her diagnosis and struggles to afford her medication and make healthy lifestyle changes. She expresses concerns about managing her diabetes while taking care of her children and working full-time. Identify means of social support that Sophia can recommend to Maria and her family to help them cope with her diabetes diagnosis.

Reflection Questions

1. Identify some strategies you as the nurse can offer a patient who may be experiencing both physical and psychological stress from a hospitalization.

2. Imagine you are a nurse caring for a client who is about to receive their first dose of chemotherapy. The client has developed high blood pressure and tachycardia and is now hyperventilating. How might stress have caused these changes in vital signs?

3. You are a nurse working on a busy medical-surgical unit. One day, you admit Mrs. Johnson, a 65-year-old woman who has been diagnosed with cancer. Mrs. Johnson is accompanied by her husband, who appears visibly distressed and overwhelmed by his wife's diagnosis. Throughout Mrs. Johnson's hospitalization, you notice that Mr. Johnson seems withdrawn and hesitant to leave his wife's side, indicating that he may be

struggling with emotional support needs. Reflect on how you would approach identifying and addressing social support for both Mrs. Johnson and her husband during this challenging time.

What Should the Nurse Do?

Jane, a 35-year-old woman, comes to the emergency department complaining of chest pain and difficulty breathing. She reports feeling overwhelmed and anxious for the past few weeks due to increased workload at her job as a project manager. She mentions experiencing frequent headaches, insomnia, and irritability. Jane has a history of hypertension and migraines but is otherwise healthy. On assessment, her blood pressure is elevated at 160/90 mm Hg, heart rate is 110 beats per minute, respiratory rate is 24 breaths per minute, and oxygen saturation is 95% on room air. She appears restless and diaphoretic.

1. What psychological factors might be contributing to Jane's presentation, and how do they interact with her physical symptoms?
2. How can the nurse provide a supportive and calming environment for Jane to help alleviate her acute stress symptoms?

You are caring for a young adult who comes to the clinic for an appointment and physical exam for a sports requirement. The young adult did not have an appointment and is told she cannot be seen. Rather than viewing it as an inconvenience that she must schedule the appointment for another day, she begins to shout at the front desk and demand an appointment today. Her response seems exaggerated and irrational.

3. As the nurse, what initial steps should you take when faced with the young adult's exaggerated and irrational behavior at the front desk?
4. Why is it important for the nurse to conduct an assessment of the young adult's current perceived stress and threats?
5. What potential factors might contribute to the young adult's behavior in this scenario?

You are studying with a fellow nursing student who confides in you about being stressed due to school demands, limited income, and a new breakup with a boyfriend. She admits she cannot study and now has the added stress of doing poorly on the upcoming exam. She is tempted to cheat on the exam to pass.

6. How can you support your fellow nursing student in developing healthy coping mechanisms to manage her stress effectively?
7. What are some strategies you could suggest to help her address the school demands, financial challenges, and emotional distress caused by the breakup?
8. How can an understanding of the physiological and psychological effects of stress help you provide empathetic and effective support to your fellow nursing student during this challenging time?

Ms. Greene, a 45-year-old woman, presents to the emergency department complaining of severe abdominal pain and tenderness. She reports experiencing intermittent fever and chills over the past few days. Ms. Greene has a medical history of type 2 diabetes and hypertension. On examination, her vital signs reveal a temperature of 38.9°C (102°F), heart rate of 110 bpm, blood pressure of 150/90 mm Hg, and respiratory rate of 22 breaths per minute. Upon further assessment, localized inflammation and guarding are noted in the right lower quadrant of her abdomen. Based on her symptoms and medical history, differential diagnoses include appendicitis, diverticulitis, or pelvic inflammatory disease. Further investigations are warranted to identify the underlying cause of her symptoms and initiate appropriate treatment.

9. What clinical manifestations would prompt the nurse to suspect an inflammatory process in Ms. Greene's case?
10. What immediate nursing interventions would be appropriate to manage Ms. Greene's symptoms and stabilize her condition?

Competency-Based Assessments

1. How does understanding the fundamental concepts of stress aid nursing students in recognizing signs and symptoms of stress in patients?
2. Explain the relationship among stress, adaptation, and homeostasis in the context of a patient experiencing a chronic illness.
3. How might an individual's past experiences influence their response to stress in the present?

4. Provide examples of how chronic stress may contribute to the development or exacerbation of autoimmune disorders.
5. What clinical manifestations would a nurse recognize when a patient is experiencing acute stress?
6. Compare and contrast the sympathetic and autonomic nervous systems' responses to stress. How can this knowledge guide nursing interventions?
7. As a clinical nurse, when you encounter a patient exhibiting signs of stress, how can you use the theory of adaptation when providing care for this patient?

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CHAPTER 9

Management of Chronic Illness

FIGURE 9.1 This wheelchair-bound patient uses a service animal but is still able to participate in daily activities, despite chronic illness. (credit: "Drive to support assistance dog owners in Dudley borough" by Dudley Council/Flickr, CC BY 2.0)

CHAPTER OUTLINE

INTRODUCTION You are a nurse assessing a 57-year-old female patient, Mia, with a history of a musculoskeletal trauma that has kept her in a wheelchair since she was 10 years old. She has also recently been diagnosed with a seizure disorder that requires the use of a service dog. She has been working closely with her care team to manage her symptoms and improve her quality of life as much as possible. She is looking forward to getting out of the house more and being around friends now that she has a trained service dog that can detect her seizures before they occur.

Regardless of their specialty and practice setting, nurses will inevitably encounter patients with chronic illness, such as Mia. Long-term but often manageable health problems affect large portions of the population despite factors such as age, gender, ethnicity, and geography. For this reason, it is important that all nurses become knowledgeable about chronic illness and are adequately prepared to care for patients with chronic medical conditions.

9.1 Chronic Disease and Illness (Prevalence and Etiology)

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Define chronic disease
- Discuss the impact of chronic disease and illness on patients
- Discuss demographic factors that influence chronic disease and chronic illness

Chronic diseases and illnesses are disorders that have a slower onset and are long-lasting. In comparison, **acute disease** refers to an illness that develops quickly and lasts a relatively short time, typically days or weeks (National Council on Aging, 2024). Chronic disorders affect more than half of the US population and are the leading causes of death and disability in the United States (Centers for Disease Control and Prevention [CDC], 2022a). They cost the US health care system nearly $3.7 trillion annually, accounting for 90% of the nation's total health care costs (CDC, 2023b).

The significance of chronic diseases and illnesses on the health of the population, coupled with associated economic costs, has shifted the focus of health care and research to disease prevention and health promotion (Healthy People 2030, n.d.). This shift has prompted the US government and health institutions to prioritize population health and implementation of strategies to prevent and mitigate the effects of chronic illness and disease.

Chronic Disease

We define **chronic disease** is defined as a medical or health problem that lasts at least 1 year and requires ongoing medical attention or limits activities of daily living (ADLs) (CDC, 2022c). This definition encompasses the pathophysiological causes of the health problem and the disorder itself but does not address the subjective feelings and experiences of the patient who is living with the illness. Examples of chronic diseases include

- Alzheimer disease
- arthritis
- cancer
- cardiovascular disease (CVD)
- chronic kidney disease
- chronic lung disorders (e.g., asthma, chronic obstructive pulmonary disease [COPD])
- diabetes mellitus
- heart failure
- hyperlipidemia
- hypertension
- HIV
- mental health disorders (e.g., anxiety, depression)
- osteoporosis
- stroke

Chronic Illness

Many people use *chronic disease* and *chronic illness* interchangeably, but it is useful to distinguish between the terms. Although the definition of chronic disease refers to the disorder itself, **chronic illness** is defined as the human experience of living with a chronic disease (Martin, 2007). This definition encompasses the emotions, values, and beliefs of the individual experiencing the chronic condition and the impact the disorder has on their quality of life and ADLs.

The feelings and experiences associated with living with chronic illness vary significantly from person to person and can change frequently depending on factors such as age, the presence (or lack) of social support, and other social and demographic characteristics. As a nurse, it is important to understand that not all patients experiencing chronic illness will successfully cope with their condition in the same way. Nurses must be able to communicate effectively and implement treatment and support strategies that are reflective of the patient's beliefs and values as they relate to their chronic conditions.

Demographic Factors Affecting Chronic Disease and Illness

Age, gender, and culture are three demographic factors that can have a significant impact on chronic disease and illness. For example, a child or adolescent experiencing a chronic disease is likely to have a completely different outlook on life than an older adult, due to differences in their respective lived experiences. Another example is the increased prevalence of certain chronic diseases seen in one gender compared with the other. Specifically, osteoporosis, depression, and arthritis are all more commonly seen in females than in males (Temkin et al., 2023). Additionally, an individual's culture, including factors such as religion or spiritual beliefs, may influence how they approach and cope with chronic illness. Regardless of the factors in any given case, it is imperative that the nurse provide patient-centered care that considers the specific preferences and needs of the patient.

CULTURAL CONTEXT

Culture and Perspectives on Chronic Disease

Culture provides an important source of values and comfort for patients, families, and communities, and it often influences how they view chronic diseases. Some cultures may view chronic disease as a punishment or a test of faith. In others, chronic disease may be attributed to environmental factors. Cultural beliefs also often influence the types of treatments sought for chronic disease. Traditional healing practices, such as herbal medicine or spiritual rituals, may be preferred over Western medical interventions in some cultures. For example, Asian Americans are more likely to use complementary and alternative medicine compared to other races (Felicilda-Reynaldo et al., 2020). It is important for the nurse to remain open-minded and nonjudgmental about the patient's cultural beliefs and preferences with regard to chronic disease.

9.2 Comorbid Chronic Diseases

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Define comorbidity and its financial impacts
- Explore common examples of comorbid chronic diseases
- Discuss unique health care needs and health care coverage for comorbid chronic diseases

If it is difficult to live with one chronic disease, imagine the challenges facing patients with multiple chronic diseases simultaneously. In fact, more than 25 percent of individuals with chronic illness are diagnosed with two or more chronic conditions (Boersma et al., 2020). This is significant considering that individuals with chronic illness report lower health-related quality of life and have higher health care costs and a substantially increased risk of morbidity and mortality.

Comorbidity

The simultaneous presence of two or more medical conditions is referred to as **comorbidity**. It has a profound impact on **disease burden**, the total effects of a disease on an individual or a society. This burden of disease, especially when it involves chronic conditions, affects many aspects of health care, including finances and health insurance coverage, both of which are discussed in more detail in the following sections.

Financial Impacts from Comorbid Chronic Diseases

As noted in the previous module, nearly 90% of health care costs in the United States are related to chronic illness (CDC, 2023b). This highlights the importance of chronic disease burden on both the economy and personal finances. As the number of diagnosed chronic conditions increases for an individual, so do the number of emergency room visits, patient readmissions, prescriptions, and outpatient clinic visits, as well as the length of inpatient hospital stays. These increases in required health care services result in higher out-of-pocket costs and health care spending by insurance companies and health care institutions. Americans diagnosed with five or more chronic conditions account for only 12% of the population but make up nearly half of total health care spending, again highlighting the significance of the relationship between chronic illness and increased health care expenditures (Buttorff et al., 2017). This places an extra financial burden on the patients themselves as well as on the health care system and the overall economy.

Health Care Coverage for Comorbid Chronic Diseases

Health insurance coverage is a topic that has been debated and discussed at length by politicians, legislators, and individual health care consumers. Although consensus about the best course of action for the provision of health insurance remains elusive, it is clear that health insurance coverage becomes more complex with the presence of chronic comorbidities.

Coverage for chronic conditions varies depending on the type of health insurance acquired. Two of the most common health insurance plans for patients with chronic disease are offered through federal programs such as Medicare and Medicaid, both of which are administered by the Centers for Medicare and Medicaid Services (CMS). However, these programs have specific eligibility requirements that may not allow all individuals with chronic illness to obtain coverage. Table 9.1 lists the eligibility requirements for each program and some of the services covered (CMS, 2023).

Characteristic	Medicare	Medicaid
Eligibility requirements	• Older than 65 years Or: • Presence of a disability or diagnosis of end-stage renal disease or amyotrophic lateral sclerosis (regardless of age)	• Individuals and families with low income (determined on the basis of household size and other factors)
Covered services	• Hospital services • Medical care (e.g., clinic visits, laboratory services, outpatient care) • Prescription medications • Some medical equipment	• Dental care • Hospital services • Long-term care • Medical care • Medical equipment • Prescription medications • Some vision benefits

TABLE 9.1 Comparison of Medicare and Medicaid

Examples of Comorbid Chronic Diseases

There are a multitude of common chronic diseases, several of which tend to occur as comorbid comorbidities. This is often due to certain characteristics of the disease, such as anatomic location or underlying pathophysiology, which can manifest as multiple disorders with similar etiologies. For example, one of the most common pairs of comorbidities is hypertension (i.e., elevated blood pressure in the blood vessels) and hyperlipidemia (i.e., elevated cholesterol in the blood vessels). This is likely because hyperlipidemia results in the deposition of fatty plaques in the vasculature, which increases the force of blood through the vessels, resulting in hypertension (Healthmatch, 2022). In this case, the presence of one chronic condition (hyperlipidemia) results in the development of another (hypertension). Other chronic conditions that often exist as comorbidities include:

- atherosclerosis and CVD
- cerebral vascular disease and carotid stenosis
- COPD and other upper respiratory disorders (e.g., chronic laryngitis, chronic sinusitis)
- diabetes mellitus and CVD
- mood disorders (e.g., depression, anxiety, bipolar disorder) and substance use disorders
- osteoarthritis and other autoimmune disorders

Comorbidity Management with Polypharmacy

With an increased prevalence in diagnosed comorbid chronic conditions, there is often an associated increase in the number of medications prescribed to treat each condition. The simultaneous use of multiple medications by a single patient is called **polypharmacy** (Figure 9.2). Polypharmacy can result in negative outcomes, including adverse medication reactions and overdoses, so it is important for nurses to be aware of the risks associated with polypharmacy when caring for patients with multiple comorbidities. Nurses should be prepared to advocate for clear

communication between providers and patients to mitigate these associated risks.

FIGURE 9.2 Polypharmacy is common in older adults, because many suffer from multiple chronic conditions. (credit: National Institute on Aging, public domain)

LINK TO LEARNING

Read this article (https://openstax.org/r/77polypharm) to learn about efforts to reduce the effects of polypharmacy in older adults.

9.3 Chronic Illness and Disability

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Define disability and identify common diseases that contribute to disability
- Discuss the chronic effects of disability on a patient's wellness continuum
- Examine the legal and ethical considerations of providing equitable care for an individual with a disability

Chronic disease has the potential to negatively affect all aspects of everyday life for those with such a diagnosis. This is especially true for those diagnosed with multiple chronic conditions. These conditions can result in physical disabilities and take emotional, mental, and financial tolls on a person's overall health and well-being. Fortunately, in the past several decades, legislation has been passed and financial resources have become more readily available for individuals with disabilities related to chronic illness. However, there is still much work to be done to ensure equitable and adequate treatment for individuals with disabilities, both within the health care system and in everyday life.

Disability

A **disability** is a limitation in function or performance of everyday activities. Disabilities often occur because of chronic illness. They vary from person to person but can include the inability to effectively see or hear, perform ADLs, work a job, or complete school assignments. One in four Americans lives with a disability that affects their everyday life (CDC, 2023c). The most common disabilities in the US include:

- cognition: difficulty concentrating, remembering, and making decisions
- hearing: complete deafness or severe hearing loss
- mobility: difficulty walking or climbing stairs
- self-care: difficulty performing ADLs
- vision: complete blindness or severe loss of eyesight

Individuals with disability are also at higher risk for having obesity, smoking, and developing additional chronic conditions, including heart disease and diabetes, all of which negatively affect overall health and well-being (CDC, 2020).

Effects of Disability on a Patient's Wellness Continuum

Though many people may assume wellness is simply the absence of illness, it is a multidimensional concept that includes several different components (Figure 9.3):

- emotional health
- meaningful spiritual life

- mental health
- physical health
- positive relationship with one's environment
- positive relationship with one's financial status
- positive relationship with one's occupation
- satisfying social life

FIGURE 9.3 Wellness is a multidimensional concept that encompasses several components. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

In addition to being multidimensional, wellness exists on a continuum: there exists a wide variety of individual definitions of health. Figure 9.4 illustrates the illness–wellness continuum. On one end of the continuum is premature death; the other end represents a high level of wellness. The middle portion of the continuum represents individuals who may have some aspects of wellness and some aspects of illness. Therefore, even with a chronic disease diagnosis, individuals may still fall somewhere on the high end of the continuum if they ensure they are improving other aspects of wellness beyond just physical health.

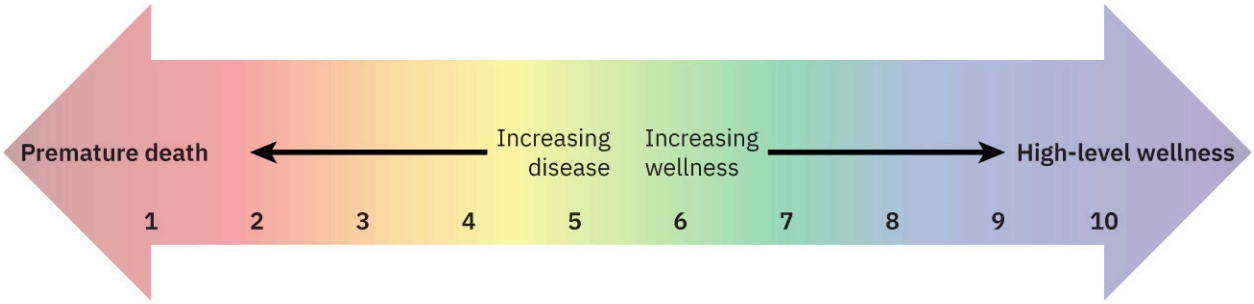

FIGURE 9.4 The wellness continuum illustrates how an individual's wellness may increase or decrease along a scale. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Health care and nursing have begun to prioritize preventive health and self-care, which allows patients to achieve higher levels of wellness along the continuum and results in an overall improved state of health and well-being, despite physical or mental disabilities (Martínez et al., 2021).

Physical Impacts

Many physical barriers can affect the everyday life of individuals with disabilities. Individuals with physical disabilities are often unable to access certain places or resources because they physically cannot get there. This includes situations such as curbs or stairs without ramps, elevators, or other accessible options; lack of automatic doors; poorly lit environments; narrow sidewalks, doors, or aisles; bathrooms or parking spaces that are

inaccessible; and lack of aids to help those with hearing impairment communicate.

Emotional and Mental Impacts

The physical barriers obstructing individuals with disabilities and the impacts of these barriers on a person's wellness are relatively easy to visualize. The emotional and mental impacts of disabilities are often more difficult to envision because they may not be physically present. Nevertheless, the experience of living with a disability, particularly in an unaccommodating or biased society, can have an even more detrimental impact on an individual's emotional and mental well-being. Studies have shown that individuals with disabilities are five times more likely to experience mental distress than those without a disability (CDC, 2023c).

Financial and Social Impacts

In addition to their physical and mental impacts on health, disabilities can also have substantial negative impacts on a person's financial and social well-being. For example, individuals with disabilities are less likely to be employed, which results in an increased risk for living in poverty and experiencing the detrimental health effects associated with low socioeconomic status, such as lack of access to dental care or being unable to afford healthy food options. Individuals with a disability who are employed will likely have to miss work periodically due to their disability, which may affect their income and potentially their employment status if their employer is unwilling to accommodate these absences. In terms of education, people with disabilities are less likely to have completed a high school education, which limits their ability to find employment (CDC, 2023c).

Although unemployment and limited education affect the financial status of the person with a disability, there are also social impacts to consider. Unfortunately, there is a stigma surrounding people with disabilities: society often views them as weaker or "less than" those without a disability. This stigma undoubtedly contributes to the unwillingness of some employers to hire individuals with disabilities and fuels biases within society. Though there has been a recent shift within society to be more inclusive of all people, there continues to be **discrimination**—the unjust or prejudicial treatment of certain people—against individuals with disabilities.

Considerations for Equitable Care among People Living with Disabilities

Though a societal shift toward inclusion and understanding is happening, discrimination toward individuals with disabilities is still common. Discrimination takes place in the workplace, social situations, and many other settings in everyday life. To help eliminate discrimination, the US government has developed several programs that provide funding and other financial resources to individuals with disabilities. An overview of these programs and resources is provided in Table 9.2.

Resource	Overview
Centers for Medicare & Medicaid Services (CMS)	Provides health insurance for low-income individuals with disabilities
Supplemental Nutrition Assistance Program (SNAP)	Helps low-income individuals and families pay for groceries (formerly known as "food stamps")
Temporary Assistance for Needy Families (TANF)	Provides a cash assistance payment program for low-income individuals and families
Social Security Disability Insurance (SSDI)	Pays for health benefits of individuals who cannot work due to medical conditions or disabilities. A person must work for a certain number of years to earn this benefit and be able to use it.

TABLE 9.2 **Federal Resources for Individuals with Disabilities**

Resource	Overview
Supplemental Security Income (SSI)	Provides monthly payments to qualified low-income individuals with a disability
Children's Health Insurance Program (CHIP)	Provides health insurance coverage to uninsured children who live in families that make too much money for Medicaid but cannot afford private health insurance

TABLE 9.2 Federal Resources for Individuals with Disabilities

Children

In addition to the financial resources listed in Table 9.2, legislation has been passed that protects children with disabilities from discrimination. Specifically, the Individuals with Disabilities Education Act (IDEA) ensures that all children with disabilities have access to a free, appropriate public education. This act provides a comprehensive and coordinated approach for implementing early intervention services for infants and toddlers with disabilities to ensure they have the resources they need to be successful in the future. Additionally, this legislation provides the necessary tools and resources to parents and educators of children with disabilities to provide an adequate educational experience regardless of a child's specific disabilities or limitations. This may include certain accommodations or special education programs that are tailored to the child and their specific disability. However, it is important to note that IDEA is severely underfunded, highlighting the need for more advocacy and federal funding on behalf of children with disabilities (Blad, 2020).

Veterans Living with Disabilities

Veterans are another group at higher risk for physical, emotional, and mental disabilities (Figure 9.5). This group has seen a significant increase in suicide rates, indicating the need for thorough mental health assessment and swift intervention if any signs of suicidal ideation are noted (Sheehy & Schwartz, 2021). Several programs have been developed to care for this specific population. Primarily, veterans have access to health care through the Department of Veterans Affairs (VA). Through the VA, eligible veterans can obtain disability compensation: a monthly, tax-free payment to veterans who are unable to work because of a disability acquired during active service. This may help take the financial burden off the veteran with a disability and improve their overall health and well-being. However, this program is underfunded and at risk of being unable to support the growing needs of this population (Shane, 2022).

Another program available to assist veterans with disabilities is the Wounded Warrior Project (WWP). The WWP is a charitable organization that provides resources to veterans after they return home from war or military conflict. These resources include counseling, rehabilitation services, and social support.

FIGURE 9.5 Members of the military, both former and present, often require special services to treat disabilities resulting from their service. (credit: "National Veterans Wheelchair Games 2022" from U.S. Department of Veterans Affairs, /Flickr, Public Domain)

Vocational Programs for Patients with Disabilities

Because a sizable portion of discrimination against individuals with disabilities occurs in the workplace, there has been an increase in the development of vocational programs to help such individuals find and keep employment. Traditionally, these programs have been offered at the state level, so they may vary from state to state in terms of services provided. However, most programs offer employment services such as job training and placement, career counseling, and financial planning. These resources are intended to help individuals with disabilities not only prepare for the hiring process but also keep their job and maintain a consistent employment status.

Americans with Disabilities Act

The Americans with Disabilities Act (ADA), passed in 1990, is a federal law that prohibits discrimination against individuals with disabilities. This law also oversees and mandates that public businesses provide individuals with disabilities an equal opportunity to access services and commercial goods. This is accomplished by ensuring that businesses and workplaces provide reasonable accommodations for those with disabilities. Examples of accommodations for patients with chronic conditions include

- allowing service animals on public transportation and inside businesses
- installing wheelchair ramps and elevator access in place of stairs (Figure 9.6)
- placing handicap parking spaces closer to entrances
- providing sign language interpretation
- providing testing accommodations for individuals with learning disabilities
- providing visual aids to assist with visual impairment
- providing wheelchair-accessible bathrooms

FIGURE 9.6 Ramps allow people in wheelchairs to access buildings whose entrances are not at ground level. (credit: "Access to the ramp in a wheelchair" by Правительство Калининградской области/Wikimedia Commons, CC BY 4.0.)

Nurses with Disabilities

There are nurses with an array of disabilities who can still practice nursing. For example, some nurses who have hearing impairments use special stethoscopes for auscultation. Some nurses leave the bedside due to physical injuries that create permanent disability, but they continue to work in other modalities such as informatics, nursing education, case management, and office work. There are also nurses with emotional and mental disabilities who have accommodations in place to ensure they can perform their duties effectively.

9.4 Access and Barriers to Health Care

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Define the common obstacles to health care access for chronically ill patients
- Explain the social and financial considerations for patients with chronic diseases
- Summarize the role of the home care nurse and criteria for patients to receive home care services

Many barriers may limit health care access for individuals with disabilities. These barriers can be financial, geographic, or social, in addition to other external environmental factors. These barriers are closely related to the social determinants of health, which are defined as the conditions in which people are born, work, grow, live, and age (see Figure 2.2) (CDC, 2022b). These determinants can significantly influence not only an individual's access to health care but their general health status as well.

LINK TO LEARNING

Race and ethnicity can have a significant impact on an individual's access to and ability to afford quality health care. This fact sheet (https://openstax.org/r/77disparities) lists data on health disparities for members of various racial ethnic groups.

Access to Health Care

Health care access has been and continues to be an important issue both in the United States and globally. Some individuals, especially those with disabilities and chronic illnesses, may have more difficulty obtaining adequate health care services. This can be due to many factors, including lack of health insurance, low socioeconomic status, limited (or lack of) transportation, geographic location (e.g., patient lives in a rural area without nearby health care services), and work and schedule constraints.

Social and Financial Considerations

Social and financial factors that may influence an individual's ability to access health care include employment status, transportation, and geographic location. Coupled with a chronic illness or disability, these factors become even more complex, making it more difficult to access necessary health care services and manage their illness. For example, members of a lower socioeconomic class may struggle to afford health care or to physically access it due

to geographic remoteness.

Employment

Employment status can contribute to lack of health care access in many ways. First, individuals with chronic illness and disabilities may have limited employment options, forcing them to take lower paying jobs without adequate health insurance coverage. Though employers are required to provide reasonable accommodations because of the ADA, they do not always comply with the law, and government regulators may lack the resources to catch and remedy noncompliance. Additionally, some jobs, such as those involving manual labor, may not be able to provide accommodations that allow for certain individuals to effectively complete the work required. Individuals with severely debilitating chronic conditions may not be able to work at all.

Some individuals may have to take lower-paying jobs and end up living in poverty, making it nearly impossible to afford health insurance or pay for health care services out of pocket. Additionally, many of the job opportunities available to individuals with disabilities are only offered part-time and, therefore, do not provide benefits such as health insurance coverage. This further reduces health care access because these individuals are unable to pay for their own private insurance or afford out-of-pocket costs for services. Though there are financial resources available for these individuals (as shown in Table 9.2), they often do not receive enough assistance and are unable to afford adequate health care.

Transportation

A lack of, or limited access to, transportation is another factor that can negatively affect health care access. Findings from a 2020 national survey show that 5.8 million Americans annually delay health care because they do not have transportation (Wolfe et al., 2020). This survey also determined that individuals living in poverty and those with chronic health conditions are disproportionately affected. This factor is compounded when many individuals with disabilities cannot use public transportation options. The ADA requires reasonable accommodations, including public transportation, but the provided accommodations are not always adequate to allow all people with disabilities to use them. This inadequacy of resources is related to multiple factors, including a lack of funding and the wide diversity of disabilities experienced in society. There may also be other constraints, such as the financial cost of taking public transportation, limited routes that do not service certain places, or limited schedules that do not coincide with an individual's availability.

The private sector has made some efforts to address this problem. For example, modern vehicles are increasingly built with adaptive equipment, including greater integration of hand controls and assistance straps, and ramps for exiting and entering the vehicle (National Highway Traffic Safety Administration, n.d.). However, more is needed. Federal legislation to expand the availability of low-cost transportation has been discussed over the past several years but is still being developed (Federal Transit Administration, 2023). Until major improvements are made to increase access to public transportation throughout the United States, this remains a major barrier for many people, especially those with chronic conditions and disabilities.

Residence (Geographic Location)

Geographic location is another factor that can affect an individual's access to health care. Just as with a lack of transportation, living too far away from health care facilities can decrease an individual's ability to obtain necessary services. An additional challenge in rural areas is the lack of the appropriate health care specialists. Partly to address this problem, there has been a shift in recent years to use more telehealth, which refers to the provision of health care remotely via telecommunication devices and technology. Insurance plans are increasingly providing coverage for telehealth services (US Department of Health and Human Services, 2023). Unfortunately, they are not always appropriate or practical, because not all individuals have access to high-speed Wi-Fi or other necessary technology for telehealth. Furthermore, not every medical service or procedure can be administered remotely. Even so, for individuals who lack convenient, in-person access to health care providers, the use of telehealth can be quite beneficial.

Self-Care and Personal Assistance

Another factor that can influence health care access is related to the individual's ability to perform self-care and the degree of personal assistance they require from others. Although some people with disabilities and chronic conditions can live independently or with family members, others may reside in skilled nursing facilities or other assisted living institutions, where they require extra help in performing ADLs and getting to and from appointments.

This makes health care access more difficult because these individuals may have to rely on others to take them to their appointments or to interpret or implement their treatment plan. Most assisted living facilities have programs in place to help with these needs, but many facilities are short-staffed, and caregivers are not always able to effectively assist patients with their health care needs (Heiks & Sabine, 2022).

This factor becomes even more complex when you consider that many individuals with disabilities are still living on their own at home and do not have access to caregivers or other services that would be provided in a facility setting. These individuals often must rely on family or friends for transportation or other help, which can be a significant barrier to health care access.

Home Care

Although some people with disabilities are unable to work, those with severe, debilitating disabilities may not even be able to leave their homes. In these situations, home nursing care may be required, but certain criteria must be met first. These criteria will vary slightly depending on the agency providing the care and the patient's insurance. For example, Medicare has the following requirements for home care (CMS, n.d.):

- leaving the home is not recommended because of the patient's condition (e.g., severe immunocompromised)
- leaving the home requires major effort
- patient has trouble leaving the home without assistance (e.g., walker, cane, wheelchair, crutches, special transportation) because of substantial illness or injury

Medicare covers the following home care services, though some benefits are temporary or require patients to meet certain criteria:

- medical equipment and supplies for use at home
- medically necessary skilled nursing and/or home aide care
- medication administration
- physical and occupational therapy
- social services
- speech-language pathology services

LINK TO LEARNING

Reimbursement for home care services from Medicare and Medicaid requires strict criteria for patients to qualify for the service. The Outcome and Assessment Information Set (OASIS) tool was created in 1999 and has been proven to be a reliable and valid instrument to determine reimbursement. The tool collects subjective and objective data on the patient's disease profile; physical, psychological, and psychosocial functioning; and living arrangements. The assessment is conducted at the initial intake visit when a patient is seen for home care (CMS, 2023). Visit this manual (https://openstax.org/r/77oasis) for more information about the OASIS.

Level of Skilled Care Required

It is important to note that patients with chronic illness and disability who are admitted to an inpatient setting for care will require an evaluation before discharge to determine the appropriate level of care after leaving the hospital. Often, patients with disabilities have been living at home alone, but after assessment in the hospital, they are determined to be unsafe in the home setting and to require a higher level of care, such as home health care or transfer to an assisted living or rehabilitation facility.

For example, many older adult patients living with musculoskeletal disabilities related to age have been living alone but are brought to the hospital after a fall or other injury. While in the hospital, a discharge evaluation is performed in which the safety of the patient being returned to their prior living situation is assessed. This evaluation process is conducted by care providers from many different disciplines, including medicine, nursing, and physical and occupational therapy. After determining what level of care the patient will require upon discharge, an interdisciplinary team, usually led by social services, works to find the patient the necessary resources to obtain this level of care. The main goal of the interdisciplinary team is to ensure safe patient discharge.

9.5 Prevention of Chronic Disease

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Describe modifiable and healthy lifestyle practices to prevent chronic disease
- Discuss the recommended preventive health screenings in diagnosing chronic disease
- Summarize secondary and tertiary prevention strategies in the management of chronic disease

Though some chronic diseases occur regardless of lifestyle choices, many are entirely preventable, or at least may be limited in severity, with the implementation of healthy lifestyle changes. Even if lifestyle changes cannot entirely prevent a disease, they may slow its progression and promote the highest quality of life possible while living with a chronic health condition. These lifestyle modifications are categorized into three levels of prevention: primary, secondary, and tertiary (Figure 9.7).

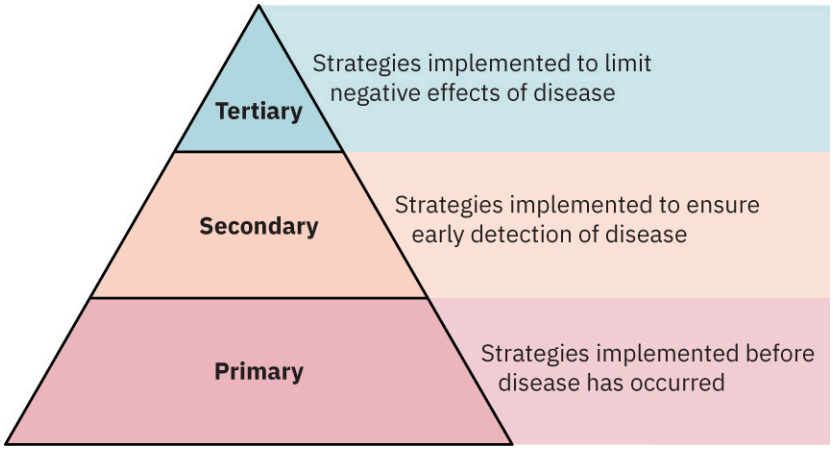

FIGURE 9.7 Chronic disease prevention occurs in three levels: primary, secondary, and tertiary. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Primary Prevention

Strategies that aim to prevent disease from occurring in healthy individuals can be identified as primary prevention. These interventions are implemented as health promotion strategies in the hope that the person will never develop chronic illness. Examples of primary prevention strategies include

- diet and exercise programs
- distribution of condoms and cervical diaphragms to prevent pregnancy or sexually transmitted diseases
- immunizations
- needle-exchange programs
- pre-exposure prophylaxis for HIV
- smoking cessation programs

Exercise

It is common knowledge that exercise is beneficial for overall health, but what is less well known is that consistent exercise has been linked to a lower risk of developing chronic health conditions such as type 2 diabetes, heart disease, dementia, certain cancers, and depression (CDC, 2023b). The CDC recommends that adults perform moderate-intensity aerobic exercise for at least 150 minutes per week, plus isometric muscle-strengthening exercises at least two days per week. Examples of moderate-intensity exercises include walking, running, biking, dancing, and gardening.

Lifestyle Choices

In addition to exercising consistently, other lifestyle choices have been linked to a decreased risk of chronic disease development. Smoking tobacco and vaping are risk factors for many chronic illnesses, so smoking cessation is one of the most important lifestyle modifications for preventing disease. Additionally, overconsumption of alcohol has been shown to increase the risk of chronic disease development, so it is recommended that adults consume alcohol in moderation: defined as two or fewer drinks in a day for a man and no more than one drink per day for a woman.

Other important lifestyle choices for preventing the development of chronic disease include getting adequate sleep each night, limiting stress, and maintaining social connectedness with others.

Healthy Eating

Diet is another factor that can be used as a primary prevention strategy for chronic disease. The typical American diet is high in processed food, fats, and sugar, increasing the risk of CVD, diabetes, and many other chronic conditions. Consuming a healthy diet significantly decrease the risk of chronic disease development (Kimokoti & Millen, 2016). Current recommendations include a diet that is high in the following foods: fruits, low-fat dairy products, nuts and seeds, omega-3 fatty acids, vegetables, and whole grains.

Additionally, current dietary recommendations suggest limiting intake of refined grains, sugary and salty foods, and processed snack items.

Secondary Prevention

Approaches aimed at the early detection of disease are called secondary prevention strategies. The hope is that by detecting the condition early, the damage from the disorder will be limited and interventions can be implemented right away. Examples of secondary prevention strategies include regular physical examinations and screenings for specific medical conditions.

Chronic Disease Screenings

For each chronic disease, there are specific screening guidelines and recommendations based on age, gender, genetics, and other demographic factors. Some of these screening recommendations are listed in Table 9.3.

Condition	Screening Recommendations
Breast cancer	• Annual mammograms should begin at age 40 years. • After age 55 years, mammograms can be performed every other year. • Guidelines may change slightly for individuals at increased risk for cancer due to family history or certain genetic mutations (e.g., in the *BRCA1* gene) (American Cancer Society, 2022).
Cervical cancer	• A human papillomavirus test is recommended every 5 years for females aged 25–65 years. • A Pap smear is recommended every 3 years (American Cancer Society, 2021).
Colorectal cancer	• Beginning at age 45 years, individuals at average risk should receive a colonoscopy every 10 years; earlier or more frequent screenings are recommended for those at higher risk due to family history or genetic factors. • Regular screenings should be continued through to at least age 75 years (if the individual is expected to live at least 10 more years) (American Cancer Society, 2023).
Diabetes	• Screening for type 2 diabetes should be performed annually in overweight and obese individuals OR in individuals aged 40–70 years (American Academy of Family Physicians, n.d.).

TABLE 9.3 Screening Recommendations for Chronic Conditions

Condition	Screening Recommendations
Hyperlipidemia	• A lipid panel should be completed every 4–6 years for healthy adults. • More frequent (typically annual) lipid panels should be completed for individuals at high risk due to factors such as genetics, family history, and poor diet (CDC, 2024).
Hypertension	• The US Preventive Services Task Force (USPTSF) recommends screening all adults who are older than 18 years and who do not have diagnosed high blood pressure. • Adults older than 40 years and those at increased risk for high blood pressure should be screened annually (US Department of Health and Human Services, 2021).

TABLE 9.3 Screening Recommendations for Chronic Conditions

Family Genetics

Many chronic conditions are associated with a family history. Individuals with a strong family history of certain chronic conditions may be advised to obtain genetic tests or counseling to see if they also possess genetic mutations that would increase their risk of developing the disorder. Individuals with such risk factors should be screened for the disorder earlier and more frequently than those without the additional risk factors.

Tertiary Prevention

Care approaches implemented after an individual has been diagnosed with a chronic disease are called tertiary prevention strategies. These strategies aim to limit the negative effects of the condition and allow the person to have the highest quality of life possible despite their chronic illness. Tertiary prevention strategies include physical and occupational therapy, rehabilitation services, and symptom control (e.g., medications, follow-up appointments).

INTERDISCIPLINARY PLAN OF CARE

Interdisciplinary Team for Patients with Chronic Illness

- Primary care provider (PCP): the main point of contact for the patient's health care needs and helps coordinate care
- Specialists (e.g., cardiologist, endocrinologist): provide specialized management of chronic conditions, including diagnosis and overseeing treatment
- Nurses: provide direct patient care, coordinate care with other providers, and educate patients and families about the management of chronic disease
- Pharmacists: ensure safe and effective medication management, including medication reconciliation, reviewing medication regimens for potential adverse effects, and providing patient education on medication use and adherence
- Physical therapists: help patients improve mobility, strength, and function through exercises
- Occupational therapists: help patients in regaining independence with ADLs
- Nutritionists and registered dietitians: provide nutritional assessment, counseling, and education to help patients manage chronic conditions through diet and lifestyle modifications
- Social workers: assist patients and families navigate the health care system, access resources, address psychosocial needs, and coordinate care across multiple providers and settings
- Home health aides (or nurses): provide assistance with ADLs, personal care, and light household tasks for patients who require support at home due to chronic illness or disability
- Case managers: coordinate care across various health care settings, ensuring continuity of care, assisting with discharge planning, and advocating for the patient's needs and preferences

9.6 The Chronic Care Model

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Define the Chronic Care Model and its components
- Explain the role that clinical information systems play in the Chronic Care Model
- Identify overarching goals of the Chronic Care Model

Because chronic diseases are associated with such high morbidity and mortality rates, it is important to prevent them from developing when possible. As a result, there has been a recent shift of focus to preventive medical and nursing care as opposed to the treatment of illnesses after diagnosis (Healthy People 2030, n.d.). Coinciding with this new focus, the Chronic Care Model was developed to guide the prevention, management, and treatment of chronic disease.

The Chronic Care Model

The **Chronic Care Model** was developed as a guide for the reorganization of health care delivery to effectively care for patients with chronic conditions. It has been used by many health care organizations to redesign their structure to focus on proactive prevention as opposed to reactive treatment of disease. At its core, the model emphasizes the role that health care organizations play within the larger community. When a community's health system is functioning effectively, proactive health care teams and informed patients have productive interactions that achieve the goals of everyone in the system.

LINK TO LEARNING

See Figure 1 in this article published in the *Delaware Journal of Public Health* (https://openstax.org/r/77chroniccare) for a graphic representation of the Chronic Care Model.

Health Care Organization

Organization of the health care system is the foundation of the Chronic Care Model. Without appropriate organization and structure, the health care system would be unable to provide effective care for chronic illness. This area of the model includes four components: self-management support, delivery system design, decision support, and clinical information systems.

Self-Management Support

Self-management support refers to the assistance that patients with chronic illness need day to day. Specifically, this includes supports such as the extension of education about the chronic disease and an individualized program to assist individuals to manage their chronic diseases. For example, patients with diabetes often have individualized programs to monitor their blood glucose levels over time. These programs usually involve recording their glucose levels so a care team can review them and make personalized recommendations about medications and other interventions. It is also important to support goal development and increase problem solving to manage chronic diseases with the assistance of health care staff (Agency for Healthcare Research and Quality, 2014). For example, for patients with hypertension, the provider or other health care staff may assist the patient in setting a mutually agreed-upon goal such as limiting sodium intake to 1,000 mg/d. The care team would then help the patient figure out strategies to use to achieve this goal, using problem solving to come up with solutions to accomplish the goal.

Delivery System Design

The delivery system design portion of the Chronic Care Model involves the design of the care provided. This area ensures that effective, efficient care is provide. Important aspects of this component of the model include the following:

- defining roles of various health care team members
- ensuring regular follow-up by the care team through a variety of methods, including telephone calls, home visits, and clinic appointments
- providing case management for complex patient cases
- using evidence-based care in practice

Decision Support

The decision support component of the Chronic Care Model refers to the implementation of evidence-based guidelines into practice (Accelerating Care Transformation [ACT Center], n.d.). This can be done both in the clinic and inpatient settings. Essentially, when a nurse or other provider is caring for a patient with a chronic disease, they should be able to quickly pull up a system or database of information, including best practice guidelines, that can assist them in the treatment and management of the condition. This is especially helpful to effectively care for the patient when providers are not as familiar with a condition or are unsure about how to manage it.

Clinical Information Systems

Clinical information systems serve multiple purposes to help providers understand the medical composite of a patient or an aggregate group, as well as understand and manage preventive care for individuals with chronic diseases. With the sophistication of electronic medical records, the benefits of these systems aid in guiding treatment, identifying problems, and gauging progress of a chronic disease. (ACT Center, n.d.). Other aspects of this part of the model include

- facilitating individual patient care planning
- monitoring the performance of the care team and patient outcomes
- providing clinicians an inclusive list of patients with a specific chronic disease from which they can monitor patient health status over time
- sharing information with patients and providers to allow for smooth transitions and better coordination of care

Community

Community is the other large, foundational component of the Chronic Care Model. The synergism of community and chronic conditions facilitates prevention strategies. Medical facilities in the community are not in solidarity; rather, they form alliances with schools, spiritual or faith-based organizations, businesses, state and local programs, and other interested and impacted parties in the community. The goal of the relationship with these organizations is to ensure that the community remains involved in the ongoing care of its individuals.

Overarching Goals of the Chronic Care Model

The Chronic Care Model aims to improve the quality of care provided to patients with chronic disease to ensure optimal patient outcomes. The foundational goal of the model is to transform health care delivery systems so they are better equipped to provide quality care. The main overarching goals of the model include

- enhancing patient self-management: empowering patients with knowledge, skills, and resources needed to make informed decisions, adhere to treatment plans, and engage in healthy lifestyle behaviors
- fostering patient-centered care: promoting shared decision-making, patient education, and support for patients' psychosocial and emotional needs
- improving patient outcomes: reducing complications, improving symptom management, enhancing quality of life, and optimizing functional status
- improving population health: addressing social determinants of health, promoting healthy behaviors, and implementing population-level interventions
- increasing health care access: ensuring appropriate access to primary care, preventive services, medications, and community support programs
- optimizing use of health care resources: reducing unnecessary hospitalizations and emergency department visits.
- promoting care coordination: communication, collaboration, and information sharing among health care team members.

9.7 Care of the Chronically Ill Patient

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Summarize important subjective assessment questions for patients with chronic illness
- Discuss interprofessional collaboration team members through the assessment
- Identify cues to recognize and analyze for patients with chronic illness
- Plan hypotheses to prioritize and generate solutions for patients with chronic illness

Nursing care for a patient with a chronic illness is unique and challenging related to changes in the acuity of the chronic disease itself. For example, inpatient admissions may be required due to an **acute exacerbation**, or sudden worsening of symptoms, of a chronic disease (e.g., acute-on-chronic heart failure). In these situations, caring for patients with acute illness also requires care of the chronic diseases that afflict the patient simultaneously. The nurse must provide patient-centered care and focus management and treatment strategies specific to the patient's needs and preferences. This section details the various components of care for patients with chronic illness.

Subjective Interview of the Patient with Chronic Illness

The assessment of a patient with a suspected or diagnosed chronic illness begins with obtaining a full subjective history and patient interview. This interview is like a typical patient history but with questions that are more focused on the specific chronic illness. For example, when assessing a patient with suspected diabetes mellitus, some of the focused questions may include

- Are you experiencing any symptoms, such as frequent urination or thirst?
- Do you ever feel lightheaded? If so, does this condition improve after eating?
- Do you have a family history of diabetes?
- Have you experienced any weight gain or loss?
- Have you had your blood glucose levels checked recently?

Questions during the subjective interview should focus on common symptoms associated with chronic illness. Asking these questions can help indicate whether the individual may have the illness and whether further testing and follow-up are necessary. These questions may also indicate improvement or worsening of the patient's chronic conditions. For patients admitted with acute exacerbations of the underlying chronic disease, it is important for the nurse to assess for any knowledge deficits the patient may have about their condition. In many cases, patients do not know enough about their chronic disease or have enough interdisciplinary support to manage it at home. In these cases, the nurse should ask the patient questions about what they know about their condition, what treatment (if any) that they are currently receiving, and what resources they have available for managing their condition. After gathering this information, the nurse will have a better understanding of the patient's knowledge level and can tailor their plan of action accordingly.

Interprofessional Collaboration

As with most patient care, caring for a patient with a chronic illness involves an interdisciplinary team approach. Collaboration between members of the health care team has been shown to improve patient outcomes and ensure that the patient receives thorough, high-quality care (Pannick et al., 2015). Table 9.4 lists typical members of the health care team and their roles.

Team Member	Roles
Provider	Performs assessments and guides implementation of the treatment and management of the chronic disease; may be a physician or a nurse practitioner
Nurse	Coordinates care, performs assessments, implements treatment interventions, evaluates care, and serves as an educator and counselor when necessary
Social worker	Ensures the patient has appropriate financial and community resources to effectively care for their chronic condition
Physical and/or occupational therapist	Works with patient to ensure optimal physical condition and performance of ADLs so the patient can maintain the best quality of life possible, despite their condition

TABLE 9.4 Interprofessional Team Members for Patients with Chronic Illness

Team Member	Roles
Dietitian	Counsels patient and implements dietary plan to promote healthy eating habits to prevent disease or limit its negative effects
Pharmacist	Coordinates prescriptions to ensure patient is receiving correct medications and dosages for their condition and symptoms

TABLE 9.4 Interprofessional Team Members for Patients with Chronic Illness

Recognize Cues

One of the most important aspects of nursing care for a patient with a chronic illness relates to assessment and recognizing cues. If the patient has not yet been diagnosed with a chronic disease but it is suspected, the nurse must be able to recognize changes in the patient's condition that may indicate the patient has the disease. If the patient has already been diagnosed with a chronic condition, the nurse should be able to recognize symptoms that would indicate the condition is worsening or improving. A comprehensive interview incorporating subjective data (e.g., patient- or family-reported data) and objective data (e.g., changes in vital signs) lends itself to using multiple recognized cues in understanding the impact of chronic disease.

Analyze Cues

After assessing symptoms related to the chronic condition, the nurse must determine the next step. Often, this involves suggesting further diagnostic testing to confirm the suspected diagnosis. Chronic disease progression is often identified in this step of the clinical judgement measurement model. By analyzing cues, the nurse is linking the patient's medical history with the cues initially identified. For example, a patient with diabetes mellitus who reports fatigue and increased hunger and thirst may trigger the nurse to review the medical history and search for the presence of diabetes mellitus. The nurse may perform a medication reconciliation and learn that the patient takes insulin therapy, indicating the existence of a chronic metabolic endocrine disorder.

Prioritize Hypotheses

Prioritizing hypotheses involves organizing the assessment data collected previously and determining what the priority issues are that require intervention. If the patient's chronic condition has become life-threatening, implementing life-saving measures is the top priority. After that, the nurse may use other models, such as Maslow's hierarchy of needs, to determine the priorities of care.

Generate Solutions

Once the priorities for the patient have been established, the planning process begins. The nurse collaborates with the care team—which includes the family and support team—to determine appropriate outcomes for the patient based on their needs. The team uses evidence-based practice guidelines to ensure that appropriate interventions are implemented to achieve optimal outcomes. Goals are developed—using simple, measurable, attainable, realistic, and timed criteria—to evaluate the effectiveness of nursing care. For example, the nurse may elect to have the patient show competence in performing a blood glucose check with return demonstration. The solution generated, ultimately, would be for the patient to monitor their chronic diabetes mellitus correctly.

Take Action

When taking action, nursing interventions are individualized for the patient and supported by evidence-based practice. In the example of the patient with diabetes, the nurse ensures blood glucose monitoring is being done competently and that the patient self-administers the ordered insulin therapy correctly. The nurse also provides education about the complications of untreated diabetes mellitus. Interventions are focused on chronic disease and tailored to the patient.

Evaluate Outcomes

After implementation of the care plan, the nurse will evaluate outcomes. The nurse should assess not only whether the outcomes have been met but also which priorities of care need further intervention. If it is determined that the outcomes were not met, the nurse is tasked with coordinating revisions to the plan of care to address the unmet outcomes. This often involves getting the interdisciplinary team together again to make changes to the plan of care

that better address the patient's needs. For patients with diabetes, for example, nurses may have to ensure there is laboratory surveillance of hemoglobin A_{1c}, follow up for chronic monitoring with foot care, and provide ongoing support for nutritional education. Given the longevity of chronic disease, nurses must consistently evaluate the patient's response to the chronic disease.

Summary

9.1 Chronic Disease and Illness (Prevalence and Etiology)

- Chronic diseases and illnesses affect more than half of the population and are the leading cause of death and disability in the United States.
- Chronic disease is defined as a medical or health problem that lasts at least 1 year and requires ongoing medical attention or limits ADLs, whereas chronic illness refers to the human experience of living with a chronic disease.
- Age, gender, and culture are three demographic factors that can significantly impact how an individual copes with a chronic medical condition.
- It is imperative that nurses provide patient-centered care that considers the specific preferences and needs of the patient diagnosed with a chronic disease.

9.2 Comorbid Chronic Diseases

- More than one-fourth of individuals with chronic illness are diagnosed with comorbidity, or the presence of two or more chronic conditions simultaneously.
- Having chronic comorbidities increases disease burden and affects many aspects of health care including finances and health insurance coverage.
- Polypharmacy often occurs because of comorbid chronic conditions and can result in negative outcomes, including adverse medication reactions and overdoses.

9.3 Chronic Illness and Disability

- Disabilities, or limitations in function or performance of everyday activities, occur often because of chronic illness.
- Wellness exists on a continuum, so even with a chronic disease, individuals may still fall somewhere on the high end of the wellness continuum if they ensure they are improving other aspects of health beyond just physical health.
- There are many barriers—including physical, emotional, mental, social, and financial—that negatively affect the health of individuals with disabilities.
- The Americans with Disabilities Act (ADA) is aimed to prevent discrimination against individuals with disabilities and mandates that “reasonable accommodations” must be provided in the workplace and on public transportation to allow individuals with disabilities to have equal access to services and opportunities.

9.4 Access and Barriers to Health Care

- There are many barriers that may limit health care access for individuals with disabilities, including social and financial factors, such as employment status, as well as access to transportation and geographic location.
- Although some people are not able to work because of their disabilities, others who have severe, debilitating disabilities may not be able to leave their homes; they may require home nursing care.
- Patients with chronic illness and disability who are admitted to the inpatient setting for care require an evaluation before discharge to determine the appropriate level of care and a safe discharge to home after leaving the hospital.

9.5 Prevention of Chronic Disease

- Though some chronic diseases occur regardless of lifestyle choices, many are preventable or may be limited, at least, in severity with the implementation of healthy lifestyle changes.
- Primary prevention strategies aim to prevent a disease from occurring in healthy individuals and include interventions such as immunizations, exercise, and healthy lifestyle modifications.
- Secondary prevention strategies are aimed at the early detection of disease and include regular physical examinations and screenings for specific medical conditions.
- Tertiary prevention strategies are implemented after an individual has been diagnosed with a chronic disease. These strategies aim to limit the negative effects of the condition and allow the person to have the best quality of life possible despite their chronic illness.

9.6 The Chronic Care Model

- The Chronic Care Model was developed to guide the prevention, management, and treatment of chronic disease. It consists of two main components: the organization of health care and the resources and policies of the community.
- Within the organization of health care, one component is self-management support. This identifies the required services an individual requires to cope with their chronic disease.
- Within the organization of health care, another component is delivery system design. This encompasses the partnership with the health care team and the individual with the chronic disease, as well as the importance of follow-ups.
- Within the organization of health care, the third component is decision support. This is defined by the evidence-based interventions in managing chronic diseases.
- Within the organization of health care, the final component is clinical information systems. These aid in understanding the health or chronic disease of an individual or aggregate.
- The overarching goals of the Chronic Care Model include improving patient outcomes, enhancing patient self-management, increasing health care access, promoting care coordination, optimizing use of health care resources, fostering patient-centered care, and improving population health.

9.7 Care of the Chronically Ill Patient

- Nursing care of a patient with a chronic illness is like that of any other patient, but with more focus on the specific chronic condition itself.
- The nurse must provide care that is patient-centered and focuses on management and treatment strategies specific to the patient's needs and preferences.
- Collaboration between members of the interdisciplinary health care team improves outcomes for patients with chronic conditions and ensures the patient receives thorough, high-quality care.

Key Terms

acute disease illness that develops quickly and lasts a relatively short period of time
acute exacerbation sudden worsening of symptoms of a chronic disease
Chronic Care Model model developed to guide the reorganization of health care delivery to effectively care for patients with chronic conditions
chronic disease medical or health problem that lasts one year or more and requires ongoing medical attention or limits activities of daily living
chronic illness human experience of living with a chronic disease
comorbidity simultaneous presence of two or more medical conditions
disability limitation in function or performance of everyday activities
discrimination unjust or prejudicial treatment of certain people, especially related to characteristics such as ethnicity, sex, age, or disability
disease burden total effects of a disease on an individual or a society
polypharmacy simultaneous use of multiple medications by a single patient

Assessments

Review Questions

1. What is an example of a chronic disease?
    a. influenza
    b. asthma
    c. chicken pox
    d. contact dermatitis

2. What eligibility requirement must be met for an individual to be able to receive health insurance coverage for chronic disease with Medicaid?
    a. being older than 65 years

b. having a disability
c. meeting a specific low-income threshold
d. being diagnosed with end-stage renal disease

3. What statement best reflects the economic impact of chronic illness in the United States?
a. Chronic illness primarily affects personal finances but has minimal impact on the broader economy.
b. The number of diagnosed chronic conditions has no correlation with health care expenditures or use of health care services.
c. Americans diagnosed with five or more chronic conditions represent a small percentage of the population and health care spending.
d. Increasing numbers of diagnosed chronic conditions correlate with a significant economic burden on both individuals and the health care system.

4. What is an example of a cognitive disability?
a. difficulty walking
b. complete deafness
c. inability to concentrate
d. difficulty performing ADLs

5. What criteria is a requirement for home nursing care according to Medicare guidelines?
a. The patient must be deaf or blind.
b. The patient must be unable to work.
c. The patient has trouble leaving the house without a wheelchair.
d. The patient can leave the home but does not have any transportation.

6. What is a secondary prevention strategy for cervical cancer?
a. eating a healthy diet
b. getting an annual mammogram
c. exercising for 30 minutes daily
d. having a Pap smear every 3 years

7. What is the recommended weekly amount of exercise for the prevention of chronic disease?
a. 100 minutes
b. 120 minutes
c. 150 minutes
d. 200 minutes

8. What action is recommended for the early detection of breast cancer?
a. Annual mammograms should begin at age 40 years.
b. Annual mammograms should begin at age 55 years.
c. Mammograms should be performed every 10 years.
d. Regular mammograms may be stopped after age 65 years.

9. What aspect of the Chronic Care Model involves use of a registry for tracking patient information?
a. decision support
b. delivery system design
c. self-management support
d. clinical information systems

10. What is the overall goal of the Chronic Care Model?
a. identifying patient follow-up needs
b. giving the patient information about their condition
c. developing relationships with community partners

d. facilitating productive interactions between patients and providers

11. The nurse is caring for a patient with CVD. What aspect of nursing care represents the "generating solutions" aspect of the clinical judgment model?
    a. assessing pitting edema in the legs
    b. asking the patient about their medical history
    c. turning the patient manually every 2 hours
    d. recommending the patient change dietary habits

Check Your Understanding Questions

1. What is the difference between chronic disease and chronic illness?
2. Give an example of two chronic diseases and explain why they might occur together.
3. How does the SNAP help ensure that patients with disabilities receive equitable care?
4. A nurse is caring for an older adult patient who presents to the hospital after a fall and hip fracture at home. The patient reports being unable to afford her medications and not having a car to get them refilled. What obstacles to health care access does this patient have?
5. What social or financial assistance programs could the nurse recommend to a patient who recently lost their job and is worried about being able to afford housing and food?
6. What are some lifestyle modifications you could suggest to a patient at high risk for developing CVD?
7. Explain the purpose of the Chronic Care Model.
8. Identify some important questions to ask a patient with suspected breast cancer during the subjective interview.

Reflection Questions

1. Based on your personal clinical experiences, what are some ways that demographic factors could possibly influence chronic illness?
2. What does the phrase "wellness exists on a continuum" mean in the context of people with disabilities?

What Should the Nurse Do?

Mrs. Harden, a 72-year-old female, visits the orthopedic clinic complaining of recurrent fractures and worsening back pain. She recently moved to the area to be closer to her family. Mrs. Harden has a medical history significant for osteoporosis, which was diagnosed 5 years ago. Other past medical history includes hypertension, COPD, and a COVID-19 infection 3 weeks ago. Her recent dual-energy X-ray absorptiometry (DEXA) scan indicates a significant decrease in bone density. On examination, her vital signs are stable, with a blood pressure of 130/80 mm Hg, heart rate of 78 beats per minute, and respiratory rate of 18 breaths per minute. Mrs. Harden reports difficulty with daily activities due to pain and concerns about her increased fracture risk.

1. What chronic diseases is Mrs. Harden currently diagnosed as having?
2. Given Mrs. Harden's history, what demographic factors does the nurse hypothesize are contributing to her current condition?

Mrs. Dickinson, a 55-year-old female, presents to the primary care clinic with complaints of persistent joint pain, stiffness, and difficulty moving. She reports a history of rheumatoid arthritis diagnosed 10 years ago, which has gradually progressed, leading to reduced mobility and increased reliance on assistive devices. Mrs. Dickinson's vital signs include a blood pressure of 130/80 mm Hg, heart rate of 82 beats per minute, respiratory rate of 18 breaths per minute, and oxygen saturation of 98% on room air. She expresses frustration with her declining ability to perform ADLs independently.

3. What disease does Mrs. Dickinson have and how does it contribute to disability?
4. Considering Mrs. Dickinson's frustration and reduced independence, what interventions or solutions could you propose to enhance her ability to perform ADLs and improve her overall well-being?

Mr. Kumar, a 30-year-old male, visits the primary care clinic with complaints of worsening shortness of breath, coughing, and chest tightness. He reports a medical history of asthma diagnosed in childhood, with occasional symptoms controlled by rescue inhalers. Recently, Mr. Kumar notes increased frequency and severity of symptoms, especially during the night. He denies any recent illnesses or changes in his medication routine. Vital signs reveal a respiratory rate of 24 breaths per minute, heart rate of 90 beats per minute, and oxygen saturation of 94% on room air. Mr. Kumar expresses concern about the impact of his symptoms on his daily activities and overall quality of life.

5. How would you analyze Mr. Kumar's vital signs, especially the respiratory rate and oxygen saturation, in the context of his reported symptoms and history of asthma?
6. Considering Mr. Kumar's vital signs and reported symptoms, what immediate actions would you take to address his asthma exacerbation during the clinic visit?
7. The nurse begins to assist with care coordination for this patient and makes a list of interdisciplinary team members who should be on the care team. Whom should the nurse include on this list?

Competency-Based Assessments

1. Compare and contrast the immediate impact of acute disease and the long-term impact of chronic illness on a patient's overall well-being. How do these impacts differ, and what considerations should a nurse keep in mind when caring for patients experiencing both acute and chronic conditions simultaneously?
2. How can age-related factors influence the impact of chronic disease on older adults? Consider cognitive changes, physical limitations, and social aspects.
3. As a nursing student, you are working with a patient who has been diagnosed with heart failure and has difficulty accessing services due to limited access to public transportation. How might the patient's limited access to health care affect the management of his chronic condition, and what strategies could the health care team use to overcome these obstacles?
4. Summarize the role of a home care nurse in supporting patients with chronic illnesses. How might the home care nurse address obstacles to health care access, considering both social and financial aspects?
5. As a nurse, how would you address a patient's reluctance to undergo recommended health screenings? What communication strategies would you use to emphasize the importance of early detection?
6. Discuss potential barriers to the implementation of tertiary prevention strategies in the community. How can nurses overcome these barriers and facilitate effective, ongoing care for individuals with chronic diseases?

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CHAPTER 10

Fluid, Electrolyte, and Acid-Base Imbalances

FIGURE 10.1 This picture illustrates severe pitting edema of the hands that is likely related to a fluid or electrolyte imbalance. (credit: "Edema Hands 01" by Wang et al./*BMC* Cancer, CC BY 2.0)

CHAPTER OUTLINE

INTRODUCTION The balances of fluids, electrolytes, acids, and bases all play key roles in maintaining the body's physiological processes and overall metabolism. Disturbances to any of these components are common and occur with several different medical conditions. If left untreated, such imbalances have the potential to negatively affect multiple body systems and even cause death. Therefore, it is critical for all nurses, regardless of their area of practice or patient population, to be knowledgeable about appropriate treatment and management of fluid, electrolyte, and acid-base imbalances.

10.1 Maintaining Homeostasis

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Explain how the components and movement of fluids within the body contribute to homeostasis
- Describe the role of the kidneys, lungs, and endocrine glands in homeostasis

In a healthy body, physiological processes exist to maintain a state of internal equilibrium. If too much of one chemical accumulates, the body can remove the excess chemicals and restore balance. This relatively stable internal state is called homeostasis.

The body must maintain appropriate balances of various fluids, electrolytes, pH, acids, and bases to maintain homeostasis. The body uses several mechanisms to compensate for natural imbalances, including those within the renal, respiratory, and endocrine systems. However, these compensatory mechanisms have limits, and the body can no longer compensate effectively in some conditions. In these cases, medical and nursing interventions may be required to assist the individual in re-establishing the body's homeostasis. This chapter will focus on how the balance of fluid and electrolytes and acid-base balance contribute to the maintenance of homeostasis.

Fluids in the Body

The body's balance of fluids, electrolytes, pH, acids, and bases are determined by chemistry. Nurses must familiarize themselves with several foundational concepts to treat patients with an imbalance. Specifically, nurses should understand the components and regulation of body fluids and the characteristics of the different homeostatic compensatory mechanisms in the body. With a solid foundational knowledge of these concepts, nurses will better understand the pathophysiologic changes occurring in the body and possess the skills to intervene and provide appropriate and timely patient care.

Composition of Fluids

To comprehend the medical significance of fluid imbalances, it is important first to have a general understanding of the overall fluid composition in the body. Body fluids consist of water, electrolytes, proteins, blood plasma and component cells, and other soluble particles, each of which is called a **solute**. These fluids are found in two main areas of the body: intracellular and extracellular compartments. Figure 10.2 illustrates these compartments. Table 10.1 describes the characteristics of both intracellular and extracellular fluid compartments. Note there are three subtypes, or spaces, of extracellular fluid.

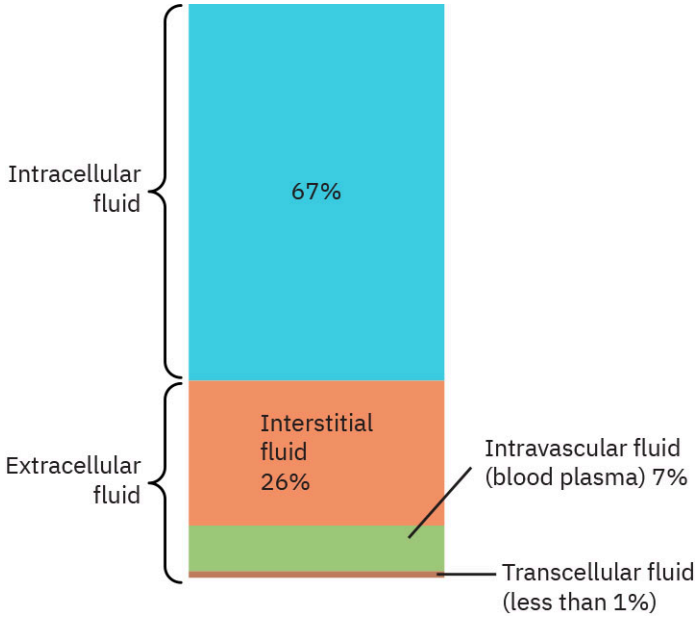

FIGURE 10.2 About two-thirds of body fluids are found within cells; the remaining fluids are extracellular. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Compartment	Definition	Characteristics
Intracellular fluid (ICF)	Fluid found inside cells	• ICF is composed of protein, water, electrolytes, and solutes. • ICF makes up approximately two-thirds of the body's total fluid volume. • The most abundant intracellular electrolyte is potassium.
Extracellular fluid (ECF)	Fluid found outside of cells Three subtypes: • Intravascular fluids, or plasma, are found in blood vessels. • Interstitial fluids surround cells. • Transcellular fluids include cerebrospinal, pericardial, synovial, intraocular, and pleural fluids.	• ECF makes up approximately one-third of the body's total fluid volume. • The most abundant extracellular electrolyte is sodium. • Intravascular solutes consist of red blood cells, white blood cells, and platelets. • Examples of interstitial fluid include lymph and edema.

TABLE 10.1 Characteristics of Body Fluids

Movement and Regulation of Body Fluid

The movement of body fluid between intra- and extracellular compartments is governed by several mechanisms, including oncotic pressure, hydrostatic pressure, and osmosis. The pressure created by colloid in a fluid is called **oncotic pressure** which prevents the movement of water from one solution to another. The force exerted by a fluid against a wall is called hydrostatic pressure. It results in the movement of fluid between compartments. For example, the hydrostatic pressure of blood is the pressure exerted by blood against the walls of the blood vessels by the heart's pumping action. The pressure exerted by plasma proteins, such as albumin and globulinis called **osmotic pressure**. It acts as a pulling force to keep fluids inside the vessel. Hydrostatic pressure opposes osmotic pressure at the arterial end of capillaries, where it pushes fluid and solutes out into the interstitial compartment. On the venous end of the capillary, hydrostatic pressure is reduced, which allows oncotic pressure to pull fluids and solutes back into the capillary. Figure 10.3 illustrates these opposing pressures inside a capillary.

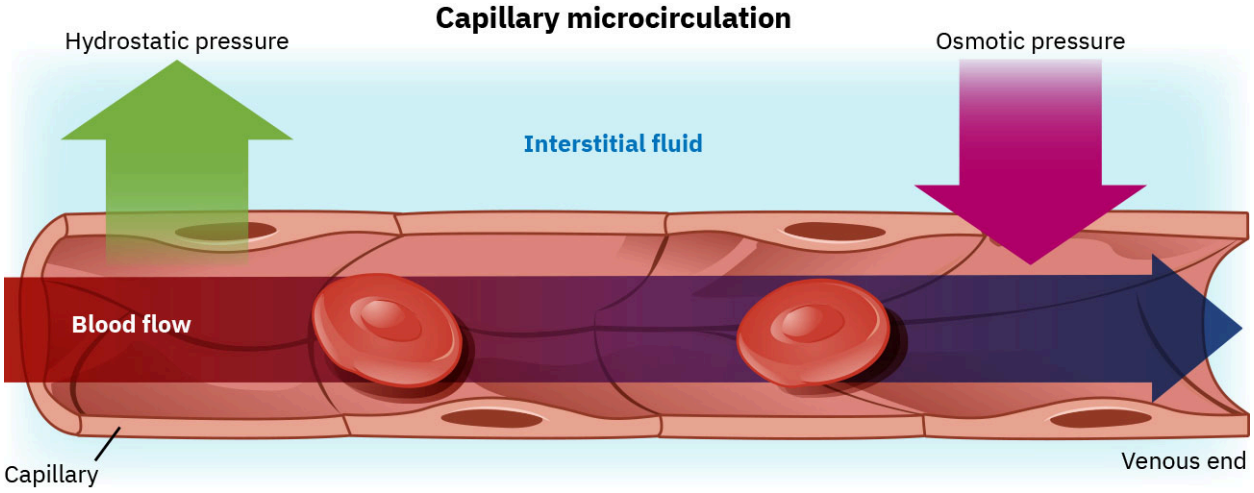

FIGURE 10.3 As blood flows through a capillary, the hydrostatic pressure inside the vessel opposes the osmotic pressure occurring in the interstitial fluid outside the vessel. (credit: modification of work from *Anatomy and Physiology 2e*. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

The movement of water through a semipermeable membrane is referred to as osmosis. The water moves from an

area of lesser solute concentration to an area of greater solute concentration, thereby equalizing the concentration of the solute on either side of the membrane. Figure 10.4 illustrates osmosis, in which water has moved to the right side of the membrane to equalize the concentration of solutes on that side with the left side. Being familiar with the concept of osmosis is especially important for understanding how the body maintains its balance of electrolytes.

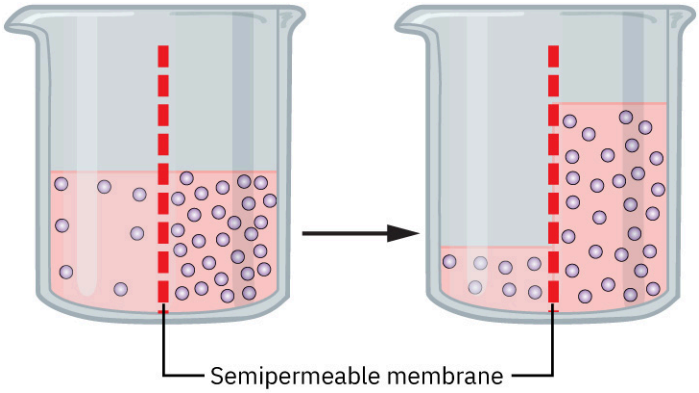

FIGURE 10.4 Through osmosis, water moves across a semipermeable membrane from an area of lesser concentration (left side of the membrane) to an area of great concentration (right side of the membrane). (credit: modification of work from *Anatomy and Physiology 2e*. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Routes of Gains and Losses

Fluids and electrolytes are gained and lost from the body through several **different routes** and mechanisms. Nearly all fluid and electrolyte gains occur through oral intake (e.g., eating and drinking). In a healthy adult, oral intake remains nearly equal to the body's output to maintain overall homeostasis. With some medical conditions, however, the intake or output of fluid becomes excessive, resulting in an imbalance and disruption to homeostasis. The various routes of fluid output (losses) are listed in Table 10.2.

Route	Mechanism
Urine output	• In a healthy adult, urine output should be approximately 1 mL/kg/h to maintain overall homeostasis. • At a minimum, urine output should be 30 mL/h.
Perspiration	• Daily amount lost will vary depending on factors such as temperature, activity level, and overall health. • Main solutes lost via this route are sodium, calcium, and potassium.
Respiratory losses	• A small amount (approximately 300 mL/d) of fluid is lost as water vapor during breathing. • This amount increases with hyperventilation and in certain climates and temperatures.
Gastrointestinal (GI) losses	• Most fluid in the GI tract is reabsorbed into the body, so these losses are minimal (approximately 250 mL/d). • GI losses increase with prolonged diarrhea or vomiting.

TABLE 10.2 Routes of Fluid Output

Evaluating Laboratory Values

Evaluating laboratory values is one of the most important nursing interventions for patients at risk for fluid and electrolyte imbalances. The nurse should be mindful of trends and changes in electrolyte levels that may indicate the patient is developing an imbalance that may threaten homeostasis. This chapter discusses specific characteristics, assessment findings, and treatments for common fluid and electrolyte imbalances in more detail.

Homeostatic Mechanisms

The body has many internal, or feedback, mechanisms in place that will attempt to compensate for fluid, electrolyte, and acid-base imbalances. These mechanisms are housed within major organs, including the kidneys, heart, and lungs, as well as within glands, including the pituitary and adrenal glands. Though these mechanisms are usually effective at compensating for imbalances, certain conditions may cause them to become insufficient and require medical intervention.

Kidney and Adrenal Functions

The kidneys play a major role in maintaining fluid, electrolyte, and acid-base balances. Most importantly, these organs filter the body's circulating fluids (5–6 liters in total) many times throughout the day, resulting in about 200 liters of daily fluid filtration. During this process, the kidneys actively remove excess toxins and other waste products for excretion as urine and promote the reabsorption of vital nutrients and electrolytes back into the bloodstream. In addition to filtering body fluid, the kidneys also actively maintain the body's pH within a tight range by excreting or retaining hydrogen ions as needed. Under normal circumstances, this mechanism will result in an adequate acid-base balance in the body, which is vital for most normal physiological processes to occur.

Hydrostatic pressure is especially important in governing the movement of water in the kidneys' nephrons to ensure proper blood filtering to form urine. As hydrostatic pressure in the kidneys increases, the amount of water leaving the capillaries also increases, and more urine filtrate is formed. If hydrostatic pressure in the kidneys drops too low, as can happen in dehydration, the functions of the kidneys will be impaired, and less wastes and fluid will be removed from the bloodstream. Any dysfunction or injury related to the kidneys can significantly affect the body's ability to maintain adequate overall fluid, electrolyte, and acid-base balances. For example, the presence of kidney stones can cause blockages that result in severe dysfunction of the kidney and resulting fluid and electrolyte imbalances. This highlights the significance of early intervention and appropriate treatment for conditions that negatively affect the kidneys' normal functions.

The adrenal glands, located on top of the kidneys, also play a major role in maintaining fluid and electrolyte balance. Specifically, these glands secrete aldosterone, a mineralocorticoid hormone that regulates water and sodium balance in the body. This hormone exerts its effects on the collecting ducts of the kidneys, where it promotes the retention of sodium and water in the bloodstream and increases the excretion of potassium as a waste product in the urine.

Renin-Angiotensin-Aldosterone System

When the kidneys detect low serum sodium levels or hypotension, they secrete a hormone called renin, which activates the renin-angiotensin-aldosterone system (RAAS) (Figure 10.5). This system is one of the most important compensatory mechanisms in the body, not only for fluid and electrolyte balance but also for the maintenance of adequate blood pressure and organ perfusion. The secreted renin acts on the inactive form of a peptide, known as angiotensinogen, released from the liver to create a hormone called angiotensin I. Angiotensin I is then transported to the lungs, where it interacts with angiotensin-converting enzyme (ACE) to synthesize angiotensin II, an active hormone that can exert its effects directly on blood vessels and the adrenal glands. When angiotensin II acts on blood vessels, it causes vasoconstriction, which increases blood pressure. When angiotensin II acts on the adrenal glands, it causes the release of aldosterone, which results in water and sodium retention and potassium excretion. Ultimately, the goals of the RAAS are to increase blood pressure, promote water and sodium retention, and excrete potassium. Thus, this compensatory mechanism plays a key role in maintaining the body's blood pressure, fluid and electrolyte balance, and overall homeostasis.

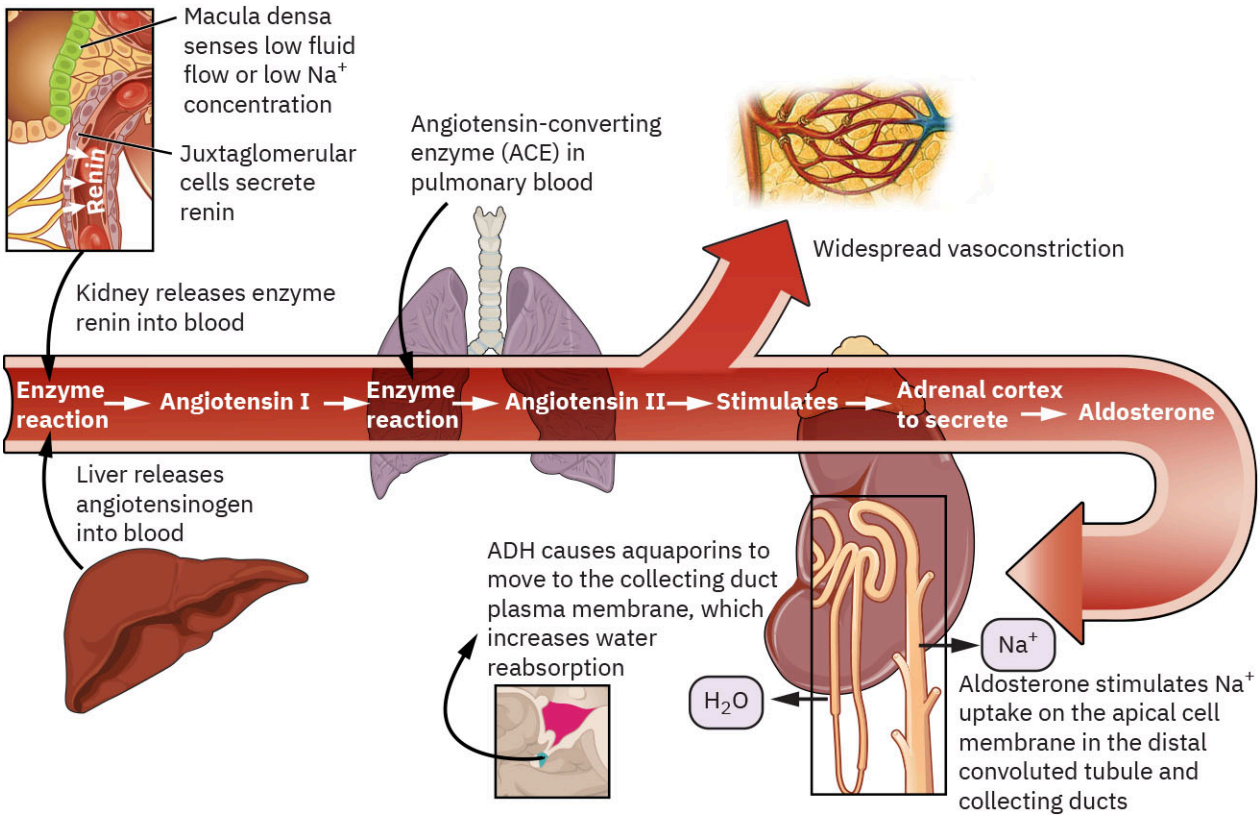

FIGURE 10.5 The renin-angiotensin-aldosterone system (RAAS) uses several important chemicals to increase blood pressure, promote water (H2O) and sodium (Na+) retention, and excrete potassium. ADH refers to antidiuretic hormone. (credit: modification of work from *Anatomy and Physiology 2e*. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Natriuretic Peptides

Acting in direct opposition to the RAAS are natriuretic peptides (NPs). NPs are stored in the heart tissue and released when the body detects high blood pressure and fluid overload. The goals of NPs are to cause vasodilation of blood vessels, which decreases blood pressure, and causes sodium to be excreted as a waste product in the urine. These opposing hormones are part of the endocrine system's negative feedback loop, which allows the body to continuously maintain an appropriate balance of fluid and electrolytes, assuming the mechanisms are functioning optimally.

Cardiac and Lung Function

The heart and lungs are two other major organs that help the body maintain homeostasis. The heart is responsible for maintaining the systemic circulation of blood throughout the body, so any cardiac dysfunction can result in decreased tissue and organ perfusion. When decreased perfusion happens to the kidneys, the kidneys cannot effectively filter the blood, resulting in potentially serious fluid and electrolyte imbalances. The heart tissue also contains **baroreceptors**, specialized nerve cells that can detect the "stretch" (i.e., the level of vasoconstriction or dilation) of vessels, which reflects blood pressure. When these receptors detect a decrease in vasoconstriction (low blood pressure), the sympathetic nervous system is stimulated, resulting in increased heart rate and contractility to compensate for the low blood pressure. An example is seen in any shock state where blood vessels are dilated, causing hypotension, and the body responds with tachycardia in an effort to compensate.

The respiratory system plays a vital role in maintaining overall acid-base balance. While breathing in oxygen, the lungs will exhale carbon dioxide (CO_2). Within the body, CO_2, as a waste product of ventilation, becomes carbonic acid, which acts as an acid inside the body and so lowers blood pH. When the lungs are not functioning optimally, as seen with conditions such as chronic obstructive pulmonary disease (COPD) or an acute respiratory illness, CO_2 is retained in the body, resulting in excessive acid levels, or **acidosis**. On the other hand, in situations where hyperventilation occurs, the patient may be exhaling too much CO_2, causing buildup of excessive levels of bases in the body, known as **alkalosis**. See section 10.4 for more information about acid-base imbalances.

LIFE-STAGE CONTEXT

Age-Related Changes That Affect Homeostasis

As people age, they may experience a decrease in the function of many major organs, including the heart, kidneys, and lungs. This suboptimal organ function places older adults at higher risk for fluid, electrolyte, and acid-base imbalances. Specifically, a decrease in cardiovascular contractility due to aging may cause decreased organ perfusion. When the decreased blood volume reaches the kidneys, it may result in an impaired ability of the kidneys to filter the blood and excrete waste products. This predisposes older adult patients to fluid, electrolyte, and acid-base imbalances that threaten overall homeostasis. In a healthy adult, these imbalances may have mild symptoms, but they can quickly become life-threatening in older adults if left untreated.

Children, on the other hand, are especially susceptible to fluid imbalances, specifically dehydration. This is related to their small stature and low body mass, in combination with their increased metabolism.

Pituitary Function

Another important controlling mechanism for maintaining fluid balance is housed in the brain, through the pituitary gland. It is controlled by signals sent to the gland from the **hypothalamus**, a structure in the brain that acts as a control center for the endocrine system.

The solute concentration of the blood, or blood **osmolarity**, may change in response to the consumption of certain foods and fluids, as well as in response to disease, injury, medications, or other factors. Blood osmolarity is constantly monitored by **osmoreceptors**, which are specialized cells in the hypothalamus that are particularly sensitive to the concentration of sodium ions and other solutes. In response to high blood osmolarity, which can occur during dehydration or following a very salty meal, osmoreceptors signal the posterior pituitary to release antidiuretic hormone (ADH), also known as vasopressin, with the goal of restoring blood osmolarity to normal levels (275–295 mOsm/kg) by retaining water in the body. Antidiuretic hormone acts on the kidneys, causing them to hold onto more water in the blood vessels and excrete less fluid as urine. With more water retention, the concentration of solutes is reduced, resulting in normalized osmolarity and better maintenance of homeostasis. Figure 10.6 illustrates the communication between the hypothalamus and pituitary gland that results in the release of ADH.

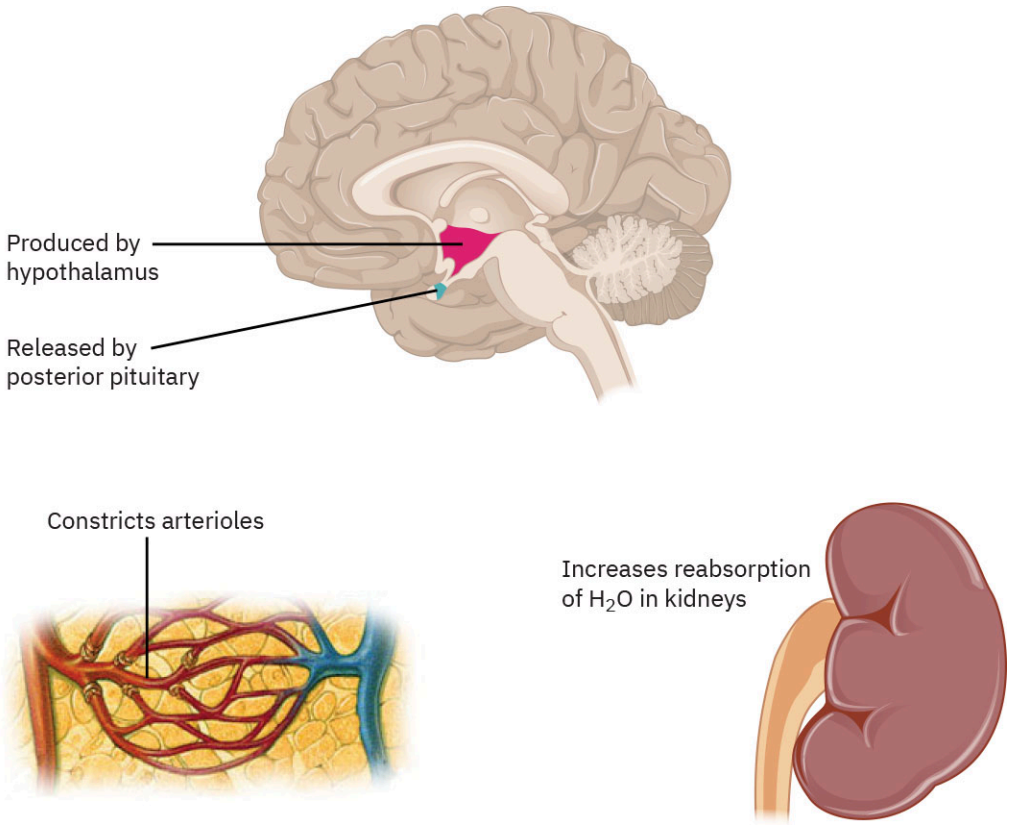

FIGURE 10.6 Antidiuretic hormone (ADH) is produced in the hypothalamus and released by the posterior pituitary gland. It causes the kidneys to retain water (H2O) and constricts arterioles in the peripheral circulation. (credit: modification of work from *Anatomy and Physiology 2e*. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

10.2 Fluid Disturbances and Replacement

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology and clinical manifestations of hypovolemia and hypervolemia
- Describe the diagnostics and laboratory values related to hypovolemia and hypervolemia
- Apply nursing concepts to and plan associated nursing care for patients with hypovolemia and hypervolemia
- Evaluate the efficacy of nursing care for patients with hypovolemia and hypervolemia
- Describe the medical therapies that apply to the care of those experiencing hypovolemia and hypervolemia
- Identify the appropriate fluid replacement method for various fluid disturbances

The importance of maintaining a normal fluid balance within the body cannot be overstated. Both excessive and inadequate amounts of fluid can alter the body's homeostasis and become life-threatening if left untreated. These imbalances are common in many different medical conditions, which nurses must be able to effectively monitor and actively treat to restore overall fluid balance and homeostasis.

Hypovolemia

A decrease in fluid volume in the intravascular space, known as **hypovolemia**, occurs when fluid loss is greater than fluid intake, resulting in a deficient volume of fluid in the body. Dehydration, often misconstrued for hypovolemia, is a decrease in extracellular fluid that can cause hypovolemia. Hypovolemia may occur on its own, affecting only the body's overall fluid balance, or in combination with other imbalances, such as those involving electrolytes or acids and bases.

Pathophysiology of Hypovolemia

The underlying pathophysiology of hypovolemia involves mechanisms that increase fluid loss from the body and

often are coupled with limited fluid intake needed to replenish lost fluids. Common causes of hypovolemia include

- burns
- excessive diaphoresis
- excessive urine loss (from diabetes insipidus or diabetes mellitus)
- fever
- malnutrition
- poor oral fluid intake
- prolonged diarrhea or vomiting
- severe hemorrhage

Certain risk factors may predispose some individuals to experiencing hypovolemia. These risk factors include

- chronic disease (e.g., diabetes mellitus, kidney disease)
- exercising or working outdoors in hot weather
- old age
- using diuretic medication
- young age (e.g., infants, children)

Assessment and Diagnostics of Hypovolemia

Hypovolemia can develop quickly and become life-threatening if not assessed and treated swiftly. Nurses can perform several important assessments to determine the patient's overall fluid status and confirm the presence of hypovolemia. These assessments and their expected findings are described in Table 10.3.

Assessment	Findings Associated with Hypovolemia
Physical assessment	• Confusion • Decreased level of consciousness • Dizziness • Dry skin and mucous membranes • Excessive thirst • Flat neck veins • Headache • Increased capillary refill time • Lethargy • Muscle cramps • Poor skin turgor (Figure 10.7) • Tachycardia
Intake and output	• Dark, concentrated urine • Decreased oral fluid intake • Oliguria
Daily weights	• Weight loss (>3% over seven days indicates potential dehydration)

TABLE 10.3 Assessments and Findings Associated with Hypovolemia

Assessment	Findings Associated with Hypovolemia
Vital signs	• Fever • Hypotension • Tachycardia • Tachypnea
Laboratory values	• ↑ Hemoglobin and hematocrit • ↑ Serum creatinine and blood urea nitrogen levels • ↑ Serum osmolarity • ↑ Serum sodium levels (hypernatremia) • ↑ Urine specific gravity

TABLE 10.3 Assessments and Findings Associated with Hypovolemia

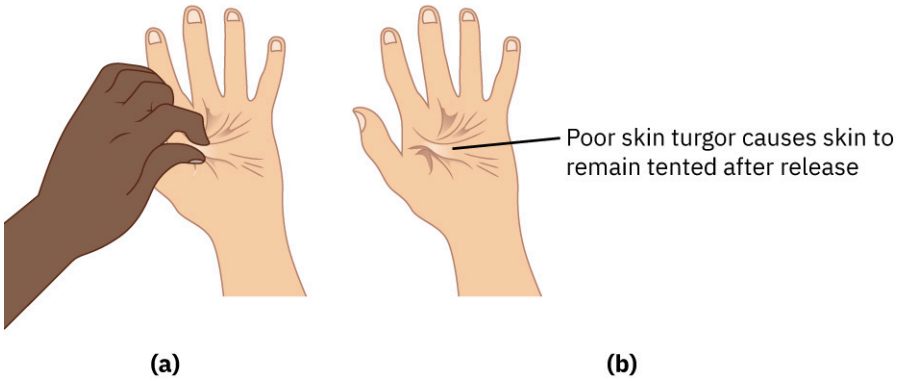

FIGURE 10.7 To test skin turgor, (a) pinch the skin and observe whether it returns to its original state. (b) Skin with poor turgor remains tented after being pinched, indicating a fluid-volume deficit. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

There are no diagnostic tests specifically for hypovolemia. This diagnosis is based on clinical manifestations, assessment findings, trends in laboratory values, and the patient's physiological response to treatment with fluid resuscitation, which is described in more detail in the following sections.

Nursing Care of Patients with Hypovolemia

First and foremost, effective nursing care for patients with hypovolemia begins with early detection of the condition. The nurse should be mindful of subtle changes in assessment findings or laboratory value trends that may indicate the development or worsening of a fluid deficit. Once the diagnosis has been made, the main goals of nursing care include restoring fluid balance to an optimal level, maintaining homeostasis, and preventing the development of complications such as **hypovolemic shock**, a life-threatening condition in which the heart cannot get enough blood and oxygen to tissues and organs.

Recognizing and Analyzing Cues

Because of the body's internal compensatory mechanisms, patients with hypovolemia may be asymptomatic at first. This highlights the importance of assessing for subtle changes in condition that may indicate the early development of a fluid deficit. Some of these early signs include

- confusion due to decreased perfusion to the brain
- hypotension, because the lack of fluid results in lower-than-normal blood pressure within blood vessels
- thirst, including dry mucous membranes

Prioritizing Hypotheses, Generating Solutions, and Taking Action

If the nurse observes signs and symptoms that are indicative of a fluid deficit, one of the first actions they should take is to gather more information and assessment data. If they have not been done already, the nurse should begin to measure and document the patient's intake and output to monitor for a steadily decreasing urine output, another potential early clinical manifestation of hypovolemia. Daily weights should be ordered to measure and monitor

overall fluid balance. If possible, the nurse should also obtain laboratory values such as serum creatinine, blood urea nitrogen (BUN), and urine specific gravity, because these tests can provide more information about the patient's overall fluid status and condition. Additionally, it is important for the nurse to take proactive actions to prevent the worsening of the condition. For example, if the patient's fluid loss stems from excessive vomiting, the nurse should ensure the patient has appropriate antiemetic medications available to prevent further fluid loss and keep the patient's condition from deteriorating. Fluid replenishment should be initiated intravenously if the patient cannot tolerate oral intake.

Evaluation of Nursing Care for Patients with Hypovolemia

After diagnosing and initiating treatment for hypovolemia, the nurse should evaluate patient outcomes to determine whether treatment was effective and if further intervention is necessary.

After treatment, the nurse should monitor the patient for signs indicating that the patient's fluid imbalance has been corrected. Signs that would indicate an improvement in condition include

- adequate blood pressure (specifically, a systolic blood pressure >100 mm Hg)
- clear, lighter-colored urine
- decreased confusion
- improved level of consciousness
- improved urine output (at minimum, 30 mL/h)
- moist mucous membranes
- normal capillary refill time and improved skin turgor
- normalized laboratory values (e.g., BUN, creatinine)
- vital signs within normal ranges

Medical Therapies and Related Care

The main aspect of medical treatment for a fluid deficit involves the replacement of lost fluid back into the body. Sometimes it is enough to encourage the patient to consume more fluids orally, especially water. However, in more severe cases, medical treatment with intravenous (IV) fluid therapy may be necessary.

The purpose of IV therapy for treating hypovolemia is to replace fluids to replenish blood volume. Using a peripheral IV catheter or central line, IV fluids are injected via a vein directly into the patient's bloodstream, where they act rapidly in the body to restore fluid volume. This treatment allows large amounts of fluids to be administered quickly to restore significant fluid volume losses, such as those experienced with severe hemorrhage and trauma. Once the fluid enters the vein, there is no way to terminate the action. Therefore, it is important to properly prepare the IV fluid, correctly calculate the dose and rate, and administer it safely to the patient. It is important to note that IV fluid administration is considered a medical intervention and requires an order from the provider prior to the initiation of therapy.

Types of IV Solutions for Therapy

Intravenous fluid therapy is administered to restore fluid volume in the intravascular compartment or within the blood vessels. However, IV fluids can also be used to facilitate the movement of fluid between compartments. The three types of IV fluids are isotonic, hypotonic, and hypertonic, and they vary on the basis of their **tonicity**, or composition and concentration of dissolved particles. An **isotonic** solution contains the same number of dissolved solutes compared with blood. A **hypotonic** solution contains fewer dissolved solutes than blood contains. A **hypertonic** solution contains more dissolved solutes than blood contains. Table 10.4 describes characteristics of each category of IV fluid. Figure 10.8 illustrates the osmotic effects of each type of fluid on red blood cells.

Characteristic	Isotonic Fluid	Hypotonic Fluid	Hypertonic Fluid
Tonicity	Contains the same number of solutes compared with blood	Contains fewer solutes than blood contains	Contains more solutes than blood contains
Fluid movement	No net movement of fluid	Fluid moves into cells (can cause cellular swelling)	Fluid moves out of cells (can cause cellular shrinking)
Situations used	Fluid replacement in states such as: • Acute blood loss • Burns • Dehydration from excessive vomiting or diarrhea • Diabetic ketoacidosis • Shock	• Hypovolemia in combination with hypernatremia • The goal is to restore lost fluid volume but not increase sodium levels.	• Hypovolemia in combination with hyponatremia • The goal is to restore lost fluid volume as well as lost sodium.
Nursing considerations	• Monitor for signs of fluid overload • Monitor for diluted electrolytes • Use with caution in patients at risk of fluid overload (e.g., those with congestive heart failure, kidney failure)	• Monitor for hypovolemia, hypotension, and confusion as fluid shifts out of the intravascular space. • Administer slowly and cautiously to prevent cardiovascular collapse and increased intracranial pressure from cerebral edema.	• Monitor for signs of fluid overload or hypernatremia. • Contraindicated in patients with renal failure • May be irritating to smaller veins • Administer slowly and cautiously to prevent pulmonary edema.
Examples	• 0.9% normal saline • Lactated Ringer's solution	• 0.45% normal saline	• 3% normal saline • 5% normal saline

TABLE 10.4 Types of IV Fluids

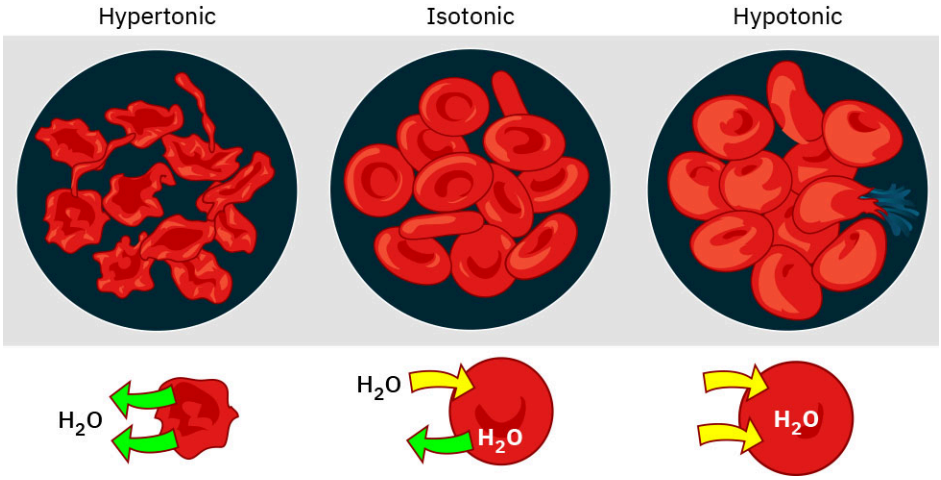

FIGURE 10.8 Hypertonic fluids cause water (H2O) to flow out of cells, hypotonic fluids cause water to flow into cells, and isotonic fluids cause no net change in osmosis. (credit: modification of work from *Anatomy and Physiology 2e*. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

CLINICAL SAFETY AND PROCEDURES (QSEN)

Safe Administration of IV Fluid Therapy

When initiating or changing a bag of IV fluids or medications, it is important to remember the following points:

- IV fluids are a medication. Verify the provider's orders and check that the patient does not have an allergy to the medication. Perform the six rights of medication administration three times, as you would when giving any other medication. Check the type of fluid and the expiration date, and verify the fluid is free of discoloration and sediment. Check the expiration date when obtaining a new tubing administration set.
- Examine the bag to ensure it is intact and not leaking. There may be moisture on the inside of the plastic IV bag storage container; this is normal.
- Verify the infusion rate of IV fluids is appropriate based on the patient's age, size, preexisting medical conditions, and prescribed indication. If a manual calculation is needed to set the IV flow rate, calculate the rate, then double-check the calculated rate with another registered nurse.
- IV tubing administration sets require routine replacement to prevent infection. Follow agency policy regarding initiating tubing change before initiating a new bag of fluid or medication.
- If administration-set tubing is present, trace the tubing from the patient to its point of origin to make sure you are accessing the correct port.
- Assess the IV site. Inspect for redness, swelling, or tenderness that could be a sign of irritation, inflammation, or infection.
- Ensure the IV site is patent when initiating new fluid or medication. Aspirate for blood return and flush the IV catheter according to agency policy.

Hypervolemia

Fluid volume overload, known as **hypervolemia**, occurs when an increased amount of fluid is retained in the intravascular compartment, resulting in an excess fluid volume. This condition may occur on its own, affecting overall fluid balance, or in combination with other imbalances, such as those involving electrolytes or acids and bases.

Pathophysiology of Hypervolemia

The underlying pathophysiology of hypervolemia involves mechanisms that increase fluid retention in the body. Common causes of hypervolemia include

- excessive consumption of fluids or salts
- heart failure
- kidney failure

- liver cirrhosis

Clinical Manifestations

Hypervolemia can quickly become life-threatening if not detected and treated early. Common clinical manifestations of hypovolemia include

- **ascites**, or fluid retention in the abdominal cavity
- bounding pulses
- crackles in the lungs
- jugular venous distension (JVD)
- pitting **edema**, or swelling, in dependent tissues and extremities due to fluid accumulation in the interstitial space (Figure 10.9 and Table 10.5)
- Weight gain

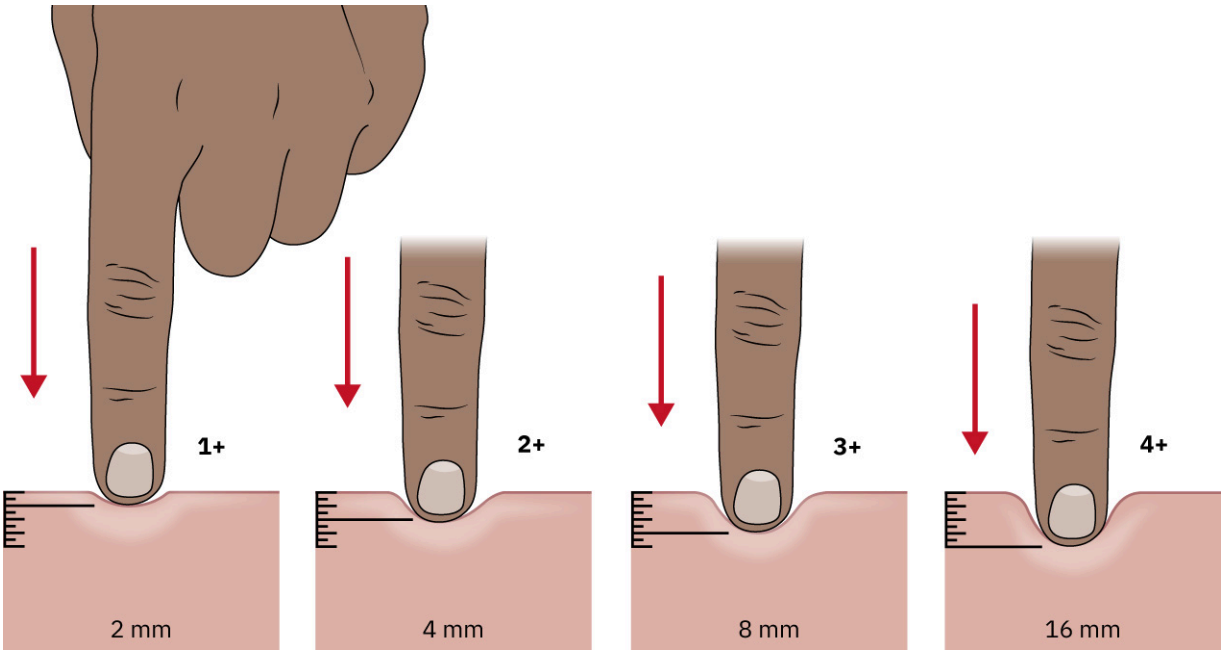

FIGURE 10.9 If a person has pitting edema, pressing on their skin leaves depressions, or "pits." (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Assessment and Diagnostics

There are several key assessments that nurses can perform to determine the patient's overall fluid status and confirm the presence of hypervolemia. These assessments and their expected findings are described in Table 10.5.

Assessment	Findings Associated with Hypervolemia
Physical assessment	• Abdominal distention, diagnosed ascites • Altered mental status or confusion • Bounding pulses • Cough • Crackles in the lungs • Dyspnea • Headache • JVD • Pitting edema (especially in the lower extremities) • Seizures
Intake and output	• Polyuria
Daily weights	• Weight gain
Vital signs	• Hypertension
Laboratory values	• ↓ BUN • ↓ Hemoglobin and hematocrit • ↓ Serum sodium levels (hyponatremia) and osmolality related to dilution

TABLE 10.5 Assessments and Findings Associated with Hypervolemia

A useful test used for diagnosing hypervolemia is a chest X-ray, because it may visualize fluid congestion in the lungs. However, there are no specific diagnostic tests for hypervolemia. As with hypovolemia, the diagnosis is made on the basis of clinical manifestations and assessment findings, laboratory value trends, and the patient's physiological response to treatment.

Nursing Care of the Patient with Hypervolemia

Effective nursing care for patients with excess fluid volume begins with early detection of the imbalance. The nurse should monitor for subtle changes in condition that may indicate the development or worsening of fluid overload. Once the diagnosis has been made, the main goals of nursing care include removing excess fluid, maintaining homeostasis, and preventing the development of complications such as **pulmonary edema**, a life-threatening condition in which the respiratory system no longer functions effectively due to excessive fluid accumulation in the lungs.

REAL RN STORIES

Name: Jenny, RN
Years in Practice: Less than one
Clinical Setting: Medical-surgical unit
Geographic Location: Midwest

Jenny, a new graduate registered nurse, is taking care of Mrs. Smith, a 56-year-old female patient on the medical-surgical unit. Mrs. Smith just arrived on the unit after a hip replacement surgery and the physician's orders are that the currently running IV liter of normal saline should be completed before placing a saline lock. After getting Mrs. Smith settled on the unit, Jenny leaves for about 2 hours to check on her other patients. When she comes back and assesses Mrs. Smith, she hears significant crackles in Mrs. Smith's lungs. She consults the electronic health record and realizes that Mrs. Smith has a history of congestive heart failure, leaving her at increased risk for hypervolemia.

Jenny quickly contacts the on-call physician who orders a STAT dose of IV furosemide and supplemental oxygen. After administration of the oxygen and diuretic, the patient reports being able to breathe much easier and her crackles are significantly improved.

Recognizing and Analyzing Cues

In the early stages of hypervolemia, the body is usually able to compensate for the increased fluid volume. Eventually, however, the major organs involved in fluid filtration and excretion become tired, resulting in fluid excess. Some of the earliest signs of hypervolemia the nurse should monitor for include

- confusion or headache, due to increased perfusion to the brain
- edema in the extremities, which occurs as fluid leaks from intravascular space into the interstitial tissues
- polyuria, as the body attempts to compensate for excessive fluid by excreting more as urine

Prioritizing Hypotheses, Generating Solutions, and Taking Action

If the nurse observes signs symptoms are indicative of hypervolemia, more information and data should be gathered to aid in the diagnosis. Similar to hypovolemia, it is important that the nurse begin accurately measuring and documenting intake and output. In some cases, one of the first signs of fluid excess is a steadily increasing urine output as the body attempts to compensate and remove excess fluid. It is also important for the nurse to take proactive actions to prevent worsening of the condition. For example, if the patient is experiencing severe pitting edema, the nurse should implement measures such as elevating the affected extremity above heart level or applying compression stockings to lessen the amount of edema present. Daily weights are another measurement intervention to enable accurate fluid balance and monitoring.

Evaluation of Nursing Care for Patients with Hypervolemia

After diagnosis of and initiation of treatment for hypervolemia, it is important for the nurse to evaluate patient outcomes to determine whether treatment was effective and if further intervention is necessary.

After treatment, the nurse should monitor the patient for signs indicating their fluid imbalance has been corrected. Signs that would indicate an improvement in condition include

- decreased confusion
- improved edema or ascites
- normal hourly urine output (approximately 30 mL/h)
- normalized laboratory values (e.g., BUN, hemoglobin)
- pulse oximetry greater than 92% and normal lung sounds
- vital signs within normal ranges

Medical Therapies and Related Care

If the fluid overload is occurring secondary to IV fluid therapy, simply stopping the fluid infusion and initiating a fluid restriction may be adequate to restore normal fluid balance. In more severe cases of hypervolemia, however, the use of diuretic medications or invasive procedures such as dialysis may be necessary. Potential treatment options for hypervolemia are displayed in Table 10.6.

Treatment	Rationale	Nursing Considerations
Fluid and sodium restriction	• Limiting oral intake of fluid and sodium can help decrease fluid volume in the body.	• Specific allowed daily amounts are determined on the basis of the patient's degree of overload and other factors, such as body weight.
Pharmacologic therapy: diuretics	Indicated for excess fluid removal: • Oral diuretics are indicated for less severe conditions. • IV diuretics are indicated for more severe conditions that require faster fluid removal (e.g., pulmonary edema).	• Monitor patient closely for electrolyte imbalances. • Monitor for increase in urine output. • Monitor lung functioning.
Dialysis	• Indicated for life-threatening cases of hypervolemia that require emergent fluid removal.	• Monitor patient closely for electrolyte imbalances or hypovolemia that may occur during or directly after dialysis.

TABLE 10.6 Treatments for Hypervolemia

10.3 Electrolyte Imbalance

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology and clinical manifestations of various electrolyte imbalances
- Describe the diagnostics and laboratory values related to various electrolyte imbalances
- Apply nursing concepts and plan associated nursing care for patients with various electrolyte imbalances
- Evaluate the efficacy of nursing care for patients with various electrolyte imbalances
- Describe the medical therapies that apply to the care of those experiencing electrolyte imbalances

Ions dissolved in body fluid are known as **electrolytes**. They play an important role in most physiological functions and assist in maintaining homeostasis. There is a very narrow target range for normal electrolyte values, and even slight abnormalities can have devastating consequences. For this reason, it is crucial to understand normal ranges for the body's key electrolytes: potassium, sodium, calcium, magnesium, phosphorus, and chloride. Nurses should also understand the causes and clinical manifestations of electrolyte imbalances and appropriate medical and nursing interventions.

LINK TO LEARNING

Explore additional information on normal laboratory values (https://openstax.org/r/77normlabvalues) and view a helpful cheat sheet.

Potassium Overview

Potassium is the most abundant electrolyte in the intracellular fluid compartment and is exchanged with sodium back and forth into and out of the cell by the sodium-potassium pump mechanism. Potassium levels normally range from 3.5 to 5.1 mEq/L, with slight range variations between different health care institutions depending on their policies and laboratory equipment. Potassium is obtained through the dietary consumption of foods such as bananas, oranges, and tomatoes, and its excretion is regulated by aldosterone in the kidneys. Recall that aldosterone causes sodium reabsorption and potassium excretion in the distal tubule of the kidneys. In response to potassium levels rising or sodium levels falling in the bloodstream, the adrenal cortex releases aldosterone and targets the kidneys. In response, the kidneys excrete potassium and reabsorb sodium. Potassium is also affected by

insulin, which moves potassium back into the cells from the extracellular fluid compartment.

Potassium Imbalances

Potassium is necessary for normal cardiac function, neural function, and muscle contractility, including effective contractility of the cardiac muscles. In a potassium imbalance, there is either too much potassium present in the blood (hyperkalemia) or too little (hypokalemia). Both types require early assessment and intervention to prevent severe adverse effects, including cardiac dysrhythmias or arrest.

A decreased potassium level in the blood is known as **hypokalemia**. Common causes of hypokalemia include

- excessive vomiting or diarrhea
- use of potassium-wasting diuretics or insulin use
- decreased dietary intake of potassium

An increased potassium level in the blood is known as **hyperkalemia**. Common causes of hyperkalemia include

- administration of potassium-sparing diuretics or oral potassium supplements
- kidney failure
- metabolic acidosis

Table 10.7 compares the pathophysiology and clinical manifestations of, and diagnostic tests, and treatments for both types of potassium imbalances.

	Hypokalemia	Hyperkalemia
Pathophysiology	Increased excretion of potassium (e.g., due to prolonged vomiting or diarrhea, potassium-wasting diuretics) or abnormal movement of potassium into cells from the intravascular space (e.g., resulting from insulin administration)	Decreased renal excretion of potassium (e.g., kidney failure) or abnormal movement of potassium out of cells and into intravascular space (e.g., acidosis, potassium-sparing diuretics)
Clinical manifestations	• Anorexia, nausea, or vomiting • Cardiac dysrhythmias (peaked T waves and prolonged QRS complex) • Constipation • Dizziness • Fatigue • Hypoactive reflexes • Hypotension • Muscle weakness or cramps • Paresthesia • Polyuria	• Cardiac dysrhythmias (depressed T waves, and & bradycardia) • Flaccid paralysis • Irritability • Muscle weakness or cramps • Tachycardia

TABLE 10.7 Hypokalemia and Hyperkalemia

	Hypokalemia	Hyperkalemia
Diagnostic tests	• Electrocardiogram will show depressed T waves, prolonged PR interval, and absent P waves (Figure 10.10) • Serum potassium level (<3.5 mEq/L)	• Electrocardiogram will show peaked T waves, ST segment depression, or appearance of U waves (Figure 10.10) • Serum potassium level (>5.1 mEq/L)
Treatments	• Increased dietary intake of potassium or oral potassium supplements • IV potassium replacement for more severe cases • Treat underlying cause	• Administration of IV insulin to promote cellular uptake of potassium • Dietary potassium restriction • Hemodialysis for severe, refractory cases • Loop diuretic administration (e.g., furosemide [Lasix]) to promote potassium excretion in the urine • Sodium polystyrene sulfonate (Kayexalate), sodium-zirconium cyclosilicate (Lokelma), or patiromer (Veltassa) administration (oral or enema) to promote potassium excretion in the stool • Treat underlying cause

TABLE 10.7 Hypokalemia and Hyperkalemia

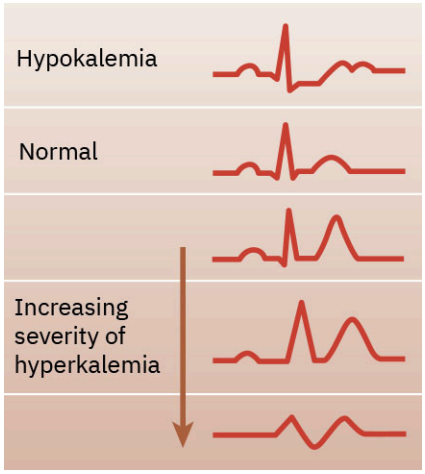

FIGURE 10.10 As potassium levels increase, the electrocardiogram shows a widening PR interval, longer QRS duration, and peaked T waves. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Nursing Care of Patients with Hypokalemia

Nursing care for patients with hypokalemia should focus on monitoring the patient's condition and preventing associated complications, especially the development of deadly cardiac dysrhythmias.

Recognizing Cues and Analyzing Cues

In the early stages of hypokalemia, the patient may be asymptomatic. However, when potassium values are less than 3.0 mEq/L, signs and symptoms become more obvious and can develop and progress quickly. It is important that the nurse monitor the patient for signs and symptoms that would indicate the hypokalemia is not improving.

Clinical manifestations associated with hypokalemia that should be assessed are listed in Table 10.7.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

First and foremost, because potassium imbalances can result in lethal cardiac dysrhythmias, it is imperative that the nurse ensure the patient's cardiovascular function is being closely monitored. Patients with hypokalemia should be placed on continuous telemetry monitoring for the early detection of electrocardiogram (ECG) changes that may indicate the development of abnormal rhythms. If the patient is being treated with oral potassium supplements, the nurse should encourage the patient to consume a large glass of water with the medication to help facilitate absorption and prevent gastrointestinal (GI) upset. If the patient has a more severe case of hypokalemia that requires administration of potassium intravenously, the nurse should be aware of the following additional safety concerns:

- Because too much potassium (especially when administered too quickly) can cause life-threatening cardiac dysrhythmias, it should never be administered as an IV push medication. Instead, IV potassium should always be given slowly over several hours via an IV pump.
- Intravenous administration of potassium can be irritating to the veins, so the patient may require co-administration of fluids to dilute the potassium or the placement of a central line in a bigger vein.

Evaluation of Nursing Care of the Patient with Hypokalemia

After diagnosis of and initiation of treatment for hypokalemia, it is important for the nurse to evaluate patient outcomes to determine whether treatment was effective and if further intervention is necessary. After treatment, the nurse should monitor the patient for signs indicating the potassium imbalance has been corrected. Signs that would indicate an improvement in condition include

- constipation
- improved muscle weakness, cramps, and paresthesia
- normal bowel movement(s)
- normal ECG findings
- normal reflexes
- normalized serum potassium level (3.5–5.1 mEq/L)

Nursing Care of Patients with Hyperkalemia

Nursing care for patients with hyperkalemia is like that of those with hypokalemia in that care should focus on monitoring the patient's condition and preventing associated complications, especially the development of lethal cardiac dysrhythmias.

Recognizing and Analyzing Cues

Though patients with hyperkalemia may be asymptomatic initially, because of internal compensatory mechanisms, clinical manifestations can develop quickly as potassium levels increase. A serum potassium level of greater than 6.0 mEq/L warrants prompt intervention and appropriate treatment to prevent serious complications.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Just as with hypokalemia, one of the most important nursing interventions is to closely monitor the patient's cardiovascular function, typically with the use of continuous telemetry monitoring. If the patient is being treated with medications such as sodium polystyrene sulfonate (Kayexalate), it is important for the nurse to monitor the patient's bowel movements. These kinds of medications promote the excretion of potassium in the stool, so the patient will likely have multiple loose stools soon after the medication is administered. If so, the nurse should monitor the patient closely for skin breakdown and ensure they are clean and dry between bowel movements to promote an optimal level of skin integrity.

If the patient is receiving therapy with IV diuretics, it is important for the nurse to monitor the patient's serum electrolyte levels closely. Occasionally, diuretics may result in the loss of too many electrolytes and can cause hypokalemia. For this reason, it is often necessary to provide potassium supplements when administering loop and thiazide diuretics, because potassium is excreted from the kidneys along with water. People taking diuretics will urinate more frequently, so the nurse should ensure the patient can ambulate safely to the bathroom on their own or that they have a call light within reach so they can call for assistance to prevent falls.

Evaluation of Nursing Care of the Patient with Hyperkalemia

After diagnosis of and initiation of treatment for hyperkalemia, it is important that the nurse evaluates patient outcomes to determine whether treatment was effective and if further intervention is necessary. After treatment, the nurse should monitor the patient for signs indicating the potassium imbalance has been corrected. Signs that would indicate an improvement in condition include

- improved muscle weakness, cramps, and paresthesia
- normal ECG findings
- normal reflexes
- normalized serum potassium level (3.5–5.1 mEq/ L)

REAL RN STORIES

Nurse: Jamie, RN
Years in Practice: Less than one
Clinical Setting: Medical-surgical unit
Geographic Location: South

Jamie, a new graduate nurse on the general medical-surgical unit, was working one of her first night shifts on her own, without a preceptor, when she was informed that she would be taking a patient from the emergency department (ED) who presented with confusion. The ED nurse called Jamie to give report and described the patient as "an older adult who came from a local nursing home and is confused. It's probably a urinary tract infection, but we are waiting on results from the urine sample. I will bring her up to you in a few minutes."

Once the patient arrived in the room, Jamie started her assessment. She spoke softly and gently to the older patient, who was clearly scared and anxious. When the patient said, "My heart is skipping around in my chest," Jamie determined she was also experiencing cardiac issues. On the basis of this information, Jamie placed the patient on telemetry monitoring and noticed tall, peaked T waves. She immediately called the resident physician and got an order to collect a blood sample to check the patient's blood cell count and to have laboratory tests conducted, including an electrolyte panel. The patient's potassium level came back at 6.1 mEq/L. Jamie made another phone call to the physician and requested an order for Kayexalate. The patient's potassium level was quickly restored to a normal level, preventing any further complications. The patient stabilized and was able to leave the hospital 2 days later.

Sodium Overview

Sodium is the most abundant electrolyte in the extracellular fluid compartment. Sodium levels in the blood typically range from 136 to 145 mEq/L, depending on the health care institution's normal reference range, and sodium levels are maintained by the sodium-potassium pump mechanism. Sodium plays an important role in maintaining adequate fluid balance in the intravascular and interstitial spaces; it also contributes to normal nerve and muscle function.

Recall from previous sections that sodium is regulated by the RAAS in the kidneys as well as by the release of ADH by the pituitary gland. Additionally, it is important to remember that wherever sodium travels, water follows.

Sodium Imbalances

In sodium imbalances, there is either too much sodium present in the blood (hypernatremia) or too little (hyponatremia). Both types are common and require early assessment and intervention to prevent severe adverse effects.

A decreased sodium level in the blood is known as **hyponatremia**. Hyponatremia can be caused by excess water intake or excessive administration of hypotonic IV solutions. For example, a marathon runner who rehydrates only with water rather than fluids containing solutes, like sports drinks, can develop hyponatremia due to dilution. Altered sodium levels often cause neurological signs and symptoms due to the movement of water into brain cells, which causes them to swell.

An elevated sodium level in the blood is known as **hypernatremia**. Typically, hypernatremia is caused by excess water loss due to lack of fluid intake, vomiting, or diarrhea. Elevated sodium levels in the blood cause the osmotic movement of water out of the cells to dilute the blood. This causes the body's cells to shrink, which is referred to as cellular dehydration. This fluid shift can have a significant impact on various organs of the body and, as with hyponatremia, is especially notable in the patient's neurological function.

Table 10.8 compares the pathophysiology and clinical manifestations of, and diagnostic tests and treatments for both types of sodium imbalances.

	Hyponatremia	Hypernatremia
Pathophysiology	Increased excretion of sodium (e.g., due to prolonged vomiting or diarrhea, diuretics) or dilution of sodium (e.g., due to increased water intake without electrolyte replenishment; overuse of hypotonic fluid replacement)	Excessive sodium intake (e.g., a high-sodium diet) or decreased fluid volume (e.g., due to prolonged vomiting or diarrhea; hypovolemia)
Clinical manifestations	• Abdominal cramps • Coma • Confusion • Headache • Nausea/vomiting • Seizures	• Confusion • Irritability • Lethargy • Seizures • Thirst
Diagnostic tests	• Serum sodium level (<136 mEq/L)	• Serum sodium level (>145 mEq/L)
Treatments	• Discontinue hypotonic IV fluid administration • Hypertonic IV fluid administration for severe cases • Limit oral water intake • Treat underlying cause	• Decrease dietary intake of sodium • Increase oral water intake • Rehydration with hypotonic IV fluids • Treat underlying cause

TABLE 10.8 Hyponatremia and Hypernatremia

Nursing Care of Patients with Hyponatremia

Nursing care for patients with hyponatremia should be focused on monitoring the patient's condition and preventing associated complications, especially the development of neurological complications.

Recognizing and Analyzing Cues

In the early stages of hyponatremia, the patient may be asymptomatic. However, as sodium levels continue to fall, signs and symptoms can begin quite suddenly and cause adverse neurological effects. With more acute declines in sodium levels—typically when the level drops to about 115 mEq/L—symptoms occur quickly and are more severe. Clinical manifestations associated with hyponatremia that should be assessed are listed in Table 10.8. Remember, where sodium goes, water follows. In cases of hyponatremia, the sodium level inside the vessel is low, indicating that the sodium has moved elsewhere, often the brain tissue. If that is the case, water will follow the sodium to the brain, resulting in signs and symptoms such as confusion and decreased level of consciousness.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

For patients who can eat and drink, nurses should promote the intake of sodium through salty food and drink options such as broth salt tablets or sports drinks. For patients unable to eat or drink, the main treatment is IV sodium replacement. This is typically done by administering isotonic fluids such as normal saline or lactated Ringer's, because both contain sodium. If the nurse is administering IV fluids with a goal of correcting sodium

balance, it is important to avoid giving the fluids too quickly. If sodium levels increase too fast (>0.5 mEq/L/h), severe neurologic damage may occur due to the movement of fluid out of brain cells, resulting in cellular shrinkage. This condition is called **osmotic demyelination syndrome**.

Evaluation of Nursing Care for Patients with Hyponatremia

After diagnosis of and initiation of treatment for hyponatremia, it is important that the nurse evaluates patient outcomes to determine whether treatment was effective and if further intervention is necessary. After treatment, the nurse should monitor the patient for signs indicating that the sodium imbalance has been corrected. Signs that would indicate an improvement in condition include

- improved mentation and level of consciousness
- normal reflexes
- normalized serum sodium level (135–146 mEq/L)

Nursing Care of Patients with Hypernatremia

As with hyponatremia, nursing care for patients with hypernatremia focuses on monitoring the patient's condition and preventing associated neurological complications.

Recognizing and Analyzing Cues

In the early stages of hypernatremia, one of the only symptoms the patient may exhibit is thirst. As sodium levels increase, water moves out of cells, resulting in brain-cell shrinkage and signs such as confusion or seizures. Clinical manifestations associated with hyponatremia that should be assessed are listed in Table 10.8.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

The main nursing intervention for patients with hypernatremia is monitoring accurate intake and output of fluid to prevent excessive gains or losses. Additionally, the nurse should encourage the patient to consume more water to dilute the excess sodium. If the patient is unable to drink fluids orally, fluid replacement with hypotonic solutions may be necessary. Just as with hyponatremia, fluid replacement should be performed slowly and cautiously. If sodium levels are decreased too quickly, water may move into brain cells and cause cerebral edema, which can quickly become life-threatening.

Evaluation of Nursing Care for Patients with Hyponatremia

After diagnosis of and initiation of treatment for hypernatremia, the nurse should evaluate patient outcomes to determine whether treatment was effective and if further intervention is necessary. After treatment, the nurse should monitor the patient for signs and symptoms indicating that the sodium imbalance has been corrected. Signs and symptoms that would indicate an improvement in condition include

- improved mentation and level of consciousness
- normalized serum sodium level (135–146 mEq/L)
- normal thirst level

INTERDISCIPLINARY PLAN OF CARE

Interdisciplinary Care of a Patient with Electrolyte Imbalances

Care of the patient with electrolyte imbalances requires collaboration within an interdisciplinary team. Team members may play different roles, depending on the patient's needs. These may include

- dietitian: counsels patient about foods high and low in sodium and ensures patient has adequate education to make informed decisions about diet at home
- laboratory technician and/or phlebotomist: collects blood and/or urine specimens, and obtains or conducts testing, and provides the results
- nurse: implements care at patient's bedside
- ordering provider: oversees care plan and makes decisions about care goals
- pharmacist: oversees prescription medications and IV fluid orders to determine correct medication, dose, route, and so forth
- physical therapist: may show patient how to move to improve circulation and blood flow and urinary output

- social worker: connects patient with necessary resources outside of hospital

Calcium Overview

Calcium levels in the body normally range from 8.6 to 10.2 mg/dL, though this may vary depending on the institution's specific protocol. Calcium circulates in the bloodstream, but the majority is stored in bones. Calcium is important for maintaining bone and teeth structure, as well as in nerve transmission and muscle contraction. Calcium excretion and reabsorption are regulated by the parathyroid hormone (PTH), which is secreted from the parathyroid glands near the thyroid. As PTH is secreted in response to low calcium levels in the blood, calcium is reabsorbed in both the kidneys and the intestine and released from the bones to increase serum calcium levels. Calcium is also affected by dietary intake and physical activity. Physical activity causes calcium to move into bones, whereas immobility causes the release of calcium from bones, making them weaker.

Calcium Imbalances

In calcium imbalances, there is either too much calcium present in the blood (hypercalcemia) or too little (hypocalcemia). Both types require early assessment and intervention to prevent associated adverse effects.

A decreased calcium level in the blood is known as **hypocalcemia**. This imbalance can be caused by hypoparathyroidism, in which not enough PTH is excreted; as a result, the reabsorption of calcium and its release from the bones both decrease. Hypocalcemia is also caused by vitamin D deficiency and renal disease. Because phosphorus is inversely related to calcium, an abnormally high phosphorus level, as seen with renal failure, can also result in hypocalcemia.

An increased calcium level in the blood is known as **hypercalcemia**. It can be caused by prolonged immobilization that allows calcium to seep out of the bones and into the serum. Additionally, many types of cancers may cause excessive calcium release from bones. And because both hyperparathyroidism and parathyroid tumors can increase PTH secretion, they can also cause hypercalcemia, because too much calcium is reabsorbed in the kidneys and intestines and released from bone.

Table 10.9 compares the clinical manifestations of and diagnostic tests and treatments for both types of calcium imbalance.

	Hypocalcemia	Hypercalcemia
Pathophysiology	• Hypoparathyroidism decreases reabsorption of calcium and its release from bones. • Phosphorus is inversely related to calcium, so in cases of hyperphosphatemia (e.g., in renal failure), hypocalcemia may occur.	• Prolonged immobilization allows calcium to seep out of bones and into serum, or some types of cancers may cause excessive calcium release from bones. • Hyperparathyroidism and parathyroid tumors can increase PTH secretion; thus, they can also cause hypercalcemia because too much calcium is reabsorbed and released from bones.
Clinical manifestations	• Dyspnea • Hyperactive bowel sounds • Muscle cramps • Paresthesia (especially around the lips, tongue, hands, and feet) • Positive Chvostek's and Trousseau's signs (Figure 10.11) • Seizures • Tetany	• Constipation • Increased thirst or urination • Nausea and vomiting • Skeletal muscle weakness
Diagnostic tests	• Serum calcium level (<8.6 mg/dL) • ECG may show prolonged QT interval	• Serum calcium level (>10.2 mg/dL)
Treatments	• Administration of medications to lower phosphorus level if elevated • Increased dietary intake of calcium and vitamin D • IV calcium replacement (e.g., calcium gluconate, calcium chloride) • Treat underlying cause	• Decrease calcium intake in the diet • Hemodialysis for severe, refractory cases • Phosphate supplementation (oral and/or IV) • Treat underlying cause (e.g., surgical removal of parathyroid gland)

TABLE 10.9 **Hypocalcemia and Hypercalcemia**

Nursing Care of Patients with Hypocalcemia

Nursing care for patients with hypocalcemia should focus on monitoring the patient's condition and preventing associated complications, especially the development of seizures.

Recognizing and Analyzing Cues

In the early stages of hypocalcemia, the patient may be asymptomatic, especially if the drop in calcium levels is gradual. More acute or severe cases of hypocalcemia result in a state of increased neuromuscular excitability; thus, some of the first signs the nurse might notice are hyperactive reflexes and involuntary muscle contractions, or **tetany**. These include **Chvostek's sign**, an involuntary twitching of facial muscles when the facial nerve is tapped, and **Trousseau's sign**, a hand spasm caused by inflating a blood pressure cuff to a level above systolic pressure for 3 minutes. Figure 10.11 illustrates both these signs. Other clinical manifestations associated with hypocalcemia

that should be assessed are listed in Table 10.9.

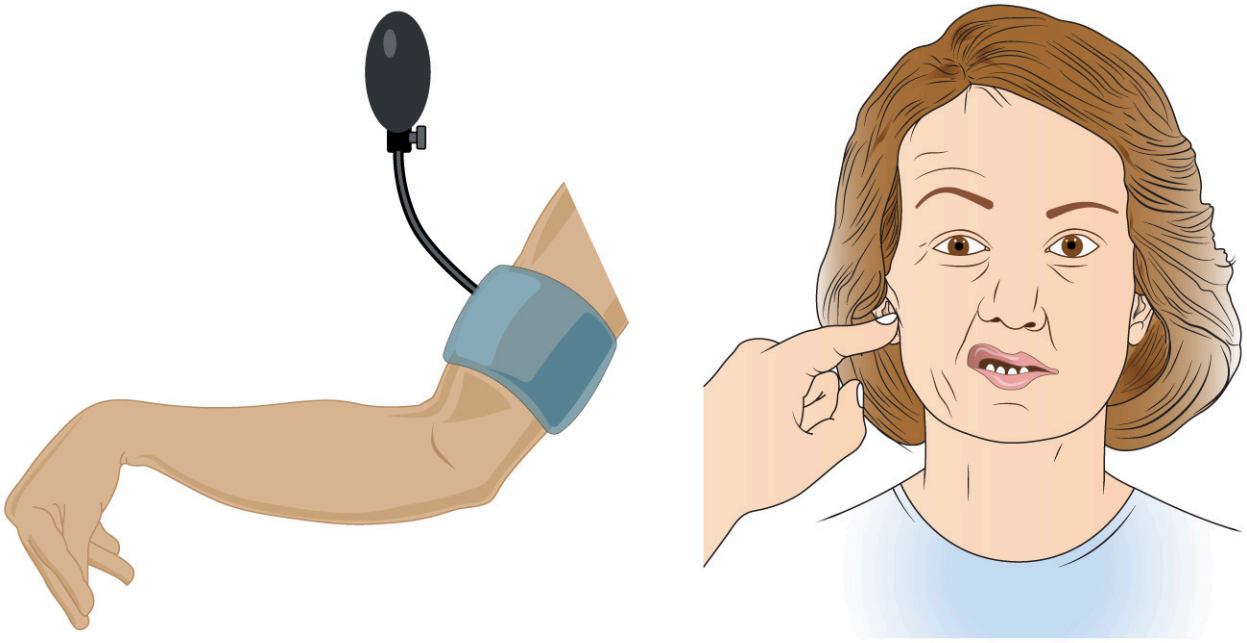

FIGURE 10.11 Positive (a) Chvostek's sign and (b) Trousseau's sign are both associated with hypocalcemia. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Prioritizing Hypotheses, Generating Solutions, and Taking Action

The main nursing intervention for a patient with hypocalcemia is the implementation of seizure precautions. Seizures are one of the most common serious effects of a low calcium level, so prophylactic prevention of injury from seizures is important. This includes padding the side rails of the patient's bed with seizure pads and ensuring that suction equipment is located within arm's reach of the bedside, per hospital protocol. Additionally, the nurse should educate the patient about foods they can consume in their diet to increase calcium levels (e.g., dairy products, green leafy vegetables, whole grains).

Evaluation of Nursing Care for Patients with Hypocalcemia

After diagnosis of and initiation of treatment for hypocalcemia, it is important for the nurse to evaluate patient outcomes to determine whether treatment was effective and if further intervention is necessary. After treatment for hypocalcemia, the nurse should monitor the patient for signs indicating that calcium imbalance has been corrected. Signs that would indicate an improvement in condition include

- normal reflexes
- no seizure activity noted
- normal serum calcium level (8.6–10.2 mg/dL)

Nursing Care of the Patient with Hypercalcemia

Nursing care for patients with hypercalcemia should focus on monitoring the patient's condition and preventing associated complications.

Recognizing and Analyzing Cues

In the early stages of hypercalcemia, the patient may be asymptomatic, especially if the increase in calcium levels is gradual. More acute or severe cases of hypocalcemia result mostly in adverse GI signs and symptoms such as nausea and vomiting. Other clinical manifestations associated with hypercalcemia that should be assessed are listed in Table 10.9.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

One of the main nursing interventions for patients with hypercalcemia includes educating the patient about ways to decrease the intake of calcium in their diet and ensuring they consume enough phosphorus. Additionally, because

prolonged immobilization is a major cause of hypercalcemia, it is important that the nurse encourages the patient to ambulate as frequently as possible to prevent the release of even more calcium from the bones.

Evaluation of Nursing Care for Patients with Hypercalcemia

After diagnosis of and initiation of treatment for hypercalcemia, it is important for the nurse to evaluate patient outcomes to determine whether treatment was effective and if further intervention is necessary. After treatment for hypercalcemia, the nurse should monitor the patient for signs indicating the calcium imbalance has been corrected. Signs that would indicate an improvement in condition include

- improved muscle weakness
- lack of GI symptoms
- normal serum calcium level (8.6–10.2 mg/dL)

Magnesium Overview

Magnesium is essential for normal cardiac, nerve, muscle, and immune system functioning. Magnesium levels typically range from 1.5 to 2.4 mEq/L; about half of the body's supply is stored in the bones. Dietary sources of magnesium include green leafy vegetables, citrus, peanut butter, almonds, legumes, and chocolate.

Magnesium Imbalances

In magnesium imbalances, there is either too much magnesium present in the blood (hypermagnesemia) or too little (hypomagnesemia). Both types require early assessment and intervention to prevent severe adverse effects, including cardiac dysrhythmias or arrest.

A decreased magnesium level in the blood is referred to as **hypomagnesemia**. It typically results from inadequate magnesium in the diet or from the use of loop diuretics that result in excretion of magnesium in urine. Additionally, patients with alcohol use disorder often have hypomagnesemia due to concurrent poor diet and impaired nutrient absorption that occurs with alcohol consumption. Chronic use of a proton pump inhibitor can also cause hypomagnesemia, due to impaired nutrient absorption.

An elevated magnesium level in the blood is known as **hypermagnesemia**. It is usually the result of renal failure, excess magnesium replacement, or the use of magnesium-containing laxatives or antacids. Table 10.10 compares the pathophysiology and clinical manifestations of, and diagnostic tests and treatments for both types of imbalances.

	Hypomagnesemia	Hypermagnesemia
Pathophysiology	Increased excretion of magnesium (e.g., with use of diuretics; cases of chronic alcohol use, laxative abuse, cancer, acute pancreatitis, malnutrition)	Decreased renal excretion of magnesium (e.g., as in kidney failure), excessive intake or replacement of magnesium (e.g., overuse of laxatives or antacids containing magnesium)
Clinical manifestations	• Cardiac dysrhythmias • Leg cramps • Lethargy and weakness • Nausea and vomiting • Tetany • Tremors	• Asystole • Bradycardia • Laxative abuse • Muscle weakness • Nausea • Slow reflexes • Tremors

TABLE 10.10 Hypomagnesemia and Hypermagnesemia

	Hypomagnesemia	Hypermagnesemia
Diagnostic tests	• Serum magnesium level (<1.5 mEq/L) • ECG may show premature ventricular contractions, flat or inverted T waves, or prolonged PR interval.	• Serum magnesium level (>2.4 mEq/L) • ECG may show peaked T waves.
Treatments	• Increase dietary magnesium intake • Oral or IV magnesium supplements (IV magnesium recommended for patients with torsade de pointes as a last-resort treatment option) • Treat underlying cause	• Dialysis for severe, refractory cases • Increase fluid intake • Stop medications containing magnesium • Treat underlying cause

TABLE 10.10 Hypomagnesemia and Hypermagnesemia

Nursing Care of Patients with Hypomagnesemia

Nursing care for patients with hypomagnesemia should focus on monitoring the patient's condition and preventing associated complications, especially the development of deadly cardiac dysrhythmias.

Recognizing and Analyzing Cues

When there is a low level of magnesium in the blood, there are often also low levels of calcium and potassium. Because of this, the nurse should monitor for clinical manifestations of hypomagnesemia and those of hypocalcemia and hypokalemia. Alterations in magnesium can cause cardiac dysrhythmias; therefore, it is important that the nurse monitors for subtle changes in the ECG that may indicate a worsening condition.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

The nurse should place patients with hypomagnesemia on continuous telemetry monitoring to catch any changes that may indicate the development of severe cardiac dysrhythmias. Other main nursing interventions for this imbalance include monitoring intake and output, administering oral or IV magnesium supplements, and regularly monitoring all electrolyte values, because they tend to influence one another.

Evaluation of Nursing Care for Patients with Hypomagnesemia

After diagnosis of and initiation of treatment for hypomagnesemia, it is important for the nurse to evaluate patient outcomes to determine whether treatment was effective and if further intervention is necessary. After treatment, the nurse should monitor the patient for signs indicating magnesium imbalance has been corrected. Signs that would indicate an improvement in condition include

- no reported adverse GI symptoms
- normal ECG
- normal reflexes

Nursing Care of Patients with Hypermagnesemia

Like nursing care for patients with hypomagnesemia, care of patients with hypermagnesemia should focus on monitoring the patient's condition and preventing associated complications.

Recognizing and Analyzing Cues

Symptoms of hypermagnesemia can be nonspecific and vague, making it difficult to diagnose without checking serum electrolyte levels. Some of the first signs of this imbalance include muscle weakness and decreased reflexes. Other signs to monitor for are listed in Table 10.10.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

The nurse should place patients with hypermagnesemia on continuous telemetry monitoring to catch any changes that may indicate the development of severe cardiac dysrhythmias, especially complete heart block. Other nursing interventions for this imbalance include monitoring intake and output, encouraging oral fluid intake, and educating the patient about stopping medications that contain high levels of magnesium.

Evaluation of Nursing Care for Patients with Hypermagnesemia

After diagnosis of and initiation of treatment for hypermagnesemia, it is important for the nurse to evaluate patient outcomes to determine whether treatment was effective and if further intervention is necessary. After treatment, the nurse should monitor the patient for signs indicating the magnesium imbalance has been corrected. Signs that would indicate an improvement in condition include

- improved muscle weakness
- normal ECG
- normal reflexes

Phosphorous Overview

Phosphorus is important in energy metabolism, RNA and DNA formation, nerve function, muscle contraction, and the building and repair of bone, teeth, and membranes. Phosphorus levels typically range from 2.5 to 4.0 mg/dL. The electrolyte is stored in the bones, excreted by the kidneys, absorbed by the intestines, and predominantly found in the intraocular fluid compartment.

Phosphorus Imbalances

In phosphorus imbalances, there is either too much phosphorus present in the blood (hyperphosphatemia) or too little (hypophosphatemia).

A decreased phosphorus level in the blood is referred to as **hypophosphatemia**. Acute hypophosphatemia can be caused by acute alcohol abuse, burns, diuretic use, respiratory alkalosis, and starvation. Chronic hypophosphatemia can be caused by hyperparathyroidism, vitamin D deficiency, prolonged use of phosphate binders, and hypomagnesemia or hypokalemia.

An increased phosphorus level in the blood is known as **hyperphosphatemia**. It can be caused by kidney disease, crush injuries, or overuse of phosphate-containing enemas. Table 10.11 compares the clinical manifestations of and diagnostic tests and treatments for both types of phosphorus imbalances.

	Hypophosphatemia	Hyperphosphatemia
Pathophysiology	• Movement of phosphorus out of vessels, often due to alcohol abuse, burns, diuretics, and starvation	• Overuse of medications containing phosphate • Crush injuries cause release of phosphorus into vessels. • Kidney disease impairs the kidneys' ability to process and excrete phosphorus.
Clinical manifestations	• Often asymptomatic • Severe cases may result in muscle weakness, encephalopathy, seizures, and death.	• Often asymptomatic • Can cause signs of hypocalcemia due to the inverse relationship between phosphorus and calcium.

TABLE 10.11 **Hypophosphatemia and Hyperphosphatemia**

	Hypophosphatemia	Hyperphosphatemia
Diagnostic tests	• Serum phosphorus level (<2.5 mg/dL)	• Serum phosphorus level (> 4.0 mg/dL)
Treatments	• Increase intake of phosphorus in the diet • Oral or IV phosphorus replacement • Treat underlying cause	• Administration of phosphate-binder medications • Decrease dietary intake of phosphorus • Hemodialysis • Treat underlying cause

TABLE 10.11 Hypophosphatemia and Hyperphosphatemia

Nursing Care of the Patient with Phosphorus Imbalances

Phosphorus imbalances are difficult to diagnose without obtaining a serum electrolyte level, because patients with phosphorus imbalance are often asymptomatic. For that reason, it is important for the nurse to be mindful of the patient's baseline status and investigate any small deviations that may indicate an electrolyte imbalance.

Recognizing and Analyzing Clues

Because phosphorus has an inverse relationship with calcium, the nurse may also want to monitor for associated signs and symptoms that may indicate the presence of another imbalance. For example, a patient with hypophosphatemia may be asymptomatic for a decreased level of phosphorus but may have signs or symptoms of hypercalcemia.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

The main nursing interventions when caring for patients with phosphorus imbalances include monitoring serum electrolyte levels regularly, recording accurate intake and output, and treating each disorder appropriately. These patients will need education about dietary choices to ensure they are getting enough (or decreasing the amount of) phosphorus in their diet.

Evaluation of Nursing Care for Patients with a Phosphorus Imbalance

After diagnosis of and initiation of treatment for a phosphorus imbalance, it is important for the nurse to evaluate patient outcomes to determine whether treatment was effective and if further intervention is necessary. After treatment, the nurse should monitor the patient for signs indicating the patient is improving. Signs that would indicate an improvement in condition include normalized serum phosphorus level (2.5–4.0 mg/dL) and normal vital signs.

Chloride Overview

Chloride is one of the main electrolytes in the extracellular fluid compartment; the normal range in blood samples is 97–107 mEq/L. Chloride is a major contributor to the osmotic pressure gradient between the intracellular and extracellular fluid compartments. Chloride is also important for maintaining proper hydration and acid-base balance in the body. Because chloride is an anion, meaning it is negatively charged, it is attracted to sodium, a positively charged cation. Consequently, these two electrolytes have a direct relationship: if sodium levels are low, chloride levels probably are as well. Chloride has an inverse relationship with bicarbonate, meaning that an increase in bicarbonate levels in the body results in a decrease in chloride levels.

Chloride Imbalances

With chloride imbalances, there is either too much chloride present in the blood (hyperchloremia) or too little (hypochloremia). Both types require early assessment and intervention to prevent severe adverse effects.

A decreased chloride level in the blood is known as **hypochloremia**. Common causes of hypochloremia include

- diuretic use
- fluid overload (e.g., from congestive heart failure)

- GI loss of chloride, such as with prolonged vomiting or diarrhea
- low dietary sodium intake
- metabolic alkalosis

An increased chloride level in the blood is known as **hyperchloremia**. Common causes of hyperchloremia include

- corticosteroid use
- fluid loss (e.g., vomiting, frequent urination)
- high intake of sodium in the diet or excessive administration of normal saline
- metabolic acidosis

Table 10.12 compares the pathophysiology and clinical manifestations of and diagnostic tests and treatments for both types of chloride imbalances.

	Hypochloremia	Hyperchloremia
Pathophysiology	Increased excretion of chloride (e.g., with prolonged vomiting or diarrhea, use of diuretics), dilution (e.g., with fluid overload), or increased bicarbonate levels (e.g., in metabolic alkalosis)	Increased sodium levels or hemoconcentration (related to fluid loss such as with vomiting or excessive urination)
Clinical manifestations	• Agitation or irritability • Coma • Hyperactive reflexes • Muscle cramps • Seizures • Slow and/or shallow respirations • Tetany • Tremors	• Coma • Deep, rapid respirations • Lethargy • Tachycardia • Weakness
Diagnostic tests	• Arterial blood gas findings indicate metabolic alkalosis • Serum chloride level (<97 mEq/L) • Serum sodium level decreased	• Arterial blood gas findings indicate metabolic acidosis • Serum chloride level (>107 mEq/L) • Serum sodium level increased
Treatments	• Discontinue diuretics, if possible • IV normal saline or 0.45% normal saline to replace lost chloride • Treat underlying cause	• Diuretics to promote chloride excretion in the urine • Hypotonic IV fluid administration • Sodium and fluid restrictions • Treat underlying cause

TABLE 10.12 Hypochloremia and Hyperchloremia

Nursing Care of Patients with Chloride Imbalances

Nursing care for patients with chloride imbalances should focus on monitoring the patient's condition and preventing associated complications, especially the development of severe acid-base imbalances.

Recognizing and Analyzing Cues

It is important for the nurse to understand the relationship between chloride and other electrolytes. Specifically, if a

patient is experiencing a sodium imbalance, the nurse should investigate the patient's chloride balance as well, because the two electrolytes have a direct relationship. Because of this relationship, clinical manifestations between hyponatremia and hypochloremia may be similar, because they often occur at the same time. This is also true of hypernatremia and hyperchloremia.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

The main nursing interventions for patients with chloride imbalances include

- closely monitoring respiratory and neurological status for deviations from baseline that would indicate worsening of the imbalance
- monitoring and recording accurate intake and output
- monitoring and treating acid-base imbalances
- monitoring vital signs

Evaluation of Nursing Care for Patients with Chloride Imbalances

After diagnosis of and initiation of treatment for a chloride imbalance, it is important for the nurse to evaluate patient outcomes to determine whether treatment was effective and if further intervention is necessary. After treatment, signs that would indicate the patient's condition is improving include

- improved mental status
- normal reflexes
- normal serum chloride level (97–107 mEq/L)

10.4 Acid-Base Imbalance

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology and clinical manifestations of acid-base imbalances
- Describe the diagnostics and laboratory values related to acid-base imbalances
- Apply nursing concepts and plan associated nursing care for patients with acid-base imbalances
- Evaluate the efficacy of nursing care for patients with acid-base imbalances
- Describe the medical therapies that apply to the care of acid-base imbalances

As with electrolytes, the correct balance of acids and bases in the body is essential to proper functioning. Even a slight variance outside of normal can be life-threatening, so it is important to understand normal acid-base values, as well the causes of imbalances and how to correct them. The kidneys and lungs work together to correct slight imbalances as they occur. As a result, the kidneys compensate for imbalances arising from the lungs, and the lungs compensate for imbalances arising from the kidneys. However, over time, these compensatory mechanisms tire out and acid-base imbalances develop.

Arterial Blood Gases

Acid-base balance is measured on the pH scale, as shown in Figure 10.12. The value that explains how much hydrogen is contained within a liquid and the activity of the hydrogen ion is its **pH** (potential hydrogen). As a review, **acid** is a byproduct of many metabolic processes in the body and form hydrogen (H^+) ions when dissolved in water. With higher acidity in the body, the overall pH of the body is lower. On the other hand, **bases** form hydroxide (OH^-) ions when dissolved in water, and more bases in the body (increased alkalinity) result in a higher pH. An **arterial blood gas (ABG)** is procedure in which blood is obtained from an arterial catheter or direct puncture and then analyzed to determine oxygenation status. Samples are most commonly collected via the radial artery. Arterial blood gases are indicators of several parameters that can affect the body's acid-base balance: the pH level of the blood, the partial pressure of arterial oxygen (PaO_2), the partial pressure of arterial carbon dioxide ($PaCO_2$), the bicarbonate level (HCO_3^-), and the oxygen saturation level (SaO_2). Normal values for each of these parameters are listed in Table 10.13. It is important that nurses understand how to interpret ABG results because correct interpretation helps determine the appropriate treatment and evaluate the effectiveness of interventions.

pH	Examples of solutions
0	Battery acid, strong hydrofluoric acid
1	Hydrochloric acid secreted by stomach lining
2	Lemon juice, gastric acid, vinegar
3	Grapefruit juice, orange juice, soda
4	Tomato juice, acid rain
5	Soft drinking water, black coffee
6	Urine, saliva
7	"Pure" water
8	Sea water
9	Baking soda
10	Great Salt Lake, milk of magnesia
11	Ammonia solution
12	Soapy water
13	Bleach, oven cleaner
14	Liquid drain cleaner

FIGURE 10.12 This chart shows where many common substances fall on the pH scale. (credit: modification of work from *Anatomy and Physiology 2e*. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Parameter	Normal Range
pH	7.35–7.45
Partial pressure of oxygen (Pao_2)	80–100 mm Hg
Partial pressure of carbon dioxide ($Paco_2$)	35–45 mm Hg
Bicarbonate (HCO_3^-)	22–26 mEq/L
Oxygen saturation (Sao_2)	95%–98%

TABLE 10.13 **Normal ABG Values**

Interpreting ABGs

Arterial blood gas values can be interpreted to indicate one of four conditions: respiratory acidosis, respiratory alkalosis, metabolic acidosis, or metabolic alkalosis. Once this interpretation is made, conditions can further be

classified as compensated, partially compensated, or uncompensated, depending on whether an internal compensatory mechanism is attempting to correct the imbalance in the body. Compensation is indicated by certain changes in ABG values.

A simple way to remember how to interpret ABG values is the acronym ROME, which stands for Respiratory Opposite, Metabolic Equal. This means that the respiratory component ($PaCO_2$) moves in the opposite direction of the pH if the respiratory system is causing the imbalance. If the metabolic system is causing the imbalance, the metabolic component (HCO_3) moves in the same direction as the pH.

LINK TO LEARNING

This video reviews the Tic-Tac-Toe Method of ABG Interpretation (https://openstax.org/r/77abginterpret) which some nurses find helpful.

Metabolic Acidosis

Under normal conditions, the kidneys work to maintain a normal pH by excreting acids through urine; they also neutralize excess acids by increasing bicarbonate (HCO_3^-) reabsorption from the urine. When the kidneys are not able to perform this buffering function to the level required to excrete and neutralize the excess acid, acids accumulate (in the form of hydrogen ions) and there is a deficiency of bases (in the form of bicarbonate). This condition is called **metabolic acidosis**.

Metabolic acidosis is characterized by a pH level below 7.35 and an HCO_3 level below 22 mEq/L. It is important to notice that both the pH and HCO_3 decrease with metabolic acidosis (i.e., they move in the same downward direction).

Pathophysiology of Metabolic Acidosis

A common cause of metabolic acidosis is diabetic ketoacidosis. In diabetic ketoacidosis, acids called ketones, a byproduct of anaerobic metabolic due to a lack of insulin, are detected and excreted in the urine. Another common cause in hospitalized patients is lactic acidosis, which can be caused by impaired tissue oxygenation. Metabolic acidosis can also be caused by increased loss of bicarbonate due to severe diarrhea or from renal disease that impairs the kidneys' ability to eliminate acid.

Clinical Manifestations of Metabolic Acidosis

Nurses may first suspect that a patient has metabolic acidosis because the patient has rapid breathing; this occurs as the lungs try to remove excess CO_2 to resolve the acidosis. Other signs and symptoms of metabolic acidosis include

- confusion
- decreased level of consciousness
- electrolyte disturbances that can progress to circulatory collapse and death if not treated promptly
- GI distress: diarrhea
- hypotension

Medical Therapies and Related Care

It is important to quickly notify the provider of suspected metabolic acidosis so that an ABG measurement can be ordered, a sample collected, and treatment prescribed (based on the cause of the metabolic acidosis) to allow acid levels to improve. Treatment includes IV fluids to improve hydration status, tight glucose management, and circulatory support. When the pH drops below 7.1, IV sodium bicarbonate is often prescribed to help neutralize the acids in the blood.

Metabolic Alkalosis

When there is too much HCO_3 in the body or an excessive loss of acid (in the form of hydrogen ions) it is known as **metabolic alkalosis**. The condition is defined by a pH above 7.45 and a bicarbonate level above 26 on ABG results. Note that both pH and HCO_3^- level are elevated in metabolic alkalosis.

Pathophysiology of Metabolic Alkalosis

Metabolic alkalosis has a variety of causes, including prolonged vomiting and nasogastric suctioning. This is because gastric secretions have high levels of hydrogen ions: as acid is lost, the pH level of the bloodstream increases. Excessive urinary loss (due to diuretics or excessive mineralocorticoids) can cause metabolic alkalosis due to loss of hydrogen ions in the urine. Intravenous administration of sodium bicarbonate can also cause metabolic alkalosis due to increased levels of bases introduced into the body.

Metabolic alkalosis can also happen when hydrogen ions shift into cells due to hypokalemia. Recall that hypokalemia refers to low levels of potassium in the bloodstream. When this happens, potassium ions shift out of cells and into the bloodstream to maintain a normal level of serum potassium for optimal cardiac function. However, as the potassium ions (K^+) move out of cells, H^+ moves into the cells from the bloodstream to maintain electrical neutrality. This transfer of ions causes the pH in the bloodstream to rise resulting in metabolic alkalosis.

Clinical Manifestations of Metabolic Alkalosis

A nurse may first suspect that a patient has metabolic alkalosis because they may have a decreased respiratory rate; this is the result of the lungs trying to retain additional CO_2 to increase the acidity of the blood and resolve the alkalosis. The patient may also be confused due to the altered pH level. The nurse should report signs of suspected metabolic alkalosis because the condition, if uncorrected, can result in hypotension and cardiac dysfunction. Additionally, any fluid loss from the stomach level and above results in loss of acids and eventual alkalosis, whereas fluid losses below the stomach result in loss of bases and eventual acidosis. For example, prolonged vomiting can result in alkalosis and prolonged diarrhea can result in acidosis.

Medical Therapies and Related Care

Treatment for metabolic alkalosis is prescribed on the basis of the ABG results and the suspected cause. For example, orders may include treating the cause of the vomiting, stopping the GI suctioning, or stopping the administration of diuretics. If hypokalemia is also present, it should be promptly treated. If bicarbonate is being administered, it should be stopped. Patients with kidney disease or severe imbalances may require dialysis.

Respiratory Alkalosis (Carbonic Acid Deficit)

When the body removes too much CO_2 through respiration, resulting in increased pH and an alkalotic state, it is known as **respiratory alkalosis**. When reviewing ABG values, respiratory alkalosis is identified when pH levels are above 7.45 and the $PaCO_2$ level is below 35. Notice that as the $PaCO_2$ level decreases, the pH level increases.

Pathophysiology of Respiratory Alkalosis

Respiratory alkalosis is caused by hyperventilation that can occur due to anxiety, panic attacks, pain, fear, head injuries, or mechanical ventilation. Overdoses of salicylates and other toxins can also cause respiratory alkalosis initially; the condition often progresses to metabolic acidosis in later stages. Acute asthma exacerbations, pulmonary embolisms, or other respiratory disorders can initially cause respiratory alkalosis as the lungs breathe faster in an attempt to increase oxygenation, which decreases the $PaCO_2$. After a while, however, these hypoxic disorders cause respiratory acidosis, as respiratory muscles tire, breathing slows, and CO_2 builds up in the blood.

Clinical Manifestations of Respiratory Alkalosis

Patients experiencing respiratory alkalosis often report feelings of shortness of breath, dizziness or light-headedness, chest pain or tightness, paresthesia, and palpitations. These symptoms result from decreased CO_2 levels. Respiratory alkalosis is not fatal, but it is important to recognize that underlying conditions such as asthma exacerbation or pulmonary embolism can be life-threatening, so treatment of these underlying conditions is essential.

Medical Therapies and Related Care

As the body's pH level increases, the kidneys attempt to compensate for the shortage of hydrogen ions by reabsorbing bicarbonate before it can be excreted in the urine. This is a slow process, so additional treatment may be necessary to address the underlying cause of hyperventilation. Acute management of patients who are hyperventilating should focus on patient reassurance, an explanation of the symptoms the patient is experiencing, and the removal of any stressors.

Respiratory Acidosis (Carbonic Acid Excess)

When CO_2 builds up in the body, **respiratory acidosis** develops, a condition known as **hypercapnia**, which causes the blood to become increasingly acidic. Respiratory acidosis is identified when ABG measurements show a pH level below 7.35 and $PaCO_2$ level above 45; these data indicate the cause of the acidosis is respiratory. Note that in respiratory acidosis, as the $PaCO_2$ level increases, the pH level decreases.

Pathophysiology of Respiratory Acidosis

Respiratory acidosis is typically caused by a medical condition such as an acute asthma exacerbation, COPD, or an acute heart failure exacerbation causing pulmonary edema; these conditions all decrease the exchange of oxygen and CO_2 at the alveolar level. Respiratory acidosis can also be caused by decreased ventilation from anesthesia, the consumption of alcohol, or the administration of medications such as opioids and sedatives.

Chronic respiratory diseases, such as COPD, often cause chronic respiratory acidosis that is fully compensated for by the kidneys retaining HCO_3^-. Because the CO_2 levels build up over time, the body adapts to elevated $PaCO_2$ levels, and they are better tolerated. However, in acute respiratory acidosis, the body does not have time to adapt to elevated CO_2 levels, causing mental status changes associated with hypercapnia. Acute respiratory acidosis is caused by acute respiratory conditions, such as an asthma attack or heart failure exacerbation with pulmonary edema, when the lungs suddenly are not able to ventilate adequately. As breathing slows and respirations become shallow, less CO_2 is excreted by the lungs and $PaCO_2$ levels quickly rise.

Clinical Manifestations of Respiratory Acidosis

Signs and symptoms of hypercapnia vary depending upon the level and rate of CO_2 accumulation in arterial blood. Patients with mild to moderate hypercapnia may be anxious or complain of mild dyspnea, daytime sluggishness, headaches, or hypersomnolence. Patients with higher levels of CO_2 or rapidly developing hypercapnia may develop delirium, paranoia, depression, and confusion that can progress to seizures and coma as levels continue to increase. Individuals with normal lung function typically exhibit a depressed level of consciousness when the $PaCO_2$ is greater than 75 to 80 mm Hg, whereas patients with chronic hypercapnia may not develop symptoms until the $PaCO_2$ is greater than 90 to 100 mm Hg.

Medical Therapies and Related Care

When a patient demonstrates signs of potential hypercapnia, the nurse should assess airway, breathing, and circulation. Urgent assistance should be sought, especially if the patient is in respiratory distress. The provider should order an ABG measurement and prescribe treatments based on assessment findings and potential causes. Treatment for respiratory acidosis typically involves improving ventilation and respiration by removing airway restrictions, reversing oversedation, administering nebulizer treatments, or increasing the rate and depth of respiration by using a bilevel positive airway pressure (BiPAP) or continuous positive airway pressure (CPAP) device. BiPAP and CPAP devices provide noninvasive positive pressure ventilation to increase the depth of respiration, remove CO_2, and oxygenate the patient. If these noninvasive interventions are not successful, the patient will likely need to be intubated and receive mechanical ventilation support.

Nursing Care of Patients with Acid-Base Imbalances

Nursing care for patients with acid-base imbalances focuses on early detection and intervention to ensure optimal patient outcomes. Even slight alterations in acid-base balance can significantly alter the body's homeostasis and result in dysfunctional physiological processes.

Recognizing and Analyzing Cues

For patients presenting with signs and symptoms indicating the presence of an acid-base imbalance, one of the first interventions is to obtain an ABG measurement. The respiratory therapist (RT) often performs this, which highlights the importance of interdisciplinary collaboration and teamwork. On the basis of the findings of the ABG sample, the nurse, RT, and provider will work together to determine the next step and develop an appropriate plan of care for the patient.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

The main nursing interventions for patients with acid-base imbalances include

- closely monitoring respiratory and neurological status for deviations from baseline that would indicate

worsening of the imbalance
- monitoring and recording accurate intake and output
- monitoring and treating the specific acid-base imbalance
- monitoring vital signs

Evaluation of Nursing Care for Patients with Acid-Base Imbalances

After diagnosis of and initiation of treatment for an acid-base imbalance, it is important for the nurse to evaluate patient outcomes to determine whether treatment was effective and if further intervention is necessary. After treatment, signs that would indicate the patient's condition is improving include

- normal ABG values
- normal serum electrolyte levels
- regular breathing pattern and adequate oxygenation

Compensation

Various compensatory mechanisms exist to maintain blood pH within a narrow range, including buffers, respiration, and renal mechanisms. Although compensatory mechanisms usually work very well, when one of these mechanisms is not working properly (e.g., as in kidney failure or respiratory disease), they have their limits. If the pH and bicarbonate to carbonic acid ratio are changed too drastically, the body may not be able to compensate. Moreover, extreme changes in pH can denature proteins. Extensive damage to proteins in this way can result in disruption of normal metabolic processes, serious tissue damage, and, ultimately, death.

Respiratory Compensation

Respiratory compensation for metabolic acidosis increases the respiratory rate to drive off CO_2 and readjust the bicarbonate to carbonic acid ratio to the 20:1 level. This adjustment can occur within minutes. The normal response of the respiratory system to elevated pH is to increase the amount of CO_2 in the blood by decreasing the respiratory rate to conserve CO_2. There is a limit to the decrease in respiration, however, that the body can tolerate. Hence, the respiratory route is less efficient at compensating for metabolic alkalosis than for acidosis.

Metabolic Compensation

Metabolic and renal compensation for respiratory diseases that can create acidosis revolves around the conservation of HCO_3^-. In cases of respiratory acidosis, the kidney increases the conservation of HCO_3^- and secretion of H^+ through exchange mechanisms. These processes increase the concentration of HCO_3^- in the blood, reestablishing the proper relative concentrations of HCO_3^- and carbonic acid. In cases of respiratory alkalosis, the kidneys decrease the production of HCO_3^- and reabsorb H^+ from the tubular fluid. These processes can be limited by the exchange of potassium by the renal cells, which use a K^+–H^+ exchange mechanism.

Summary

10.1 Maintaining Homeostasis

- To maintain homeostasis or stable internal equilibrium of physiological processes, the body must maintain appropriate balances of fluids, electrolytes, pH, acids, and bases.
- Body fluids are found in two main areas in the body: intracellular and extracellular compartments.
- The movement of fluid between intracellular and extracellular compartments is governed by several mechanisms, including hydrostatic pressure, oncotic pressure, and osmosis.
- The body has many internal mechanisms in place that attempt to compensate for fluid, electrolyte, and acid-base imbalances.
- When the body's compensatory mechanisms are not able to completely correct these imbalances, medical intervention is warranted.
- Two of the major compensatory mechanisms in the body include antidiuretic hormone (ADH) and the renin-angiotensin-aldosterone system (RAAS).

10.2 Fluid Disturbances and Replacement

- Both excessive and inadequate amounts of fluid can alter the body's homeostasis and become life-threatening if left untreated.
- Hypovolemia occurs when the loss of fluid is greater than fluid intake, resulting in a deficient amount of fluid volume in the body.
- The main goals of nursing care for patients with hypovolemia include restoring fluid balance to an optimal level, maintaining homeostasis, and preventing the development of complications such as hypovolemic shock.
- Three types of IV fluids are used to treat hypovolemia—isotonic, hypotonic, and hypertonic fluids—and they vary on the basis of their tonicity, or composition and concentration of dissolved particles.
- Hypervolemia, also known as fluid volume overload, occurs when an increased amount of fluid is retained in the intravascular compartment, resulting in excess fluid volume.
- The main goals of nursing care for patients with hypervolemia include removing excess fluid, maintaining homeostasis, and preventing the development of complications such as pulmonary edema.

10.3 Electrolyte Imbalance

- Electrolytes play an important role in most physiological body functions and assist in maintaining homeostasis.
- There is a very narrow target range for normal electrolyte values, and even slight abnormalities can have devastating consequences.
- Potassium imbalances are a high priority because they often result in fatal cardiac dysrhythmias if left untreated.
- In sodium imbalances, there is either too much sodium present in the blood (hypernatremia) or too little (hyponatremia). Both types are common and require early assessment and intervention to prevent severe adverse effects.
- Hypocalcemia (too little calcium in the blood) results in signs and symptoms including tetany, muscle cramps, and paresthesia; whereas hypercalcemia (too much calcium in the blood) causes nausea, vomiting, constipation, and increased thirst or urination.
- In magnesium imbalances, there is either too much magnesium present in the blood (hypermagnesemia) or too little (hypomagnesemia). Both types require early assessment and intervention to prevent severe adverse effects, including cardiac dysrhythmias or arrest.
- Hyperphosphatemia (too much phosphorus in the blood) is caused by conditions such as alcohol abuse, burns, diuretic use, and starvation; whereas hypophosphatemia (too little phosphorus in the blood) is caused by kidney disease, crush injuries, and overuse of phosphate-containing enemas.

10.4 Acid-Base Imbalance

- As with electrolytes, acids and bases must be correctly balanced for the body to function properly.
- The kidneys and lungs work together to correct acid-base imbalances as they occur. As a result, the kidneys compensate for shortcomings of the lungs, and the lungs compensate for shortcomings of the kidneys.

- Interpreting arterial blood gas values can indicate one of four conditions: respiratory acidosis, respiratory alkalosis, metabolic acidosis, or metabolic alkalosis.
- Metabolic acidosis occurs when there is an accumulation of acids (hydrogen ions) and not enough bases (bicarbonate) in the body.
- Metabolic alkalosis occurs when there is too much bicarbonate in the body or an excessive loss of hydrogen ions.
- Respiratory alkalosis develops when the body removes too much carbon dioxide through respiration, resulting in increased pH and an alkalotic state.
- Respiratory acidosis develops when carbon dioxide builds up in the body (a state known as hypercapnia), causing the blood to become increasingly acidic.

Key Terms

acid byproduct of many metabolic processes in the body and forms hydrogen ions (H^+) when dissolved in water
acidosis condition involving excessive levels of acids in the body
alkalosis condition involving excessive levels of bases in the body
arterial blood gas procedure in which blood is obtained from an arterial catheter or direct puncture and then analyzed to determine oxygenation status
ascites fluid accumulation in the abdominal cavity
baroreceptors specialized nerve cells that can detect the "stretch" (i.e., the level of vasoconstriction) of vessels, which reflects blood pressure
base forms hydroxide (OH^-) ions when dissolved in water
Chvostek's sign involuntary twitching of facial muscles when the facial nerve is tapped; a classic sign of acute hypocalcemia
edema swelling in the dependent tissues and extremities related to fluid accumulation in the interstitial space
electrolytes ions dissolved in body fluid that play important roles in most physiological functions and assist in maintaining homeostasis
hydrostatic pressure force exerted by a fluid against a wall, causing the movement of fluid between compartments
hypercalcemia increased level of calcium in the blood
hypercapnia elevated carbon dioxide levels in the blood
hyperchloremia increased level of chloride in the blood
hyperkalemia increased level of potassium in the blood
hypermagnesemia increased level of magnesium in the blood
hypernatremia increased level of sodium in the blood
hyperphosphatemia increased level of phosphorus in the blood
hypertonic describes a solution that contains more dissolved solutes than blood contains
hypervolemia a state that occurs when an increased amount of fluid is retained in the intravascular compartment, resulting in an excess volume of fluid
hypocalcemia decreased levels of calcium in the blood
hypochloremia decreased level of chloride in the blood
hypokalemia decreased level of potassium in the blood
hypomagnesemia decreased level of magnesium in the blood
hyponatremia decreased level of sodium in the blood
hypophosphatemia decreased level of phosphorus in the blood
hypothalamus structure in the brain that acts as a control center for the endocrine system
hypotonic describes a solution that contains fewer dissolved solutes than blood contains
hypovolemia state that occurs when fluid loss is greater than fluid intake, resulting in a deficient volume of fluid
hypovolemic shock life-threatening medical condition in which the heart cannot get enough blood and oxygen to body tissues due to a severe intravascular fluid deficit
isotonic describes a solution that contains the same number of dissolved solutes compared with blood
metabolic acidosis condition resulting from an accumulation of acids and a deficiency of bases in the bloodstream
metabolic alkalosis condition resulting from an accumulation of bases and a deficiency of acids in the bloodstream

oncotic pressure pressure created by colloid in a fluid; prevents the movement of water from one solution to another
osmolarity solute concentration of the blood
osmoreceptors specialized cells in the hypothalamus that are particularly sensitive to the concentration of sodium ions and other solutes
osmosis movement of water through a semipermeable membrane from an area of lesser solute concentration to an area of greater solute concentration
osmotic demyelination syndrome brain cell dysfunction that results from osmotic changes, often due to rapid correction of hyponatremia
osmotic pressure the pressure exerted by plasma proteins (e.g., albumin), acting as a pulling force to keep fluids inside blood vessels
pH value that explains how much hydrogen is contained within a liquid and the activity of the hydrogen ion
pulmonary edema life-threatening condition in which the respiratory system no longer functions effectively due to excessive fluid accumulation in the lungs
respiratory acidosis condition that develops when carbon dioxide builds up in the body, causing the blood to become increasingly acidic
respiratory alkalosis condition that develops when the body removes too much carbon dioxide through respiration, resulting in increased pH and an alkalotic state
solute substance dissolved in another substance
tetany involuntary contraction of muscles that is often related to hypocalcemia and leads to painful muscle cramps, spasms, and hyperactive reflexes
tonicity composition and concentration of dissolved solutes in a solution
Trousseau's sign hand spasm caused by inflating a blood pressure cuff to a level above systolic pressure for 3 minutes; a classic sign of acute hypocalcemia

Assessments

Review Questions

1. What kind of fluid is found in the intravascular space of the extracellular fluid compartment?
   a. plasma
   b. lymph
   c. synovial fluid
   d. cerebrospinal fluid

2. What force is exerted by plasma proteins in an effort to keep fluids inside the blood vessels and prevent them from leaking into the interstitial space?
   a. osmosis
   b. oncotic pressure
   c. hydrostatic pressure
   d. glomerular filtration

3. What situation would result in activation of the RAAS?
   a. hypokalemia
   b. hyponatremia
   c. elevated blood pressure
   d. increased serum osmolarity

4. A nurse is caring for a patient diagnosed with hypovolemia secondary to excessive vomiting. What clinical manifestation would the nurse anticipate?
   a. weight gain
   b. tachycardia
   c. bounding pulses
   d. jugular venous distension

5. What abnormal laboratory value would be most consistent with a diagnosis of hypervolemia?
   a. hyponatremia
   b. increased hematocrit
   c. increased serum osmolarity
   d. decreased serum creatinine

6. What fluid order would the nurse anticipate for a patient who presents with severe bleeding after a motor vehicle accident?
   a. 3% normal saline
   b. 5% normal saline
   c. 0.45% normal saline
   d. 0.9% normal saline

7. What nursing intervention is the priority when caring for a patient receiving oral potassium supplements?
   a. neurological checks
   b. telemetry monitoring
   c. fluid administration
   d. frequent turns

8. What is an assessment finding that a nurse would expect for a patient with a serum sodium level of 130 mEq/L?
   a. cardiac dysrhythmias
   b. weight loss
   c. hypertension
   d. seizures

9. What is a factor that increases the risk of developing hypercalcemia?
   a. prolonged immobility
   b. hypoparathyroidism
   c. vitamin D deficiency
   d. high intake of phosphorus

10. How should the nurse interpret these results? A nurse is caring for a patient with the following ABG results:
   - pH: 7.34
   - $PaCO_2$: 50 mm Hg
   - HCO_3^-: 26 mEq/L

   a. metabolic acidosis
   b. metabolic alkalosis
   c. respiratory acidosis
   d. respiratory alkalosis

11. What acid-base imbalance should a nurse anticipate in a patient who presents with diabetic ketoacidosis?
   a. metabolic acidosis
   b. metabolic alkalosis
   c. respiratory acidosis
   d. respiratory alkalosis

12. What acid-base imbalance should a nurse anticipate in a patient who presents with hyperventilation secondary to anxiety?
   a. metabolic acidosis
   b. metabolic alkalosis
   c. respiratory acidosis

d. respiratory alkalosis

Check Your Understanding Questions

1. What role do the kidneys play in maintaining the body's homeostasis?
2. What is the difference between baroreceptors and osmoreceptors?
3. What is the meaning of homeostasis?
4. What assessment findings would you expect to see in a patient diagnosed with hypervolemia?
5. What would the nurse be most concerned about when administering potassium intravenously?
6. Why are patients with COPD at high risk for developing respiratory acidosis?

Reflection Questions

1. What assessment findings in your patient would help confirm that the RAAS is working effectively?
2. Which acid-base imbalance is most likely to result in the need for intubation and mechanical ventilation? Why?

What Should the Nurse Do?

An emergency department nurse is caring for a patient who presents with shortness of breath. The patient reports that she was walking around the house and suddenly "couldn't catch my breath." She also reports that she forgot to take her "water pill" for the last week and feels like she has gained a few pounds because of it.

1. Based on the information provided, what condition do you think the patient has? What information led you to this conclusion?
2. What assessments should you perform on the patient?
3. What orders do you anticipate from the provider for this patient?
4. What outcomes would indicate that the orders were successful?

A nurse is caring for Ms. Chen, a 62-year-old female who presents to the emergency department after experiencing 2 days of severe nausea and vomiting. The patient also reports muscle cramping and excessive fatigue. After obtaining an ECG, the nurse notices the presence of U waves.

5. Which electrolyte imbalance should the nurse suspect on the basis of the patient's presentation and assessment findings?
6. What other signs and symptoms should the nurse assess for?
7. What treatment(s) and intervention(s) should the nurse anticipate?
8. What patient outcomes would indicate the treatments or interventions were effective?

A nurse is caring for Mr. Johnson, a 74-year-old male who presents to the emergency department with a COPD exacerbation. Upon assessment, the nurse notices that the patient is becoming more lethargic, and his oxygen saturation is only 87% despite being on 4 liters of supplemental oxygen. ABG results are as follows:

pH: 7.24
$PaCO_2$: 60 mm Hg
HCO_3^-: 25 mEq/L

9. Which acid-base imbalance should the nurse suspect on the basis of the patient's presentation and assessment findings?
10. What other symptoms should the nurse assess for?
11. What treatment(s) and intervention(s) should the nurse anticipate?
12. What patient outcomes would indicate the treatments or interventions were effective?

Competency-Based Assessments

1. A patient with chronic kidney disease is admitted to the hospital. How do the impaired functions of the kidneys affect the homeostasis of fluids and electrolytes in the body? Discuss potential nursing interventions.

2. As a clinical nurse, you are working with a patient who has been diagnosed with diabetes mellitus, a condition affecting the pancreas. What is the impact of impaired pancreatic function on both fluid balance and the body's ability to maintain homeostasis?
3. A patient is admitted with hypovolemia due to severe dehydration after a prolonged bout of vomiting. Describe the pathophysiology of hypovolemia, identify relevant risk factors, and outline the clinical manifestations a nurse should assess in this patient.
4. In the emergency department, you encounter a patient with severe hypovolemia due to gastrointestinal bleeding who needs fluid replacement. Discuss the factors you should consider when selecting the appropriate type and rate of fluid replacement.
5. As a nursing student, how would you assess the effectiveness of nursing care for a patient with hypernatremia?
6. A patient with electrolyte imbalances is receiving medical therapies, including IV potassium replacement and loop diuretics. Discuss the nursing considerations and potential complications associated with these therapies. How would you evaluate the efficacy of the nursing care provided?
7. Explain the interplay between the respiratory system (lungs) and the endocrine system in maintaining acid-base balance. How does this contribute to overall homeostasis?

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CHAPTER 11

Gas Exchange, Airway Management, and Respiratory System Disorders

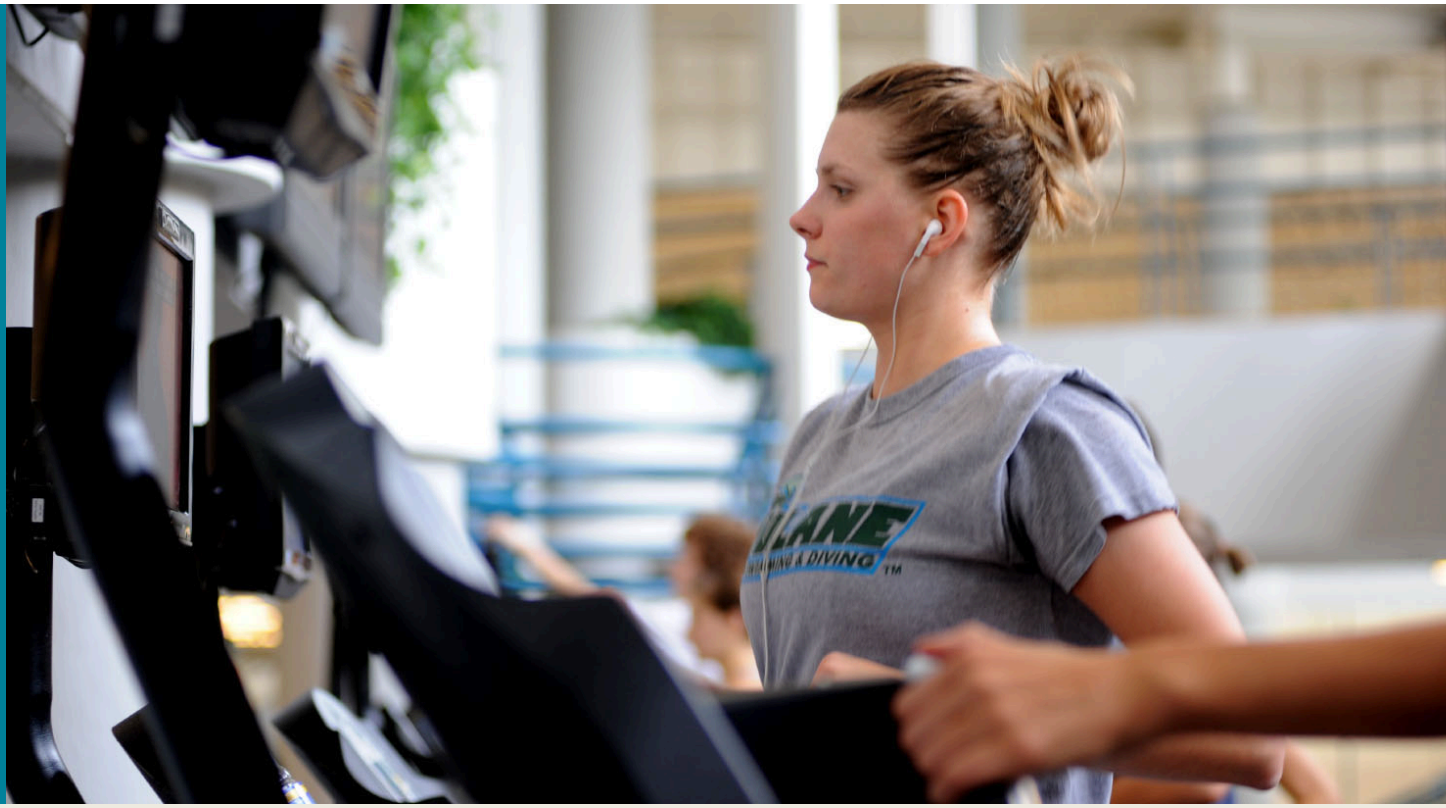

FIGURE 11.1 Vigorous exercise requires a healthy respiratory system. (credit: modification of "Working Out At The Reily Center (3726377407)" by Tulane Public Relations/Wikimedia Commons, CC BY 2.0)

CHAPTER OUTLINE

INTRODUCTION Adequate lung function is an essential bodily function. Both acute and chronic respiratory conditions can impact the body's ability to achieve effective gas exchange. When changes occur due to illness or injury, the body works hard to compensate. Despite the body's efforts to achieve effective gas exchange when damage has occurred, problematic symptoms may require urgent intervention to prevent life-threatening complications. Understanding oxygenation, perfusion, and common disorders of the respiratory system is essential for providing effective nursing care for patients with respiratory issues. Nursing assessment of the upper and lower

airways provides an opportunity for close monitoring of potential and active respiratory problems.

11.1 Concepts of Oxygenation and Perfusion

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Describe the functions of respiratory anatomy and physiology
- Define the concepts of oxygenation and ventilation
- Discuss the relationship of respiratory physiology on oxygenation and ventilation
- Define the concept of perfusion
- Discuss the relationship of respiratory physiology on perfusion

An adequately functioning respiratory system is vital to survival. Each breath provides an opportunity for the body to receive oxygen, remove carbon dioxide, and help maintain acid-base balance. A functioning respiratory system has adequate airflow in and out of the lungs, provides oxygen to fuel the body's tissues, and allows sufficient clearance of carbon dioxide during exhalation. Nonessential tasks of the respiratory system include sensing odors and speech production. Because of the vital functions of the respiratory system, protection is necessary. The ribs, as well as protective membranes, safeguard the lungs from injury. The body also has multiple defenses to prevent pathogens from entering the respiratory tract, such as mucus and nasal mucosa.

Respiratory Anatomy and Physiology Review

The respiratory system allows the body to breathe in air, eliminate carbon dioxide, and oxygenate blood. It is made up of two zones: the conducting zone and the respiratory zone. The **conducting zone** includes all parts that help deliver air to the lower airway for ventilation and perfusion. These areas serve as passageways for air to flow into and out of the lungs. The **respiratory zone** describes the parts that perform gas exchange. These are the areas where oxygen from the outside air enters the bloodstream and is swapped for carbon dioxide.

The major structures of the respiratory system are shown in Figure 11.2.

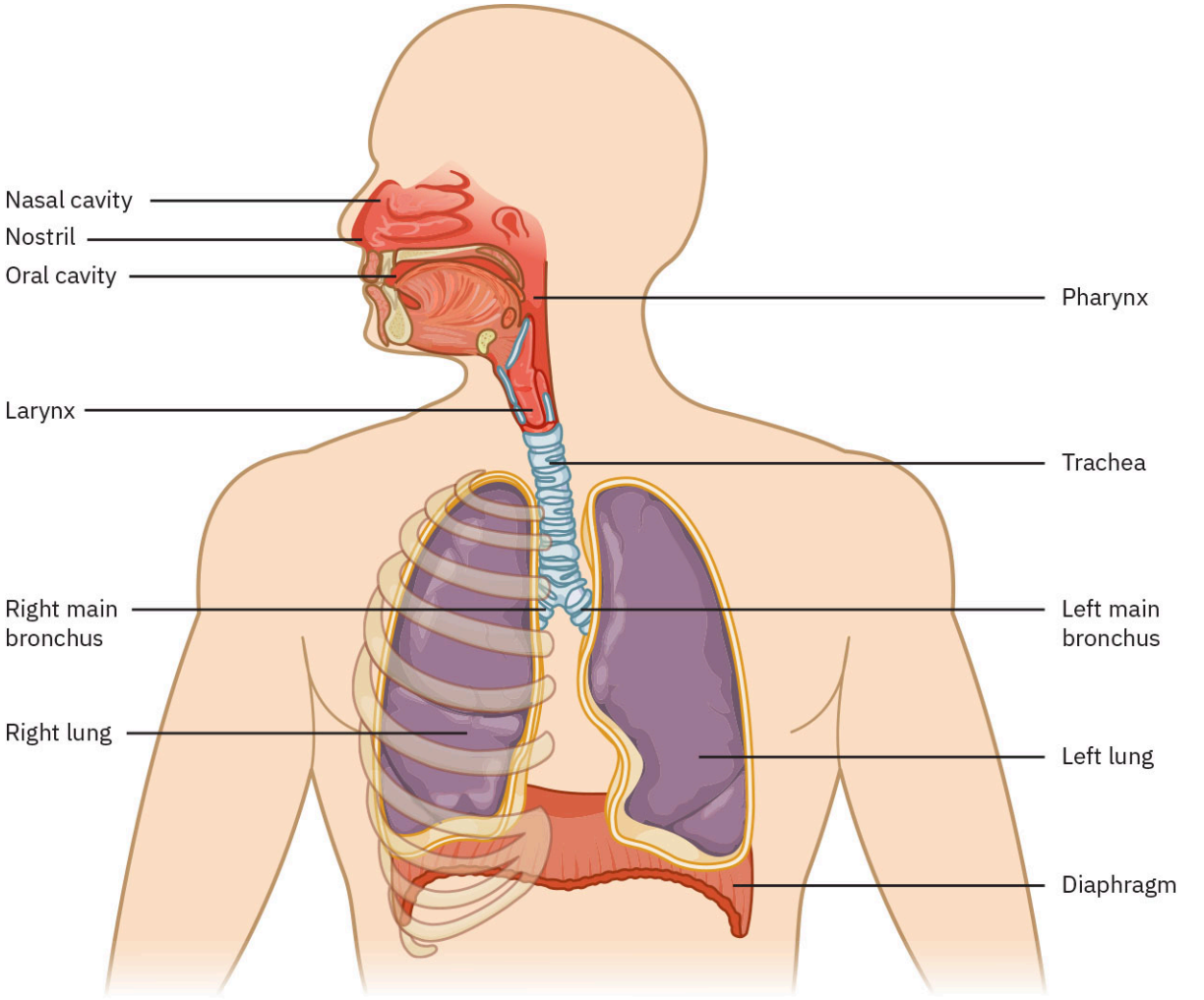

FIGURE 11.2 The respiratory system consists of the conducting zone, which is represented by the trachea, larynx, pharynx, nostril/nasal cavity, and oral cavity. The bronchus, left lung, right lung, and diaphragm deliver air to the lower airway and the respiratory zone, where gas exchange occurs. (modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

LINK TO LEARNING

Watch this Crash Course on the respiratory system (https://openstax.org/r/77RespSystem) that reviews respiratory anatomy and physiology.

Components of the Conducting Zone

The conducting zone starts at the nose and mouth, where air enters and exits the body. The primary purposes of this zone are to humidify and warm air and to minimize the likelihood of pathogens and debris entering the body. The nasal passages and paranasal sinuses are lined with respiratory epithelium. Respiratory epithelium generates mucus, which helps to catch and trap debris. The cilia of respiratory epithelium are short, hairlike structures that move continuously, sweeping mucus and debris toward the throat so it can be swallowed instead of advancing into the lower respiratory tract. Because the epithelium is moist, it adds humidification to air as it enters the body. Capillaries under the epithelium are a source of warmth. When inhaled air is warmed and humidified, it is less likely to damage delicate tissues in the lungs. Some cells in this area provide protection by secreting antibacterial enzymes and proteins. Protective immune cells exist in the connective tissue underneath the respiratory epithelium.

The **pharynx** is a muscular tube with an inner mucous membrane lining; it connects the nasal passages and oral cavity to the trachea and esophagus (Figure 11.3). Its three regions are the nasopharynx, oropharynx, and

laryngopharynx. The **nasopharynx** allows air to pass from the nasal cavity toward the trachea. The **oropharynx** allows passage of both air and food. The **laryngopharynx** is the most inferior portion of the pharynx. It is located superior to both the trachea and esophagus. Like the oropharynx, it allows passage of both air and food. The upper portion of the laryngopharynx is lined with epithelial cells capable of secreting mucus, which helps to trap pathogens and debris. Additionally, cilia beat continuously, sweeping mucus and debris upward so it can be swallowed instead of remaining in the respiratory tract.

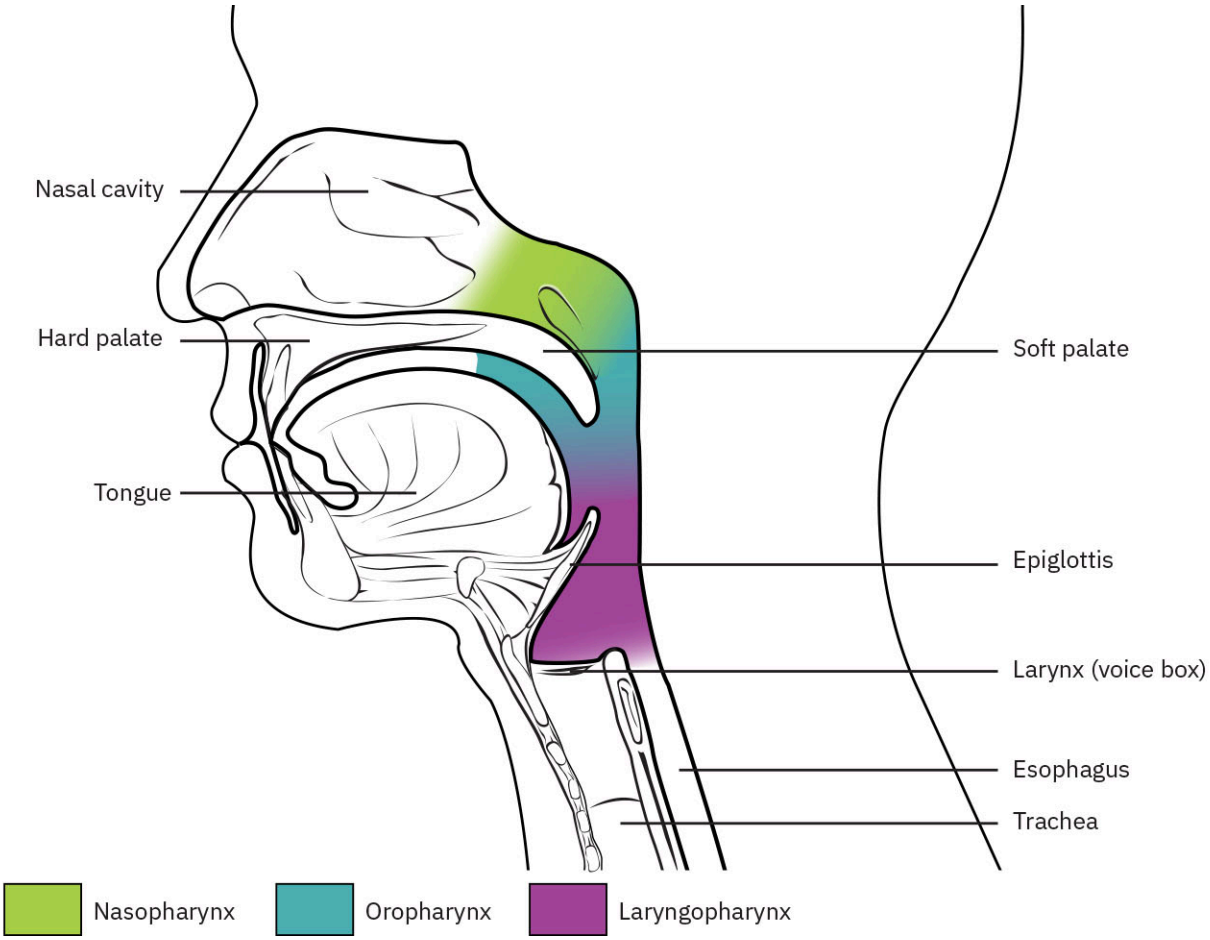

FIGURE 11.3 The pharynx is divided into three regions: the nasopharynx, the oropharynx, and the laryngopharynx. (modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

The **larynx** is made of cartilage and joins the pharynx to the trachea (Figure 11.4). It regulates how much air goes into and out of the lungs. The thyroid cartilage, epiglottis, and cricoid cartilage are the key structures in the larynx. The laryngeal structures protect the opening of the trachea during swallowing and allow vibrations in the vocal cords to produce sound.

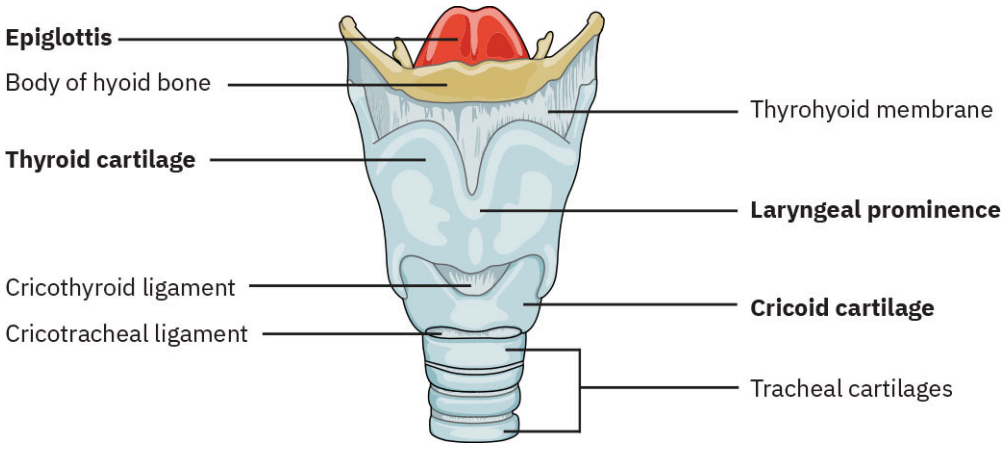

FIGURE 11.4 The larynx extends from the laryngopharynx and the hyoid bone to the trachea. (modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

The **trachea** is anterior to the esophagus and extends downward from the larynx to the lungs (Figure 11.5). This tube is made up of sixteen to twenty C-shaped pieces of hyaline cartilage, joined by connective tissue. The cartilage rings provide rigid support and keep the trachea open. A fibroelastic membrane encases the posterior trachea. The fibroelastic membrane provides flexibility to permit the trachea to shift and stretch slightly during breathing. The trachea is lined with epithelial cells that secrete mucus and beat consistently to sweep debris up and out of the airway.

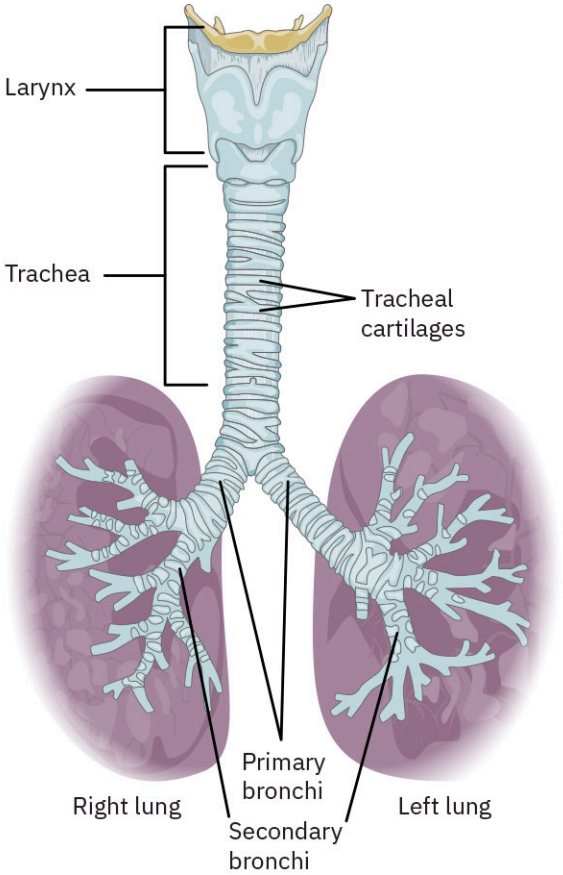

FIGURE 11.5 The tracheal tube is formed by stacked, C-shaped pieces of hyaline cartilage. (modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

The **carina** is the point where the trachea splits into the right and left primary bronchi. Specialized nervous tissue in the carina can detect foreign bodies (such as food) and will cause forceful coughing to expel it. The bronchi are lined with epithelial cells capable of producing mucus. Each primary bronchi enters the lung and continues to split into a bronchial tree. The bronchi serve as a passage for air to enter and exit the lung. The bronchi continue to branch into

smaller and smaller airways called bronchioles. Bronchioles have muscular walls that can flex to increase or decrease airflow. With a diameter of approximately one millimeter, these tiny airways continue branching off until they end in small terminal bronchioles. Terminal bronchioles lead to the site where gas exchange occurs.

The lungs connect to the trachea via the right and left bronchi (Figure 11.6). The diaphragm is adjacent and inferior to the lungs. To accommodate space for the heart, the left lung is smaller than the right lung. The left lung has two lobes, and the right lung has three lobes. The ribs and sternum provide protection for the lungs and heart. The lungs are encased in protective membranes called **pleurae**. The parietal pleura is the outer layer, and the visceral pleura is the inner layer. The pleural space is the small area between the parietal and visceral pleura.

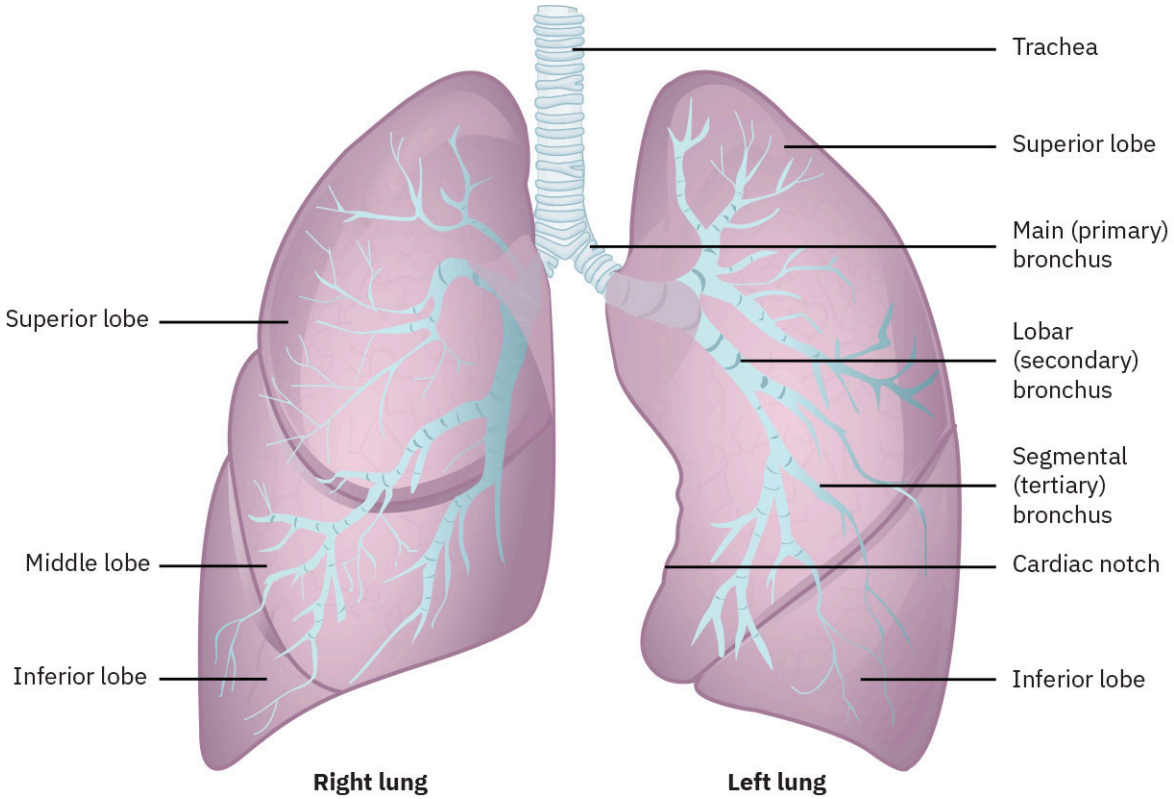

FIGURE 11.6 Each lung is composed of smaller units called lobes. Fissures separate these lobes from each other. The right lung consists of three lobes: the superior, middle, and inferior lobes. The left lung consists of two lobes: the superior and inferior lobes. (modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

A small volume of pleural fluid provides lubrication and creates surface tension to keep the lungs expanded. Most of the pressure changes that drive inspiration and expiration are caused by movement in the intercostal muscles and diaphragm.

The **medulla oblongata** in the brain is the respiratory center and controls breathing by responding to shifts in carbon dioxide, oxygen, and blood pH (potential hydrogen). When changes in the pH of cerebrospinal fluid (CSF) are detected in the medulla oblongata, it can change the respiratory rate so that pH shifts back into the normal range. Autonomic functions control the rate and depth of respiration based on the chemical changes discussed preceedingly.

Components of the Respiratory Zone

The respiratory zone begins where terminal bronchioles meet a respiratory bronchiole (Figure 11.7). This connects to an alveolar duct and opens into a cluster of alveoli. An **alveolus** is an individual, grapelike sac in the lungs where gas exchange occurs, and an **alveolar sac** is a group of alveoli. Alveoli are elastic and stretch during inspiration, increasing the available surface area for gas exchange.

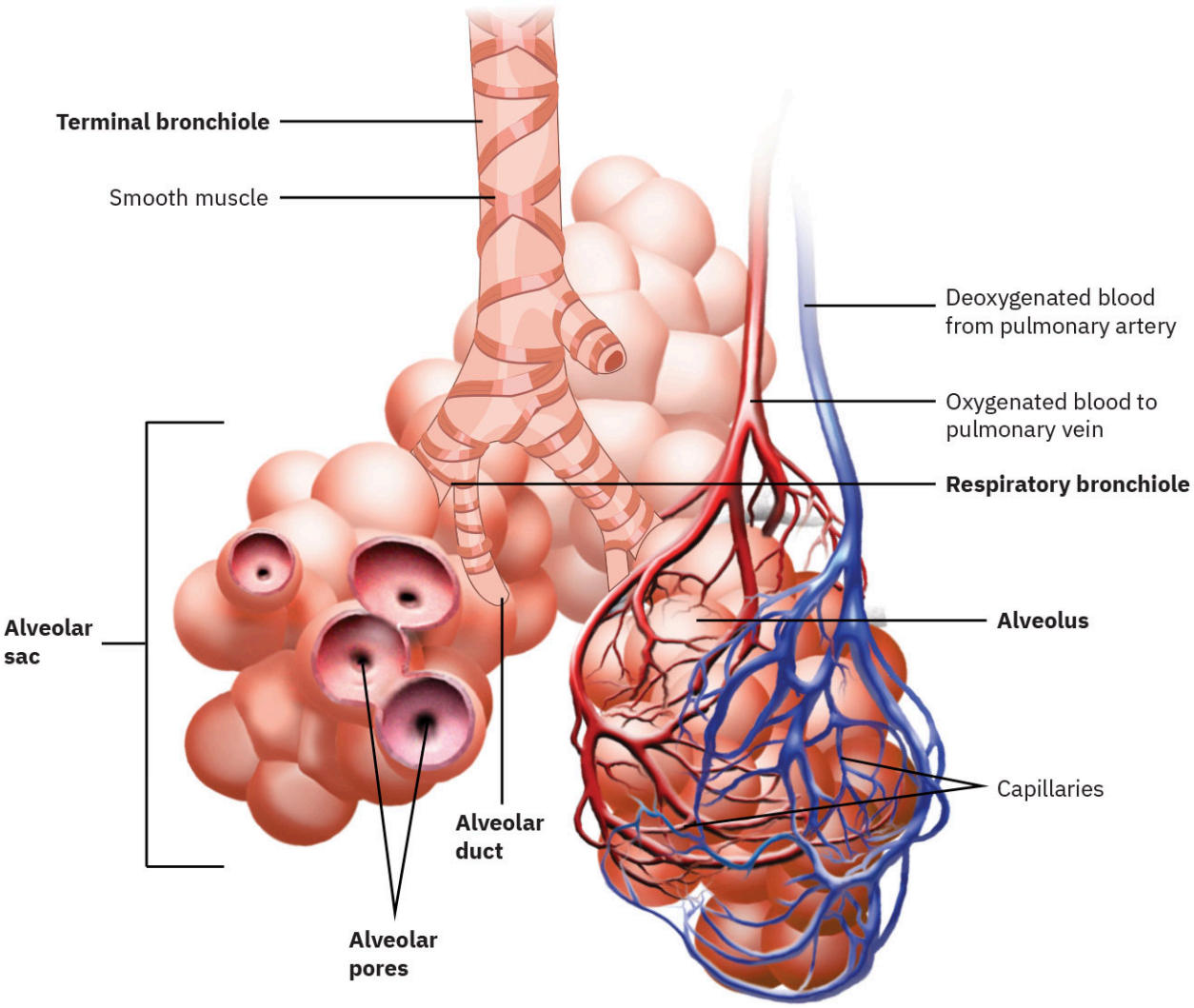

FIGURE 11.7 Bronchioles lead to alveolar sacs in the respiratory zone, where gas exchange occurs. (modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

LINK TO LEARNING

Watch this Crash Course on the respiratory system (https://openstax.org/r/77Respiratory) that reviews diffusion, the mechanics of breathing, and gas exchange.

Oxygenation and Ventilation

The movement of air into and out of the lungs, which allows gas exchange to occur, is called **ventilation**. Air flows from an area of high pressure to an area of low pressure. During inhalation, air passes through the conducting zone and travels to the respiratory bronchiole and the alveolar sacs.

The process when oxygen from the air moves into the bloodstream is called **oxygenation**. When air enters the lungs and travels to the alveoli, oxygen molecules pass into the capillaries by **diffusion**, which is the movement of substances from an area of high concentration to an area of low concentration (Figure 11.8). The term **partial pressure** refers to how much of a gas is dissolved in the blood. Because there is a higher partial pressure of oxygen in the alveoli than the capillaries, the pressure gradient pulls oxygen into the bloodstream. Carbon dioxide in the blood diffuses across the capillaries into the alveoli, where it leaves the body during exhalation.

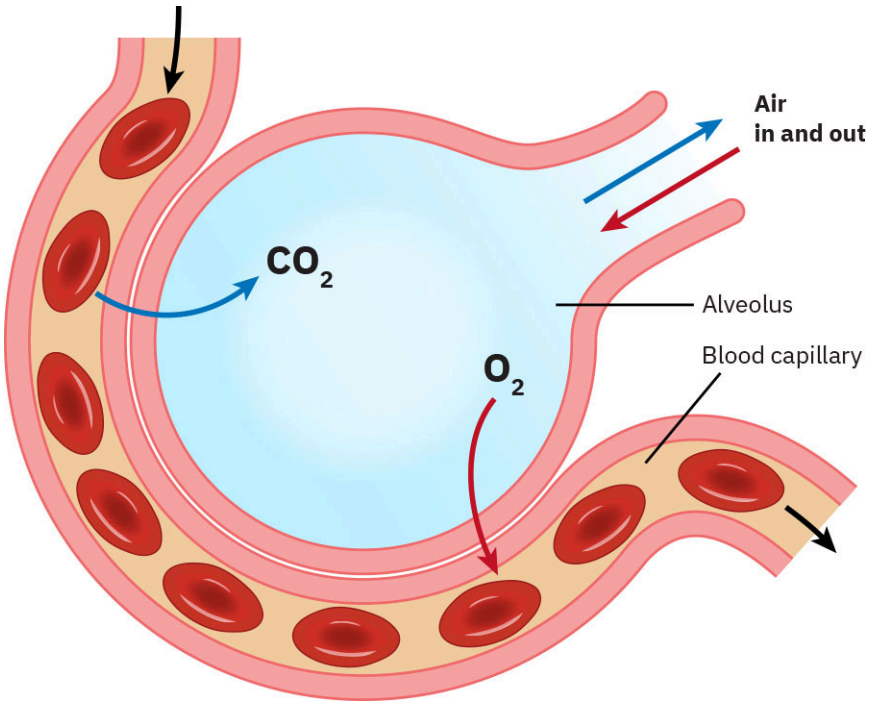

FIGURE 11.8 When air enters the lungs and travels to the alveoli, oxygen molecules pass into the capillaries by diffusion. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Because oxygen does not dissolve well in liquids, it uses red blood cells as a means of transportation. Oxygen molecules attach to hemoglobin in the red blood cells. When oxygen binds to hemoglobin, a chemical reaction occurs, and **oxyhemoglobin** is formed. Oxyhemoglobin is a bright red molecule and contributes to the vivid red color observed in arterial blood. Once oxygen is in the blood, it can travel through the body and be transferred to the tissues.

LINK TO LEARNING

View a real-time MRI of the thorax (https://openstax.org/r/77ThoraxMRI) during breathing. Note how the diaphragm lowers and the ribs expand during inspiration. Note how the diaphragm raises and the ribs contract during expiration.

Factors That Affect Oxygenation and Ventilation

Many factors affect oxygenation and ventilation (Table 11.1). Any condition that creates a decreased respiratory rate or limitation of chest wall/diaphragmatic expansion can create a decrease in oxygenation either through hypoventilation or other factors. Narrowed airways, found in conditions such as asthma or **angioedema** (soft tissue swelling in the deep layers of the skin, most commonly in the mouth, eyelids, and genitals), can limit airflow into the body, decreasing the amount of oxygen the lungs can utilize. In conditions, such as anemia or hemorrhage, a decreased volume of red blood cells reduces hemoglobin levels and limits the body's oxygen-carrying capability. Damaged alveoli and pulmonary capillaries can occur in lung diseases, such as chronic obstructive pulmonary disease (COPD), decreasing the areas that are available for ventilation and causing inadequate oxygenation. In atelectasis as well as pneumonia, some alveoli are unventilated, leaving fewer capillaries available for gas exchange. Alveolar filling disorders, such as hemorrhage, affect ventilation and oxygenation due to a decrease in available areas of gas exchange (Theodore, 2022).

Condition	Effect
Asthma or angioedema	Narrowed airways can limit airflow into the body, decreasing the amount of oxygen the lungs can utilize.
COPD	Damage to alveoli and pulmonary capillaries can decrease the areas that are available for ventilation and cause inadequate oxygenation.
Atelectasis and pneumonia	Some alveoli are unventilated, leaving fewer capillaries available for gas exchange.
Alveolar filling disorders (e.g., hemorrhage)	Ventilation and oxygenation are affected due to a decrease in available areas of gas exchange.
Anemia or hemorrhage	A decreased volume of red blood cells reduces hemoglobin levels and limits the body's oxygen-carrying capability.
Perfusion defects, such as pulmonary embolus or blood clot	The oxygen-carbon dioxide exchange can be impaired.

TABLE 11.1 Factors Affecting Oxygenation and Ventilation

Perfusion

While the term **perfusion** is used to describe blood flow throughout all parts of the body, certain concepts specifically relate to perfusion of the respiratory system. Perfusion occurs when blood flows through the pulmonary capillaries. This flow allows:

- deoxygenated blood to flow toward the alveoli to receive oxygen by way of diffusion
- oxygenated blood to flow into the pulmonary vein and enter the left side of the heart, to be pumped out through the circulatory system

Factors That Affect Perfusion

Factors that affect blood flow through the blood vessels of the lungs affect perfusion. When blood vessels are blocked or narrowed, it decreases the lung's ability to oxygenate blood. When areas of the lung are inadequately ventilated, more problems occur. Capillaries become constricted and blood flow is diverted to alveoli that are sufficiently ventilated. Conversely, in alveoli that are adequately ventilated, the diameter of the pulmonary arterioles increases in response to a greater partial pressure of oxygen in the alveoli. The increased diameter allows greater blood flow through these functioning parts of the lung.

11.2 Upper and Lower Respiratory Assessment

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Describe the components of an upper respiratory airway assessment
- Describe the components of a lower respiratory airway assessment
- Summarize the cues to recognize and analyze in both upper and lower airway assessment

Respiratory assessment is important for all patients, even in the absence of known respiratory problems. Initial assessment looks at the patient's overall appearance, observing for pallor, cyanosis, or sweating. Vital signs are evaluated and help reflect the efficiency of the respiratory system by monitoring the respiratory rate and oxygen saturation. Changes in respiratory rate, capnography, and level of respiratory effort can be early signs of other systemic problems, whereas drops in oxygen saturation may be later signs of systemic problems. This section will explore the assessment of the upper and lower respiratory airway system.

Subjective assessment involves focused questions to elicit information about a patient's current symptoms and concerns, including:

- Have you ever been diagnosed with a respiratory condition, such as asthma, COPD, pneumonia, or allergies?
- Are you short of breath with activity?
- Does shortness of breath or difficulty breathing interfere with your ability to perform activities of daily living?
- Do you use supplemental oxygen?
- Do you use home respiratory equipment like CPAP (continuous positive airway pressure), BiPAP (bilevel positive airway pressure), nebulizer devices, or a ventilator?
- Are you currently taking any medications, herbs, or supplements for respiratory concerns?
- Have you noticed any changes with your breathing?
- Have you had any feelings of breathlessness (dyspnea)?
- Do you have a cough?
- Do you smoke or vape?

Upper Respiratory Airway Assessment

An upper respiratory airway assessment builds on the initial results of vital signs and level of consciousness. Determine the patient's respiratory rate. Then, consider if the patient's breathing pattern is regular or irregular and observe the approximate duration of inspiration compared with expiration. Note the level of effort and observe for accessory muscle usage. Before using a stethoscope, note if the patient's breathing is audible, and identify the characteristics of any sounds that are present.

Observe the patient's position to obtain important cues about their respiratory status. A patient may breathe easily in any position, or they may struggle more when they are not upright. Similarly, the patient's activity level and ability to speak offers significant information. One patient may be able to walk and exert themself with no significant change in respiratory effort. Another patient may experience visible breathlessness when trying to speak and have limitations on their activity level.

Observe the patient's nose and mouth. Assess for the presence of mucus, drainage, bleeding, and any signs of trauma. Inspection of the patient's oral cavity looks at dental status and evaluates the gums and tongue for swelling, color, moisture level, and open areas. Assess for the presence of a cough. Important information to note includes frequency, severity, sound, and any production of sputum or blood.

Evaluate the patient's chest for symmetry and shape. The trachea should be midline; clavicles should be symmetrical. Chest wall movement during inspiration and expiration should be equal. Compare the anterior-posterior diameter of the chest to the transverse diameter (Figure 11.9). A ratio of 1:2, where the front-to-back distance is about half of the side-to-side distance, is expected. Palpate the patient's chest to look for injuries, swelling, masses, and pain. Palpation can also identify the presence of any sensation or sounds associated with air trapped in the tissues. Listen for any **adventitious lung sounds**, which are breath sounds other than a clear sound of air.

(a) (b)

FIGURE 11.9 Comparison of (a) chest with normal anterior/posterior diameter to a (b) barrel chest. Barrel chest is a common clinical finding a nurse may visually observe in a patient with a disease called chronic obstructive pulmonary disease (COPD). (credit: "Figure 8.9" by NCBI Bookshelf. A service of the National Library of Medicine, National Institutes of Health/Chippewa Valley Technical College, CC BY 4.0)

UNFOLDING CASE STUDY

COVID Complications: Part 1

The nurse is assessing a sixty-two-year-old man who presents to the ED and reports he has had increasing difficulty in breathing and shortness of breath the past four days. The patient is accompanied by his wife. The patient states he was exposed to COVID one week ago.

PMH	Patient is recently retired from working as a manager in a health-care facility. He has diabetes managed with oral hyperglycemic agents, CABG ten years ago with two coronary artery grafts, and developed community acquired pneumonia. He has HTN controlled with medication. The patient has received his pneumococcal, influenza, and COVID vaccine six months ago. **Family History** Father has a history of a heart attack, tobacco use, HTN, DM, and passed away at age sixty. Mother died of breast cancer at age fifty-eight. He has three grown children who all live out of town. One brother died of a heart attack ten years ago. **Social History** Patient lives at home with wife. Past history of tobacco abuse and quit four years ago. He states he has three to four drinks/week socially. Patient states he retired early due to stress at work. **Current Medication** Atorvastatin 40 mg once daily Losartan 100 mg twice daily, takes in the a.m. Carvedilol 50 mg twice a day Baby ASA once daily Liraglutide 10 mg daily Acetaminophen 500mg 2 tabs for temperature > 100.7 No Known Allergies
Nursing Notes	**1930: Triage Assessment** Patient presents with dyspnea and shortness of breath (SOB), which increases when talking, and a dry, nonproductive cough. Patient's O_2 saturation is 90 percent on room air. Patient has elevated BP, HR, and RR. Skin is warm and dry to the touch. Patient is slightly restless and anxious and reports fatigue. He is asking if he has COVID. He does not want to be admitted to the hospital but is cooperative. He is alert and oriented to person, place, and time. Lung sounds with bilateral diminished breath sounds and scattered crackles in bilateral bases. He is restless and fidgety. He tries to sit at edge of cart, moving self frequently. Patient reports he "just retired." He did not take his medications yet today. The provider orders his usual meds and nurse administers.

Flow Chart	**1930: Triage Assessment** Blood pressure: 170/92 Heart rate: 110 Respiratory rate: 30 Temperature: 101.2 Oxygen saturation: 90% room air Pain: no pain Weight: 190 lbs Height: 5 ft. 9 in **02/20/23, 00:00** **Physical Examination** HEENT: Pupils equal and reactive to light, mucous membranes dry, no thyroid enlargement. Lymphatic: Lymphatic nodes were not swollen or enlarged Respiratory: Increased agitation, increased vital signs, increasing effort to breathe. Lung sounds with diminished bases and mid lung field, with increasing crackles from baseline. Dry nonproductive cough. Cardiovascular: Tachycardia, repeat ABG demonstrating respiratory acidosis with lower pH, decreased PO_2, and increased PCO_2 from baseline. Abdomen: Soft, denies pain by nodding no, not distended, bowel sounds present all four quadrants Musculoskeletal: Weak, bodily fidgeting has decreased. Not following all commands to move extremities. Skin: Pale, moist **Mental Assessment** Increased agitation and onset of confusion.

Flow Chart	**2/20/24, 0:00** Blood pressure, 182/92 Heart rate, 108 Respiratory rate, 30 Temperature, 101.1 Oxygen saturation, 90% room air Pain, denies pain **02/20/2024, 04:00 Assessment** Blood pressure, 150/88 Heart rate, 100 Respiratory rate, 30 Temperature, 101.0 Oxygen saturation, 88% room air Pain, denies pain ABG: pH, 7.31 PCO_2, 55 mmHg PO_2, 60 mmHg HCO_3, 30 mEq/L **2/20/2024, 08:00** Increased agitation, increased vital signs, increasing effort to breathe. Dry nonproductive cough. Lung sounds with diminished bases and mid lung field, with increasing crackles from baseline. tachycardia, repeat ABG demonstrating respiratory acidosis with lower pH, decreased PO_2, and increased PCO_2 from baseline. Weak, bodily fidgeting has decreased. Not following all commands to move extremities. Physical Examination: HEENT: Pupils equal and reactive to light, mucous membranes dry, no thyroid enlargement. Lymphatic: Lymphatic nodes were not swollen or enlarged Respiratory: Increased agitation, increased VS, increasing effort to breathe. Lung sounds with diminished bases and mid lung field, with increasing crackles from baseline Cardiovascular: Tachycardia, repeat ABG demonstrating respiratory acidosis with lower pH, decreased PO_2, and increased PCO_2 from baseline. Abdomen: Soft, denies pain by nodding no, not distended, bowel sounds present all four quadrants Musculoskeletal: Weak, bodily fidgeting has decreased. Not following all commands to move extremities. Skin: Warm and moist

Lab Results	**2/19/24, 20:00** WBC, 14.3 x10E3/u C-reactive protein, 4.0 mg/L Hgb, 14 g/dL Hct, 44% INR, 1.0 BUN, 10 mg/dL Creatinine, 0.09 mg/dL Lactic acid, 3 mmol/L Na, 146 mEq/L K+, 3.8 mEq/L Cl, 100 mEq/L Rapid PCR COVID test, positive RT-PCR COVID antigen test, pending Pulse oximetry, 90% RA ABG: pH, 7.31 PCO_2, 55 mmHg PO_2, 60 mmHg HCO_3, 30 mEq/L BS, 108 mg/dL Blood cultures ×3, pending **02/20/24, 0630** Lactic acid, 3 mmol/L Na, 139 mEq/L K+, 3.8 mEq/L Cl, 98 mEq/L WBC, 14 cells/mm^3 Blood cultures ×3, pending ABG: pH, 7.31 PCO_2, 55 mmHg PO_2, 60 mmHg HCO_3, 30 mEq/L BS, 110 mg/dL
Diagnostic Tests/ Imaging Results	**2/19/24, 2030** CXR: unilateral base pneumonia with parapneumonia pleural effusions

Provider's Orders	**2/19/24, 2030** CXR stat ABG prior to O2 O2 at 3 LPM via NC Start IV ½ NS @ 75cc/hr EKG Blood cultures × 3 Sputum for C&S Place in contact and droplet isolation Bedrest with BRP with assist Continue meds patient is currently taking: Atorvastatin 40 mg once daily Losartan 100 mg twice daily, takes in the a.m. Carvedilol 50 mg twice a day Baby ASA once daily Admit to telemetry with continuous pulse oximetry. Albuterol nebulizer X1 administer by respiratory therapy Pulmonary Consult Infection Control Consult Acetaminophen 500 mg 2 tabs for temperature > 100.7 Repeat labs in a.m.: CBC with differential Hgb Hct Lactic acid Electrolytes Repeat CXR ABG Lipid Profile BS **02/20/24, 12:00** Transfer to ICU Critical care consult for hemodynamic compromise
	02/19/24, 20:30 Interventions Use appropriate PPI for positive covid CXR result: Pneumonia O_2 2L nasal canula IV started left antecubital, #20 gauge of ½ NS, rate of 75 ml/hr Administered home meds as ordered: Atorvastatin 40 mg once daily Losartan 100 mg twice daily, takes in the a.m. Carvedilol 50 mg twice a day Baby ASA once daily Acetaminophen 500 mg 2 tabs for fever. Liraglutide 10 mg daily First set of blood cultures drawn Cefazolin 1.5 mg IV started per order Reassess VS: B/P, HR, RR, temperature, O_2 saturation Albuterol nebulizer X1 administer by respiratory therapy Acetaminophen 500 mg 2 tabs for temperature > 100.7

1. After assessing the patient, the nurse determines the patient's presentation is due to [Option 1] resulting in a new symptom of [Option 2]. Choose the most likely options for the information missing from the statement by selecting from the lists of options provided.

Option 1	Option 2
Panic attack	Increased SOB and fever
Medication side effects	Irritability
Asthma	Cough
Respiratory infection	Wheezing
Depression	Respiratory rate 30

2. Once the nurse has reviewed the relevant patient information, which assessment finding(s) are most consistent with the associated disease process?

Assessment Finding	Respiratory Infection	COPD	Pneumothorax
Pain in chest and intense chest pain that is worse with movement			
Temperature: 101.2			
Tracheal deviation			
Subcutaneous emphysema			
Barrel-shaped chest			

Lower Respiratory Airway Assessment

A lower respiratory airway assessment focuses on auscultation of lung sounds during inspiration and expiration. Ideally, lung auscultation is performed with the patient in the upright position. If an injury or serious illness prevents the patient from sitting up, turn them to the side. Using the diaphragm of the stethoscope, systematically move the stethoscope side to side across all lung fields (Figure 11.10); this allows the nurse to compare lung sounds at the same level on both sides.

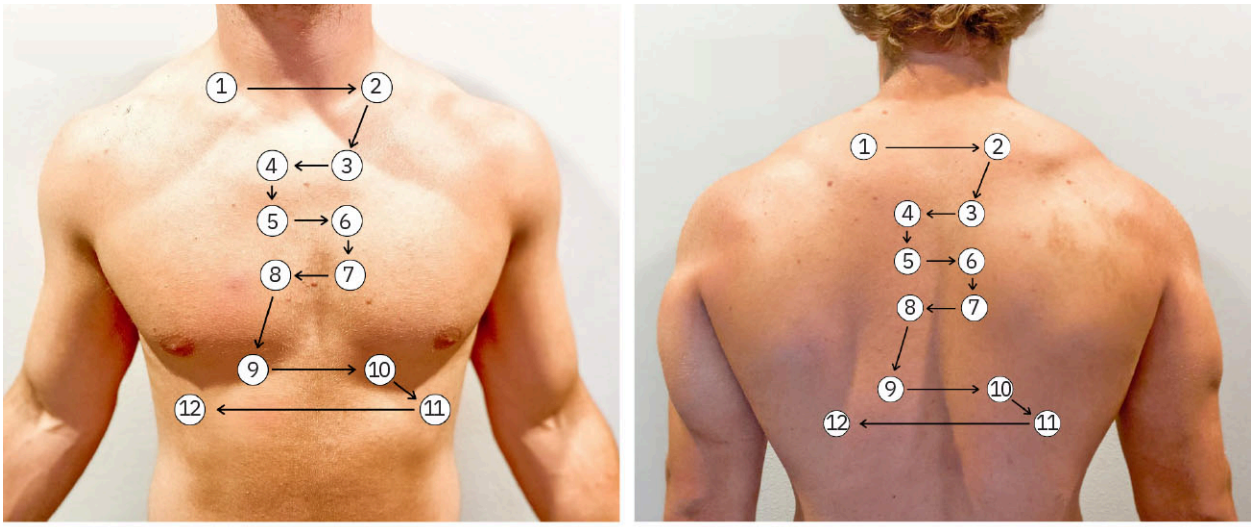

FIGURE 11.10 Anterior and posterior auscultation areas of the lungs should be auscultated following a systematic pattern. (modifications of credit: "Figure 10.5 Anterior Auscultation Areas" and "Figure 10.6 Posterior Auscultation Areas" by Meredith Pomietlo/Chippewa Valley Technical College, CC BY 4.0)

Normal lung sounds vary based on the part of the lung field being auscultated:

- The **bronchial breath sounds** are high-pitched, loud sounds heard over the trachea and larynx.
- The **bronchovesicular breath sounds** are medium-pitched and heard over the major bronchi.
- The **vesicular breath sounds** are lower-pitched sounds heard over the lung surfaces; they are often described as soft, rustling sounds.

Adventitious lung sounds can indicate airway diseases and problems. The presence of mucus or fluids changes the way air flows through the passageways, resulting in abnormal lung sounds. Obstruction, inflammation, and infection can also cause adventitious lung sounds. Examples include the following:

- Popping or crackling sounds heard on inspiration as collapsed airways reopen are called **fine crackles** or **rales**. This occurs with conditions such as heart failure or pneumonia, when fluid accumulates within the alveoli and other lung spaces or when airways collapse. Crackles may be fine or coarse. Fine crackles are soft and higher pitched. Coarse crackles are loud and lower pitched.
- Whistling-type noises produced during expiration (and sometimes inspiration) are called **wheezes**. Wheezes occur when air travels through airways narrowed by constriction or swelling.
- Coarse, loud sounds that occur due to constriction in the larger airways due to mucus or fluid are called **rhonchi**.
- Heard only on inspiration, **stridor** is harsh, high-pitched, and is often loud enough to hear without a stethoscope. Stridor occurs when the upper airway is narrowed, and airflow is obstructed. Stridor is a potentially life-threatening emergency.
- Caused by inflamed lung surfaces rubbing against each other, **rub** has a grating sound.

LINK TO LEARNING

This video gives examples of abnormal breath sounds (https://openstax.org/r/77AbnormBreath) such as crackles, rales, wheezes, rhonchi, and others.

Cues to Recognize and Analyze for Upper and Lower Airway Assessment

A thorough respiratory assessment provides important information that may indicate the patient requires immediate intervention. Even with normal vital signs, respiratory problems can be present. Before using a stethoscope or obtaining vital signs, the nurse first observes for potential signs of distress. Respiratory compromise can present as changes in level of consciousness. Both **hypoxemia** (low blood levels of oxygen) and hypercapnia can cause a

decreased level of consciousness, irritability, anxiousness, restlessness, or confusion.

Subtle changes in the rate of breathing can be a sign of deteriorating condition; accurate assessment of respiratory rate is necessary. Normal breathing is regular and has a rate of twelve to twenty breaths per minute and regular. By contrast, **bradypnea** is less than twelve breaths per minute, and **tachypnea** is greater than twenty breaths per minute. Oxygen saturation is also assessed; the normal range is 94 to 100 percent (SpO2). Increased heart rate and blood pressure can also occur when someone is struggling to breathe.

CLINICAL SAFETY AND PROCEDURES (QSEN)

Safety: The Challenges of Pulse Oximetry Monitoring

Measuring oxygen saturation, or pulse oximetry, is commonly used as a part of a routine assessment. These devices can provide helpful, noninvasive information about blood oxygen saturation. Recent research shows, however, that **pulse oximeter**s can be less accurate in patients with darker skin pigmentation, or even colored fingernail polish, which may overestimate their oxygen saturation when their actual oxygen levels may be less than 80 percent. This inaccuracy can mask hypoxemia and result in lower oxygen supplementation and poor patient outcomes. It is also challenging to measure oxygen saturation of patients with poor perfusion or fluid volume deficit. Because an accurate representation of oxygenation is difficult to obtain, awareness of how this measurement bias can contribute to race-based disparities in care is essential. Ongoing study is needed, especially in the context of models that use data from electronic health records and artificial intelligence to identify and predict outcomes. Patients, clinicians, and manufacturers are all affected parties.

(Feldman & Lane-Fall, 2021

End-tidal carbon dioxide ($EtCO_2$) monitoring, or **capnography**, is a noninvasive way to measure exhaled carbon dioxide and provide information about ventilation. Capnography can alert clinicians to abnormally elevated or decreased carbon dioxide levels that may require intervention. Capnography can detect respiratory depression earlier than pulse oximetry. Commonly used during anesthesia and in settings requiring intubation, it is now gaining favor in other settings. In spontaneously breathing patients, capnography can be helpful in circumstances including:

- assessing for hypoventilation in patients who are unconscious, unresponsive, or receiving sedation
- assessing seizing or critically ill patients
- identifying treatment response during acute respiratory distress
- identifying the efficacy of CPR and the possible return of spontaneous circulation during cardiac resuscitation (Krauss et al., 2022).

During physical assessment with inspection, the nurse notes changes in appearance that can indicate respiratory distress, such as pallor and cyanosis. The patient's position and posture can offer information about respiratory status. Many patients who are struggling to breathe will be unable to tolerate lying flat. They will naturally move their body into a **tripod position**, an upright position with hands braced on knees or a table (Figure 11.11). This position maximizes the space available for the lungs to expand.

FIGURE 11.11 The tripod position eases the work of breathing by optimizing the space available in the thoracic cavity for lung expansion. (credit: "Figure 13.18 Tripod Position" by Nic Ashman/Chippewa Valley Technical College, CC BY 4.0)

The nurse should closely observe the patient's breathing pattern, including the rhythm, effort, and use of accessory muscles. Normal breathing is subtle and can be almost imperceptible. Audible breathing, nasal flaring, and pursed lip breathing are signs of respiratory difficulty; pursed lip breathing increases the amount of carbon dioxide exhaled so that more oxygen can be inhaled. Stridor indicates a narrowed or obstructed upper airway and requires urgent evaluation. Abnormal breathing may be labored, irregular, or unusually shallow or deep. Normally, inspiration is about half as long as expiration; when expiration is prolonged, it can be reflective of lung problems, such as emphysema. Anatomical structures should be symmetrical; if the trachea is not midline, it can be a sign of decreased lung volume (i.e., from a tumor) or fluid accumulation.

A patient with labored breathing may experience shortness of breath with exertion. In patients with serious lung problems, speaking can be difficult due to shortness of breath. The patient may only be able to speak in short sentences, phrases, or single words. In severe cases of respiratory distress, patients may be unable to speak (Reyes et al., 2022). Other indicators of labored breathing can include diaphoresis and accessory muscle usage. Accessory muscles are found in the upper back, neck, abdomen, and between the ribs.

REAL RN STORIES

Nurse: Emily, RN
Years in Practice: One
Clinical Setting: Inpatient medical unit

Geographic Location: Rural Northwest Community Hospital

As a newly licensed RN, Emily was working on an inpatient medical unit. One of Emily's patients was an older person who had been admitted with pneumonia. The doctors did not yet know what type of pneumonia the patient had and were doing more diagnostic studies.

At the start of her shift, Emily entered the patient's room to do a set of vital signs. The patient was alert and able to answer her questions, the patient's temperature was normal, and the patient's blood pressure was a little bit high.

She put the pulse oximeter on the patient's finger and waited. At first, it had no reading! Then, it displayed a reading of 73 percent, but that went away, and the machine read no result. Emily asked the charge nurse to come into the room to help her troubleshoot the equipment.

As the charge nurse entered the room, together they immediately looked at the patient. The charge nurse asked Emily, "Has the patient been breathing like this the whole time?" The charge nurse—who had years of experience—was able to immediately identify labored breathing. Now that Emily looked more closely at the patient and timed the respirations, she realized that the respiratory rate was about thirty breaths per minute, the patient appeared pale and stressed, and intercostal muscle usage was present. The charge nurse immediately placed a non-rebreather mask on the patient and called the medical team. The patient needed to be transferred to the intensive care unit for closer monitoring and to receive more oxygen therapy.

Palpation of the chest can evaluate potential areas of injury or complications related to a procedure. A popping or crackling sensation when the skin is palpated, **crepitus** is a sign of air trapped under the subcutaneous tissues. This can occur when air trapped in the pleural space moves into the subcutaneous tissue and becomes trapped there. Inspect the fingers for **clubbing**, a bulbous enlargement of the tips of the fingers due to chronic hypoxia. It often occurs in chronic respiratory diseases, such as COPD, as well as other conditions that cause chronic low oxygen levels or malabsorption (Figure 11.12).

FIGURE 11.12 Clubbing is a bulbous enlargement of the tips of the fingers due to chronic hypoxia. (modification of "Showing bilateral grade III clubbing with cyanosis of the extremities" by Twayana et al./BMC Research Notes, CC BY 4.0)

Auscultation identifies adventitious lung sounds, including crackles and wheezes. The nurse analyzes the presence of adventitious lung sounds as well as how they may have changed. Adventitious lung sounds can occur in different lung fields and can also change in volume.

11.3 Disorders of the Upper Respiratory System: Bronchiectasis

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss pathophysiology, risk factors, and clinical manifestations for bronchiectasis
- Describe the diagnostics and laboratory values in the disease of bronchiectasis
- Apply nursing concepts and plan associated nursing care for the patient with bronchiectasis
- Evaluate the efficacy of nursing care for the patient with bronchiectasis
- Describe the medical therapies that apply to the care of bronchiectasis

Bronchiectasis is a chronic lung condition that results in widened, damaged airways. In the United States, there are approximately 350,000 to 500,000 adults with bronchiectasis. Increased case rates occur in women, adults over sixty, and patients with a structural lack of access to resources.

Pathophysiology

In **bronchiectasis**, the elastic, supportive structures of the bronchial wall become damaged, and the bronchi abnormally dilate (Figure 11.13). The damage and dilation make it harder to cough up and clear lower airway secretions. When mucus and phlegm remain trapped in the lower airways, bacteria can flourish. Infection and inflammation cause additional damage to the airways and can worsen bronchiectasis. This causes a recurrent cycle of infection, inflammation, and airway damage.

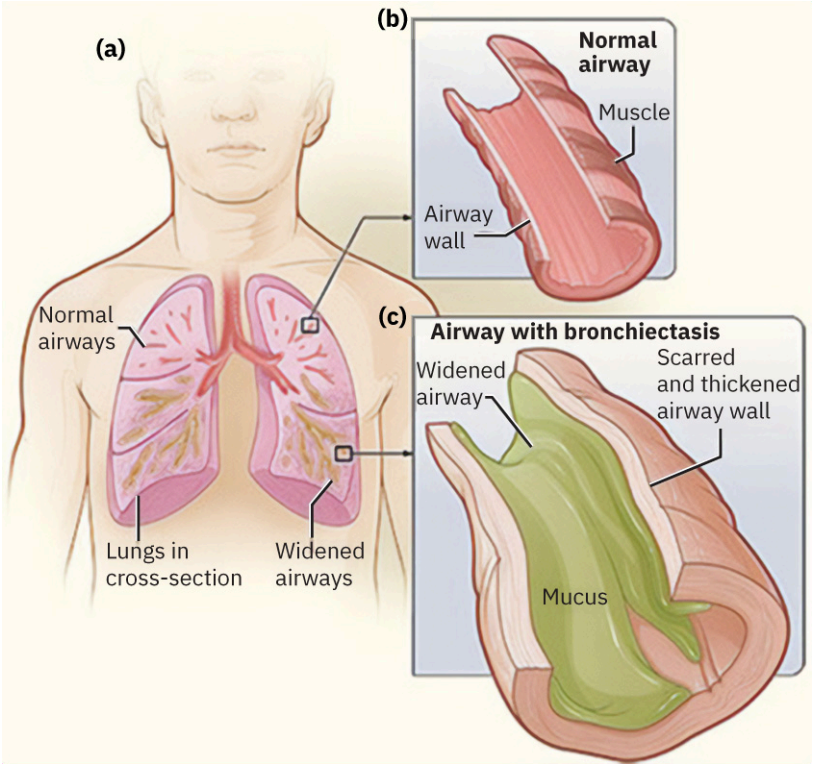

FIGURE 11.13 (a) In this patient's lungs, the upper airways are normal while the lower airways are widened. (b) The normal airway is elastic and retains its shape. (c) The airway with bronchiectasis is wider; sputum can easily become trapped. (credit: "How bronchiectasis affects the lungs." by NIH: National Heart, Lung, and Blood Institute, Public Domain)

Risk Factors

Risk factors for bronchiectasis include genetic diseases that affect the respiratory tract, including cystic fibrosis and primary ciliary dyskinesia. Previous lung infections and immunosuppression can predispose a person to bronchiectasis. Asthma and connective tissue disorders are also associated with a greater incidence of bronchiectasis. The risk of bronchiectasis is increased with airway obstruction; causes of obstruction can include tumor, aspiration, and COPD. Approximately 40 percent of cases are considered **idiopathic**, which means the cause is unknown (American Thoracic Society, 2022). Bronchiectasis is more common in female patients and older adults. In adults sixty and older, bronchiectasis is eight to ten times more prevalent when compared with patients fifty

years old and younger (Barker, 2023c).

Clinical Manifestations

The primary clinical manifestations of bronchiectasis are cough and sputum production. Signs of infection, including fatigue, chills, fever, and night sweats can occur. During an acute infection, the sputum may increase and change color. Patients may report shortness of breath, chest tightness, **hemoptysis** (coughing up blood), and unintentional weight loss (American Thoracic Society, 2022).

Assessment and Diagnostics

Diagnosis of bronchiectasis is made based on the presence of patient-reported symptoms in conjunction with imaging tests. Ninety-eight percent of patients with bronchiectasis will report a cough. Bronchiectasis is suspected in patients who report both a cough and sputum production experienced most days of the week. Because a cough and sputum production can occur with other illnesses, imaging is used to identify anatomical abnormalities that are specific to bronchiectasis. Adventitious lung sounds present in bronchiectasis commonly include crackles, but wheezes may also be present (Barker, 2023c).

To formally diagnose bronchiectasis, imaging is needed. A chest x-ray will commonly show nonspecific abnormalities, such as dilated, thickened airways or **atelectasis**, which is a condition that causes a partial or complete collapse of the lung. A CT scan is needed for definitive diagnosis, however. A CT scan provides evidence of anatomical abnormalities that confirm the diagnosis and identifies which parts of the lungs are affected. Lung function tests, such as spirometry and a six-minute walk, may be used once diagnosis is established. Lung function tests are not used to diagnose bronchiectasis, but to evaluate lung function, disease trajectory, and response to treatment (Barker, 2023c). When infections are present or suspected, additional testing is required. Sputum may be sent for Gram stain and culture; viral testing can evaluate for viruses like flu or COVID-19 (Barker, 2023b).

Nursing Care of the Patient with Bronchiectasis

When providing nursing care to a patient with bronchiectasis, areas of focus include preventing complications and managing symptoms. With comprehensive prevention strategies, modifiable risk factors for developing complications can be addressed, potentially leading to better outcomes.

Recognizing Cues and Analyzing Cues

The nurse providing care to a patient with bronchiectasis recognizes and analyzes subjective and objective assessment data to provide safe care. Subjective data includes shortness of breath, chest pain, and signs of infection, such as chills, feeling warm, and night sweats. Monitor vital signs because of the risk of infection and respiratory compromise. Subtle changes in vital signs, especially respiratory rate, oxygen saturation, and temperature, are especially important to monitor and track. The nurse performs auscultation, noting the location and character of any adventitious lung sounds. A cough will often be present, and the patient should be questioned about its frequency and characteristics. It is important to note the volume and character of any mucus produced, including the presence of visible blood.

Environmental irritants can worsen bronchiectasis. The nurse should ask the patient about exposure to air pollution, smoke, and secondhand smoke. If the patient smokes or vapes, inquire about frequency, years of use, and duration. Because preventable respiratory illnesses can worsen bronchiectasis, inquire about the patient's immunization status.

CLINICAL SAFETY AND PROCEDURES (QSEN)

Teamwork and Collaboration

The care of patients with bronchiectasis can be complex and requires a strong, collaborative, interprofessional team. Medications may be nebulized or inhaled. A nebulizer converts liquid medication into a fine mist. The mist is inhaled through a mask or mouthpiece. A nebulizer is often used to treat those with severe respiratory conditions. An inhaler is a handheld device that delivers a premeasured dose of medication in the form of a spray or powder, and is often used to open the airway passages. Inhalers should be administered prior to nebulizers for optimal absorption of the medications. Respiratory therapists may administer the medication or reinforce teaching with the

nurse, patient, and family. Successful airway clearance strategies may require the cooperation of nursing staff, physical therapists, respiratory therapists, and physicians. Similarly, oxygen administration can require close communication between physicians, nurses, and respiratory therapists to ensure oxygenation goal (usually > 92 percent) is met.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Signs of active infection and inadequate oxygenation are a high priority. When a patient reports symptoms, such as fever and purulent sputum, the nurse should communicate these findings to the provider. Nursing interventions based on a provider order may include administering antipyretics, preparing a patient for CT scan, obtaining a sputum sample for Gram stain and culture, and administering antibiotics. Some patients with bronchiectasis may require supplemental oxygen. The nurse collaborates with respiratory therapy and the provider to identify SpO2 targets and optimize oxygenation. Additionally, the nurse works together with the patient and respiratory therapy on airway clearance strategies, including chest physical therapy, positive expiratory pressure devices, and wearable percussion vests. If a large volume of blood is present in sputum, hemoptysis can be an emergency. Nursing interventions may be related to suctioning and airway clearance, oxygen administration, or preparing the patient for a procedure to stop the bleeding.

Educational topics include immunizations and strategies to avoid environmental irritants. The nurse may provide coaching and resources on smoking cessation. Additional teaching may reinforce how to identify signs of infection and airway clearance strategies and devices.

Evaluation of Nursing Care for the Patient with Bronchiectasis

Evaluate the efficacy of nursing care by assessing the patient's respiratory status. The nurse considers if indicators of infection, adventitious lung sounds, and cough have improved. Consider activity tolerance and oxygen requirement. The absence of vaccine-preventable infections is a goal.

LINK TO LEARNING

Nurses or respiratory therapists will often provide chest physiotherapy (CP) to optimize clearing of the airway. Watch this video for a chest physiotherapy (https://openstax.org/r/77ChestPhysioTx) demonstration.

Medical Therapies and Related Care

Effective treatment of bronchiectasis requires collaboration with the interprofessional team, including physicians, respiratory therapists, and pharmacists. Often, a variety of interventions will be necessary to provide symptom relief and prevent disease progression. In addition to being a potential trigger for the initial development of bronchiectasis, lung infections can also worsen existing cases. Key points for treatment include:

- Treatment with antibiotics is necessary for bacterial infections.
- Antibiotics may be oral, intravenous, inhaled, or nebulized.
- Antiviral medications can be used when a viral infection is present.
- Some patients with recurrent exacerbations may be prescribed a preventive antibiotic.
- Some types of fungal infections cause inflammation that can lead to bronchiectasis; in these cases, antifungal medications and steroids are prescribed.
- A key component of nonpharmacologic therapy for bronchiectasis is avoiding substances that irritate the respiratory tract. Patients are instructed on smoking cessation (including vaping) and to avoid other irritants like cleaning products, dust, and smoke. Some patients may be advised to wear masks to avoid environmental triggers.
- Airway clearance interventions can improve a patient's ability to clear mucus. These include **chest physical therapy**, which can improve drainage and mobilization of mucus; **positive expiratory pressure devices**, which let the patient breathe in easily but create resistance as they exhale, slowing down the breath and causing the patient to increase the force of exhalation; and wearable chest wall high frequency oscillation vests, which provide movement and percussion that helps mobilize secretions.
- Nebulized hypertonic saline is used to thin mucus.

- When immunodeficiencies are present, treatment with immune globulin may prevent bronchiectasis or delay disease progression. An **immune globulin** is a product that may be administered intravenously or subcutaneously to provide necessary antibodies to strengthen the immune system.
- Treating dysphagia or reflux that causes aspiration pneumonia can limit disease progression.
- In patients with major hemoptysis related to severe lung damage, procedures to stop the bleeding may be necessary.
- In advanced cases, surgical removal of the damaged section of lung can be performed.
- Lung transplantation is sometimes necessary (Barker, 2023b).

Treatment is often complex, challenging, and prolonged. Coordinated care that encompasses psychosocial support is essential.

LINK TO LEARNING

The nurse or respiratory therapist will incorporate positive expiratory devices to encourage an increase in the force of expiration to assist with clearing mucus from the airway. Watch this video for a demonstration of a positive expiratory pressure device (https://openstax.org/r/77ExPressDevice) in use.

11.4 Disorders of the Lower Respiratory System: Asthma

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for asthma
- Describe the diagnostics and laboratory values in the disease of asthma
- Apply nursing concepts and plan associated nursing care for the patient with asthma
- Evaluate the efficacy of nursing care for the patient with asthma
- Describe the medical therapies that apply to the care of asthma

Asthma is one of the most prevalent conditions in the United States. Nationwide, about one in every thirteen people has asthma. About 4.8 million children and about 21 million adults have asthma. In children, asthma is more common in males. In adults, asthma is more common in females.

Pathophysiology

Asthma primarily affects the trachea and bronchi. Normally, lungs can easily expand and contract with inspiration and expiration. In asthma, inflammation narrows the airway, making it harder for the lungs to expand, causing an **asthma attack** (Figure 11.14). An asthma attack is also known as asthma exacerbation. Asthma exacerbations have an early phase and a late phase. In the early phase, triggers, such as exercise, cold air, hormonal fluctuations, allergens, and fumes, cause antibodies to be released. These antibodies bind to mast cells and basophils within the lining of the respiratory tract. Mast cells release leukotrienes, histamine, and prostaglandins. These substances cause **bronchoconstriction**, meaning the smooth muscle in the airways constrict, narrowing the airway.

In the late phase, white blood cells, including basophils, eosinophils, neutrophils, and helper and memory T-cells, flow to the lungs. Inflammation, further bronchoconstriction, and increased mucous production occur. Airflow becomes obstructed because of inflammation and airway constriction, causing increased respiratory effort. In a patient with asthma, the airways are considered hyperresponsive, indicating they narrow more than usual in response to stimuli (Sinyor & Perez, 2022).

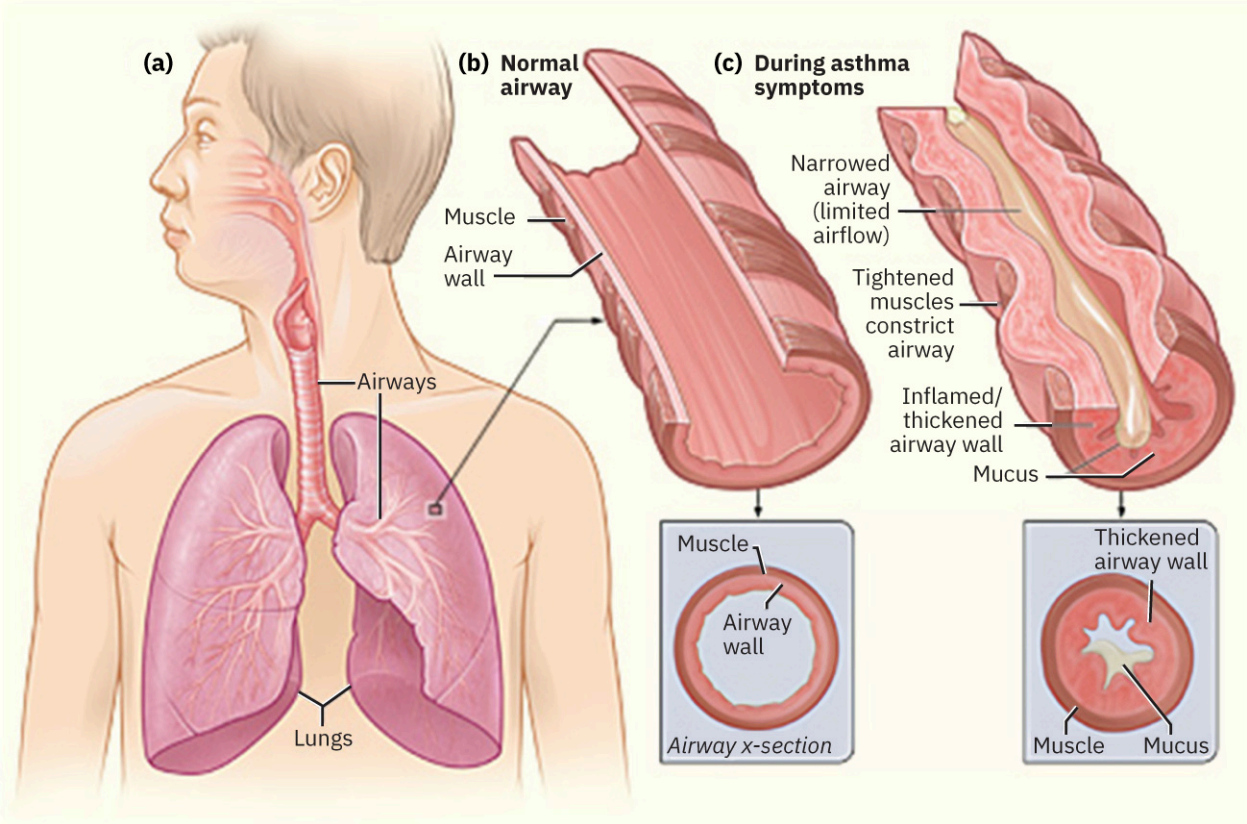

FIGURE 11.14 Lungs with asthma differ from normal lungs. Tight muscles, swollen airways, and mucus are present. As a result, moving air in and out can become difficult. (credit: "Asthma attack-illustration NIH" by United States-National Institute of Health: National Heart, Lung, Blood Institute/Wikimedia Commons, Public Domain)

LINK TO LEARNING

Watch this video about asthma pathophysiology (https://openstax.org/r/77AsthmaPhysTx) to learn more.

Risk Factors

In the United States, 13.5 percent of people have been diagnosed with asthma, and females have a 12 percent higher prevalence of an asthma diagnosis than males (American Lung Association, 2024). Additional risk factors for developing asthma include a family history, prematurity, maternal smoking during pregnancy, and obesity. Many factors both increase the risk of asthma and can trigger an asthma attack. These include allergies, allergic conditions like eczema, viral respiratory infections, cigarette smoking, air pollution, and exposure to substances including dust, fumes, mold, and vapor (Morales et al., 2021).

There are significant racial and ethnic disparities that affect how likely a person is to experience exacerbations, illness, and death related to asthma. Structural factors include systemic racism, lack of access to adequate care, economic disparities, and the physical environment. These factors create inequitable risk that disproportionately affect patients with fewer financial resources, older adults, and Black, Hispanic, and American Indian/Alaska Native populations. Black Americans are nearly three times more likely than White Americans to die from asthma. Overall, Black females have the highest risk of death related to asthma. Compared with White men, Black women have more than triple the risk of dying of asthma. In 2021, 3,517 people died due to asthma. Notably, nearly all asthma deaths are preventable when there is access to adequate resources (Asthma and Allergy Foundation of America, 2023).

Clinical Manifestations

Asthma has four defined stages based on severity: intermittent, mild, moderate, and severe (Table 11.2). Regardless of stage, patients with asthma usually report difficulty breathing, wheezing, and a cough. Often, the cough is worse at night. Symptoms are commonly in response to a trigger, such as exercise or allergens. In severe exacerbations,

respiratory rate and heart rate increase, and patients may sit upright to lean forward into tripod position to facilitate easier breathing.

Stage of Asthma	Symptom Frequency	Nighttime Awakenings Due to Symptoms
Intermittent	< 2 days per week	< 2 times per month
Mild	> 2 days a week but not daily	3 to 4 times a month
Moderate	Daily	> than once a week but not nightly
Severe	Daily + throughout the day	Often > 7 times per week

TABLE 11.2 **Stages of Asthma**

Assessment and Diagnostics

Asthma symptoms may shift over time. Accurate assessment is crucial during initial diagnosis and to prevent complications. Diagnostic tests can provide information about disease severity.

Asthma is diagnosed based on patient history combined with pulmonary function testing. History includes at least one or two, though sometimes all, of the following symptoms in response to a trigger (e.g., allergen, cold air, exercise, infection):

- shortness of breath
- cough that is often worse at night
- wheezing
- chest tightness

Because these symptoms can occur with many respiratory illnesses, additional information is necessary to diagnose asthma. Asthma symptoms typically wax and wane over a period of hours to days and commonly occur in response to a trigger, such as cold air or exercise. Asthma is more common in patients with a family history of asthma and allergies. A person's personal history of asthma-like symptoms as a child, with or without a formal diagnosis of asthma, increases the likelihood of an asthma diagnosis as an adult. Patients with asthma also often exhibit other inflammatory conditions, such as eczema.

The gold standard of an asthma diagnosis is pulmonary function testing. These tests provide precise information about how air flows into and out of the body. Moreover, **spirometry** testing (Table 11.3) measures:

- Forced vital capacity (FVC): the maximum volume of air that can be forcibly exhaled after fully inhaling
- Forced expiratory volume (FEV_1): the amount of that can be forcefully exhaled in one second

These measurements demonstrate specific patterns in asthma, assess the level of airflow obstruction, and provide information about disease severity. Spirometry tests are also used to assess airway changes in response to **bronchodilator** administration; bronchodilators open narrowed airways and allow a significant increase in the volume of air that can be inhaled and forcefully exhaled.

Spirometry Testing	What It Measures or Identifies
Forced vital capacity (FVC)	The maximum volume of air that can be forcibly exhaled after fully inhaling
Forced expiratory volume (FEV_1)	The amount of that can be forcefully exhaled in one second Expressed as a percent of predicted value Obstruction is defined as less than 0.8 (80 percent)
FEV_1/FVC ratio	Can identify if there is baseline airflow obstruction A reduced ratio indicates obstruction Obstruction is defined as less than 0.7

TABLE 11.3 Spirometry Testing

Exhaled nitric oxide measurement can be used to support an asthma diagnosis, though it is not considered conclusive. In some patients with asthma, airway inflammation leads to increased levels of nitric oxide during exhalation. Similarly, complete blood count test results can be used to support an asthma diagnosis. Elevated eosinophil levels can be present in allergic asthma (Fanta & Lange-Vaidya, 2022).

Nursing Care of the Patient with Asthma

While asthma is a treatable condition, there is the potential for serious complications and even death. Careful monitoring, robust patient education, and timely intervention are key interventions to optimize outcomes. Asthma diagnosis can range from intermittent, to persistent, allergy and exercise induced, pediatric and adult-onset, as well as overlap with other respiratory diseases like chronic obstructive pulmonary disease (COPD).

Recognizing Cues and Analyzing Cues

The nurse providing care to a patient with asthma utilizes both objective and patient-reported data to optimize care. Subjective data can include the presence of shortness of breath, wheezing, chest tightness, cough, increased mucus, activity limitations, and frequency of nighttime waking due to breathing difficulty. Vital signs are evaluated with a focus on respiratory rate and oxygen saturation. In periods of labored breathing, tachycardia may be present. The nurse performs auscultation, noting the location and character of any abnormal lung sounds. Expiratory wheezes are the most common adventitious lung sound in asthma. If the patient has a cough, the nurse asks about the frequency and characteristics; a nighttime cough is common with asthma.

Environmental irritants can trigger asthma exacerbations; ask the patient about exposure to allergens, secondhand smoke, and vapors. If the patient smokes or vapes, inquire about frequency and duration. Preventable respiratory illnesses can cause serious illness. Discuss immunization status and recommended vaccines as clinically appropriate. Patients may have to mask if they are susceptible to illness and in congested public areas.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Signs of respiratory distress and inadequate oxygenation are a high priority. The nurse may assist with spirometry testing and review results and administer medications such as bronchodilators and glucocorticoids. Patient education topics include using an inhaler and peak flow meter, strategies to avoid triggers, and implementing an asthma action plan (Figure 11.15, Figure 11.16, and Figure 11.17). An asthma action plan gives a patient detailed information about how to monitor symptoms and adjust medications when needed to prevent severe exacerbations.

ASTHMA ACTION PLAN

For: _____ Doctor: _____ Date: _____

Doctor's Phone Number: _____ Hospital/Emergency Department Phone Number: _____

GREEN ZONE

DOING WELL

- No cough, wheeze, chest tightness, or shortness of breath during the day or night
- Can do usual activities

And, if a peak flow meter is used,

Peak flow: more than _____
(80 percent or more of my best peak flow)

My best peak flow is: _____

Daily Medications

Medicine	How much to take	When to take it
_____	_____	_____
_____	_____	_____
_____	_____	_____

Before exercise ☐ _____ ☐ 2 or ☐ 4 puffs 5 minutes before exercise

YELLOW ZONE

ASTHMA IS GETTING WORSE

- Cough, wheeze, chest tightness, or shortness of breath, or
- Waking at night due to asthma, or
- Can do some, but not all, usual activities

–Or–

Peak flow : _____ to _____
(50 to 79 percent of my best peak flow)

1st **Add: quick-relief medicine—and keep taking your GREEN ZONE medicine.**

_____ (quick-relief medicine) _____ Number of puffs **or** ☐ Nebulizer, once Can repeat every _____ minutes up to maximum of _____ doses

2nd **If your symptoms (and peak flow, if used) return to GREEN ZONE after 1 hour of above treatment:**

☐ Continue monitoring to be sure you stay in the green zone.

–Or–

If your symptoms (and peak flow, if used) do not return to GREEN ZONE after 1 hour of above treatment:

☐ Take: _____ (quick-relief medicine) _____ Number of puffs **or** ☐ Nebulizer

☐ Add: _____ mg per day (oral steroid) For _____ (3–10) days

☐ Call the doctor ☐ before/ ☐ within _____ hours after taking the oral steroid.

FIGURE 11.15 An asthma action plan provides detailed information about how to monitor symptoms, adjust medications, and when to seek urgent help. The first part focuses on monitoring symptoms. (credit: "Asthma Action Plan" by United States-National Institute of Health: National Heart, Lung, Blood Institute, Public Domain)

RED ZONE

MEDICAL ALERT!

- Very short of breath, or
- Quick-relief medicines have not helped,
- Cannot do usual activities, or
- Symptoms are same or get worse after 24 hours in Yellow Zone

–Or–

Peak flow : less than _____
(50 percent of my best peak flow)

Take this medicine:

❑ _____
(quick-relief medicine)
_____ Number of puffs
or ❑ Nebulizer

❑ _____ mg
(oral steroid)

Then call your doctor NOW. Go to the hospital or call an ambulance if:

- You are still in the red zone after 15 minutes AND
- You have not reached your doctor.

DANGER SIGNS

- **Trouble walking and talking due to shortness of breath**
- **Lips or fingernails are blue**

→

- **Take _____ puffs of _____ (quick relief medicine)**
  AND
- **Go to the hospital or call for an ambulance _____ (phone) NOW!**

HOW TO CONTROL THINGS THAT MAKE YOUR ASTHMA WORSE

This guide suggests things you can do to avoid your asthma triggers. Put a check next to the triggers that you know make your asthma worse and ask your doctor to help you find out if you have other triggers as well. Keep in mind that controlling any allergen usually requires a combination of approaches, and reducing allergens is just one part of a comprehensive asthma management plan. Here are some tips to get started. These tips tend to work better when you use several of them together. Your health care provider can help you decide which ones may be right for you.

IRRITANTS

❑ Tobacco Smoke

- If you smoke, visit smokefree.gov or ask your health care provider for ways to help you quit.
- Ask family members to quit smoking.
- Do not allow smoking in your home or car.

❑ Smoke, Strong Odors, and Sprays

- If possible, avoid using a wood-burning stove, kerosene heater, or fireplace. Vent gas stoves to outside the house.
- Try to stay away from strong odors and sprays, such as perfume, talcum powder, hair spray, and paints.

❑ Vacuum Cleaning

- Try to get someone else to vacuum for you once or twice a week, if you can. Stay out of rooms while they are being vacuumed and for a short while afterward.
- If you must vacuum yourself, using HEPA filtration vacuum cleaners may be helpful.

FIGURE 11.16 This part of the asthma action plan monitors symptoms in the red zone and provides information on controlling it. (credit: "Asthma Action Plan" by United States-National Institute of Health: National Heart, Lung, Blood Institute, Public Domain)

HOW TO CONTROL THINGS THAT MAKE YOUR ASTHMA WORSE (CONTINUED)

ALLERGENS

❑ Dust Mites

These tiny bugs, too small to see, can be found in every home—in dust, mattresses, pillows, carpets, cloth furniture, sheets and blankets, clothes, stuffed toys, and other cloth-covered items. If you are sensitive:

- Mattress and pillow covers that prevent dust mites from going through them should be used along with high efficiency particulate air (HEPA) filtration vacuum cleaners.
- Consider reducing indoor humidity to below 60 percent. Dehumidifiers or central air conditioning systems can do this.

❑ Cockroaches and Rodents

Pests like these leave droppings that may trigger your asthma. If you are sensitive:

- Consider an integrated pest management plan.
- Keep food and garbage in closed containers to decrease the chances for attracting roaches and rodents.
- Use poison baits, powders, gels, or paste (for example, boric acid) or traps to catch and kill the pests.
- If you use a spray to kill roaches, stay out of the room until the odor goes away.

❑ Animal Dander

Some people are allergic to the flakes of skin or dried saliva from animals with fur or hair. If you are sensitive and have a pet:

- Consider keeping the pet outdoors.
- Try limiting to your pet to commonly used areas indoors.

❑ Indoor Mold

If mold is a trigger for you, you may want to:

- Explore professional mold removal or cleaning to support complete removal.
- Wear gloves to avoid touching mold with your bare hands if you must remove it yourself.
- Always ventilate the area if you use a cleaner with bleach or a strong smell.

❑ Pollen and Outdoor Mold

When pollen or mold spore counts are high you should try to:

- Keep your windows closed.
- If you can, stay indoors with windows closed from late morning to afternoon, when pollen and some mold spore counts are at their highest.
- If you do go outside, change your clothes as soon as you get inside, and put dirty clothes in a covered hamper or container to avoid spreading allergens inside your home.
- Ask your health care provider if you need to take or increase your anti-inflammatory medicine before the allergy season starts.

❑ Other Things That Can Make Asthma Worse

- Sulfites in foods and beverages: Do not drink beer or wine or eat dried fruit, processed potatoes, or shrimp if they cause asthma symptoms.
- Cold air: Cover your nose and mouth with a scarf on cold or windy days.
- Other medicines: Tell your doctor about all the medicines you take. Include cold medicines, aspirin, vitamins and other supplements, and nonselective beta-blockers (including those in eye drops).

U.S. Department of Health and Human Services
National Institutes of Health

NIH National Heart, Lung, and Blood Institute

NIH Publication No. 20-HL-5251
February 2021

FIGURE 11.17 This page of the asthma action plan provides additional ways to control asthma. (credit: "Asthma Action Plan" by United States-National Institute of Health: National Heart, Lung, Blood Institute, Public Domain)

Steroid inhalers can increase the risk of oral candida infections, so patient education should include rinsing the mouth after use, and use of spacers if indicated. In acute exacerbations, nursing interventions may include monitoring oxygen saturation and applying supplemental oxygen. The nurse collaborates with respiratory therapy and the provider to identify SpO2 targets and optimize oxygenation.

LINK TO LEARNING

The Asthma and Allergy Foundation of America has resources for patients and families. This video provides important teaching points (https://openstax.org/r/77AsthmaAllergy) about how to use inhalers, nebulizers, spacers, and chambers.

Evaluation of Nursing Care for the Patient with Asthma

Evaluating nursing care for patients with asthma centers around symptom assessment and management. Accurately understanding the patient's experience of symptoms improves the nurse's ability to evaluate outcomes.

The primary patient outcome related to asthma management is symptom frequency. The nurse evaluates how often the patient experiences symptoms, including how often the patient is awakened from sleep due to difficulty breathing. It is important to understand how often the patient experiences respiratory distress severe enough to warrant using rescue medications. Lung function can be evaluated using spirometry. In acute exacerbations, monitor oxygen saturation and requirements.

Medical Therapies and Related Care

Asthma treatment focuses on controlling current asthma symptoms and decreasing future complications. Collaborative care for patient and caregiver education is a key component of asthma care. The interprofessional team includes providers, nurses, respiratory therapists, and pharmacists. Patient education topics include medication administration, home monitoring, and strategies to prevent exacerbation. Patient education strategies may include videos, teaching materials, and hands-on demonstration. A personalized, written asthma action plan can help caregivers and patients stay safe. These can include contact information for clinical team members, a medication list with instructions, clear information on how to manage flares, and when to seek help or call 911. A home **peak flow meter** (Figure 11.18) allows patients to track and observe trends in their lung function.

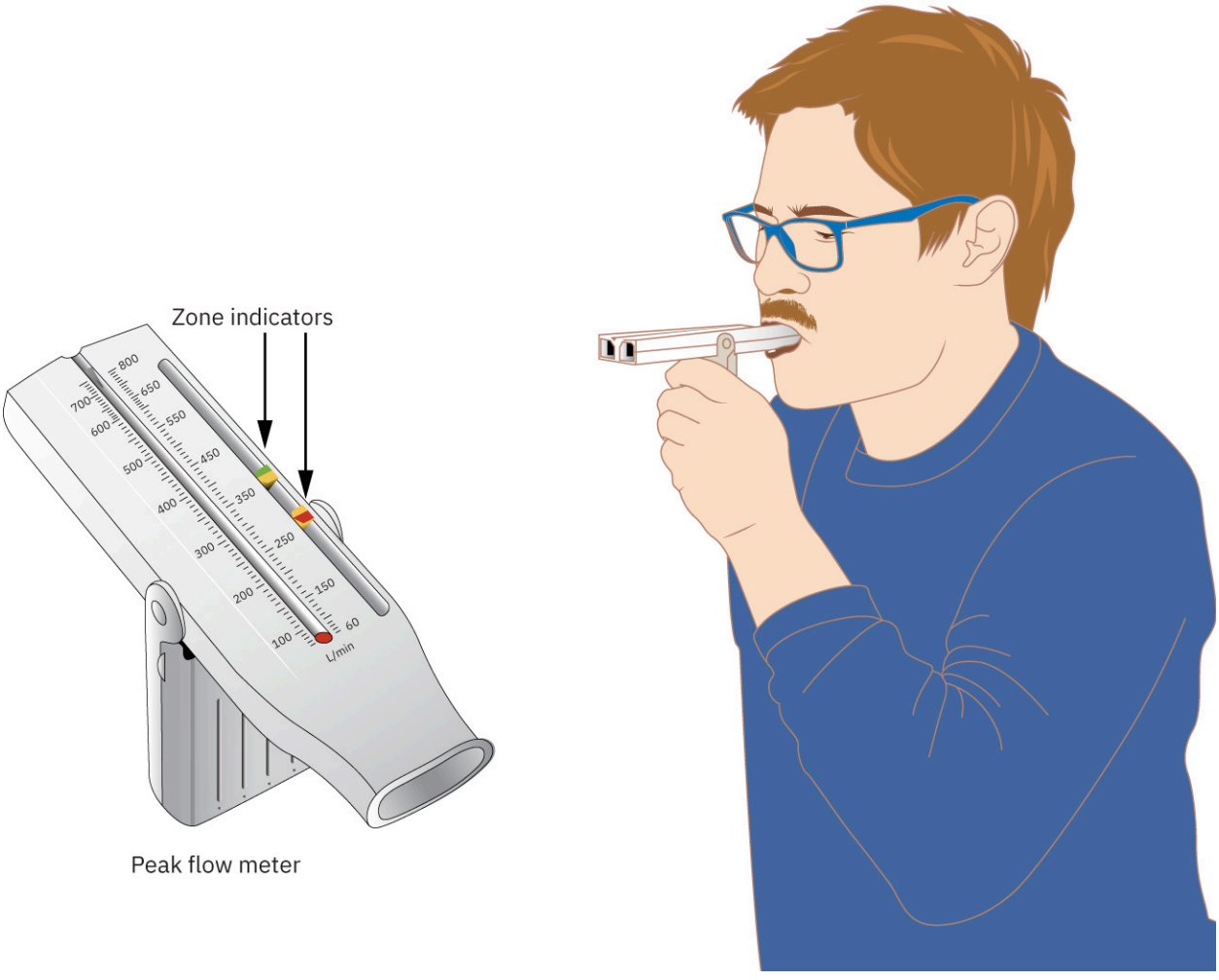

FIGURE 11.18 A peak flow meter is used to allow patients to track and observe trends in their lung function. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Identifying triggers and controlling exposure is important for patients with asthma. Some triggers (e.g., exercise, significant emotions, hormonal fluctuations, respiratory illnesses) cannot be avoided. In those cases, awareness of

their personal response to various triggers can help patients to anticipate and manage symptoms.

During times when an asthma patient is experiencing acute shortness of breath, short-acting beta-agonists (SABAs) are bronchodilators used to decrease bronchoconstriction. These are considered "rescue" medications because they start working within fifteen to thirty minutes. Medications in this class include albuterol and levalbuterol. In severe flares, oral or intravenous corticosteroids are often necessary to decrease inflammation. Medications used to treat asthma are summarized in Table 11.4.

Medication Class	Example	Additional Information
Short-acting beta-agonist (SABA)	Albuterol Levalbuterol	Inhaled or nebulized Onset of action: 15 to 30 minutes Considered "rescue" medications
Long-acting beta-agonist (LABA)	Salmeterol Formoterol	Oral, inhaled, or nebulized
Inhaled corticosteroids	Budesonide Fluticasone propionate	In severe flares, oral or IV corticosteroids are used.
Leukotriene inhibitors	Montelukast	Oral Can prevent asthma symptoms and treat allergy symptoms
Long-acting muscarinic antagonist (LAMA)	Tiotropium	Used in moderate cases Dry powder or mist inhaler
Mast cell stabilizers	Cromolyn	Can be used to treat allergic responses and prevent exercise-induced symptoms Rarely used due to more effective treatment options
Methylxanthine	Theophylline	Used to treat bronchoconstriction Rarely used due to more effective treatment options

TABLE 11.4 Asthma Medications

Long-term medication management focuses on reducing chronic inflammation. These medications can include long-acting beta-agonists (LABAs), like salmeterol or formoterol, inhaled corticosteroids, and leukotriene inhibitors, like montelukast. Some inhalers combine corticosteroid with a LABA. Inhaled long-acting muscarinic antagonists (LAMAs), like tiotropium, are used in moderate cases. Additionally, mast cell stabilizers, such as cromolyn, can be used to treat allergic responses and prevent exercise-induced symptoms. Theophylline is a methylxanthine that is sometimes used to treat bronchoconstriction.

11.5 Disorders of the Lower Respiratory System: Chronic Obstructive Pulmonary Disease

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for chronic obstructive pulmonary disease
- Describe the diagnostics and laboratory values in the disease of chronic obstructive pulmonary disease
- Apply nursing concepts and plan associated nursing care for the patient with chronic obstructive pulmonary disease
- Evaluate the efficacy of nursing care for the patient with chronic obstructive pulmonary disease
- Describe the medical therapies that apply to the care of chronic obstructive pulmonary disease

One widely prevalent obstructive respiratory disease is **chronic obstructive pulmonary disease (COPD)**. Thirteen percent of American adults (age forty to seventy-nine) have COPD. Most cases are linked to cigarette smoking, though COPD can occur in people who have never smoked. Some studies suggest that exposure to secondhand smoke increases the risk of COPD. It can cause chronic illness, hospitalization, and death. Annually, the United States sees 120,000–140,000 deaths attributable to COPD. COPD is more common in Black Americans than in other groups. There is a slightly higher prevalence of cases in males compared with females (Avital & Oji, 2021).

Pathophysiology

COPD is a chronic condition characterized by inflammation of the airways, blood vessels, and lung tissues that obstruct gas exchange. Most commonly, an irritant (e.g., smoking) causes dangerous levels of inflammation. This results in changes to the airways, including narrowing, smooth muscle hypertrophy, and increased mucous production. Over time, scar tissue can form and cause further narrowing of the airways. When alveolar walls become damaged and lose elasticity, resulting in problems with exhalation and CO_2 trapping, **emphysema** occurs (Figure 11.19).

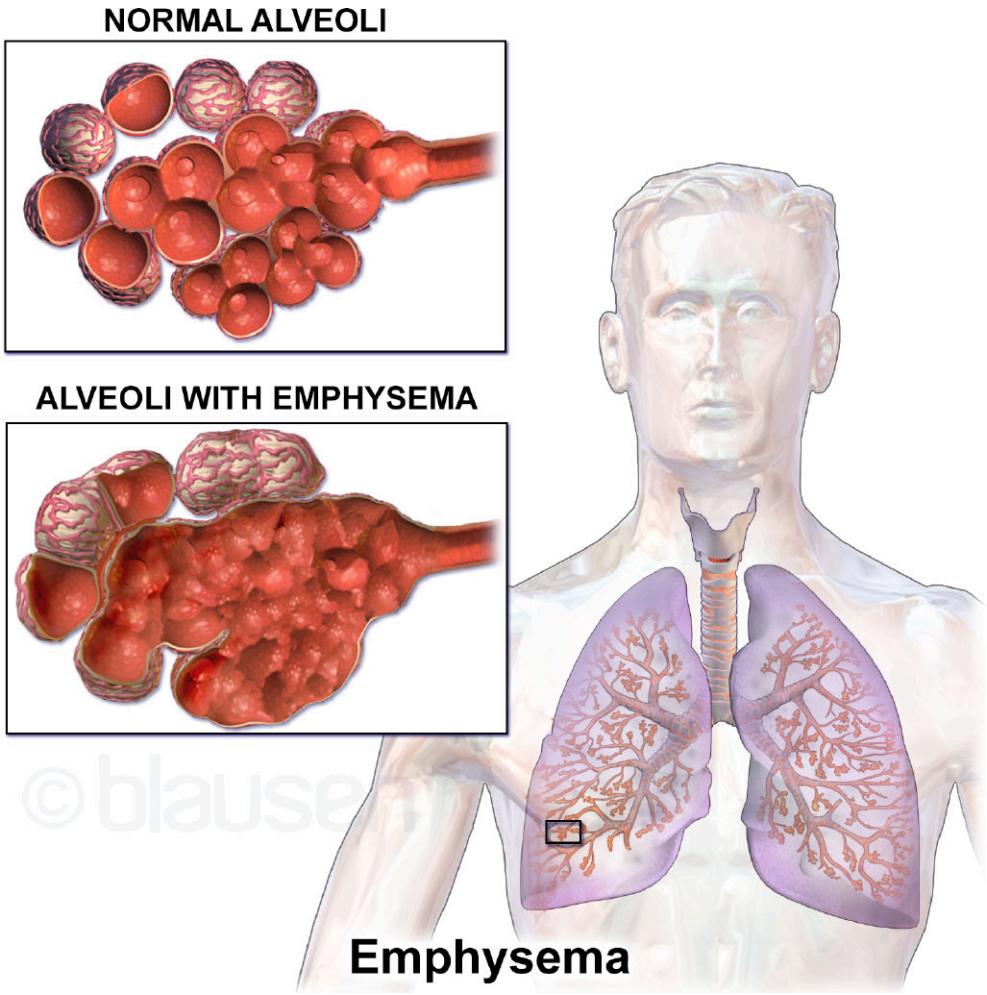

FIGURE 11.19 In COPD, emphysema occurs where alveolar walls become damaged and lose elasticity, resulting in problems with exhalation and CO2 trapping. (credit: "Blausen 0343 Emphysema" by Blausen Medical Communications, Inc./Wikimedia Commons, CC BY 3.0)

In rare cases, alpha-1 antitrypsin deficiency causes COPD. This genetic disorder results in misfolded, mutated proteins that build up in the liver. A lack of alpha-1 antitrypsin means that the body is unable to neutralize an enzyme that, when unchecked, can overwork and increase the risk of lung damage. Unlike smoking-related COPD, COPD caused by alpha-1 antitrypsin deficiency typically only affects the lower lobes of the lungs (Agarwal et al., 2023).

Risk Factors

Cigarette smoking is the most significant risk factor for COPD. Typically, a smoking history of more than ten to fifteen pack-years is seen with COPD. Occupational or environmental exposures to dust and fumes account for the approximately 20 percent of COPD patients who are nonsmokers (Han et al., 2023). Secondhand smoke and alpha-1 antitrypsin deficiency are additional risk factors for developing COPD (Agarwal et al., 2023).

Clinical Manifestations

COPD generally presents in adults, with the initial onset of problematic symptoms occurring more often during winter months due to irritation from cold air. Patients will report a cough, progressive shortness of breath, and mucous production.

Physical assessment may reveal wheezing. Patients with COPD may demonstrate a prolonged expiratory phase. Because exhalation becomes difficult in COPD, air becomes trapped in the lungs. The anterior-posterior chest wall diameter can increase and become barrel shaped from the chronic air trapping. Because of the increased effort required to breathe, patients with chronic COPD can develop muscle wasting and **cachexia**, a disorder that causes loss of muscle and adipose tissue (Figure 11.20). Clubbing of the fingers can occur due to chronic hypoxia. In severe

cases and during acute exacerbations, patients may experience noticeable respiratory distress. Manifestations can include accessory muscle usage, pursed lip breathing, and cyanosis. In advanced cases, right-sided heart failure can occur, causing lower extremity edema (Agarwal et al., 2023).

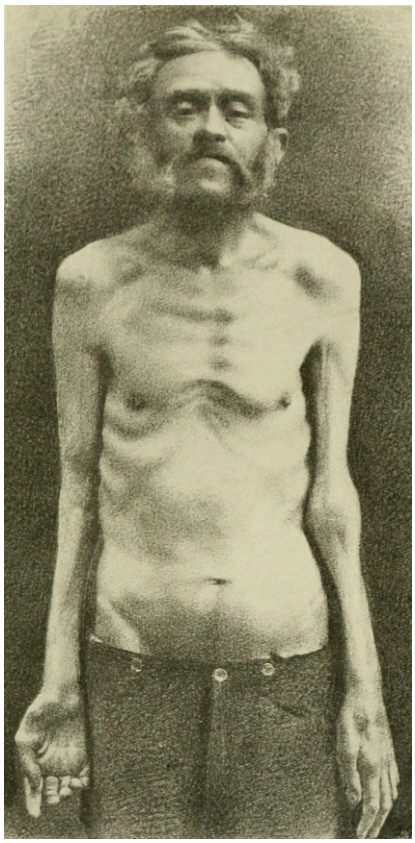

FIGURE 11.20 Muscle wasting and cachexia are often the result of COPD. (credit: “Image from page 812 of "Internal medicine; a work for the practicing physician on diagnosis and treatment, with a complete Desk index" (1920)” by Internet Archive Book Images/Flickr, Public Domain)

REAL RN STORIES

Nurse: Hannah, student nurse
Years in Practice: Less than one
Clinical Setting: Medical-surgical unit
Geographic Location: Atlanta, Georgia

At Hannah’s first clinical site, she was assigned to a patient with advanced COPD. Hannah had completed prework before clinical and understood that the patient would likely be using oxygen therapy and may have some activity limitations due to dyspnea.

As she entered the room to introduce herself to the patient, she was shocked by the patient’s appearance. In hindsight, she should have anticipated that the patient might have cachexia, but that day it took her by surprise: the patient was skin and bones. Because of the patient’s extremely thin extremities, Hannah needed to use a very small blood pressure cuff when doing vital signs. As she observed the RN administer a subcutaneous medication, it was clear that the patient had almost no subcutaneous tissue. The nurse struggled to find a location with enough fat to administer the subcutaneous medication.

Hannah and her classmate helped the patient get washed up. Because the patient was so dyspneic with any exertion, the two student nurses needed to complete the entire bed bath for the patient. As they helped the patient lift their limbs and wash, both students noticed that even the patient’s underarms showed signs of cachexia as the pocket of the underarm was so deep.

In postconference, the nursing instructor asked about the patient's diet order. Hannah recalled the patient was ordered a low-fat/low-cholesterol diet due to hyperlipidemia. The instructor reminded the group that for patients with advanced COPD and severe dyspnea, this diet was perhaps not the best choice. Sometimes a high-calorie, high-fat diet is a better option for a malnourished patient where every bite counts. The students learned that often COPD patients must choose between food and breathing as they can't do both at the same time when breathing is labored and limited.

Assessment and Diagnostics

COPD is assessed during initial diagnosis, ongoing treatment, and during acute exacerbations. Precise testing can provide important information about lung function. Other than diagnostic findings, the nurse might notice clues, such as tripod positioning, pursed lip breathing, and lower oxygenation saturation with exacerbation.

COPD is diagnosed and staged with pulmonary function tests using spirometry. Lung function may be evaluated before and after administration of an inhaled bronchodilator. The maximum exhaled volume in one second (**forced expiratory volume** [FEV_1]) is compared with the overall maximum volume that can be exhaled (**forced vital capacity** [FVC]). If the ratio of forced expiratory volume in one second to forced vital capacity (FEV_1/FVC) is under 0.7, or 70 percent of predicted, COPD is present. After a diagnosis of COPD is confirmed, severity is identified using the Global Initiative for Chronic Obstructive Lung Disease (GOLD) classification system, which is the gold standard for diagnosis. This compares the patient's actual FEV_1 to the expected FEV_1. A higher FEV_1 indicates that the disease is mild, and the patient is closer to normal lung function. A lower FEV_1 indicates diminished lung function and increased disease severity.

- GOLD 1: mild disease; the FEV_1 is >/= 80 percent of the predicted value.
- GOLD 2: moderate disease; the FEV_1 is 50–79 percent of the predicted value.
- GOLD 3: severe disease; the FEV_1 is 30–49 percent of the predicted value.
- GOLD 4: very severe disease; the FEV_1 is < 30 percent of the predicted value.

Laboratory testing may be performed. A complete blood test is used to evaluate anemia, infection, and polycythemia. If alpha-1 antitrypsin deficiency is suspected, these levels can be evaluated with a blood test. Diagnostic imaging, such as chest x-rays and computed tomography (CT scans), may be used to evaluate disease progression and acute infections.

An acute exacerbation usually presents with increased dyspnea, increased sputum volume, and purulent sputum. In a mild exacerbation, at least one of those assessment findings will be present, plus one of the following additional symptoms:

- increased wheezing
- increased cough
- fever without another cause
- recent upper respiratory infection (within five days)
- increased heart rate compared with baseline
- increased respiratory rate compared with baseline

Moderate and severe exacerbations will have two or three of the following: worsening shortness of breath, increased volume of sputum, and/or purulence.

When a low oxygen level is present or suspected, pulse oximetry and arterial blood gas analysis can provide helpful information that can guide therapy, including oxygen administration. Arterial blood gas analysis can also be used to assess elevated levels of carbon dioxide (> 45 mmHg) (Agarwal et al., 2023). Patients with mild or moderate COPD will often have arterial blood gas results that demonstrate mildly low oxygen levels without elevated CO_2 levels. Over time, as COPD becomes more severe, oxygen levels drop, and elevated CO_2 can occur. Respiratory acidosis is the most common blood gas abnormality in COPD. Adequate CO_2 clearance is not possible due to lung damage. CO_2 levels rise, decreasing the pH to an acidotic level (Han et al., 2023).

Nursing Care of the Patient with COPD

Nursing care of the patient with COPD takes place during initial diagnosis or ongoing treatment. When interviewing a

patient, careful listening can provide important clues about respiratory and functional status.

INTERDISCIPLINARY PLAN OF CARE

Interdisciplinary Plan of Care for a Patient with COPD

The interdisciplinary plan of care includes a variety of health-care professionals who work together to coordinate care for a patient with COPD. Their goal is to provide continued care, management, and preventative measures to reduce readmission to the hospital for acute episodes of exacerbation. The interdisciplinary team includes the following:

- Diagnostic imaging team to perform CXRs, and blood sampling collection
- Pharmacists to manage medications and verify compatibility
- Nutritionists to provide disease specific meal plans and supplements
- Social workers to collaborate post-discharge resources and referrals
- Therapists, including occupational, physical, recreational, and speech language
- Providers: pulmonologist/primary care to oversee the patient's plan of care
- COPD educators to provide best practices to prevent acute episodes and improve quality of life at home
- Cardiopulmonary team to perform cardiopulmonary rehab in an outpatient setting
- Home care providers to arrange services in the home post discharge

Recognizing Cues and Analyzing Cues

The nurse caring for a patient with COPD integrates objective data with the patient's subjective observations. The patient may report subjective symptoms, including a cough, worsening shortness of breath, and mucous production. Additionally, many patients will have a history of smoking or exposure to environmental irritants. Inquire about the frequency and duration of exposure to cigarette smoke and other irritants. Because preventable respiratory illnesses can cause serious infections in patients with COPD, ask patients about their immunization status.

Objectively, vital signs are evaluated with a focus on respiratory rate and oxygen saturation. Lung auscultation may reveal wheezing. Patients with COPD may demonstrate a prolonged expiratory phase. Physical assessment can also reveal a barrel-shaped chest, with increased anterior-posterior diameter. In patients with long-standing disease, muscle wasting, cachexia, and digital clubbing may be present. Physiological causation of clubbing is not entirely understood (Burcovschii & Aboeed, 2022). When evaluating for a COPD exacerbation, the nurse observes one or more of the key assessment findings to diagnose COPD.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

In patients with COPD, signs of inadequate oxygenation and respiratory distress are a high priority. The nurse may assist with spirometry testing and review results with the patient, and administer medications, such as bronchodilators and glucocorticoids. Educational topics include smoking cessation, infection prevention, vaccination, and how to use inhaled medications. Because steroid inhalers can increase the risk of oral *candida* infections, rinsing the mouth after use is an important teaching point. Educate also on the correct usage of spacers to decrease infection. Dyspnea can limit a patient's activity tolerance, meaning energy conservation strategies (e.g., activity pacing) can be helpful. In patients who struggle with activities of daily living due to dyspnea, nutritional coaching and interventions can be helpful. High-calorie foods can be a good choice when dyspnea makes eating challenging. When chronic oxygen therapy is utilized, patient teaching also addresses oxygen safety.

In acute exacerbations, nursing interventions may include monitoring oxygen saturation and applying supplemental oxygen. The nurse collaborates with respiratory therapy and the provider to identify SpO_2 targets and optimize oxygenation. Because of the risk of CO_2 retention, the nurse should assess for signs of elevated CO_2 levels thirty to sixty minutes after oxygen therapy is initiated (Han et al., 2023). Pulmonary rehabilitation may be indicated. In pulmonary rehabilitation, a supervised coaching program helps people with chronic lung disease optimize their respiratory status through various breathing techniques and exercises. Pulmonary rehabilitation assists patients to increase exercise with less symptom burden (Terry & Dhand, 2023).

Evaluation of Nursing Care for the Patient with COPD

Nursing care for patients with COPD involves assessing both respiratory and functional status. As disease progresses, and during acute exacerbations, pulmonary status can worsen and difficulties with ADLs can occur. The most important outcomes related to COPD focus on symptom management, oxygen level, activity tolerance, and prevention of exacerbations. The nurse evaluates symptom severity and how it affects the patient's ability to perform activities of daily living. Spirometry testing is used to identify changes in lung function. In acute exacerbations, signs of infection, oxygen saturation, and oxygen requirement are monitored.

Medical Therapies and Related Care

COPD treatment focuses on controlling current symptoms and decreasing the risk of exacerbations. The interprofessional team includes nurses as well as respiratory therapists, providers, physical therapists, occupational therapists, dietitians, and pharmacists. Pulmonary rehabilitation therapy can help patients improve endurance and activity tolerance.

Many of the strategies used to treat COPD are like those used to treat asthma. Smoking cessation is a cornerstone of treatment. Infection prevention, including influenza and pneumococcal vaccines, can provide important prevention against serious illness. Several types of bronchodilators are used in treatment and maintenance. Beta-2 agonists work by dilating the smooth muscles in the airway; they can be short-acting or long-acting. Short-acting beta-2 agonists are used for acute treatment, while long-acting beta-2 agonists are used for long-term therapy. Antimuscarinics keep airways open by preventing bronchoconstriction. Like beta-2 agonists, antimuscarinic agents can be short-acting or long-acting. Methylxanthines are a long-acting therapy; they cause bronchodilation by relaxing smooth muscle. Some studies support the use of prophylactic azithromycin to decrease the number of exacerbations in COPD patients (Agarwal et al., 2023).

Inhaled corticosteroids are commonly used to decrease airway swelling and are used as long-term therapy. Phosphodiesterase-4 inhibitors, such as Roflumilast, reduce inflammation and are used in patients with severe disease. In some patients, long-term use of azithromycin can decrease the likelihood of exacerbations. Despite medication and pulmonary rehabilitation, most patients with COPD will eventually have low oxygen levels, even at rest. Chronic oxygen therapy is a common treatment that can improve symptoms and lengthen survival. Surgery is sometimes used to treat severe cases. Surgical options include removal of damaged lung areas, surgery to decrease overall lung volume, and lung transplantation.

Acute exacerbations of COPD can require additional therapy. Oral and parenteral glucocorticoids are utilized for short-term treatment of acute exacerbations. Antibiotics may be necessary if there is a confirmed or suspected bacterial infection. The GOLD strategy supports starting antibiotics empirically when sputum is increasing in purulence or volume, dyspnea is increasing, or ventilatory support is needed (Terry & Dhand, 2023). Supplemental oxygen, up to and including ventilator support, may be necessary (Agarwal et al., 2023). Pulmonary rehabilitation can be a valuable intervention to improve quality of life.

11.6 Disorders of the Lower Respiratory System: Pneumothorax

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations of pneumothorax
- Describe the diagnostics and laboratory values in the disease of pneumothorax
- Apply nursing concepts and plan associated nursing care for the patient with pneumothorax
- Evaluate the efficacy of nursing care for the patient with pneumothorax
- Describe the medical therapies that apply to the care of pneumothorax

The pleural space typically contains only 10 to 20 milliliters of pleural fluid. When air enters pleural space, a pneumothorax develops. Each year, approximately 20,000 cases of pneumothorax occur in the United States. The large umbrella diagnosis of pneumothorax includes both traumatic and nontraumatic cases (Table 11.5). Nontraumatic pneumothoraxes are further categorized into primary spontaneous pneumothorax, secondary spontaneous pneumothorax, and iatrogenic. All types of pneumothoraxes are more common in males. Primary spontaneous pneumothorax is most common in individuals ages twenty to thirty. Secondary spontaneous

pneumothorax is most prevalent in older adults, ages sixty to sixty-five.

Type of Pneumothorax	Cause
traumatic pneumothorax	Air enters the pleural space due to a traumatic injury
Nontraumatic pneumothoraxes	
primary spontaneous pneumothorax	Air enters the pleural space spontaneously; there is *no underlying lung disease*.
secondary spontaneous pneumothorax	Air enters the pleural space spontaneously *as a complication of underlying lung disease*.
iatrogenic pneumothorax	Air enters the pleural space due to a complication from a surgery or invasive procedure (e.g., placement of a central venous catheter).

TABLE 11.5 **Types of Pneumothorax**

Pathophysiology

The pleural space is the area between the inner (visceral) pleural layer and the outer (parietal) pleural layer. Under normal circumstances, the two pleural layers are separated by only a small volume of pleural fluid (Figure 11.21). Pneumothorax occurs when air enters the pleural space. Air can enter the pleural space when there is trauma through the chest wall, or if there is a rupture of the inner (visceral) pleural layer. The accumulation of air increases pressure, causing the lung to collapse and deflate. As a result of collapse and deflation, the lung area available for oxygenation and ventilation is dramatically decreased.

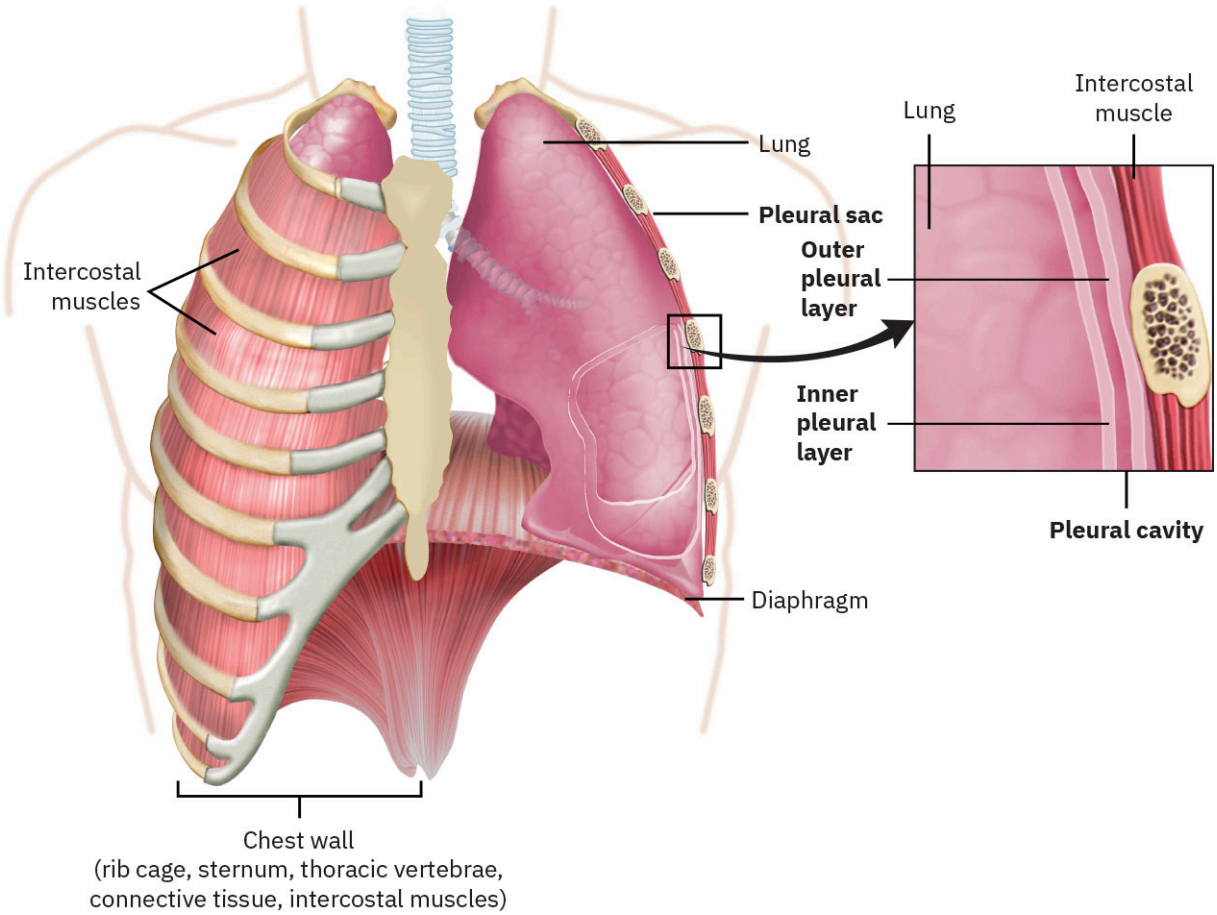

FIGURE 11.21 The lung is surrounded by the outer (parietal) and inner (visceral) pleura. The space between is called the pleural space. Under normal circumstances, the pleural space contains only 10 to 20 mls of pleural fluid. (modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

The volume of air that has entered the pleural space affects the degree of lung collapse. When a small volume of air enters the pleural space, the degree of collapse may be minor. With a large volume of air, a **tension pneumothorax** can occur. In addition to causing a major amount of lung collapse, the large volume of air exerts high pressure; this can force the heart and trachea to shift (Figure 11.22).

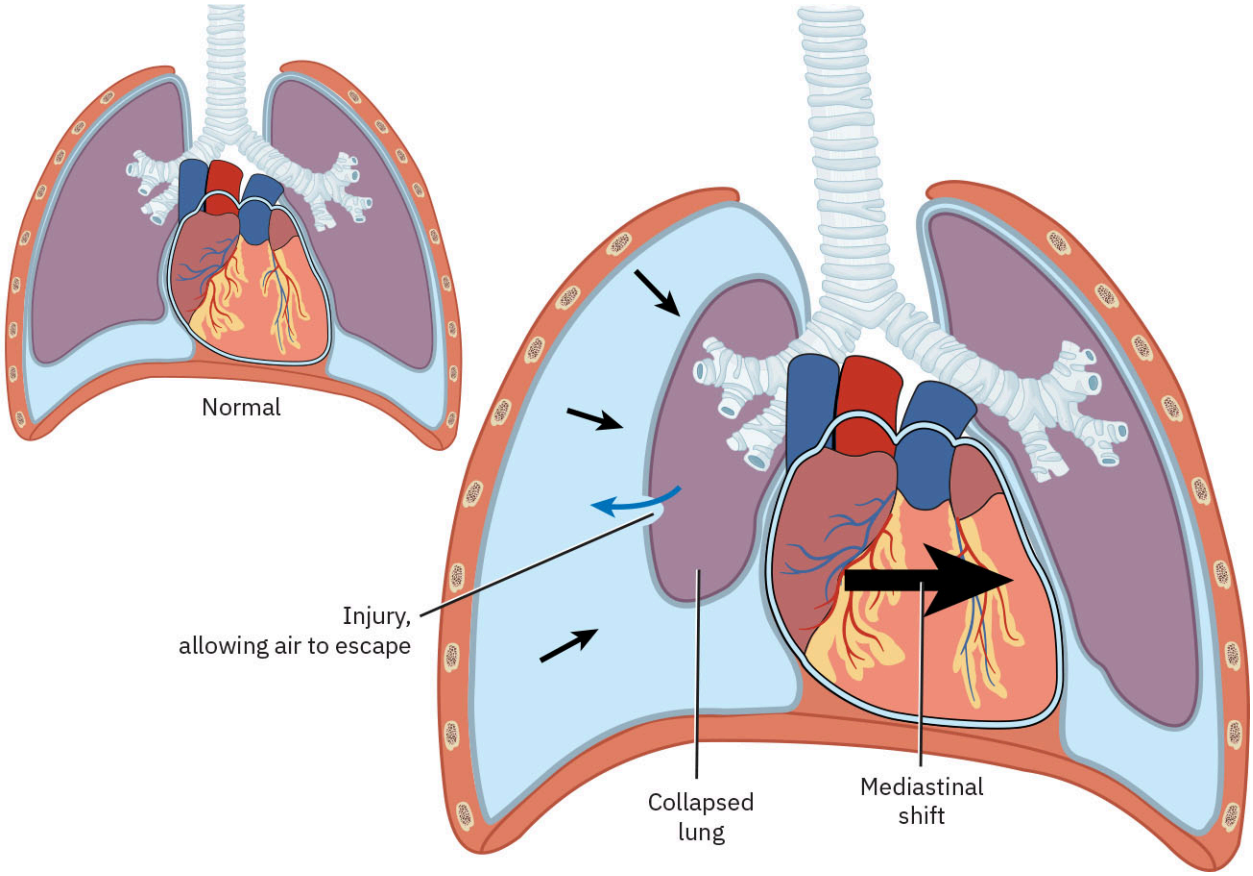

FIGURE 11.22 A tension pneumothorax occurs when air enters the pleural space and causes the lung to collapse. If the volume of air is large, it will force the heart and lungs to shift. (modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Risk Factors

Pneumothorax can occur as a result of many medical conditions, especially respiratory diseases such as COPD, asthma, cystic fibrosis, pneumonia, and tuberculosis. Smoking, pregnancy, and a family history of pneumothorax also increase a patient's risk. Various medical procedures, such as lung biopsy, tracheostomy placement, or placement of a central venous catheter, carry a risk of pneumothorax (McKnight & Burns, 2023). Patients with COPD have a significantly higher incidence of pneumothorax when compared with non-COPD patients. For heavy smokers, the risk of pneumothorax is 102 times higher when compared with nonsmokers (McKnight & Burns, 2023).

Clinical Manifestations

The high pressure of the air in the pleural space collapses the lung, limiting the body's ability to oxygenate and ventilate. While a patient with a small pneumothorax may be asymptomatic, most patients will have symptoms. Respiratory distress is a common clinical manifestation of pneumothorax. Patients commonly report a rapid onset of dyspnea, cough, and intense chest pain that is worse with movement.

Vital sign abnormalities can include an increased respiratory rate, decreased oxygen saturation, and increased heart rate. Physical assessment findings can include unequal chest expansion and decreased or absent breath sounds. When high pressure air is forced through the tissues, **subcutaneous emphysema** can occur. This creates a "popping" sensation with palpitation and can cause visible swelling. If the pneumothorax is a result of penetrating trauma through the chest wall, a wound may be visible. With tension pneumothorax, low blood pressure, cyanosis, and **tracheal deviation** (trachea in a non-midline position) can occur (McKnight & Burns, 2023).

Assessment and Diagnostics

Prompt diagnosis of pneumothorax is essential to prevent the possibility of life-threatening complications. Imaging and physical assessment are utilized to identify signs of pneumothorax. It is imperative the nurse realize that without immediate intervention, the patient's life is at risk.

Pneumothorax is diagnosed using imaging to visualize the area of collapsed lung. Most often, x-ray is used, although CT scan and ultrasound can also be utilized. Pulse oximetry and blood gas analysis may be performed, but results indicating low oxygen level can occur with many medical conditions and are not specific to pneumothorax. However, tension pneumothorax is an emergency, and treatment needs to be initiated immediately, without waiting for imaging (McKnight & Burns, 2023).

READ THE ELECTRONIC HEALTH RECORD

Assessment of a Patient with a Pneumothorax

Patient Information
Name: Charles Brenman
Age: 47 years
Sex: Male
Chief complaint:

- Severe shortness of breath and sharp stabbing chest pain

Medical history:

- Diagnosed with hypertension 3 years ago.
- Previous episodes last year of mild spasms related to gallstones, treated successfully with antispasmodics and diet change; no recurrence noted

Vital signs:

- Temperature: 93.3°F
- Heart rate: 132 bpm
- Blood pressure: 152/94 mm Hg
- Respiratory rate: 32 breaths per minute
- Oxygen saturation: 82% on room air
- BMI: 34

Recent laboratory results:

- WBC count: 10,000 /µL (normal)
- Hemoglobin: 13.5 g/dL (normal)
- Hematocrit: 40.5% (normal)
- Platelets: 250,000 /µL (normal)
- Electrolytes:
  - Sodium: 138 mmol/L (normal)
  - Potassium: 4.0 mmol/L (normal)
  - Chloride: 102 mmol/L (normal)

Imaging results:

- Ultrasound of chest: Findings consistent with small pneumothorax. The presence of a visible rim of less than 2 cm between the lung margin and the chest wall

Progress notes:

- Patient reports sudden onset of sharp pleuritic chest pain and shortness of breath, after falling off a ladder.
- Mild diaphoresis observed upon admission.
- Otherwise presents as an active middle-aged adult with mild health disparities

Current medications:

- Acetaminophen 500 mg every night as needed for pain
- Norvasc 10 mg a day day for hypertension

1. What information in the patient's chart concerns you?
2. What information is the most concerning?

3. What is an expected finding?
4. What information should you question?

Nursing Care of the Patient with Pneumothorax

Nursing care for a patient with pneumothorax focuses on prompt identification of potential respiratory and circulatory compromise. Anticipating and preparing for potential treatment interventions are key nursing roles.

Recognizing Cues and Analyzing Cues

The nurse caring for a patient with suspected or confirmed pneumothorax synthesizes patient-reported subjective data and objective assessment findings. Self-reported symptoms may include a rapid onset of dyspnea, cough, and intense chest pain that worsens with movement. The nurse may inquire about the patient's past medical history, especially any known lung diseases.

Objectively, vital signs are evaluated with a focus on respiratory rate and oxygen saturation. Respiratory rate may be increased while oxygen saturation may be decreased. Lung auscultation may reveal diminished or absent breath sounds in the affected lung field(s), and unequal chest expansion may be present. Skin assessment may demonstrate subcutaneous emphysema, which can cause the skin to appear swollen and has a popping sensation with palpation. If the pneumothorax occurred as a result of a traumatic injury, a penetrating wound may be visible (McKnight & Burns, 2023).

Prioritizing Hypotheses, Generating Solutions, and Taking Action

In patients with pneumothorax, signs of respiratory distress and decreased oxygenation are a high priority. The nurse may need to monitor vital signs, administer oxygen, or prepare a patient for imaging and/or procedures. If there is an open chest wound from a penetrating trauma, or if a chest tube becomes dislodged, the nurse must be ready to apply a three-sided occlusive dressing, which allows trapped air to escape while preventing more air from entering. If signs of tension pneumothorax are present, the nurse should anticipate emergent treatment due to the risk of decompensation and death. Tension pneumothorax is treated with immediate needle decompression, also known as needle thoracostomy. A needle is inserted between ribs into the pleural space, which allows the air that has accumulated in the pleural space to escape out of the body.

If a chest tube is inserted, it's important for the nurse to ensure that the tube from the patient is securely connected to the drainage device. Additionally, the nurse monitors output, evaluates the dressing at the insertion site, and, if ordered by the provider, may connect suction to the drainage device (McKnight & Burns, 2023).

Evaluation of Nursing Care for the Patient with Pneumothorax

When evaluating nursing care for patients with pneumothorax, respiratory assessment provides important information about patient status. Over time, respiratory status should improve as the air in the pleural space decreases. The most important outcomes related to pneumothorax center on improved oxygenation and lung reexpansion. The nurse monitors pulse oximetry, oxygen requirement, and lung sounds. Repeat imaging may be ordered and evaluated. If a chest tube is present, the nurse assesses the chest drainage system. As the pneumothorax resolves, the nurse should observe decreased air output (McKnight & Burns, 2023).

Medical Therapies and Related Care

Medical therapies vary based on the severity of the pneumothorax. Collaboration between nurses, physicians, and respiratory therapists is needed for optimal outcomes. Patients with a small, asymptomatic pneumothorax may not require any treatment because the body will reabsorb air in the pleural space over time. Some minor cases of pneumothorax are treated with high flow oxygen administration. Oxygen speeds up the body's ability to reabsorb air from the pleural space.

If the patient is symptomatic, the size of the pneumothorax is larger, or with a pneumothorax that occurs secondary to a disease (e.g., COPD, pneumonia), a provider may aspirate the pneumothorax using a needle (Figure 11.23). The needle is inserted between ribs, into the pleural space, and allows accumulated air to flow out of the body. For some patients, aspiration will be adequate treatment. If the patient's clinical status does not improve, the next treatment option is a thoracostomy tube placed by a provider. A **thoracostomy tube**, also referred to as a **chest tube**, is a tube

inserted through the skin into the pleural space, to drain air, fluid, or blood (Figure 11.24). Both procedures have the potential for moderate to severe pain. The nurse may advocate for, administer, and monitor the effects of analgesia.

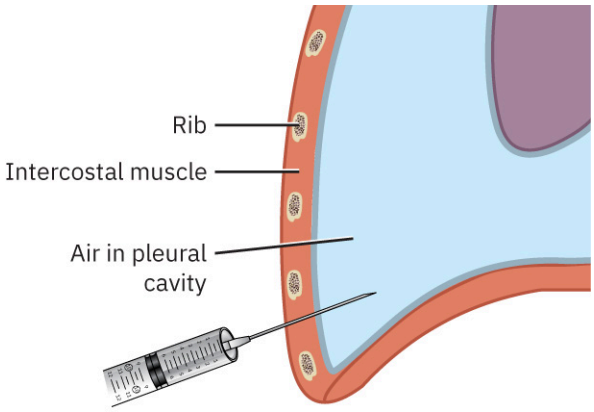

FIGURE 11.23 The provider inserts a thoracostomy tube through the skin into the pleural space, to drain air, fluid, or blood. This skilled procedure takes extensive training and is usually performed by a specialist such as a pulmonologist or emergency medicine provider. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

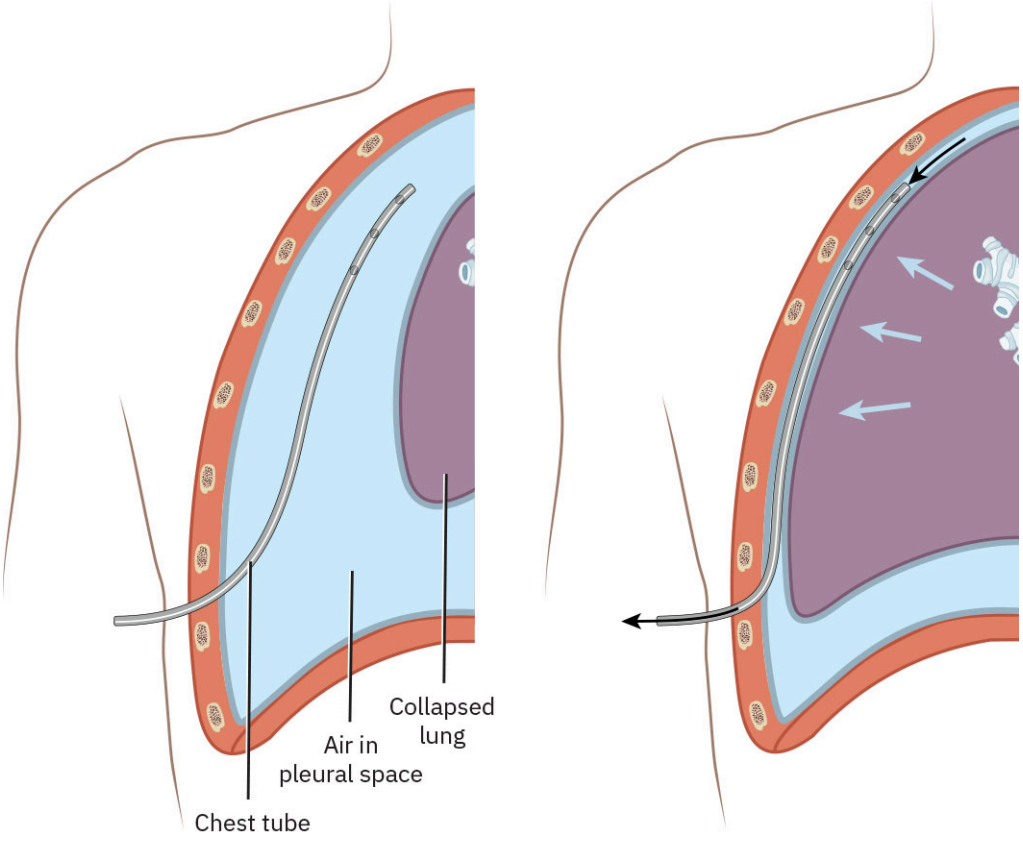

FIGURE 11.24 A thoracostomy tube, also referred to as a chest tube, is inserted through the skin into the pleural space. It can drain air, fluid, or blood. As these accumulated substances leave the pleural space, the lung can reexpand, improving oxygenation. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

To prevent air in the room from traveling through the chest tube and into the patient's pleural space, the chest tube needs to be connected to a specialized drainage device (Figure 11.25). While there are a variety of device models and manufacturers, all of these devices are designed for one-way drainage. This means that air and fluids can flow out of the body, but nothing can flow back in. To help the air drain out of the patient, suction needs to be applied to the chest drainage device. The amount of wall suction is specified in the provider order.

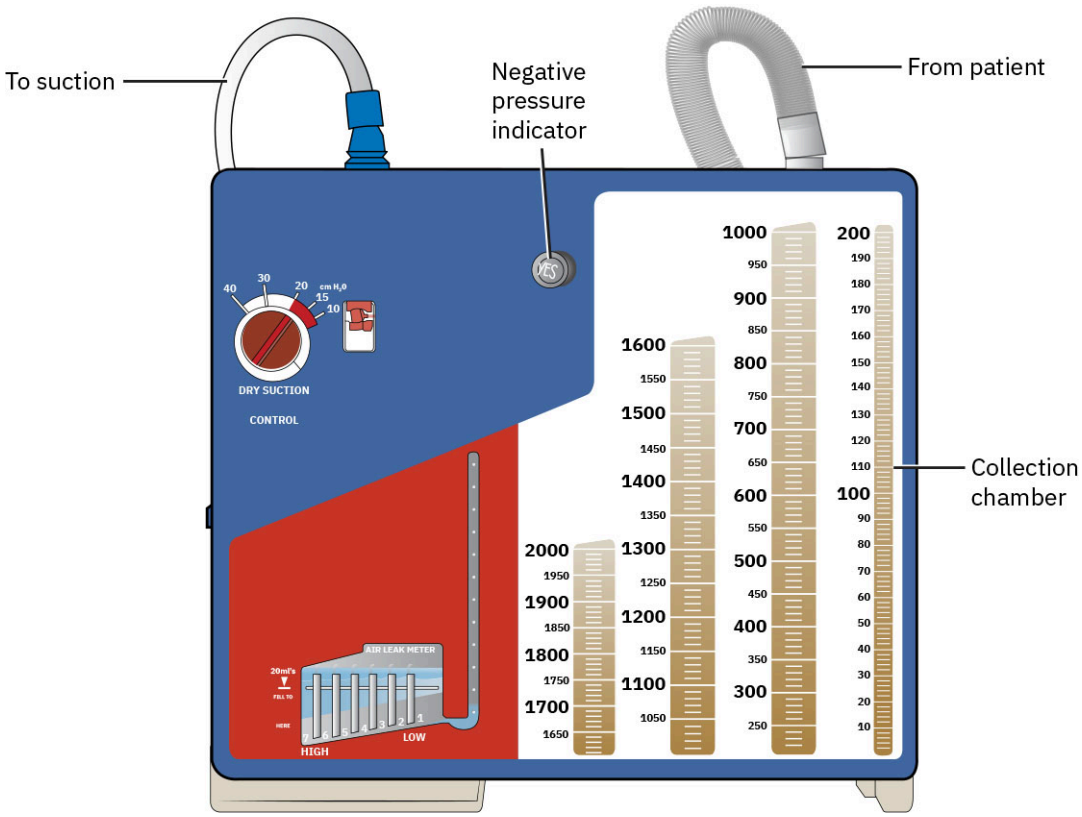

FIGURE 11.25 A specialized drainage device is connected to a thoracostomy tube (chest tube). All drainage devices are designed for one-way drainage, though different manufacturers and models exist. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Parts of the drainage device are:

- Collection chamber: This is where any fluid evacuated from the pleural space collects. Milliliter markings allow the amount of drainage to be quantified.
- Water seal/air leak monitor: In most devices, the water seal maintains one-way drainage, though some achieve this without a water seal area. This area can also show evidence of air moving through the system. When a pneumothorax is being treated, the device pulls air from the pleural space through the drainage system, so bubbles are expected to appear here as air flows through the system. When a chest tube drainage device is used to evacuate fluids from the pleural space, bubbles are not expected to appear here, and can indicate a break in the system.
- Suction control: The suction control dial indicates how much suction will be delivered to the patient when adequate wall suction is applied.
- Bellows: The bellows is used to determine if adequate wall suction has been applied. Typically, there is a marking where the bellows should expand.

If penetrating chest trauma is the cause of the pneumothorax, a temporary dressing may be necessary while more definitive treatment is in progress (Figure 11.26). To complete this process:

- An occlusive material (for example, Vaseline gauze, or something plastic) is placed over the wound.
- The dressing is taped in place fully on three edges, leaving an opening on one side.
- When the patient breathes in, the dressing is pulled toward the skin, sealing the opening, and preventing air from entering.
- When the patient exhales, air from the pleural space can escape through the open part of the dressing.

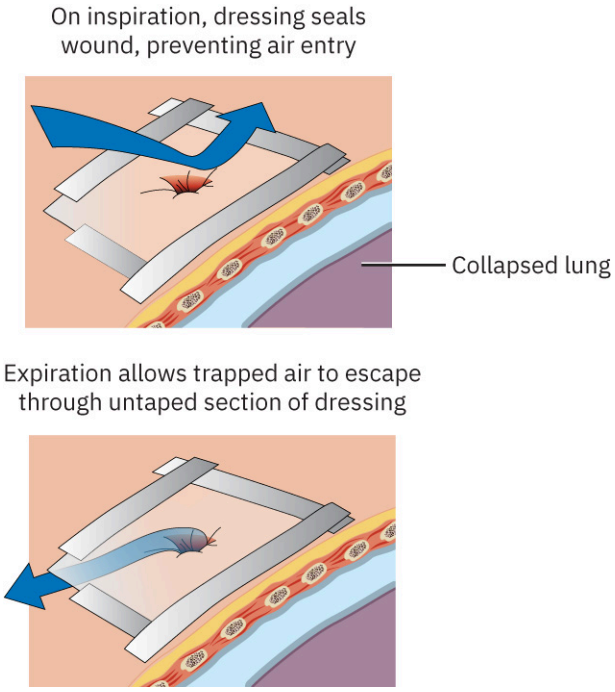

FIGURE 11.26 In the event the tube gets dislodged, creating an opening by only taping down three slides provides an exit for the trapped air to exit the puncture wound, rather than collected in the pleural space, worsening the pneumothorax. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Some patients may require surgical intervention. Surgical treatment may be indicated in a patient with recurrent pneumothorax, bilateral pneumothoraxes, or in cases where the pneumothorax has not resolved after seven days of treatment. Patients in professions that expose them to dramatic changes in barometric pressure, such as aviation or diving, may also require surgery. A surgical technique called **pleurodesis** is used to heal the break in the pleural space and can be mechanical or chemical. Mechanical pleurodesis involves abrading the parietal pleura, causing the inflammatory response to patch up the break in the pleural space. Chemical pleurodesis involves instilling chemicals into the pleural space, with the irritation creating an inflammatory response.

Because tension pneumothorax is an emergency that can result in death, immediate treatment is required to stabilize circulatory status. Tension pneumothorax is treated with **needle decompression**, where a large needle is inserted through the skin, between the ribs, into the pleural space. The large volume of air in the pleural space escapes through the needle and the lung can reexpand (McKnight & Burns, 2023).

11.7 Disorders of the Lower Respiratory System: Pneumonia and Aspiration

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for pneumonia and aspiration
- Describe the diagnostics and laboratory values in the disease of pneumonia and aspiration
- Apply nursing concepts and plan associated nursing care for the patient with pneumonia and aspiration
- Evaluate the efficacy of nursing care for the patient with pneumonia and aspiration
- Describe the medical therapies that apply to the care of pneumonia and aspiration

Pneumonia is common and affects persons without medical problems as well as persons with a variety of comorbid conditions. Pneumonia causes infections, hospitalizations, and deaths. While there are various types of pneumonia, community-acquired pneumonia (CAP) is the eighth leading cause of death in the United States. Worldwide, CAP is the leading cause of sickness and death (Ferreira-Coimbra et al., 2020). Significant mortality exists for patients hospitalized with pneumonia in the United States, at a rate of 13 percent (Ferreira-Coimbra et al., 2020).

Pathophysiology

Pneumonia is an umbrella term for a variety of infections that affect the lungs and cause inflammation (Figure 11.27). Infection can be caused by a virus, bacteria, or fungi. In aspiration pneumonia, food, fluid, upper airway

secretions, or emesis enter the trachea and respiratory tract, causing an inflammatory response (Figure 11.28). When a virus, bacteria, or fungi enters the lungs, macrophages try to eradicate the pathogen by surrounding it. This triggers inflammatory cells to travel to the infected area. Once lung tissues become inflamed, the capillaries become damaged. The affected alveoli can fill with fluid or pus, limiting the body's ability to oxygenate and ventilate.

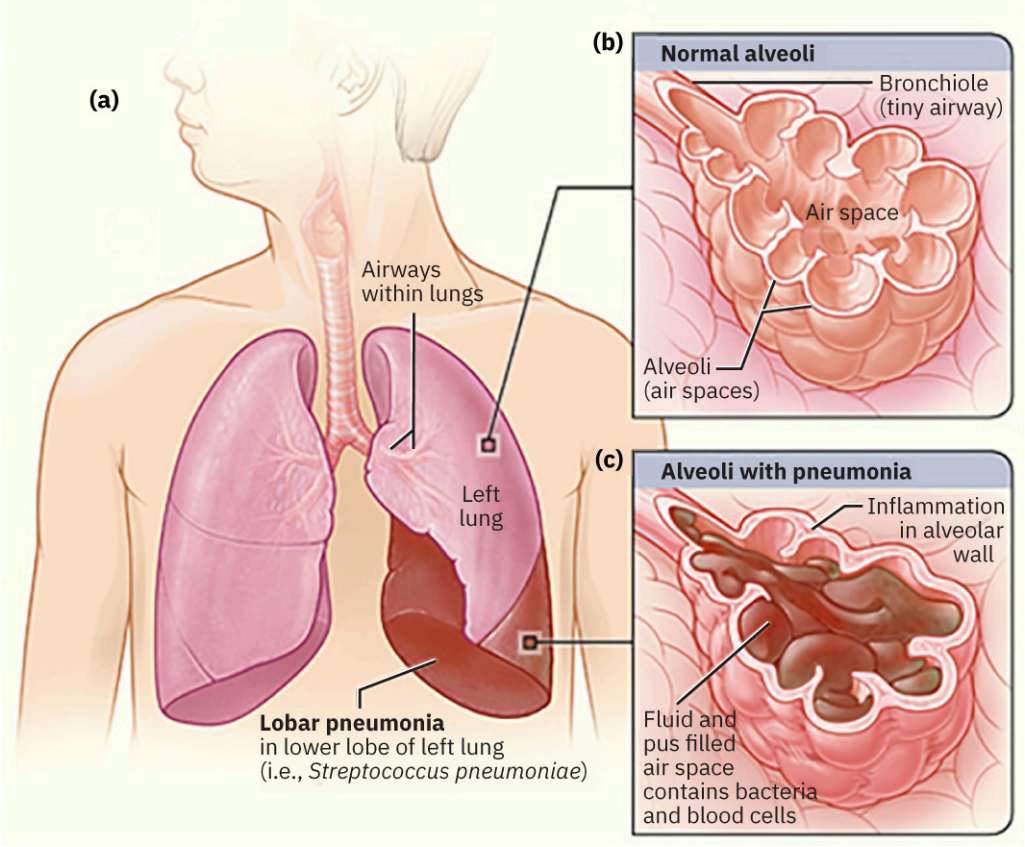

FIGURE 11.27 (a) Pneumonia may cause inflammation in all or a portion of the lungs. (b) Healthy lungs are not swollen and have adequate open air space. (c) Pneumonia causes inflammation in lung tissue and the air space can become filled with fluid. (credit: "Pneumonia, caused by bacteria." by NIH: National Heart, Lung, and Blood Institute, Public Domain)

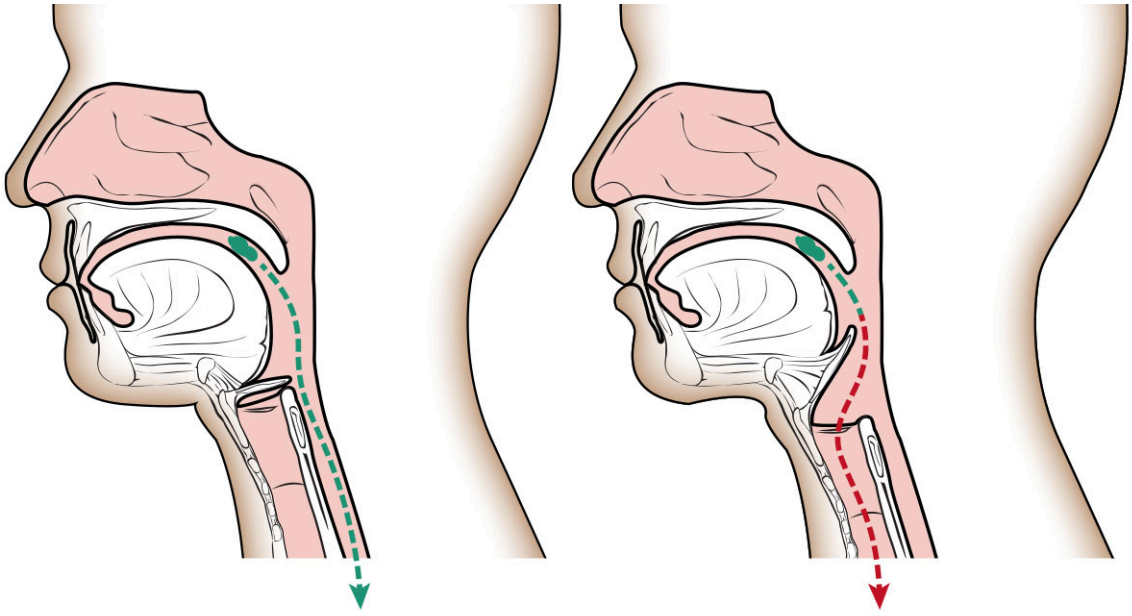

FIGURE 11.28 (a) In normal swallowing, food leaves the oral cavity and enters the esophagus. (b) In aspiration, food leaves the oral cavity and enters the trachea instead of the esophagus. (modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

A variety of organisms can cause pneumonia. Common pathogens implicated in pneumonia are listed in Table 11.6.

Type of Pathogen	Causes
Bacteria	*Streptococcus pneumoniae* *Haemophilus influenzae* *Moraxella catarrhalis* *Staphylococcus aureus* Group A streptococci Aerobic gram-negative bacteria (e.g., klebsiella, *Escherichia coli*) Legionella *Mycoplasma pneumoniae* *Chlamydia pneumoniae* *Chlamydia psittaci* *Coxiella burnetiid*
Viruses	Influenza A and B viruses Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) Other coronaviruses (e.g., CoV-229E, CoV-NL63, CoV-OC43, CoV-HKU1) Rhinoviruses Parainfluenza viruses Adenoviruses Respiratory syncytial virus Human metapneumovirus Human bocaviruses
Fungi	Blastomyces Histoplasma Coccidioides

TABLE 11.6 Common Pathogenic Causes of Pneumonia (Jain et al., 2022; Ramirez, 2022)

When pneumonia develops in a hospital setting, it is classified as **hospital-acquired pneumonia (HAP)**. If it occurs after a ventilator is initiated, it is termed **ventilator-associated pneumonia (VAP)**. The most common organisms seen in HAP and VAP are *pseudomonas aeruginosa, Escherichia coli, staphylococcus aureus, enterobacter,* and a*cinetobacter* (Jain et al., 2022).

Risk Factors

A variety of risk factors can increase the risk of pneumonia. These can include demographic factors as well as comorbid conditions. Pneumonia disproportionately affects patients who are under-resourced and face high poverty rates. Environmental factors, like crowded living conditions (e.g., areas with high poverty rates, prisons, shelters) and exposure to toxins like gasoline and certain paints also increase the likelihood of CAP. Older adults, persons who smoke, and persons living with lung disease, cardiac problems, diabetes, and immunosuppression are all at increased risk for severe illness and death. A diagnosis of COPD is the most significant risk factor for hospitalization with pneumonia (Jain et al., 2022; Ramirez, 2022). More specifically:

- Adults older than age sixty-five, compared with the general population, are three times more likely to be hospitalized with CAP.
- Chronic lung disease, especially COPD, significantly increases the likelihood of pneumonia.
- Viral infections can cause viral pneumonia and increase the risk of secondary bacterial pneumonia.
- All immunocompromised patients are at higher risk of pneumonia when compared with the general population; this is especially true about fungal pneumonias.
- Patients with aspiration due to dysphagia, anesthesia, or drug and alcohol use are at high risk of developing pneumonia.
- Smoking, heavy alcohol use, and opioid use increase the risk of pneumonia.
- Comorbid conditions, including chronic heart disease, malnutrition, and diabetes, increase the likelihood of severe infection.

- Socioeconomic factors, including poverty, crowded living conditions, and exposure to toxins, all increase the risk of pneumonia (Jain et al., 2022; Ramirez, 2022).

When providing care to patients with pneumonia, clinicians need to be able to identify which patients are likely to require hospital admission. An evidence-based severity score called CURB-65 uses several different criteria to assess pneumonia patients and predict need for hospitalization (Table 11.7).

	Description	Points
C	Confusion	1
U	Uremia: blood urea nitrogen > 7 mmol/L (20 mg/dL)	1
R	Respiratory rate: ≥ 30 breaths/minute	1
B	Blood pressure: systolic < 90 mmHg or diastolic < 60 mmHg	1
65	Age ≥ 65 years	1

Score of 0 or 1: Outpatient management is typically adequate.
Score of 2 or 3: Hospital admission is generally recommended.
Score of 4 to 5: ICU admission is recommended.

TABLE 11.7 **CURB-65 Pneumonia Severity Score** (Jain et al., 2022)

Clinical Manifestations

Many patients with pneumonia will display signs of systemic infection, such as fatigue, fever, chills, muscle pain, and decreased appetite. A cough is common and may be productive of yellow, green, brown, or blood-tinged sputum. Many patients with pneumonia will experience dyspnea. Some patients will demonstrate altered mental status, chest pain, or abdominal pain.

Vital sign abnormalities can include increased respiratory rate, fever, tachycardia, and decreased oxygen level. Lung auscultation can reveal crackles or decreased breath sounds. In severe cases, patients will demonstrate signs of respiratory distress, such as accessory muscle usage, nasal flaring, and difficulty speaking (Jain et al., 2022).

Assessment and Diagnostics

Diagnostic testing for pneumonia can utilize a variety of modalities. Imaging and laboratory tests are utilized to diagnose pneumonia, track its severity, and identify treatable organisms. Subjective and objective data are equally assessed to determine the best plan of care for each patient.

For a conclusive diagnosis of pneumonia, imaging is required. While a chest x-ray is utilized most often, chest CT is also an option; both can demonstrate visual evidence of pneumonia. Areas of inflammation and consolidation caused by pneumonia are often identifiable as whitish areas of opacity. A complete blood count can show increased white blood cells. Viral swabs and sputum cultures are done to identify the responsible organism so appropriate medications are given to the patient. When certain types of pneumonia (e.g., *legionella*) are suspected, urinary antigen testing is used. C-reactive protein and procalcitonin are used to differentiate bacterial and viral pneumonia. Lactic acid level may be checked if septic pneumonia is suspected. In severe cases, arterial blood gas analysis may indicate low oxygen levels. To evaluate patients with potential VAP, bronchoscopy may be used. A thin tube called a **bronchoscope** is inserted into the mouth or nose and a camera allows visual examination of lung tissue. The bronchoscope can obtain biopsy samples and treat blockages. In VAP patients, using a bronchoscope to obtain a sample can identify the organism to treat (Figure 11.29) (Jain et al., 2022).

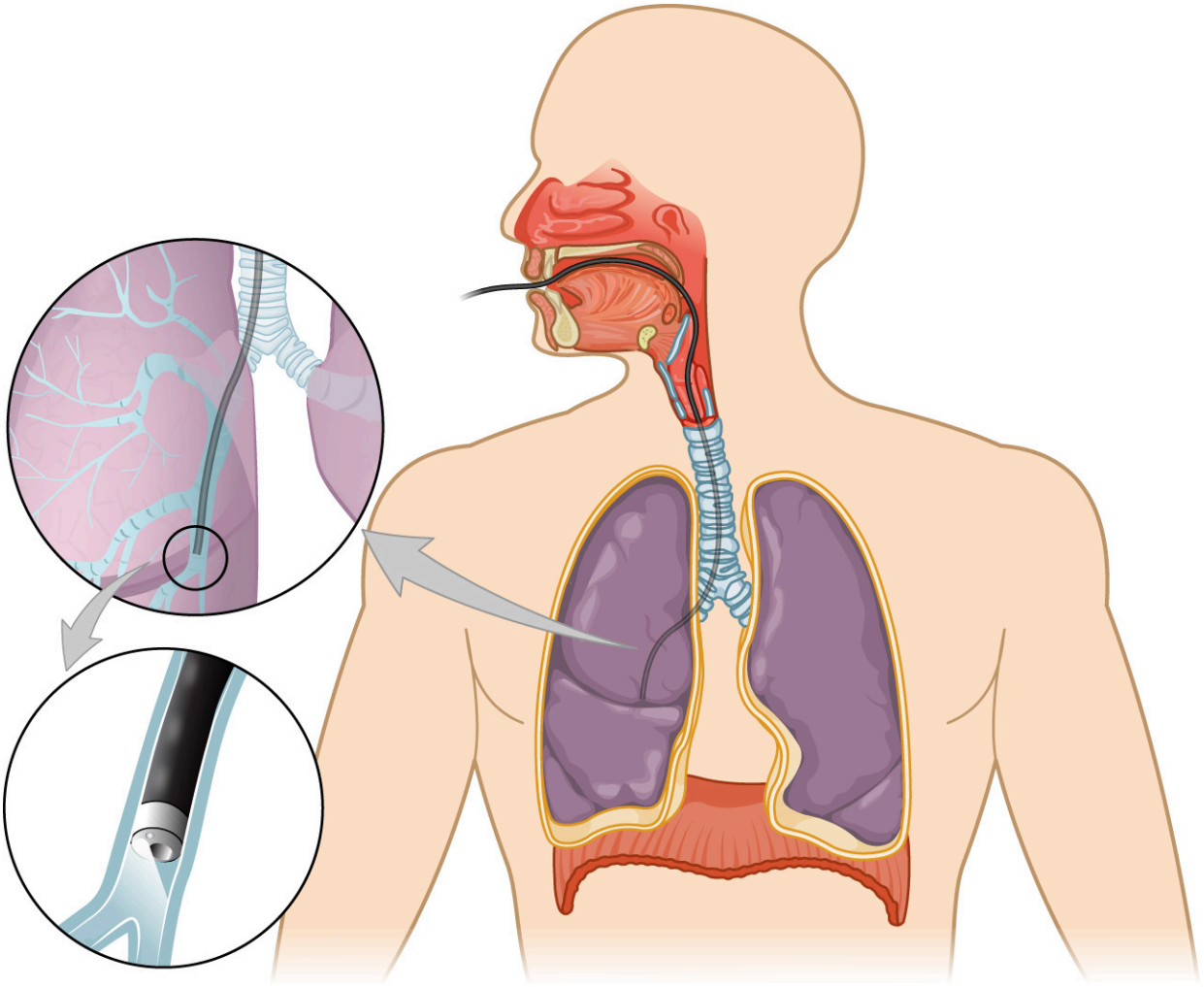

FIGURE 11.29 A thin tube called a bronchoscope is inserted into the mouth or nose. A camera allows visual examination of lung tissue. The bronchoscope can obtain biopsy samples and treat blockages. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Nursing Care of the Patient with Pneumonia and Aspiration

While pneumonia is common and often easily treatable, there is the potential for life-threatening illness. Close monitoring and timely intervention can, in many cases, prevent complications.

Recognizing Cues and Analyzing Cues

The nurse caring for a patient with suspected or confirmed pneumonia considers patient-reported data as well as objective assessment findings. Self-reported symptoms may include cough, dyspnea, and general signs of systemic infection. Purulent or blood-tinged sputum can occur with bacterial pneumonia. Sputum associated with viral pneumonia is often watery, though occasionally contains both mucus and pus (Jain et al., 2022). Understanding the patient's medical history is essential, especially any known lung diseases, neurological insult, such as stroke, cardiac problems, diabetes, and being immunocompromised. Objectively, vital signs are evaluated with a focus on respiratory rate and oxygen saturation. Fever and tachycardia may be present. Lung auscultation may reveal crackles or diminished breath sounds in some lung fields. The nurse identifies if breathing is labored or unlabored.

CLINICAL SAFETY AND PROCEDURES (QSEN)

QSEN Competency: Safety

Disclaimer: Always follow the agency's policy for medication administration.

Definition: Minimizes risk of harm to patients and providers through both system effectiveness and individual performance. The nurse will...

Skill: Demonstrate effective strategies to reduce the risk of harm to self or others.

Attitude: Value the contributions of standardization/reliability to safety. Patients suspected of having pneumonia should be made NPO right away, until cleared by a provider, because one of the major complications is aspiration pneumonia leading to additional infections.

- The patient should remain NPO until a trained provider or speech pathologist can perform a swallow screen using an evidence-based tool.
- Swallow should be evaluated before any PO food, fluids, or medications are given to identify dysphagia and prevent aspiration.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

In patients with pneumonia, signs of respiratory distress and decreased oxygenation are the highest priority. The nurse will monitor vital signs, administer oxygen, or prepare a patient for imaging and/or procedures. A decreased oxygen level, increased respiratory rate, signs of labored breathing, and alterations in mental status are all signs that supplemental oxygen (and possibly ventilation) is urgently required. Medication administration may include antibiotics, antiviral medications, or bronchodilators. Instruction on energy conservation and pacing can be helpful as patients recover. Due to the possibility of spread via droplet or airborne particles, PPE is often indicated when providing care to patients with pneumonia.

CLINICAL SAFETY AND PROCEDURES (QSEN)

Evidence-Based Practice: Strategies to Prevent Aspiration Pneumonia

Many cases of aspiration pneumonia can be prevented. Prevention strategies address oral hygiene and actual or potential swallowing problems.

1. Improve oral hygiene and increase access to dental care to decrease the likelihood of harmful bacteria in the oral cavity.
2. In hospitalized patients, assist with toothbrushing, denture care, and routine oral care. This may include suctioning out excess saliva, swabbing the mouth with moisturizer, and applying lip balm.
3. When aspiration risk is related to swallowing problems, collaborate with speech-language pathologists for expert guidance on strategies for safe swallowing.
   - An upright position (at least 30 degrees), appropriate head position, and maintaining an upright position after eating can decrease the risk.
   - Many patients will benefit from a slow pace while eating and drinking.
   - Some patients will require a specialized diet with textures that decrease the risk of aspiration.
4. When feeding tubes are utilized, it is important to ensure correct placement so that food, fluid, and medications do not inadvertently enter the respiratory tract.
5. For planned procedures requiring anesthesia, preprocedure fasting is suggested (Texas Health and Human Services).

Evaluation of Nursing Care for the Patient with Pneumonia and Aspiration

With skilled interprofessional care, most patients with pneumonia will recover well. Close assessment during the recovery period provides information about illness trajectory and need for ongoing treatment. The most important outcomes related to pneumonia center on resolution of respiratory symptoms. The nurse monitors pulse oximetry, oxygen requirement, and lung sounds. Signs of infection are evaluated, including temperature, white blood count, and sputum production. Patient-reported symptoms to reevaluate include dyspnea, cough, fatigue, fever, and chills. Repeat imaging may be required to identify if pneumonia is improving or has resolved.

LIFE-STAGE CONTEXT

Gerontological Considerations

When caring for older adults, the nurse must consider various gerontologic considerations to ensure optimal outcomes. Age-related changes, such weaker immune systems, make them more prone to developing pneumonia. The older adult populations have more comorbidities to consider, such as previous strokes, decline in cognition, and Parkinson's disease and dementia. These contribute to a higher probability of aspiration, which can lead to aspiration pneumonia. Older adults with identified risks for aspiration should have nursing interventions implemented to reduce these risks. The primary methods used to prevent aspiration during oral intake include:

- Referral for a swallow study
- Texture modification of food/liquids
- Positional swallowing maneuvers, such as chin-tuck
- Thickened liquids

Older adults are also at an increased susceptibility to increased risk of infection, due to lower immunity thresholds, all of which necessitate a tailored approach to the older population.

Medical Therapies and Related Care

Medical therapy varies based on the severity of illness (Table 11.8). When community-acquired pneumonia occurs, oral antibiotic therapy is usually utilized. A stronger antibiotic may be needed if the patient smokes or has comorbid conditions like COPD, heart disease, or diabetes. When patients are admitted to the hospital with severe pneumonia, intravenous antibiotics are often needed. Inhaled bronchodilators can be used to improve the sensation of shortness of breath. Viral pneumonia may be treated with antiviral medications, such as oseltamivir. Antifungal medications are used to treat fungal pneumonias.

Severity of Pneumonia	Appropriate Therapy
CAP, CURB-65 score 0 to 1	If adverse comorbidities are present: fluoroquinolones or beta-lactams plus macrolides If no adverse comorbidities are present: macrolides or doxycycline
CAP, CURB-65 score 2 to 3	Fluoroquinolones or macrolides plus beta-lactams
CAP, CURB-65 score 4 to 5	Beta-lactams plus fluoroquinolones or beta-lactams plus macrolides
VAP & HAP	Broad-spectrum antibiotics: • For patients without risk factors for multidrug resistance: piperacillin/tazobactam plus cefepime plus levofloxacin • For patients with risk factors for multidrug resistance: combination of an aminoglycoside plus one of the following: imipenem, meropenem, aztreonam, piperacillin/tazobactam, ceftazidime, or cefepime

TABLE 11.8 Antimicrobial Therapy for Pneumonia (Jain et al., 2022)

In many cases, hospitalized patients will require supplemental oxygen. In severe cases, ventilatory support may be needed. This can be noninvasive (e.g., BiPAP) or invasive (e.g., ventilator) (Figure 11.30). Bilevel positive airway pressure, or **BiPAP**, can provide breathing support to patients in respiratory distress. A tight-fitting mask goes over

the nose and/or mouth, and the attached machine blows air into the airway. Bilevel means there are two pressure settings: inhalation positive airway pressure (IPAP) and exhalation positive airway pressure (EPAP). BiPAP can increase oxygen levels and lower carbon dioxide levels. The care of a patient with pneumonia can be complex. It involves close collaboration between physicians, nurses, respiratory therapists, pharmacists, and radiologists (Ramirez, 2022).

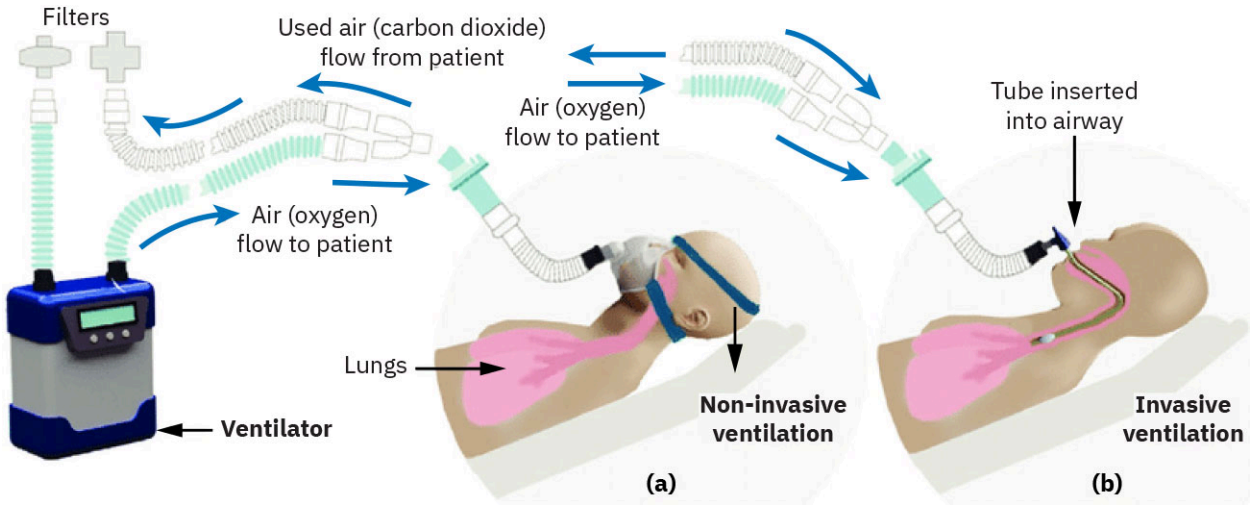

FIGURE 11.30 A ventilator is a machine that is used to support breathing. It delivers oxygen and removes carbon dioxide. Additionally, it can provide pressure to maintain open airways. Tubes from the machine connect to (a) a tight-fitting mask (noninvasive ventilation) or (b) a breathing tube in the trachea (invasive ventilation). (credit: "Figure 3" by Christou, Adamos & Ntagios, Markellos & Hart, Andrew & Dahiya, Ravinder/Research Gate, CC BY 4.0)

11.8 Disorders of the Lower Respiratory System: Tuberculosis

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for tuberculosis
- Describe the diagnostics and laboratory values in the disease of tuberculosis
- Apply nursing concepts and plan associated nursing care for the patient with tuberculosis
- Evaluate the efficacy of nursing care for the patient with tuberculosis
- Describe the medical therapies that apply to the care of tuberculosis

While the prevalence of tuberculosis is lower in the United States than in many other countries, more than 1.7 billion people worldwide are estimated to be infected. With 22 percent of the world's population infected with tuberculosis, it is impossible to overstate the burden of disease and global suffering. India, Sub-Saharan Africa, and the islands of Southeast Asia experience the highest rates of infection, with a rate of 300 cases per 100,000. In the United States, tuberculosis infects less than 25 persons per 100,000. Global poverty, including lack of access to adequate health care and clean water, accounts for this disparity (Horsburgh, 2024).

LINK TO LEARNING

Dr. Paul Farmer was a pioneering physician and medical anthropologist who died suddenly in 2022. He cofounded an organization called Partners in Health (https://openstax.org/r/77PartnerHealth) that is focused on providing high-quality health care to people worldwide in underserved areas.

Pathophysiology

Tuberculosis is caused by the airborne bacterium *Mycobacterium tuberculosis* (*M. tuberculosis*). Tiny particles called **droplet nuclei** are expelled from an infected person during talking, coughing, or singing, and these droplets remain airborne for several hours. While airborne, the infectious particles can be inhaled by others, eventually reaching the alveoli. After exposure, not everyone is infected with tuberculosis. Several factors impact the likelihood of infection:

- immune status of the person who is exposed
- how infectious the ill person is
- environmental factors (e.g., small spaces, inadequate ventilation, recirculation of infectious air)
- proximity, length, and frequency of exposure

Once inhaled, the droplet nuclei bring the tubercle bacilli to the lungs, where they eventually reach the alveoli. Macrophages ingest the tubercle bacilli, damaging and destroying many of them. In some cases, the body will clear the initial infection. In other cases, the initial infection persists but becomes latent. The tubercle bacilli become walled off into a capsule called a **granuloma**, which prevents spread.

Often, the initial infection will become reactivated, causing the tubercle bacilli to spread to other locations within the lung. Again, the body attempts to control the infection by encasing the tubercle bacilli in a granuloma. During widespread infection, however, this becomes problematic. Granulomas can develop cavities. They are filled with a lipid-rich substance, which can accelerate the spread throughout the lungs and body via the lymphatic or circulatory systems. Distant TB disease is most likely to develop in the brain, bone, kidneys, regional lymph nodes, and the uppermost part of the lungs.

LINK TO LEARNING

Watch this short video from the series *Rx for Survival*, entitled "An Incurable TB?" (https://openstax.org/r/77IncurableTB) to learn more about TB.

Risk Factors

In the United States, major risk factors include immunosuppression (including HIV), substance abuse, and malnutrition. Due to TB spreading by close contact, the risks of TB infection increase in high-density living situations, including incarceration and other congregate living settings. Structural poverty diminishes access to health care, so increased rates of infection occur among under-resourced populations. Significant disparities in infection rates exist when comparing demographic groups in the United States, as shown in (Table 11.9).

Demographic Group	Disease Incidence per 100,000
Asian	21.7
Black	15.3
Hispanic	8
White	2.8

TABLE 11.9 Variations in TB Infection Rates across Ethnic Groups
(CDC, 2021; Horsburgh, 2024)

Clinical Manifestations

Patients with active TB infection typically present with systemic symptoms. These can include fever, chills, night sweats, weight loss, weakness, fatigue, and decreased appetite. A chronic cough, lasting longer than three weeks, can be present, along with bloody or purulent sputum. Patients may also report shortness of breath and pleuritic chest pain. Lung sounds may be decreased or demonstrate crackles or wheezing (Loddenkemper et al., 2016).

Assessment and Diagnostics

Accurate assessment and diagnosis of TB is necessary so that infection prevention strategies and treatment can be initiated promptly. There are two types of laboratory tests that can test for TB: a blood test and a skin test. The utility of both blood and skin tests is limited because they are unable to differentiate an active infection from a latent one. An additional challenge related to skin testing is that false positives can occur when people have received a certain type of TB vaccine; additional screening is necessary to conclusively determine TB status.

Imaging is often used to identify abnormal areas of the lungs. Chest x-ray is most often utilized although CT scan can also be used. While abnormalities that look like TB, such as cavitary lesions, can be identified on imaging, it does not confirm a diagnosis. The conclusive way to diagnose TB is by obtaining a sputum sample and examining it for the presence of tubercle bacilli. When evaluating a complete blood count, elevated platelets, elevated white blood cells, and anemia may be present (CDC, 2021).

Nursing Care of the Patient with TB

Nursing care of the patient with TB begins with screening, symptom assessment, and infection prevention. Diagnostic imaging and medication administration are additional key components.

Recognizing Cues and Analyzing Cues

The nurse caring for a patient with suspected or confirmed TB understands that TB is a highly infectious disease, which merits priority interventions and actions. The nurse evaluates both subjective and objective data. Self-reported symptoms may include fever, chills, night sweats, weight loss, weakness, fatigue, and decreased appetite. Many patients with TB will report a chronic cough, lasting longer than three weeks, along with bloody or purulent sputum. Patients may report shortness of breath, and **pleuritic** chest pain can occur; this type of pain is severe, sudden, and happens with inhalation and exhalation. Patients describe it as burning, stabbing, or sharp. The nurse should also ask the patient about any recent travel or potential exposure. Objectively, vital signs are evaluated with a focus on respiratory rate and oxygen saturation. Lung auscultation may reveal decreased lung sounds, crackles, or wheezing (Loddenkemper et al., 2016).

Prioritizing Hypotheses, Generating Solutions, and Taking Action

In patients with suspected or confirmed TB, prevention of the spread of the infection is a high priority. The nurse should facilitate placement into a negative airflow private room. If a negative airflow room is not available, the patient should always wear a surgical mask and be moved to a location away from others. Necessary staff require personal protective equipment (PPE), including a respirator that has been fit tested for each individual. The nurse may need to monitor vital signs, prepare a patient for imaging, or administer medications. Coaching about the importance of medication compliance is crucial. Instruction on strategies to minimize the risk of transmission at home is important. These include isolating when possible, sleeping alone, avoiding visitors, and covering nose and mouth with sneezing and coughing (CDC, 2021).

Evaluation of Nursing Care for the Patient with TB

Evaluation of nursing care for patients with TB requires a focus on symptom assessment, treatment efficacy, and potential infection transmission. Initial and follow-up imaging is often needed. The most important outcomes related to TB treatment are ensuring the patient's continued cooperation with the medication regimen, preventing spread of infection during treatment, and continuing treatment until a definitive cure is achieved. An additional treatment goal is to prevent the development of disseminated tuberculosis, where mycobacteria has spread to distant body parts. Additionally, the nurse may assess for any changes in symptoms, such as worsening cough and night sweats. Repeat imaging may be ordered to determine if TB is improving, worsening, or plateaued (CDC, 2021).

Medical Therapies and Related Care

TB generally requires at least six months of treatment. Most of the bacteria are eradicated within the first eight weeks of treatment, but persistent organisms can remain and must be treated to prevent ongoing illness, infectious spread, and antibiotic resistance. The four main TB treatment drugs are isoniazid, rifampin, ethambutol, and pyrazinamide; a four-drug regimen is used (Table 11.10). With appropriate treatment, virtually all patients can be cured. Because TB is disproportionately prevalent in under-resourced areas, inadequate treatment can occur due to medication and staff shortages. This can result in ongoing infections and drug resistance. To help patients complete the long treatment regimen, many treatment centers offer in-person or electronic directly observed therapy (DOT).

Drug Class	Medication
First-line drugs	Isoniazid (INH)
	Rifampin (RIF)
	Pyrazinamide (PZA)
	Ethambutol (EMB)
	Rifabutin (RBT)*
	Rifapentine (RPT)
Second-line drugs	Streptomycin (SM)
	Cycloserine
	Capreomycin
	ρ-Aminosalicylic acid
	Levofloxacin*
	Moxifloxacin*
	Gatifloxacin*
	Amikacin/Kanamycin*
	Ethionamide

TABLE 11.10 Medications Currently Used to Treat TB in the United States *Not approved by the U.S. Food and Drug Administration for the treatment of TB (CDC, 2024)

Because the burden of treatment is so complex, collaborative care is crucially important. Successful care of a patient with TB may involve physicians, nurses, laboratory scientists, pharmacists, social workers, and respiratory therapists. Each interdisciplinary team member is assigned a portion of the directly observed therapy short course plan.

11.9 Disorders of the Lower Respiratory System: Cystic Fibrosis

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for cystic fibrosis
- Describe the diagnostics and laboratory values in the disease of cystic fibrosis
- Apply nursing concepts and plan associated nursing care for the patient with cystic fibrosis
- Evaluate the efficacy of nursing care for the patient with cystic fibrosis
- Describe the medical therapies that apply to the care of cystic fibrosis

Cystic fibrosis (CF) is an inherited disease caused by a gene mutation. This mutation impacts how sodium and chloride ions travel across cell membranes. As a result, thick mucus accumulates in the lungs and throughout the body. Serious breathing problems and other physical issues occur. In the United States, more than 30,000 people are affected by CF. It is most common in White persons and especially persons of Northern European descent. In

those populations, about one in 3,500 births is affected. CF is caused by a mutation affecting the CF transmembrane conductance regulator (CFTR) gene. Some people carry the gene but do not develop CF. Because of treatment advances, life expectancy has climbed for patients with CF. Currently, the median survival age for patients with CF is forty. While the pulmonary implications of CF are the primary cause of illness and death, it does affect other organ systems. There is a major treatment burden associated with CF, and recurrent hospitalizations are common (Brown et al., 2017; Karakashian et al., 2021).

Pathophysiology

CF is an inherited disease caused by a mutation in the CFTR gene. Because of the mutation, changes occur that affect how sodium and chloride ions move across cell membranes. When this movement is impaired, thick mucus builds up in the lungs and throughout the body (Figure 11.31). This causes breathing problems and affects other body systems. The thick mucus creates an optimal environment for bacterial colonization. Common infections include pseudomonas, *Haemophilus influenza*, and *staphylococcus aureas*. A person with CF experiences a major inflammatory response to the infection. Over time, the repeated cycles of infection and inflammation destroy parts of the airways.

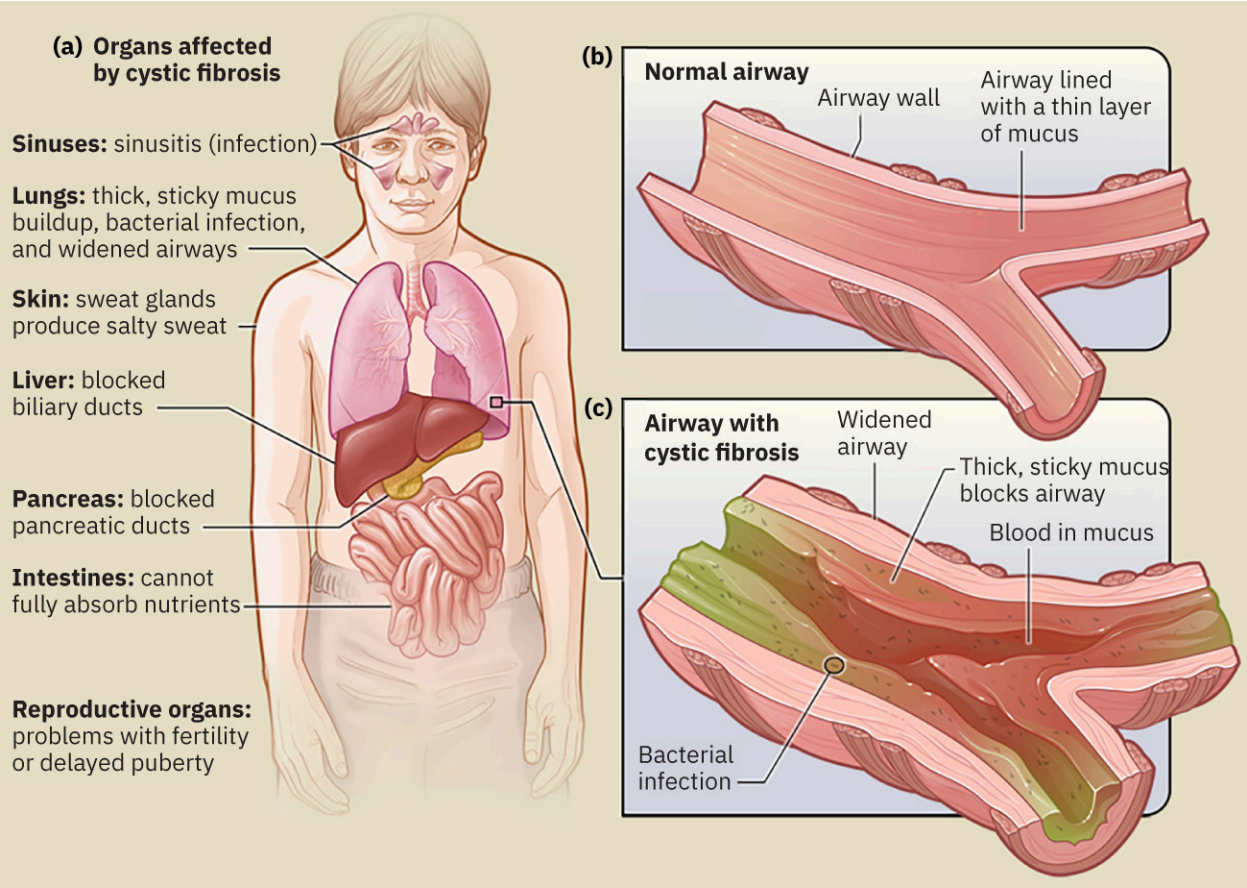

FIGURE 11.31 (a) There are lung problems associated with cystic fibrosis that occur due to mucus in the airways. Patients with cystic fibrosis also experience impacts to other body systems. (b) In a normal airway, the walls are lined with a thin layer of mucus. (c) The airway in CF is widened and filled with thick, sticky mucus. (credit: "How cystic fibrosis affects the body." by NIH: National Heart, Lung, and Blood Institute, Public Domain)

Risk Factors

Because CF is an inherited disease, family history is the primary risk factor. If both parents carry the gene mutation, their offspring will have a one in four chance of developing CF and a one in two chance of becoming a carrier (Brown et al., 2017; Karakashian et al., 2021).

Signs and Symptoms/Clinical Presentation

Most people will be diagnosed with CF before age two when there are not yet obvious manifestations. Observable symptoms usually affect the gastrointestinal system first. Symptoms can manifest at birth; a neonate may present

with an ileus from their first stool (**meconium**). Children may have a chronic cough, wheezing, and GI malabsorption. This can result in failure to thrive, growth restrictions, small stature, and decreased weight gain. Additional GI symptoms can include abdominal bloating, fatty stools, constipation, volvulus, intussusception, and biliary cirrhosis. Respiratory symptoms can include recurrent pneumonia, hemoptysis, shortness of breath, bronchiolitis, nasal polyps, and bronchiectasis. Over time, digital clubbing and increased anterior/posterior chest diameter can occur. Genitourinary symptoms associated with CF include decreased fertility, sterility, undescended testes, and congenitally absent vas deferens (Brown et al., 2017; Karakashian et al., 2021).

Assessment and Diagnostics

Timely diagnosis of CF is critical to ensure prompt access to treatment and care. Effective screening guidelines have been implemented. In the United States, all newborns are screened at birth for CF using a heel stick blood test. The average age at diagnosis is six to eight months and most patients are diagnosed prior to age two. If the initial blood test is positive, a **sweat test** is used for conclusive diagnosis. During a sweat test, a chemical and a small amount of electrical stimulation are applied to the skin to encourage sweat production. Over the course of thirty minutes, sweat is collected and sent to the lab for analysis. Elevated levels of sodium and chloride in the sweat confirm a diagnosis of CF. When an infection is suspected, a sputum culture and Gram stain can identify the organism so targeted treatment can be initiated. Liver function tests may show elevated results. A seventy-two-hour stool test can evaluate the presence of fecal fat and show increased fat and decreased albumin.

Imaging, most commonly chest x-ray, is used to assess disease progression and evaluate exacerbations. Pulmonary function testing is used to quantify disease progression and the severity of exacerbation. Arterial blood gas analysis can demonstrate hypoxemia and abnormally low blood pH. These results can support the initial diagnosis as well as provide information on disease progression (Brown et al., 2017; Karakashian et al., 2021).

Nursing Care of the Patient with CF

Nursing care of a patient with CF occurs across the life span, typically starting in childhood. While respiratory manifestations are prevalent, other body systems are also affected.

Recognizing Cues and Analyzing Cues

The nurse caring for a patient with suspected or confirmed CF evaluates both subjective and objective data. Prior to diagnosis, it is important to understand family history and known risk of inherited disease. The nurse assesses the patient and caregiver's stress and emotional well-being as they face a chronic disease. In an infant, meconium ileus may be present. Parents may note salty sweat, gastrointestinal problems, or a chronic cough. In a patient with known CF, the nurse asks about difficulty breathing, secretions, and cough. Because CF is a systemic disease that affects more than the lungs, it is important to assess for gastrointestinal symptoms, such as bowel obstruction, malabsorption, and pancreatic insufficiency. Objectively, vital signs are evaluated with a focus on respiratory rate, oxygen saturation, and temperature. Lung sounds may demonstrate crackles or wheezing (Karakashian et al., 2021).

Prioritizing Hypotheses, Generating Solutions, and Taking Action

In patients with CF, respiratory status is a high priority. The nurse may need to monitor vital signs, prepare a patient for imaging, or administer medications. Medications may be oral, intravenous, or inhaled. Antibiotics are commonly needed. Many patients with CF will require supplemental oxygen. Gastrointestinal interventions may include evaluating food intake, administering pancreatic enzymes and salt tablets, and supporting bowel function. To improve airway clearance, collaboration with respiratory therapy (and sometimes physical therapy) is necessary. When patient and caregiver stressors are present, the nurse prioritizes their emotional well-being and coping skills by facilitating access to resources like support groups, financial assistance, and mental health counseling (Karakashian et al., 2021).

Evaluation of Nursing Care for the Patient with CF

Nursing care for patients with CF centers on managing secretions, airway clearance, and prevention and treatment of exacerbations. Evaluation considers patient history, physical assessment, and physiologic parameters. The most important outcomes related to CF are airway clearance, prevention of exacerbation, and increased life expectancy. Patient reporting, lung auscultation, direct observation of cough, and vital sign assessment can provide important information about airway clearance status and signs of exacerbation. Adequate hydration, nutrition, and elimination

are important outcomes to monitor (CDC, 2021; Karakashian et al., 2021).

Medical Therapies and Related Care

The treatment of CF is complex and ongoing. Effective care requires close collaboration between the patient, caregivers, physicians, nurses, respiratory therapists, pharmacists, and rehabilitation therapists. Preventive care includes vaccination for preventable respiratory illnesses. Airway clearance therapy is necessary to help patients clear the thick, tenuous airway secretions. This can include manual chest percussion, a wearable high-frequency vest that delivers compression (Figure 11.32), flutter valve therapy, and mechanical ventilation. Inhaled medications, such as hypertonic saline and dornase alfa, can thin secretions, making it easier for mucus to be cleared. In children under eighteen, high-dose ibuprofen is utilized; studies have demonstrated that it decreases loss of lung function. When exacerbations occur, corticosteroids decrease inflammation and inhaled bronchodilators decrease airway hyperresponsiveness. Antibiotics are used during active infections and sometimes as prophylaxis. Some patients will be candidates for a lung transplant, which can extend life span by about five years in children and eight years in adults.

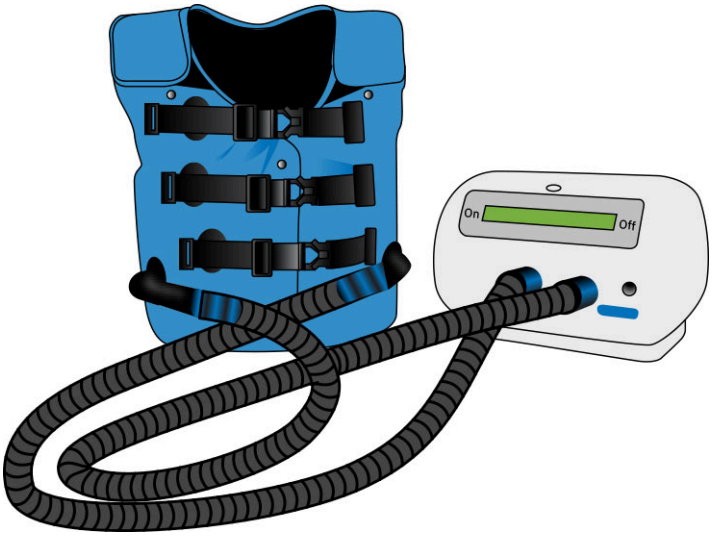

FIGURE 11.32 To help remove thick mucus, a patient with CF may use a wearable vest connected to a machine. A compressor rapidly sends air into and out of the vest through hoses. The vibrations and pressure can break up thick secretions, making it easier for the patient to clear them. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Because the gene mutation affects organs other than the lungs, additional treatment is required. Many patients with CF will experience digestion problems related to pancreatic insufficiency and require **pancreatic enzymes** supplementation as part of their treatment. In most male patients, the vas deferens is absent, but the body still produces sperm. In patients who want to consider reproduction, sperm can be harvested and used for assisted conception.

11.10 Effects of Smoking, Vaping, and Environmental Triggers of the Respiratory System

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the effects of smoking, vaping, and environmental triggers of the respiratory system
- Apply nursing concepts and plan associated nursing care for the patient who smokes, vapes, or has environmental triggers of respiratory illness
- Evaluate the efficacy of nursing care for the patient who smokes, vapes, or has environmental triggers of respiratory illness

Worldwide, cigarette smoking causes over seven million deaths every year. New tobacco products, e-cigarettes, became available around 2007 and rapidly gained popularity. Today, millions of Americans, including adolescents, use e-cigarettes (“vape”). Despite known health risks, this profitable industry continues to use marketing and advertising to promote cigarettes and **vaping**. Due to the novelty of e-cigarettes, long-term data to illustrate the

consequences and trajectory of use is not available.

Pathophysiology of Smoking and Vaping

The pathophysiology of cigarette smoking affects virtually every body system. Tobacco smoke contains about sixty known carcinogens. Research suggests that these carcinogens damage DNA, causing mutations that lead to tumor formation. When tobacco smoke is inhaled, it causes an inflammatory state in the lungs and increases the number of free radicals in the body. Increased oxidative stress leads to problems with dilation and constriction of blood vessels, increased blood clot risk, and increased inflammation. This can cause serious coronary artery disease (Adams & Morris, 2022). Smoking is a primary risk factor for developing COPD. Lung damage results in elevated CO_2, low oxygen levels, and vasoconstriction.

In vaping, the e-cigarette heats up a solution, which vaporizes and can be inhaled. This solution can contain nicotine, tetrahydrocannabinol (THC), butane hash oils, and cannabidiol, as well as other additives. The vaporization process turns the solution into ultrafine particles, allowing volatile organic compounds and heavy metals to be inhaled. Some of the additives decompose into dangerous compounds (e.g., formaldehyde). Similar to cigarette smoking, these compounds have been linked to oxidative stress, inflammation, emphysema, and increased cardiovascular risk (Perkins, 2020).

Clinical Manifestations of Chronic Effects from Smoking and Vaping

Smoking and vaping both carry a risk of causing severe health problems for patients. The danger may feel abstract to patients because noticeable problems may not occur for months or years.

Assessment and Diagnostics

Chronic smoking can cause many clinical symptoms and conditions. Some patients may smoke heavily for years before encountering symptoms. Chronic cough, dyspnea, hypoxia, and development of COPD are common. Smoking is linked with many other lung conditions (e.g., pulmonary fibrosis) and can exacerbate asthmatic symptoms. Many diagnostic tests are used to evaluate respiratory problems related to smoking. Imaging can include chest x-ray, CT scan, and ultrasound. The lungs can be directly visualized and biopsied by using bronchoscopy. Pulmonary function testing can be used to evaluate lung function.

Patients who use e-cigarettes can develop EVALI (e-cigarette or vaping use-associated lung injury). This can cause chest pain, bloody sputum, fever, cough, headache, muscle aches, fatigue, and shortness of breath. EVALI can result in life-threatening complications, including hemorrhage, pneumonia, acute lung injury, and pneumothorax. In addition, they can develop **pleural effusion**, a serious consequence that impacts breathing due to fluid accumulated in the pleural space and **acute respiratory distress syndrome (ARDS)**, a potentially fatal complication. As a result of lung injury, fluid builds up in the lungs, oxygen levels drop, and scarring can occur. Vital sign changes include increased respiratory rate and decreased oxygen level. Because these symptoms are nonspecific and can occur with many diseases, EVALI is considered a diagnosis of exclusion. Diagnostic tests will include chest x-ray, CT scan, bronchoscopy, and influenza screening (Perkins, 2020).

Smoking is linked to approximately 90 percent of lung cancer cases and is the most significant risk factor. The U.S. Preventive Services Task Force currently recommends that certain smokers undergo periodic low-dose CT screening to evaluate for lung cancer. When lung cancer is caught at an early stage, treatment is more likely to be effective. Annual CT screening is recommended for adults between the ages of fifty to eighty, with a twenty pack-year smoking history, who smoke currently, or quit sometime in the last fifteen years (U.S. Preventive Services Task Force, 2021).

Nursing Care of the Patient Who Smokes and/or Vapes

In both the near- and long-term, smoking and vaping can have serious consequences for patients. Nursing care aims to stabilize the immediate situation and provide resources to mitigate future complications. Cessation strategies and support are central aspects of nursing care.

Recognizing Cues and Analyzing Cues

Accurately understanding a patient's smoking history is important. The nurse should ask how many packs or cartridges per day the patient consumes, and how many years they have smoked. The nurse evaluates subjective and objective data, including patient reports of cough, dyspnea, and pain. Physical assessment evaluates for

adventitious lung sounds and changes that can occur with chronic smoking-related lung disease, such as a barrel-chested appearance. Patient position can provide important information about work of breathing. Many patients struggling to breathe are unable to tolerate lying flat and instinctively assume an upright, tripod position. Vital signs are assessed with a focus on respiratory rate and oxygen saturation. Educate the patient about fire safety concerns related to cigarette or e-cigarette smoking. Traditional cigarettes have a fire risk related to the open flame; e-cigarettes also have a fire risk related to the battery.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

In patients who smoke cigarettes or vape, respiratory status is a high priority. Depending on the complication, the nurse may need to monitor vital signs, prepare a patient for imaging, or administer medications. Medications may be oral, intravenous, or inhaled. Many patients will require supplemental oxygen. Patient education around fire safety, especially for patients who use supplemental oxygen, is an important nursing action. Smoke detectors and fire extinguishers should be readily available. Smoking in the same room as oxygen is potentially life-threatening.

At a minimum, patients need to stay at least six feet from an open flame (candle, fireplace, or stove) (MedlinePlus, 2022).

Supporting patients in efforts to quit smoking is a crucial nursing action. Structured frameworks exist that can guide clinicians as they undertake this complex task. The U.S. Preventive Services Task Force recommends the 5A's approach (Table 11.11).

Intervention	Technique
Ask	Implement an officewide system that ensures that, for every patient at every clinic visit, tobacco-use status is queried and documented. Repeated assessment is not necessary in the case of the adult who has never used tobacco, or has not used tobacco for many years, and for whom this information is clearly documented in the medical record.
Advise	Strongly urge all tobacco users to quit in a clear, strong, personalized manner.
	Advice should be:
	• Clear: "I think it is important for you to quit smoking now and I can help you." "Cutting down while you are ill is not enough."
	• Strong: "As your clinician, I need you to know that quitting smoking is the most important thing you can do to protect your health now and in the future. The clinic staff and I will help you."
	• Personalized: Tie tobacco use to current health/illness and/or its social and economic costs, motivation level/readiness to quit, and/or the impact of tobacco use on children and others in the household.
Assess	Determine the patient's willingness to quit smoking within the next thirty days:
	• If the patient is willing to make a quit attempt at this time, provide assistance.
	• If the patient will participate in an intensive treatment, deliver such a treatment or refer to an intensive intervention.

TABLE 11.11 The 5As Approach to Supporting Patients in Smoking Cessation (Tobacco Use and Dependence Guideline Panel, 2008)

Intervention	Technique
	• If the patient clearly states that they are unwilling to make a quit attempt at this time, provide a motivational intervention and/or offer the option of initiating pharmacotherapy rather than waiting until they are ready to quit.
	• If the patient is a member of a special population (e.g., adolescent, pregnant smoker), provide additional information specific to that population.
Assist	Provide aid for the patient to quit. These actions are summarized in the accompanying table.
Arrange	Schedule follow-up contact, either in person or by telephone. Follow-up contact should occur soon after the quit date, preferably during the first week. A second follow-up contact is recommended within the first month. Schedule further follow-up contacts as indicated.
	Congratulate success during each follow-up. If tobacco use has occurred, review circumstances and elicit recommitment to total abstinence. Remind the patient that a lapse can be used as a learning experience. Identify problems already encountered and anticipate challenges in the immediate future. Assess pharmacotherapy use and problems. Consider use or referral to more intensive treatment.

TABLE 11.11 The 5As Approach to Supporting Patients in Smoking Cessation (Tobacco Use and Dependence Guideline Panel, 2008)

Cessation-related interventions may include nicotine replacement therapy, other medications, and support groups/mental health counseling. To maximize the likelihood of success, implementation strategies must be comprehensive (Table 11.12).

Action	Strategies for Implementation
Help the patient with a quit plan	Set a quit date. Ideally, the quit date should be within two weeks.
	Tell family, friends, and coworkers about quitting and request understanding and support.
	Anticipate challenges to planned quit attempt, particularly during the critical first few weeks. These include nicotine withdrawal symptoms.
	Remove tobacco products from the environment. Prior to quitting, avoid smoking in places where they spend a lot of time (e.g., work, home, car).
Provide practical counseling (problem-solving/training)	Abstinence: Total abstinence is essential. “Not even a single puff after the quit date.”
	Past quit experience: Review past quit attempts, including identification of what helped during the quit attempt and what factors contributed to relapse.
	Anticipate triggers or challenges in upcoming attempt: Discuss challenges/triggers and how patient will successfully overcome them.
	Advise patient to remove all tobacco from home, car, and work environment.

TABLE 11.12 Implementation Strategies for Smoking Cessation (Tobacco Use and Dependence Guideline Panel, 2008)

Action	Strategies for Implementation
	Alcohol: Because alcohol can cause relapse, the patient should consider limiting/abstaining from alcohol while quitting.
	Other smokers in the household: Quitting is more difficult when there is another smoker in the household. Patients should encourage housemates to quit with them or not smoke in their presence.
Provide intra-treatment social support	Provide a supportive clinical environment while encouraging the patient in their quit attempt. "My office staff and I are available to assist you."
Help the patient obtain extra-treatment social support	Help the patient develop social support for their quit attempt in their environments outside of treatment. "Ask your spouse/partner, friends, and coworkers to support you in your quit attempt."
Recommend the use of approved pharmacotherapy, except in special circumstances	Recommend the use of pharmacotherapies found to be effective. Explain how these medications increase smoking cessation success and reduce withdrawal symptoms.
Provide supplementary materials	Sources: Federal agencies, nonprofit agencies, or local/state health departments. Offer a free telephone quitline (in the United States, 1-800-QUIT-NOW or 1-800-784-8669 can be used).
	Type: Culturally/racially/educationally/age appropriate for the patient
	Location: Readily available at every clinician's workstation

TABLE 11.12 Implementation Strategies for Smoking Cessation (Tobacco Use and Dependence Guideline Panel, 2008)

Evaluation of Nursing Care for the Patient Who Smokes and/or Vapes

When providing nursing care for the patient who smokes and/or vapes, the nurse uses subjective and objective data to determine next steps. Nursing care may impact physiologic status, medication regimens, and cessation. When evaluating the patient with complications from smoking or vaping, the nurse asks if their respiratory status has stabilized or improved. The nurse can evaluate lung sounds, perceived dyspnea, oxygen requirement, and medication regimen. Regarding smoking and vaping cessation, the nurse can assess any changes in the patient cigarette/e-cigarette usage along with the patient's symptoms and adherence to a medication regimen.

Medical Therapies and Related Care

Medical therapies related to cigarette smoking and vaping focus primarily on treating conditions that have developed and supporting patients to quit. E-cigarettes are not recommended as a cigarette smoking cessation strategy. Nicotine replacement therapy and other medications can help patients stop smoking. For patients with complications related to cigarette smoking, medical treatment will often involve inhalers, bronchodilators, and corticosteroids. Patients may also need to use supplemental oxygen to maintain their respiratory status.

In patients with EVALI, hospital admission may be required, and supplemental oxygen is commonly needed. Antibiotics are commonly utilized; corticosteroids are used in severe cases (Perkins, 2020). When serious complications develop (e.g., diffuse alveolar hemorrhage), emergent treatment is necessary. Bronchoscopy can be used to visualize and stop bleeding. Treatment options for bleeding available via bronchoscopy include topical vasoconstrictors (e.g., epinephrine), tamponade, and lavage with iced saline (Ingbar & Dincer, 2023).

Collaborative care for patients who smoke and vape includes many disciplines. Nursing, medicine, pharmacy, and respiratory therapy will work together on the plan of care that includes medications, oxygen therapy, imaging, and procedures. Social workers and mental health counselors can be important sources of support for patients and

families dealing with smoking-related consequences and challenges with quitting.

Pathophysiology, Risk Factors, and Clinical Manifestations of Environmental Triggers on Respiratory Illness

Work-related asthma is a common respiratory illness related to environmental triggers. Exposure to allergens, high temperatures, humidity extremes, and irritants can cause airway irritation and constriction. Inhaling dust, fumes, gases, and vapors can cause COPD and worsen existing cases. Asbestos exposure can lead to lung irritation as well as cancer. Asbestosis occurs when asbestos is inhaled, and mesothelioma is the asbestos-linked cancer that can arise in the lining of the lungs. Moreover, **black lung disease**, or **pneumoconiosis**, is a pulmonary disease that leads to lung scarring as a result of inhaled coal dusts. Histoplasmosis is a fungal infection caused by inhaling spores from soil (American Lung Association, n.d.).

Due to a variety of respiratory illnesses caused by environmental triggers, the manifestations can vary. Common symptoms do include shortness of breath, productive cough, wheezing, chest pain, and a history of known exposure to an environmental trigger. Patients may be asymptomatic for many years before damage becomes apparent. Diagnosis is made using history and physical, pulmonary function tests, x-ray, tissue biopsy, and CT scan (American Lung Association, n.d.).

Nursing Care of the Patient with Respiratory Illness from Environmental Triggers

Respiratory illness from environmental triggers can be serious, progressive, and debilitating. Nursing care centers on exposure identification, physiologic stabilization, and emotional well-being.

Recognizing Cues and Analyzing Cues

When evaluating patients with a suspected or confirmed respiratory illness related to an environmental trigger, potential exposure to substances and smoking history are both considered. Patients should be questioned about their occupations (e.g., miners, farmers, construction workers, factory workers) to help determine if environmental hazards are present. The nurse considers the possible triggering substance along with the duration and frequency of exposure. It is crucial to understand what, if any, personal protective equipment the patient had access to at the time of potential exposure. Some environmentally triggered respiratory illnesses have a rapid onset; others are delayed for years. Subjective data will include the patient's description of symptoms, including time of onset. The nurse evaluates objective data, including lung sounds, shortness of breath, and cough. Vital signs are evaluated with a focus on respiratory rate and oxygen saturation.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

High-priority findings include acute respiratory distress and hypoxia. The nurse may need to monitor vital signs, prepare a patient for imaging or pulmonary function tests, or administer medications. Many patients with environmentally triggered respiratory illnesses will require supplemental oxygen. Because most of these illnesses are incurable, patient and caregiver stressors are often present, and the nurse prioritizes emotional well-being and coping skills through facilitating access to resources like support groups, financial assistance, and mental health counseling. Smoking cessation education is a high-priority action.

Evaluation of Nursing Care with Respiratory Illness from Environmental Triggers

Because most environmentally triggered respiratory illnesses are permanent, a cure is not usually a possible outcome. For most patients, the goal is to stabilize or improve their respiratory status, at least temporarily. The nurse can evaluate lung sounds, perceived dyspnea, ability to perform activities of daily living, oxygen requirements, and medication regimen to determine the patient's respiratory status.

Medical Therapies and Related Care

Unfortunately, there is no cure for most environmentally triggered lung diseases, although some treatments can delay disease progression. Histoplasmosis is one environmentally triggered lung disease that can be cured; antifungal medication is administered for three months to a year. Key treatment strategies focus on preventing future exposure and smoking cessation. Oxygen therapy will often be necessary with most diseases. Bronchodilators can often improve symptoms by opening up airways. Pulmonary rehabilitation therapy can help some patients improve quality of life and activity tolerance. Surgery, including lung transplantation, may be

necessary in some cases.

LINK TO LEARNING

New medications are becoming available that can slow the progression of some lung diseases. Nintedanib (Ofev) is used to treat idiopathic pulmonary fibrosis as well as lung fibrosis that occurs with scleroderma and progressive fibrosing interstitial lung disease. Review this patient education information from the American College of Rheumatology (https://openstax.org/r/77LungMeds) to learn more.

Summary

11.1 Concepts of Oxygenation and Perfusion

- The respiratory system allows the body to breathe air and oxygenate blood. It is made up of the conducting zone and the respiratory zone.
- The lungs are protected by the ribs and sternum and are covered in protective membranes called pleurae.
- The bronchi branch off into tiny airways called bronchioles, ending in a terminal bronchiole. Terminal bronchioles meet a respiratory bronchiole, then connect to an alveolar duct. Gas exchange occurs in the alveolar sacs, at the end of the alveolar duct.
- Ventilation refers to the movement of air into and out of the lungs. During inhalation, air passes through the conducting zone and travels to the respiratory bronchiole and the alveolar sac. Carbon dioxide in the blood diffuses across the capillaries into the alveoli, leaving the body during exhalation.
- Oxygen molecules from inhaled air pass into the capillaries by diffusion. Most of the oxygen attaches itself to hemoglobin in the red blood cells so it can travel throughout the body, delivering oxygen to tissues.
- Physiologic factors that negatively affect oxygenation include hypoventilation related to decreased respiratory rate, limitations in chest wall/diaphragmatic expansion, and narrowed airways. Additionally, damaged alveoli and pulmonary capillaries, unventilated alveoli, and alveolar filling disorders can also cause inadequate oxygenation.
- Perfusion, as it relates to the respiratory system, means blood is flowing through the pulmonary capillaries. To receive oxygen, blood must be able to flow toward the alveoli, and oxygenated blood must be able to flow into the pulmonary vein so it can travel to the left side of the heart.
- When blood vessels are narrowed or blocked, blood flow decreases, and the lungs are less able to oxygenate blood.

11.2 Upper and Lower Respiratory Assessment

- Subjective assessment obtains information about the patient's history and current symptoms.
- Initial assessment looks at the patient's overall affect and appearance, observing for anxiety, distress, confusion, pallor, cyanosis, sweating, and ability to speak.
- Look at the patient's posture and observe accessory muscle usage, pursed lips, and nasal flaring.
- Before using a stethoscope, note if the patient's breathing is audible.
- Auscultation can identify adventitious lung sounds.
- A normal respiratory rate is twelve to twenty breaths per minute.
- Normal oxygen saturation (SpO_2) is 94 to 100 percent.
- Even with normal vital signs, respiratory problems can be present.
- Both hypoxemia (low blood levels of oxygen) and hypercapnia (high blood levels of carbon dioxide) can cause changes in level of consciousness, irritability, and distress.

11.3 Disorders of the Upper Respiratory System: Bronchiectasis

- Bronchiectasis is a chronic lung disease that leads to widened, damaged airways.
- The supportive structures of the bronchial wall lose elasticity and the bronchi dilates abnormally. The damage and dilation make it harder to clear mucus from the lower airways.
- Bacteria can flourish, causing a recurrent cycle of infection, inflammation, and airway damage.
- Almost all patients with bronchiectasis will have a cough.
- Bronchiectasis is diagnosed by CT scan.
- Crackles are the most common adventitious lung sound.
- Patients with bronchiectasis need to avoid environmental irritants, including smoking, secondhand smoke, and air pollution.
- Antibiotic therapy is often needed to treat an infection.
- Airway clearance therapies are necessary to help patients raise and clear phlegm.

11.4 Disorders of the Lower Respiratory System: Asthma

- Asthma is one of the most prevalent diseases in the United States.
- There are significant sex-, race-, and socioeconomic-based disparities in asthma care and outcomes.

- An asthma attack (or exacerbation) occurs when a trigger causes inflammation; this narrows the airway, causing bronchoconstriction.
- In a patient with asthma, the airways are considered hyperresponsive, meaning they narrow more than usual in response to stimuli.
- Asthma is classified into four stages (intermittent, mild, moderate, severe) based on how often symptoms occur.
- Shortness of breath, cough that is often worse at night, wheezing, and chest tightness are classic asthma symptoms.
- Pulmonary function testing confirms an asthma diagnosis.
- Bronchodilators are used to treat asthma; they work by opening narrowed airways.
- Environmental irritants can trigger asthma exacerbations.
- Patient education includes using an inhaler and peak flow meter, implementing an asthma action plan, and strategies to avoid triggers.
- Medication management may include both short- and long-acting medications.

11.5 Disorders of the Lower Respiratory System: Chronic Obstructive Pulmonary Disease

- COPD is a common chronic disease in the United States.
- Smoking is the primary risk factor for COPD.
- In patients with COPD, inflammation causes airway changes, including narrowing, smooth muscle hypertrophy, and increased mucous production.
- Problems with exhalation develop due to emphysema; alveolar walls become damaged and lose elasticity.
- Patient-reported symptoms include cough, progressive shortness of breath, and mucous production.
- Spirometry testing is used to diagnose COPD.
- Spirometry testing is also used to stage COPD; the disease can be mild, moderate, severe, or very severe.
- Medication management includes both short- and long-acting medications.
- Many patients with COPD will need to use long-term oxygen therapy.
- Vaccinations for preventable respiratory diseases are an important part of COPD management.
- Signs of an acute exacerbation include worsening cough, increased wheezing, fever with no other cause, recent upper respiratory infection, increased respiratory rate, or increased heart rate.

11.6 Disorders of the Lower Respiratory System: Pneumothorax

- COPD and smoking increase the risk of pneumothorax.
- Pneumothorax occurs when air accumulates in the pleural space, causing the lung to collapse and deflate, limiting the area available for oxygenation and ventilation.
- Patient-reported symptoms commonly include a rapid onset of dyspnea, cough, and intense chest pain that is worse with movement.
- Vital sign changes can include an increased respiratory rate, decreased oxygen saturation, and increased heart rate.
- Physical assessment findings can include unequal chest expansion and decreased or absent breath sounds.
- Pneumothorax is diagnosed with imaging, most commonly chest x-ray.
- A small pneumothorax may be asymptomatic and not require treatment.
- More substantial pneumothoraxes will require chest tube placement with connection to a specialized drainage device.
- Surgery is used to treat pneumothorax in certain patient populations.
- If there is an open chest wound from a penetrating trauma, the nurse must be prepared to apply a three-sided occlusive dressing.
- A tension pneumothorax occurs when a large volume of air enters the pleural space, causing a major amount of lung collapse and forcing the heart and trachea to shift.
- Tension pneumothorax is treated with immediate needle decompression.
- Treatment of pneumothorax is often painful; pain assessment and management are necessary.
- Patient education includes information about the treatment plan, mobility restrictions related to procedures or inserted tubes, and pain management.

11.7 Disorders of the Lower Respiratory System: Pneumonia and Aspiration

- Pneumonia occurs when infection occurs in the lungs and tissues become inflamed.
- Pneumonia can be caused by bacteria, a virus, or a fungus.
- Community-acquired pneumonia is common; hospital-acquired and ventilator-acquired pneumonia can also occur.
- Typical symptoms include cough, fever, and fatigue.
- Patients with COPD have the highest risk of hospitalization for pneumonia.
- Other high-risk diagnoses include heart disease, diabetes, smoking, alcohol and opioid use, and immunosuppression.
- Imaging, usually chest x-ray, is used for conclusive diagnosis.
- Sputum cultures and viral testing can identify the responsible organism.
- Treatment may involve antibiotics, antivirals, or antifungal medications.
- Ongoing assessment of a patient's respiratory effort, observing for signs of labored breathing, is a key nursing task.
- In serious cases, supplemental oxygen, including noninvasive ventilation or a ventilator, may be necessary.
- Patient education topics may include medication management, oxygen therapy, vaccines, and ventilatory support.
- In cases of aspiration pneumonia, patient education will often center around safe swallowing techniques.

11.8 Disorders of the Lower Respiratory System: Tuberculosis

- While TB is relatively rare in the United States, the global burden of disease is immense.
- TB is a highly contagious airborne illness.
- Immunocompromise increases the risk of infection and serious disease.
- Common symptoms include fever, cough, night sweats, weight loss, fatigue, chills, decreased appetite, shortness of breath, and pleuritic chest pain.
- Diagnostic evaluation of a patient with suspected TB may include a blood or skin test and imaging. A conclusive diagnosis can only be made, however, by examining a sputum sample for the presence of tubercle bacilli.
- Because TB is an airborne illness, infection prevention is a high priority.
- Patients should ideally be placed in a private, negative airflow room. Staff PPE should include a respirator that has been fit tested for everyone.
- TB generally requires a six-month treatment course of antibiotics. Incomplete treatment can result in ongoing infection and antibiotic resistance.

11.9 Disorders of the Lower Respiratory System: Cystic Fibrosis

- CF is an inherited genetic disorder that affects about one in 3,500 births in the United States.
- Most patients are diagnosed in infancy; virtually all are diagnosed prior to age two.
- The gene mutation impairs the movement of sodium and chloride ions across cell membranes, causing thick mucus to build up in the lungs and throughout the body.
- CF is conclusively diagnosed using a sweat test; it will show elevated levels of sodium and chloride.
- Because of treatment advances, the average life expectancy of a person with CF has increased to the age of forty.
- Antibiotics are commonly used to treat exacerbations; some patients will require prophylactic antibiotics.
- Inhaled medications and airway clearance techniques are used to help patients raise thick mucus.
- Many patients with CF will have pancreatic insufficiency, so supplementation with pancreatic enzymes is necessary.

11.10 Effects of Smoking, Vaping, and Environmental Triggers of the Respiratory System

- Cigarette smoking is a major cause of preventable morbidity and mortality worldwide.
- Vaping, or e-cigarette usage, involves heating a liquid to a high temperature; particles become a fine vapor, which is inhaled. Many of the inhaled components are damaging to lung tissue.
- There are many environmental and occupational triggers for respiratory disease.

- Most environmentally triggered respiratory diseases are not curable.
- Personal protective equipment can mitigate the risk of occupationally triggered respiratory diseases if available and used properly.
- Coaching and patient education around smoking cessation is a complex, challenging, high-priority intervention.

Key Terms

acute respiratory distress syndrome (ARDS) potentially fatal lung injury that can be triggered by a variety of events; fluid builds up in the lungs, oxygen levels drop, and scarring can occur
adventitious lung sounds breath sounds other than a clear sound of air
alveolar sac group of alveoli
alveolus individual, grapelike sac in the lungs where gas exchange occurs
angioedema soft tissue swelling in the deep layers of the skin, most commonly in the mouth, eyelids, and genitals
aspiration food, fluid, upper airway secretions, or emesis enter the trachea and respiratory tract
asthma attack (also: *asthma exacerbation*) inflammation narrows the airway, making it harder for the lungs to expand
atelectasis condition that causes a partial or complete collapse of the lung
BiPAP bilevel positive airway pressure, a form of noninvasive ventilation that uses a tight-fitting mask over the nose and/or mouth to increase oxygen levels and lower carbon dioxide levels; bilevel means there are two pressure settings: inhalation positive airway pressure (IPAP) and exhalation positive airway pressure (EPAP)
black lung disease pulmonary disease that leads to lung scarring due to inhaled coal dusts, also known as pneumoconiosis
bradypnea less than twelve breaths per minute
bronchial breath sounds heard over the trachea and larynx and are high-pitched and loud
bronchiectasis condition in which the elastic, supportive structures of the bronchial wall become damaged, and the bronchi abnormally dilate
bronchoconstriction smooth muscles in the airways contract, causing the airway to narrow
bronchodilator medication that opens narrowed airways
bronchoscope thin tube inserted into the mouth or nose with a camera for visual examination of lung tissue, can obtain biopsy samples and treat blockages
bronchovesicular breath sounds medium-pitched and heard over the major bronchi
cachexia disorder that causes loss of muscle and adipose tissue
capnography (also: *end-tidal carbon dioxide [$EtCO_2$] monitoring*) noninvasive way to measure exhaled carbon dioxide and provide information about ventilation
carina point where the trachea splits into the right and left primary bronchi
chest physical therapy airway clearance technique that can improve drainage and mobilization of mucus
chest tube (also: **thoracostomy tube**) tube inserted through the skin, into the pleural space, to drain air, fluid, or blood
chronic obstructive pulmonary disease (COPD) widely prevalent obstructive respiratory disease
clubbing bulbous enlargement of the tips of the fingers due to chronic hypoxia
conducting zone all parts of the respiratory system that do not participate in gas exchange, the passageways for air to flow into and out of the lungs
crepitus feels like a popping or crackling sensation when the skin is palpated; is a sign of air trapped under the subcutaneous tissues
diffusion movement of substances from an area of high concentration to an area of low concentration
droplet nuclei tiny particles expelled from an infected person during talking, coughing, or singing; they remain airborne for several hours
emphysema occurs when alveolar walls become damaged and lose elasticity, resulting in problems with exhalation
fine crackles (also: **rales**) popping or crackling sounds heard on inspiration as collapsed airways reopen
forced expiratory volume (FEV_1) maximum exhaled volume of air in one second
forced vital capacity (FVC) overall maximum volume of air that can be exhaled
granuloma walled-off capsule that develops as the body attempts to contain tubercle bacilli

hemoptysis coughing up blood
hospital-acquired pneumonia (HAP) pneumonia that develops in a hospital setting
hypercapnia high blood levels of carbon dioxide
hypoxemia low blood levels of oxygen
iatrogenic pneumothorax air enters the pleural space due to a complication from surgery or invasive procedure (e.g., placement of a central venous catheter)
idiopathic having an unknown cause
immune globulin product that may be administered intravenously or subcutaneously to provide necessary antibodies to strengthen the immune system
laryngopharynx most inferior portion of the pharynx, allows passage of both air and food
larynx cartilaginous structure that joins the pharynx to the trachea and regulates how much air goes in and out of the lungs, allows vibrations in the vocal cords to produce sound
meconium newborn's first stool
medulla oblongata respiratory center of the brain, controls breathing by responding to shifts in carbon dioxide, oxygen, and blood pH
nasopharynx region of the pharynx allows air to pass from the nasal cavity toward the trachea
needle decompression treatment for tension pneumothorax where a large needle is inserted through the skin, between the ribs, into the pleural space; the large volume of air in the pleural space escapes through the needle and the lung can reexpand
oropharynx region of the pharynx, allows passage of both air and food
oxygenation process that occurs when oxygen from the air makes its way into the bloodstream
oxyhemoglobin bright red molecule formed when oxygen binds to hemoglobin
pancreatic enzymes supplementary medication required by patients with CF due to pancreatic insufficiency
partial pressure how much of a gas is dissolved in the blood
peak flow meter device that measures lung function and allows patients to track and observe trends
perfusion blood flow
pharynx muscular tube with an inner mucous membrane lining, it connects the nasal passages and oral cavity to the trachea and esophagus
pleurae protective membranes that encase the lungs
pleural effusion accumulation of fluid in the pleural space
pleuritic severe, sudden type of chest pain that occurs with inhalation and exhalation; described as burning, stabbing, or sharp
pleurodesis technique used to heal the break in the pleural space by creating an inflammatory reaction in the pleural space
pneumoconiosis pulmonary disease that leads to lung scarring due to inhaled coal dusts, also known as black lung disease
positive expiratory pressure device airway clearance device that lets the patient breathe in easily but creates resistance as they exhale, slowing down the breath and causing the patient to increase the force of exhalation; air is more able to move behind the mucus and helps to dislodge it
primary spontaneous pneumothorax air enters the pleural space spontaneously; there is no underlying lung disease
pulse oximeter noninvasive device that provides information about blood oxygen saturation
rales (also: **fine crackles**) popping or crackling sounds heard on inspiration as collapsed airways reopen
respiratory zone parts of the respiratory system that perform gas exchange
ronchi coarse, loud sounds that occur due to constriction in the larger airways due to mucus or fluid
rub grating sound
secondary spontaneous pneumothorax air enters the pleural space spontaneously as a complication of underlying lung disease
spirometry pulmonary function test that measures the maximum volume of air that can be inhaled and how much someone can forcefully exhale in one second
stridor harsh, high-pitched sound heard only on inspiration that is often loud enough to hear without a stethoscope
subcutaneous emphysema occurs when high-pressure air is forced through the tissues, creates a "popping"

sensation with palpation and can cause visible swelling

sweat test conclusive diagnostic test for CF; a chemical and a small amount of electrical stimulation are applied to the skin to encourage sweat production. Sweat is collected and analyzed; elevated levels of sodium and chloride confirm a diagnosis of CF

tachypnea more than twenty breaths per minute

tension pneumothorax when a large volume of air enters the pleural space, in addition to causing a major amount of lung collapse, the high pressure also forces the heart and trachea to shift

thoracostomy tube (also: **chest tube**) tube inserted through the skin, into the pleural space, to drain air, fluid, or blood

trachea anterior to the esophagus, this tube extends downward from the larynx to the lungs

tracheal deviation trachea in a non-midline position

traumatic pneumothorax air enters the pleural space due to traumatic injury

tripod position upright position with hands braced on knees or a table. This position maximizes the space available for the lungs to expand and is often seen in respiratory distress

vaping using an e-cigarette that heats a solution so it vaporizes and can be inhaled, the solution can contain nicotine, THC, butane hash oils, cannabidiol, and other additives

ventilation movement of air into and out of the lungs

ventilator-associated pneumonia (VAP) pneumonia that occurs after a ventilator is initiated

vesicular breath sounds heard over the lung surfaces, are lower-pitched, and often described as soft, rustling sounds

wheezes whistling-type noises produced during expiration (and sometimes inspiration)

Assessments

Review Questions

1. What is the primary way oxygen enters the blood and travels?

a. Oxygen enters capillaries by diffusion, then attaches to hemoglobin.
b. Oxygen enters capillaries by perfusion, then attaches to hemoglobin.
c. Oxygen enters capillaries by diffusion, then attaches to platelets.
d. Oxygen enters capillaries by perfusion, then attaches to platelets.

2. What condition could impact both oxygenation and ventilation?

a. congestive heart failure
b. hypertension
c. lung cancer
d. asthma

3. You are providing care to a patient with postoperative atelectasis. The patient states, “The doctor told me parts of my lungs aren’t working. I don’t understand, I had surgery on my colon.” What is an example of a response by the nurse accurately summarizes atelectasis?

a. “The anesthesia caused problems for your lungs that should wear off in 12 to 24 hours.”
b. “Due to swelling from the surgery, your airways have narrowed.”
c. “When you’re not able to breathe as deeply as usual, maybe because of discomfort, small parts of the lung become collapsed.”
d. “Most likely there is a minor hemorrhage in your lungs related to the surgery; it usually resolves on its own.”

4. When assessing the components of an upper respiratory airway assessment, what should the nurse do after auscultating with a stethoscope?

a. Palpate the patient’s chest.
b. Position the patient.
c. Note if the patient has any audible sounds with breathing.
d. Note for any accessory muscle use with inspiration or expiration.

5. What term is used for a harsh, high-pitched sound, heard on inspiration, often loud enough to hear without a stethoscope?
   a. stridor
   b. wheezes
   c. rales
   d. crepitus

6. What assessment finding would the nurse utilize to discuss bulbous enlargement of the fingertips?
   a. clubbing
   b. tripod
   c. hypoxemia
   d. stridor

7. How can bronchiectasis be best summarized?
   a. a chronic condition that results in widened, damaged airways
   b. a chronic condition that is caused by fluid accumulation in the lining of the lung
   c. a chronic condition that results from medication toxicity
   d. a chronic condition that is caused by blood clots in the lung

8. What diagnostic would best support a diagnosis of bronchiectasis?
   a. patient reporting a constant cough
   b. chest x-ray with evidence of atelectasis
   c. elevated eosinophils
   d. patient reporting green frothy sputum

9. You are providing care for a patient with bronchiectasis. They report that they just coughed up sputum that was "mostly blood." What is the priority nursing intervention?
   a. Ensure that suction is available and ready to use.
   b. Notify the treating clinician.
   c. Apply supplemental oxygen via nasal cannula.
   d. Obtain sputum sample and send to the laboratory.

10. When providing patient education to a patient with bronchiectasis, what teaching points does the nurse include? Select all that apply.
   a. Immunization against preventable respiratory illnesses can help prevent complications.
   b. Exposure to air pollution can worsen disease.
   c. Avoiding secondhand smoke is helpful for patients with bronchiectasis.
   d. All patients with bronchiectasis should avoid smoking.

11. What is a known trigger of asthma exacerbations?
   a. hormonal fluctuations
   b. warm air
   c. steroids
   d. immobility

12. What diagnostic would the nurse anticipate if a patient is suspected to have asthma?
   a. pulmonary function test
   b. arterial blood gas
   c. capnography
   d. bronchodilation

13. You are working in a primary care office and receive a phone call from a patient with asthma. They state that their symptoms have been worse, and they've needed to use rescue medications frequently. They say, "My

asthma action plan says to go to the hospital, but I feel like I can manage this at home." How should the nurse respond?

a. "As long as your rescue medications are providing relief, it's okay to monitor things at home for the next two to four hours."
b. "You need to go to the hospital immediately. Your symptoms could get even more severe, very quickly."
c. "I'll discuss this with the physician and call you back later today."
d. "Doubling the dose of your rescue medications should stabilize your symptoms."

14. You are providing care to a patient with asthma. They state, "When I get really short of breath, I use the steroid inhaler, but it doesn't seem to be helping." How should the nurse respond?

a. "Let's review the instructions for each of your inhalers. The steroid inhalers are long-acting so aren't typically meant to be used when symptoms are flaring."
b. "It sounds like the dose might need to be increased."
c. "Are you rinsing your mouth with water after use? That's important to do with steroid inhalers."
d. "Let's talk to the doctor; I think another round of lung function testing might help us get some answers."

15. Your patient is being evaluated for a potential new diagnosis of asthma. They state, "I don't think I need any tests, I'm sure I have it. A lot of people in my family have asthma, and I tried one of their inhalers and it made me feel better." How should the nurse respond?

a. "A family history and a response to medication like that confirms the diagnosis."
b. "Those symptoms certainly suggest asthma; to conclusively diagnose it, we'll need to do a CT scan of your chest."
c. "Those symptoms sound like asthma. To be sure, we'll need to do some tests called spirometry."
d. "We'll do a blood test to be confirm that it's definitely asthma."

16. What risk is associated with steroid inhaler use?

a. oral *Candida* infection
b. wheezing
c. tachycardia
d. barrel-shaped chest

17. Which of the following values would represent a diagnostic finding of COPD?

a. FEV_1 0.5 (FEV_1 levels < 0.7 represent a diagnosis of COPD)
b. FEV_1 0.8
c. pulse oximeter reading 91 percent
d. carbon dioxide level 46 mm HG

18. While providing care for a patient hospitalized with a COPD exacerbation requiring supplemental oxygen therapy, what is a priority intervention?

a. Titrate supplemental oxygen up to an oxygen saturation level of 100 percent.
b. Use no more than 1–2 L of supplemental oxygen.
c. Assess for signs of CO_2 retention thirty to sixty minutes after starting oxygen.
d. Assess for signs of peripheral vasoconstriction related to supplemental oxygen.

19. Identify the abnormal lung sounds associated with pneumothorax:

a. diminished or absent
b. stridor
c. wheezing
d. crackles

20. What dressing would be appropriate to place over a chest tube that has become dislodged?

a. sterile gauze
b. band aid

c. Vaseline gauze
d. paper towel

21. When providing care for a patient with a pneumothorax being treated with a chest tube, what action does the nurse take if the tube becomes dislodged?
a. Apply sterile gauze at the insertion site.
b. Start CPR immediately.
c. Apply 100 percent oxygen via face mask.
d. Apply a three-sided occlusive dressing.

22. You are caring for a sixty-two-year-old patient with COPD, admitted for a large left-sided pneumothorax. A chest tube has been in place for two days connected to a drainage system. What physical assessment finding suggests resolution of the pneumothorax?
a. lung sounds audible in all lung fields
b. trachea is midline
c. ongoing air leakage in chest drainage system
d. oxygen requirement has resolved

23. What is the primary risk factor to develop pneumonia during a hospitalization?
a. COPD
b. age > 65
c. smoking
d. diabetes

24. What indicator would the nurse expect to find when the patient is having a therapeutic response to antibiotics for pneumonia?
a. white count 12,500/microliter
b. pulse oximetry 90 percent
c. patient reporting improved dyspnea
d. a smaller consolidation on chest x-ray

25. Your patient states, "The doctor told me they think I have pneumonia, and I'll need some tests. How will we know for sure if I have pneumonia?" What is an example of an accurate response from the nurse?
a. "To conclusively diagnose pneumonia, an invasive test called bronchoscopy is necessary."
b. "A sample of mucus, or sputum, needs to be tested to identify the organism causing pneumonia."
c. "A chest x-ray is usually how we diagnose pneumonia."
d. "Blood tests provide conclusive evidence of pneumonia."

26. A patient is being treated in an inpatient unit for suspected community-acquired bacterial pneumonia. A COVID test was negative. They have a strong, frequent cough, productive of sputum. What PPE is indicated during direct patient care?
a. gloves
b. fit tested respirator and face shield
c. surgical mask and eye protection
d. fit tested respirator

27. Identify a symptom commonly present in active TB infection.
a. night sweats
b. weight gain
c. stridor
d. frothy sputum

28. What diagnostic procedure would be able to determine if TB is in its active form?

a. PPD skin test
b. chest x-ray
c. QuantiFERON blood test
d. sputum sample

29. What is the priority action in the care of a patient with active TB?
a. administration of antibiotics
b. prevention of the spread of infection
c. collecting a sputum specimen
d. having the patient wear a mask

30. Your patient is being evaluated for suspected TB. They ask, "How will you know if I have TB or if it's something else?" What is an example of an accurate response from the nurse?
a. "A chest x-ray will provide the information that we need."
b. "A CT scan of your chest is used because it will provide more detailed images than an x-ray."
c. "A blood test provides conclusive information about if you have TB or not."
d. "We'll take a sample of sputum—the mucus that you cough up—and send it to the lab."

31. Your patient is being treated for active TB and has been receiving antibiotic therapy for the past month. They state, "Lately I've been forgetting to take the medication. But I'm feeling a lot better and not even coughing anymore. I figured I was done with it, so I stopped the medication." What is an example of an appropriate response from the nurse?
a. "Taking the medication is not optional. If you can't take it as prescribed, we'll be forced to admit you to the hospital for supervised treatment."
b. "You completed a month of treatment, that is usually adequate."
c. "Even though you are feeling better, you'll need to finish another month of treatment."
d. "Let's talk about ways to help you remember to take the medication. There are some electronic options that can be helpful."

32. Identify the diagnostic test used to conclusively diagnose CF.
a. sweat test
b. chest x-ray
c. chest CT
d. pulmonary function tests

33. The patient has been prescribed an airway clearance vest. The parent asks, "Tell me again how this works." Which statement by the nurse best summarizes how an airway clearance vest works?
a. "A compressor sends air into and out of the vest. It causes vibrations and pressure that can help to break up mucus."
b. "The vest is worn at night and provides positive pressure to help keep the airway open."
c. "A snug-fitting vest provides postural support and helps them to be able to take deeper breaths."
d. "The vest sends air into and out of the mouth and nose. It causes vibrations and pressure that can help to break up mucus."

34. You are providing care for a patient with cystic fibrosis admitted to the hospital for pneumonia. What action by the nurse takes priority?
a. administering antibiotics
b. obtaining a sputum sample for culture
c. administering pancreatic enzymes
d. assessing respiratory rate and oxygen saturation

35. What outcome suggests that the patient's condition has improved?
a. Lung sounds demonstrate bilateral crackles throughout lung fields.

b. Patient is coughing approximately once an hour.
c. The patient's temperature is 38.8°C/102°F.
d. The patient's respiratory rate is 24.

36. Identify an environmentally triggered respiratory illness that can be cured.
a. histoplasmosis
b. asbestosis
c. mesothelioma
d. black lung disease (pneumoconiosis)

37. You are providing care for a patient with COPD who continues to smoke. When other clinicians had previously attempted to provide smoking cessation education, the patient had become defensive and dismissive. What is an example of an appropriate response from the nurse?
a. "I need you to know that quitting smoking is the most significant thing you can do for your health today and in the future. We'll support you every step of the way."
b. "We recommend that you cut back during times of illness."
c. "I know you weren't ready to talk about your smoking at the last visit; let's consider talking about it at your next visit."
d. "If you are unable to quit smoking, unfortunately you'll need to find another physician. We only provide care to nonsmokers."

38. Your patient has a new diagnosis of COPD. They have a twenty pack-year smoking history. They state, "I don't think smoking had anything to do with it. I think this COPD must have been caused by all that time I spent working on engines, getting exposed to fumes and chemicals." What is an example of an appropriate response from the nurse?
a. "Smoking is the biggest risk factor for COPD, though workplace exposures and fumes do sometimes play a part."
b. "Smoking typically only causes COPD when there is a fifty pack-year history. Your workplace exposures are probably the primary cause."
c. "It's most likely that you inherited a genetic disposition to COPD."
d. "Because you live in an area with unhealthy air quality, the COPD was most likely caused by dust and fumes in the air."

Check Your Understanding Questions

1. Describe some of the ways the respiratory system protects itself from foreign bodies and pathogens.

2. Describe some assessment findings, other than vital sign changes and lung sound abnormalities, that can indicate respiratory system problems.

3. Describe how bronchiectasis increases infection risk.

4. Describe how a nurse would evaluate the efficacy of nursing care delivered to a patient with bronchiectasis.

5. Describe bronchoconstriction and how bronchodilators improve asthma symptoms.

6. Describe some interventions a patient would need to take in an asthma action plan.

7. Describe strategies to prevent COPD exacerbations.

8. Describe how chest tube placement treats pneumothorax.

9. Describe the potential physical assessment findings for a patient with severe pneumonia.

10. Describe airborne infection isolation precautions and why this is necessary for TB patients.

11. Describe how the genetic mutation causes respiratory problems in CF.

12. Describe how vaping causes lung damage.

Reflection Questions

1. What information might you need to identify a perfusion disorder affecting the respiratory system?
2. You are providing care to a patient with pneumonia in an inpatient setting. Which upper respiratory assessment would the nurse expect to find?
3. Which cues would the nurse recognize as symptoms of elevated carbon dioxide levels?
4. A nurse has conducted an educational intervention for a patient who is newly diagnosed with asthma. Briefly discuss how the nurse would evaluate the efficacy of the teaching.
5. Discuss how trauma patients are at risk for pneumothorax.
6. What clinical assessment findings would the nurse expect for a patient to be hospitalized in the intensive care unit for pneumonia?

Critical-Thinking Questions about Case Studies

1. Refer to COVID Complications: Part 1.
   Designate which cues in Option 1 are recognized with the rationales in Option 2.
   a. Option 1: respiratory failure; Option 2: bacterial pneumonia
   b. Option 1: increased work of heart; Option 2: hypertension and tachycardia
   c. Option 1: fever, fatigue, cough; Option 2: Covid

2. Refer to COVID Complications: Part 1.
   The nurse is planning next actions for this patient. List the cues that are relevant for this patient.

Competency-Based Assessments

1. A patient who has been a smoker for twenty-eight years is admitted to the medical unit for shortness of breath. The nurse observes the patient in the bed is very short of breath and showing signs of respiratory distress despite being on five liters nasal canula. Develop a plan of care that outlines what steps the nurse should take for each following intervention.
   1. Obtain a pulse oximetry reading.
   2. Position the head of the bed to high Fowler's position.
   3. Measure the patient's blood pressure.
   4. Call the lab for (ABG) arterial blood gas results.

2. Conduct a brief internet search on the risk factors and populations at risk for bronchiectasis. Develop a five-minute presentation identifying what age groups and comorbid conditions elevate the risk.
3. Develop a presentation to present at a community health fair that discusses how lifestyle practices of smoking lead to COPD.
4. Create a teaching plan for a patient who is starting rifampin for treatment of TB.
5. Conduct an internet search in how high-risk patient populations are screened antenatally for CF. Develop a poster presentation describing what resources are there in your community.

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CHAPTER 12
Cardiovascular System

FIGURE 12.1 Monitoring patients who are challenged by cardiovascular disease is an important part of cardiac rehabilitation. While this chapter focuses on common inpatient cardiac diseases, optimization of perfusion also occurs in the outpatient sector. (credit: "Running and Motivation" by Airman First Class Jelani Gibson/Sheppard Air Force Base, Public Domain)

CHAPTER OUTLINE

INTRODUCTION Cardiovascular care is inclusive of all populations nurses work with. The concepts of oxygenation and perfusion work synergistically to ensure optimal oxygenated blood flow is delivered to all essential tissues. While the physiological functions of cellular compliance are dependent on these actions, patient response also changes when there are alterations in oxygenation and perfusion. This chapter explores common cardiovascular diseases nurses encounter in the medical-surgical setting. Each of the modules introduce overlapping themes of primary, secondary, and tertiary preventive strategies, along with the identification of modifiable and nonmodifiable risk factors. But first, it is important to do a brief overview of cardiovascular physiology.

12.1 Cardiovascular Overview

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss anatomy of the coronaries, valves, arteries, veins, and cardiac muscle
- Review cardiac physiology
- Define cardiac output, stroke volume, preload, and afterload

The cardiovascular system performs the essential role of ensuring that oxygenated blood and essential nutrients are efficiently delivered throughout the body. Understanding the precise anatomy and physiology of the heart and its associated structures, including the heart valves, major arteries and veins, and the cardiac muscle itself, is crucial for grasping their roles in maintaining cardiovascular health. We explore how the heart's chambers and valves orchestrate the flow of blood, and examine the functional dynamics of cardiac output, stroke volume, preload, and afterload. By integrating this knowledge, you will gain a comprehensive understanding of the heart's mechanical and physiological processes, which are fundamental to assessing and managing cardiovascular health in clinical practice.

Cardiac Anatomy

The human heart, which is roughly the size of a human fist, resides slightly left to the sternal border (Figure 12.2). The external tissue comprises a thin serous sack, known as the pericardium, that contains roughly 15-50 milliliters of serous fluid (Fender & Zack, 2021). Pericardial fluid permits the contractile action of the heart without adhering to the chest wall.

There are two major venous systems bringing blood to the heart from the systemic circulation, the superior and inferior vena cava, from the right atrium, through the tricuspid valve and into the right ventricle to be sent to the pulmonary unit. The pulmonary vein returns oxygenated blood to the left atrium. The small coronary arteries, which are discussed in 12.5 Myocardial Infarction, bring oxygenated blood to the cardiac muscle for a multitude of reasons. The pulmonary artery delivers deoxygenated blood from the right ventricle to the pulmonary circuit for oxygenation and, once oxygenated, returns the blood to the right atria, through the mitral valve and to the right ventricle to be expelled through the aorta to systemic circulation. Within the four cardiac chambers (left atrium, left ventricle, right atrium, and right ventricle), there is the endocardium that has fibrous structures securing valvular functions inside the heart. The myocardium, which is the middle and thickest part of the cardiac muscle, is encapsulated by the epicardium. This layer is encapsulated by the pericardial sac.

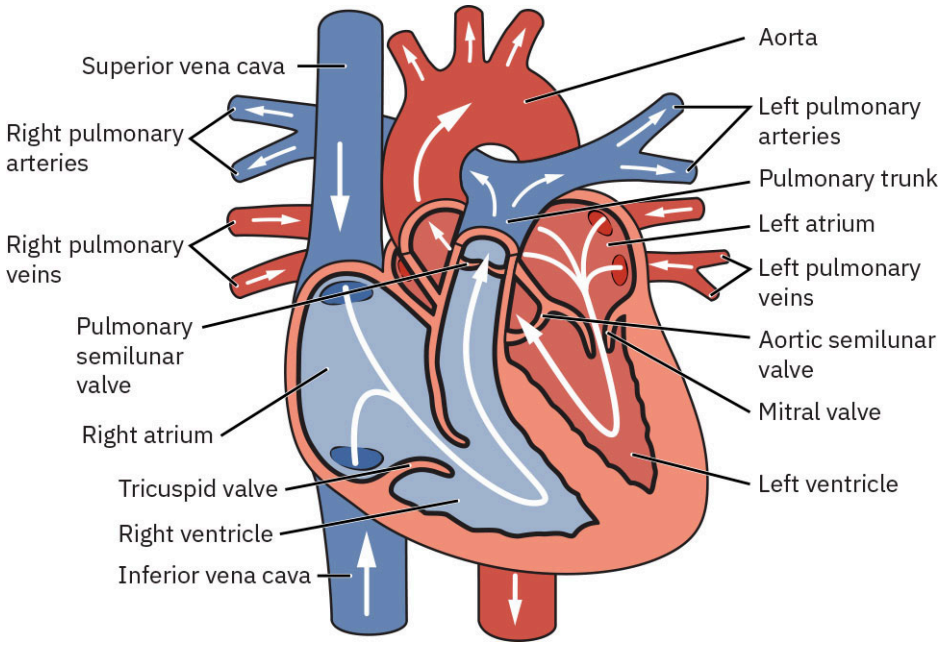


FIGURE 12.2 Blood flows through the heart, following the direction of the arrows. Blue represents deoxygenated blood, and red represents oxygenated blood. (modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Valves act essentially as “gates” that open and close during different parts of the cardiac cycle. The mitral and tricuspid valves communicate between the atria and ventricles and open during ventricular filling and close during ventricular contraction. In contrast, the aortic and pulmonic valves close during ventricular filling and open during ventricular contraction. The purpose of these structures is to keep a forward flow of blood going to the pulmonary unit for oxygenation and forward flow to the systemic circulation.

Myocardial Cell Physiology

Myocardial cells, also referred to as myocytes, are unique in that they can contract, stretch, and remodel. Also, they can be excited by neurological impulses. An electrical impulse is generated by the native “pacemaker” or sinoatrial node. Deep within the cardiac myocyte is a sodium-potassium ion pump, in which there is an ion exchange that generates an electrical impulse, defined as an action potential (Figure 12.3). However, other influences from the adrenal glands, the brain, and changes in volume status can also influence the nerve impulse. These impulses, ignited by an action potential, occur under the influences of sodium ions going in and potassium ions going out. With these chemical exchanges, an impulse is generated through the membrane and creates a muscular contraction.

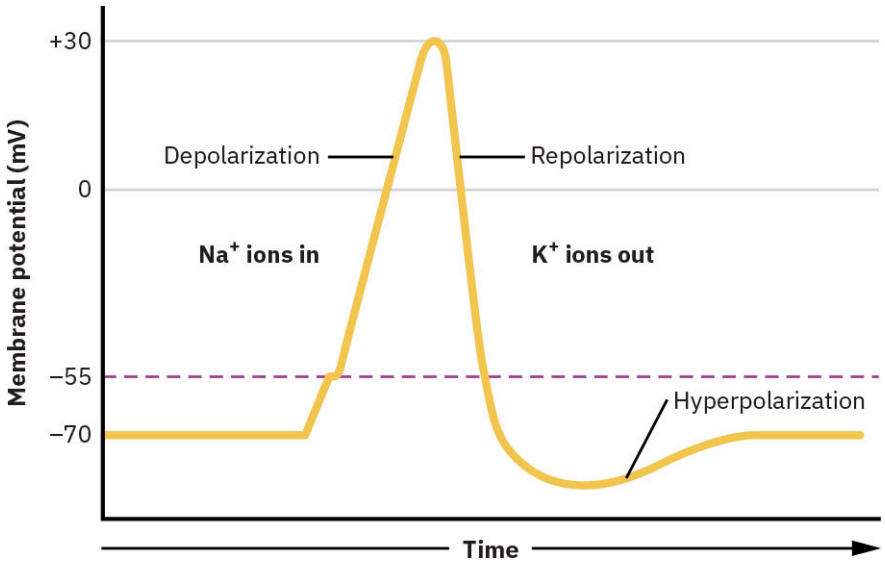


FIGURE 12.3 Here, a stimulus is occurring, creating depolarization, in which there is an influx of sodium ions, and during repolarization, there is flux of potassium ions, creating a muscular contraction. (modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Cardiac Physiology Terminology

Each minute, the heart perfuses a total of 2 to 4 liters of blood out through the aorta, known as **cardiac output**. Cardiac output varies depending on disease state, gender, age, and other factors. The **stroke volume** is the amount of blood pumped out of the left ventricle during systolic contraction. The initial stretch of the cardiac cells prior to contraction is called **preload**, while **afterload** is the amount of pressure the heart needs to exert during ventricular contraction. Medications and certain diseases, such as coronary artery disease and heart failure, can affect these functions. Nurses must have a fundamental understanding of these terms as these measurements will be greatly affected during a cardiac ailment and with pharmacological actions.

12.2 Dysrhythmia

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the anatomical and physiological functions of the cardiac electrical system
- Discuss and compare pathophysiology, clinical manifestations, and nursing care of bradycardic and tachycardic dysrhythmias
- Discuss and compare pathophysiology, clinical manifestations, and nursing care of ectopic beats
- Discuss and compare pathophysiology, clinical manifestations, and nursing care of heart blocks
- Discuss and compare pathophysiology, clinical manifestations, and nursing care of atrial fibrillation and atrial flutter
- Discuss and compare pathophysiology, clinical manifestations, and nursing care of ventricular tachycardia and ventricular fibrillation
- Discuss and compare pathophysiology, clinical manifestations, and nursing care of asystole
- Evaluate the nursing care of the patient with dysrhythmia

Cardiac myocytes require coronary perfusion for contractility. Concepts for disturbances in cardiac rhythms centralize around the ability of cardiac myocytes to conduct electricity, which assist the atrial and ventricular contraction. If there is a defect in the cardiac electrical conduction system, it leads to contractility problems. Figure 12.4 summarizes the conduction system of the heart.

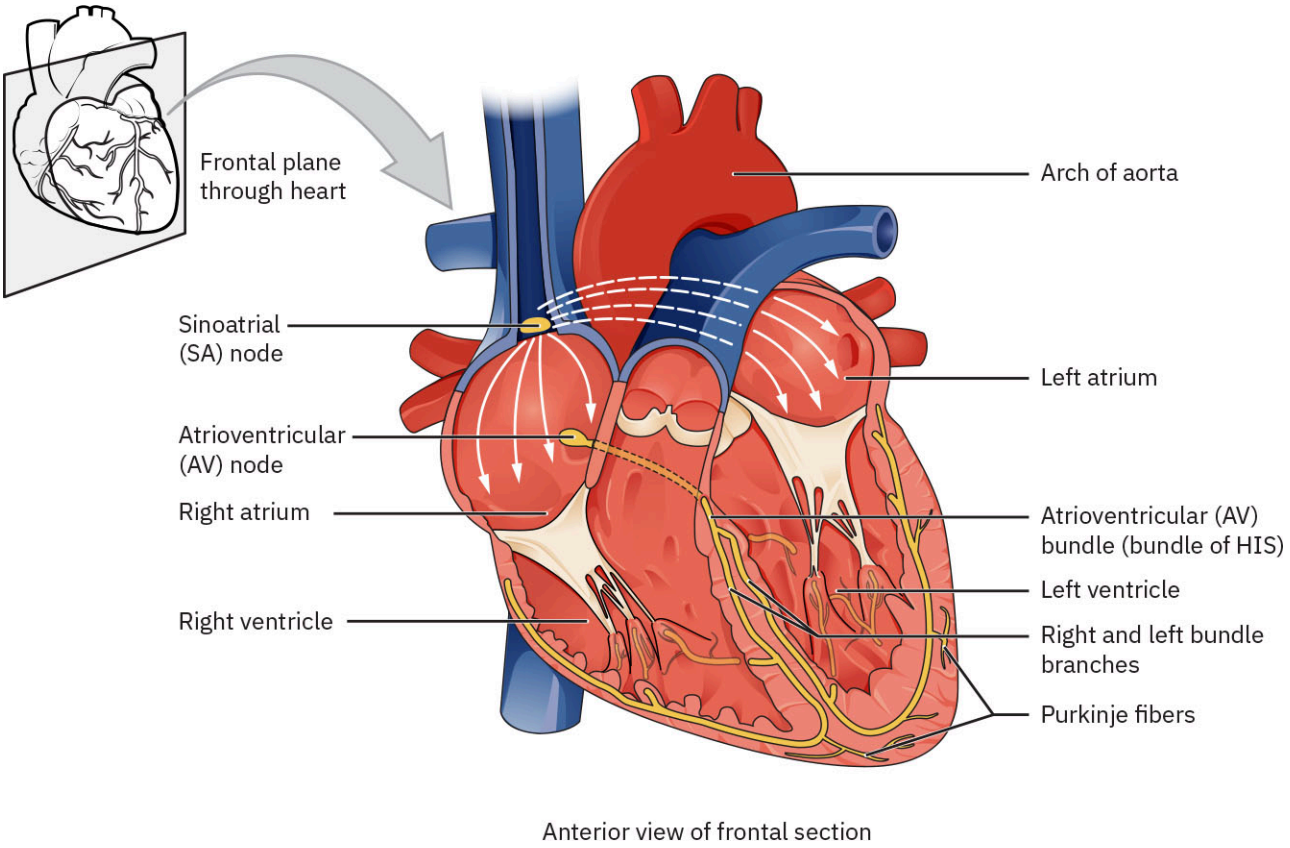


FIGURE 12.4 Electrical pathways originate in the sinoatrial node, travel through the atria and into the atrioventricular junction, down the Purkinje fibers, into the left and right bundle branches, and cause a contraction. (modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

When a patient has dysrhythmia, the normal cardiac conduction process is interrupted. Two mechanisms are occurring and not in synchronicity. As the right and left ventricles fill with blood, the atria contract to inject blood into those respective ventricular chambers (diastole). Once the ventricles are adequately filled, the tricuspid and mitral valves open, the semilunar valves close, and blood is pushed from the ventricles into the lungs and systemic circulation (systole). Continuous cardiac telemetry analysis was not introduced into the acute care setting until the 1960s, reserved for higher levels of care such as intensive care units (Chen et al., 2018). With this advancement in

technology, close monitoring of patients experiencing dysrhythmias was more possible. However, to fully understand dysrhythmia identification, intervention, and nursing care, the nurse needs to understand rhythm analysis.

Rhythm Interpretation

The **normal sinus rhythm**, or the rhythm that originates from the sinus node and describes the characteristic rhythm in the healthy human heart, includes several features (Figure 12.5). The first small, round hill observed is called the P wave. The P wave represents electrical depolarization, or the channeled travel of electricity, in the atria, whereas the QRS complex, a jagged triangular shape, represents electrical current traveling through the ventricle. An **atrial depolarization** is represented by the interval between the P wave and the R wave in the QRS complex; this is a measurement of the time needed for electricity to travel from the atria to the ventricles. Normal criteria for the PR interval are 0.16 to 0.20 seconds. A **ventricular depolarization** is the measurement of the time electricity travels through the ventricles to conduct a ventricular contraction and is represented by the QRS complex. It is shorter in duration compared to the PR interval, less than 0.12 seconds. Figure 12.5 summarizes these times.

FIGURE 12.5 This normal sinus rhythm shows a P wave, preceding the QRS, followed by the T wave. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

To capture measurements of these electrical travel times, a nurse may use calipers to measure the distance between the P wave and the R wave or the space in the QRS complex (Figure 12.6). However, the most common method used is measuring boxes in a telemetry strip. It is important to note that in each large box are five small boxes. Each small box represents 0.04 seconds, and each large box represents 0.20 seconds.

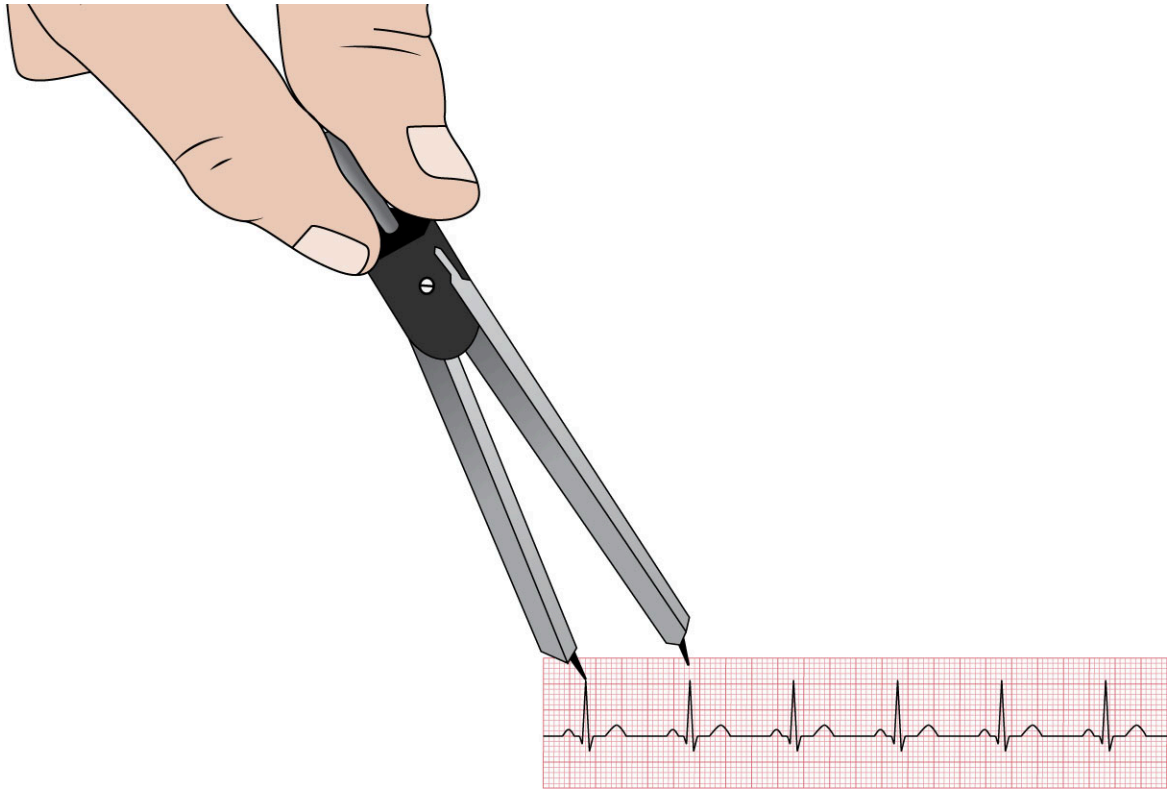


FIGURE 12.6 Telemetry calipers may be used to measure several interval distances, such as the distance between the P wave and the R

wave, the space in the QRS complex, or the distance between R waves, as seen here. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

In addition to normal measurements for the PR and size of the QRS complexes, regularity and rate must be established. A 6-second strip is required to determine these features. The nurse must "march out" with calipers or by tracing the P-to-P waves to evaluate regularity, or whether beats are occurring at regular intervals. One comparison would be the regular tempo of music: is it regular and is the beat predictable? The same applies to cardiac conduction. If there is regularity between the P-to-P waves and R-to-R waves, this is deemed a regular rhythm.

The second measurement is the heart rate, which normally falls between 60-100 beats per minute (bpm) (Table 12.1). The fastest method to obtain heart rate is to count the number of QRS complexes in a 6-second strip and multiply that number by ten. For instance, if the nurse counts seven QRS complexes in a 6-second strip, the ventricular rate is approximately 70 beats a minute. For a more accurate assessment of heart rate, the nurse can count the number of large or small boxes occurring between the R-to-R complexes if regularity has been established. Once the number of small boxes or large boxes have been determined, the constant used for division is 300 seconds ÷ number of large boxes or 1500 seconds ÷ number of small boxes. For instance, if the nurse counts 20 small boxes from the R-to-R interval, 1500 seconds ÷ 20 small boxes will yield a heart rate of 75 beats.

Cardiac Rhythm Component	Description	Normal Interval
P wave duration	Time for atrial depolarization	0.06–0.12 seconds
PR interval	Time from the start of atrial depolarization to the start of ventricular depolarization	0.12–0.20 seconds
QRS duration	Time for ventricular depolarization	0.06–0.10 seconds Greater than 0.12 seconds is considered abnormal and "wide"
QT interval	Time from the start of ventricular depolarization to the end of ventricular repolarization	0.36–0.44 seconds
ST segment	Period between the end of ventricular depolarization and the start of ventricular repolarization	Typically isoelectric (flat)
T wave duration	Time for ventricular repolarization	Variable; typically follows the ST segment
RR interval	Time between successive R-wave peaks	Variable; dependent on heart rate
Heart rate (HR)	Derived from RR interval; the number of beats per minute	60-100 beats per minute (BPM)

TABLE 12.1 Normal Intervals in Cardiac Rhythms

CLINICAL SAFETY AND PROCEDURES (QSEN)

Safety: Telemetry Monitoring

Definition: Reducing the risk of patient harm through effective system and individual action.

Knowledge: Identify the benefits and limits of safety-enhancing technologies (e.g., barcodes, Computer Provider Order Entry, medication pumps, and automatic alerts/alarms).

Skill: Effectively use technology and standardized practices that promote safety and quality. To demonstrate competence, the nurse will:

- Follow institutional practices for the use of telemetry monitoring, which may include:
  - Setting and maintaining alarms per policy and order
  - Using alternative devices (such as wireless monitors) for ambulation or transportation for patients unable to be removed from monitor
  - Carrying a pager or device on your person to receive alerts
  - Physically assessing the patient's status and apical heart rate in response to alerts

Attitude: Understand and appreciate how standardization and reliability contribute to safety.

(QSEN Institute, n.d.)

Bradycardic and Tachycardic Dysrhythmias: Clinical Manifestations and Nursing Care

Normal heart rates are 60 to 100 beats per minute (bpm). There are normal fluctuations in heart rate, including lower heart rates with relaxation, medication, and during sleep. During peaks of productivity, exercise, or even illness, such as infection, the heart rate may increase.

Bradycardic rhythms are rates less than 60 bpm (Figure 12.7). Features of **sinus bradycardia** are a rate less than 60 bpm, with regular PR and QRS intervals.

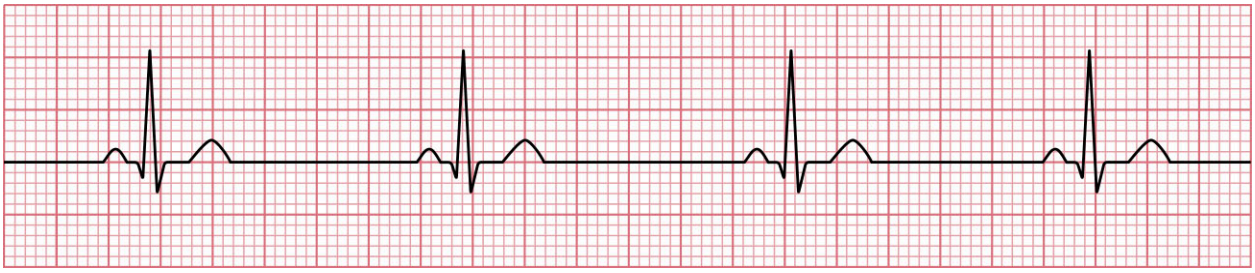


FIGURE 12.7 Sinus bradycardia is a heart rate of less than 60 bpm. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Sinus bradycardia may occur due to medications, such as beta-blockers, digoxin, or opioids, or increasing vagal tone from bearing down. Patients may be asymptomatic, or report fatigue, dizziness, or weaknesses. For cues to be recognized, it is imperative for the nurse to inquire about the patient's level of activity. In some patients, a resting heart rate of less than 60 bpm may be a clinical finding in an active runner. Nursing interventions for symptomatic patients include holding cardiac medications if pulse is less than 60 bpm (alert the provider), having the patient stay in bed as the patient may be lightheaded or dizzy, and continuing to monitor the patient. The provider may also order medications to raise the heart rate (such as atropine) or initiate **transcutaneous pacing**, a noninvasive procedure that uses electrical impulses to temporarily pace a patient's heart.

LINK TO LEARNING

Atropine is an anticholinergic that can be administered intravenously to correct symptomatic bradycardia. Side effects include decreased gastric secretions, drying of mucus membranes, and increased esophageal sphincter tone. Read more about atropine (https://openstax.org/r/77Atropine) at StatPearls.

In contrast, tachycardic rhythms are rates greater than 100 bpm (Figure 12.8). Features of sinus tachycardia are a rate greater than 100 bpm with regular PR and QRS intervals.

FIGURE 12.8 Sinus tachycardia is a heart rate greater than 100 bpm. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Factors contributing to tachycardia may include stress, dehydration, fever, exercise, caffeine, or illegal substances such as cocaine or stimulants. Clinical manifestations may include shortness of breath, anxiety, fluttering, flushed face, or dizziness, but the patient may also be asymptomatic. Interventions include rest, fluids, treatment of the underlying cause, medications, such as beta blockers, and monitoring hemodynamics.

Ectopic Beats: Clinical Manifestations and Nursing Care

An occasional, singular, irregular beat, also known as an **ectopic beat**, may originate from the atria or the ventricles (Figure 12.9). Atrial ectopic beats will cause an early, irregular occurrence of P and QRS waves; this is called a **premature atrial contraction (PAC)**. In contrast, a **premature ventricular contraction (PVC)** is when a ventricular ectopic beat appears without a P wave and widens the appearance of the QRS. If there are frequently occurring ventricular beats that all look the same, they are unifocal, or uniform; if they look different, they are multifocal, or multiform.

A compensatory pause after a PVC occurs as the heart's natural response to the early, irregular beat; this pause allows the heart to reset its rhythm and ensures that the subsequent beat falls in line with the normal rhythm, thereby helping to maintain overall cardiac rhythm stability. A non-compensatory pause following a PAC occurs because the premature beat disrupts the regular cardiac cycle, causing a brief interruption in the normal rhythm without a full reset of the heart, which results in a shorter pause before the next beat compared to a compensatory pause.

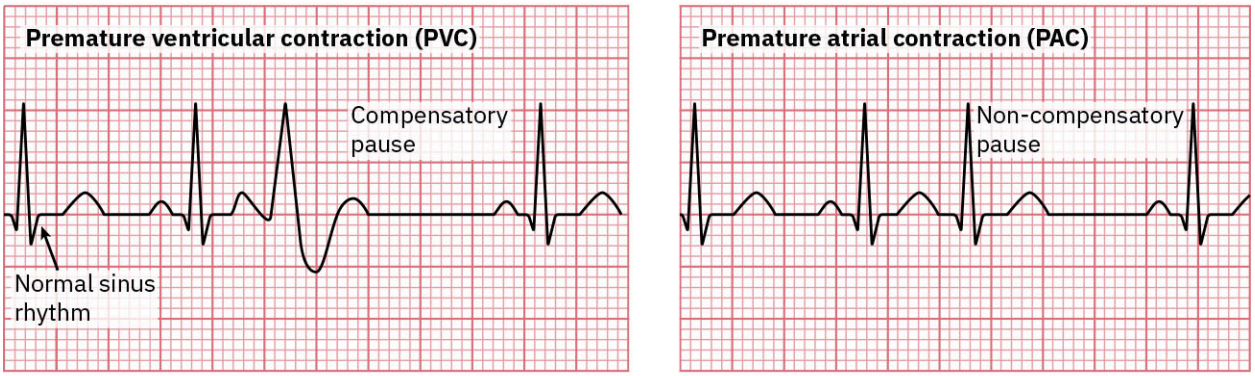


FIGURE 12.9 (a) A PVC is an early, wide-appearing QRS without a P wave, followed by a compensatory pause. (b) A PAC is an early occurrence of a P and QRS wave, followed by a non-compensatory pause. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

The frequency of the ectopic beat may vary. An ectopic beat occurring on every other beat is bigeminy; an ectopic beat occurring on every third beat is trigeminy. When there are more than three PVCs in a row, this is called a run of ventricular tachycardia, which is a potentially life-threatening cardiac dysrhythmia that occurs when the lower chambers of the heart beat too fast to pump well.

Ectopic beats may be triggered by drugs, caffeine, alcohol, stress, electrolyte disturbance, or certain medications. Patients may experience few to no symptoms with occasional ectopic beats. However, ectopic beats that occur more frequently will cause symptoms. Clinical manifestations include subjective complaints of dizziness, palpitations, fluttering in the chest, adjusting of heart rate, or chest pain. Nursing interventions include having the patient remain calm and do some deep breathing, administering cardiac medications/electrolyte replacement as ordered, and monitoring the patient's vital signs. It may be necessary to check laboratory values to assess for abnormal potassium, calcium, or magnesium levels. The patient should be instructed to avoid caffeine and alcohol,

as these may trigger more ectopic beats.

READ THE ELECTRONIC HEALTH RECORD

Laboratory Values

Glucose	BUN	Creatinine	Sodium	Potassium	Chloride	Carbon Dioxide	Magnesium
98	18	0.92	138	3.1	104	36	1.4

1. What information on the EHR is concerning?
2. What is an expected finding?
3. What interventions should the nurse take?

Heart Blocks: Clinical Manifestations and Nursing Care

Another commonly occurring dysrhythmia is heart block, in which there is an impulse interruption between the atria and ventricles, called an atrioventricular (AV) block, or heart block. There are three types of heart block: first-degree heart block (Figure 12.10); second-degree, further broken down into Type I and Type II; and third-degree heart block. In **first-degree heart block**, the PR interval is consistently greater than 0.20 seconds (Table 12.1), while QRS is normal and regular. Patients are often asymptomatic, and it is often found incidentally. First-degree heart block may be due to medications, increased vagal tone, or family heart disease. It is the nurse's responsibility to monitor for worsening symptoms. However, most patients live with first-degree heart block without complication.

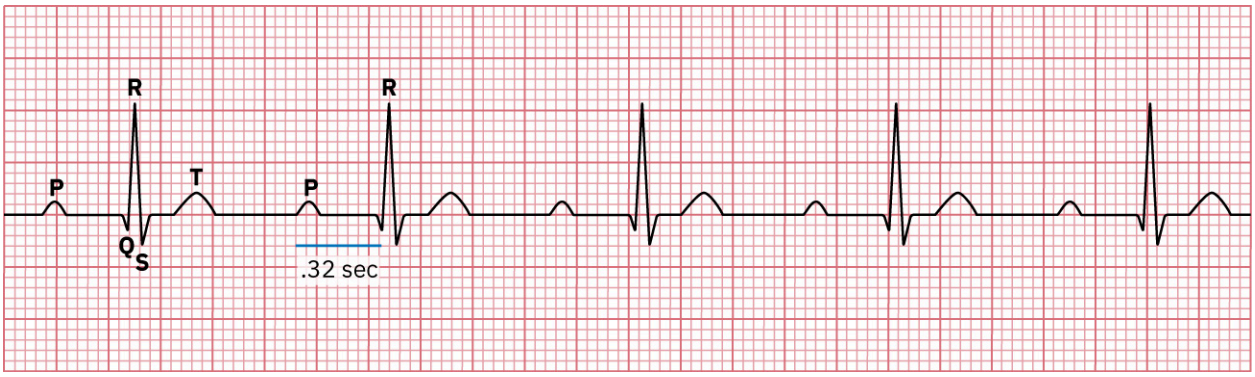
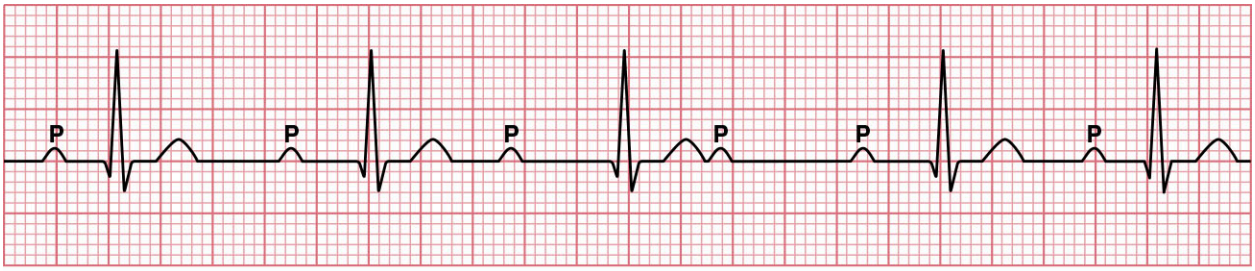
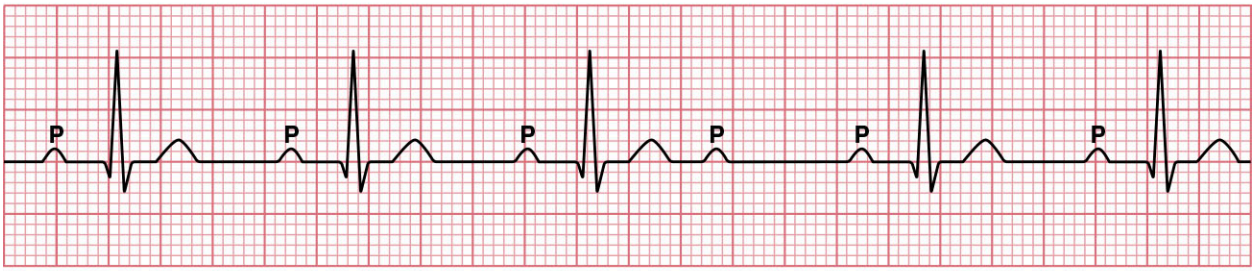


FIGURE 12.10 PR intervals in a normal sinus rhythm should be between 0.12 to 0.20 seconds long. Here, the measurement of the PR interval is greater than 0.20 seconds, indicating a first-degree heart block. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Second-degree heart block is further broken down into two parts: Type I (also known as Mobitz I or Wenckeback) and Type II (Mobitz II) (Figure 12.11). With **Mobitz I second-degree heart block**, the classic features are a PR interval that gets longer with each beat until a QRS is dropped, and the pattern repeats. In contrast, in **Mobitz II second-degree heart block**, the PR interval is constant, and some of the QRSs are blocked. This does not occur in a pattern like Mobitz I. Mobitz II heart block is more serious and can potentially lead to third-degree heart block. With Mobitz I, the patient may be asymptomatic. Other complaints, more consistently, from Mobitz II, are dizziness, fatigue, chest pain, shortness of breath, or the subjective feeling of a skipped beat. Typical causes of second-degree heart block may be medications, underlying heart disease, or an aging conduction system.



(a)



(b)

FIGURE 12.11 (a) In Mobitz I second-degree heart block, the PR interval gets progressively longer until a QRS is dropped; the pattern repeats. (b) In Mobitz II second-degree heart block, the PR interval remains constant, but some of the QRSs are randomly dropped. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Nursing responsibilities include telemetry monitoring, trending the blood pressure, or if the patient becomes more symptomatic (for example, becomes hypotensive, complains of increased chest pain or dizziness), administering an anticholinergic such as atropine to transiently raise the heart rate. The patient may require transcutaneous pacing and be prepared for surgery for a **pacemaker**, a small implantable machine with a battery life of approximately ten years that recognizes when the heart rate is too fast or too slow and will pace the rhythm to a preset range (e.g., a heart rate of 60 to 70 bpm) to meet perfusion needs (Figure 12.12). Patients with pacemakers must be instructed to carry a card for passage through metal detectors and to avoid direct exposure to microwaves as these appliances can compromise the device's battery. The presence of a pacemaker should be identified for safety with MRI.

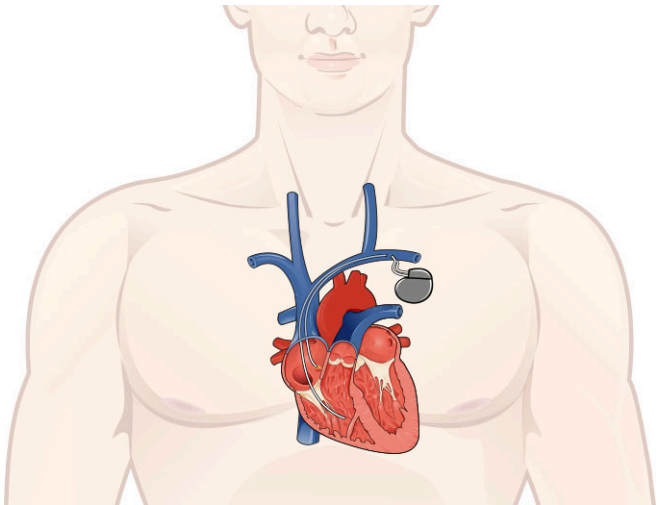


FIGURE 12.12 Pacemaker wires are threaded into the veins and detect slow heart rhythms and pace the slow rate into a normal rate. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

A **third-degree heart block** is the most serious heart block as there is a loss of electrical impulses between the atria and the ventricles (Figure 12.13). In essence, the ventricles must beat independently to maintain cardiac output. In contrast to myocyte contractility rates in the atria, the ventricular tissue has a slower impulse control with a rate of 20 to 40 bpm. P-P and R-R intervals are variable. Atrial and ventricular rates will differ drastically. Also, the QRS interval is wide, greater than 0.12 seconds. The patient will report feeling lightheaded, dizziness, fatigue, chest pain, or may have a syncopal episode and hypotension.

FIGURE 12.13 With third-degree heart block, the P waves are not related to the QRS complexes, showing that the atria are electrically disconnected from the ventricles. The QRS complexes represent an escape rhythm arising from the ventricle. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Third-degree heart block requires quick intervention. Nurses must apply telemetry to the patient and prepare for transcutaneous pacing, assess oxygenation, check labs to alert the provider if there are any electrolyte shifts (potassium or magnesium), maintain bed rest, and hold antiarrhythmics/beta blockers. Patients will require a pacemaker.

Atrial Dysrhythmias: Clinical Manifestations and Nursing Care

The most common rhythm disturbances occur in the atrial tissue. A popular umbrella term utilized to discuss rhythm disturbances that occur above the ventricles is **supraventricular tachycardia (SVT)** (Figure 12.14). The most common forms of SVT are **atrial fibrillation (AFib)** and atrial flutter. AFib is an irregular, fast rhythm originating from the atria due to multiple impulses being fired. The CDC (2022) predicts that by 2030, 12.1 million people in the United States will have AFib. The telemetry qualifiers are regularly irregular, the PR interval is indeterminate due to the irregularity, and the QRS interval is less than 0.12 seconds. AFib is considered rate controlled if the rate is between 60 and 100 bpm, or rapid when rates consistently climb over 100 bpm.

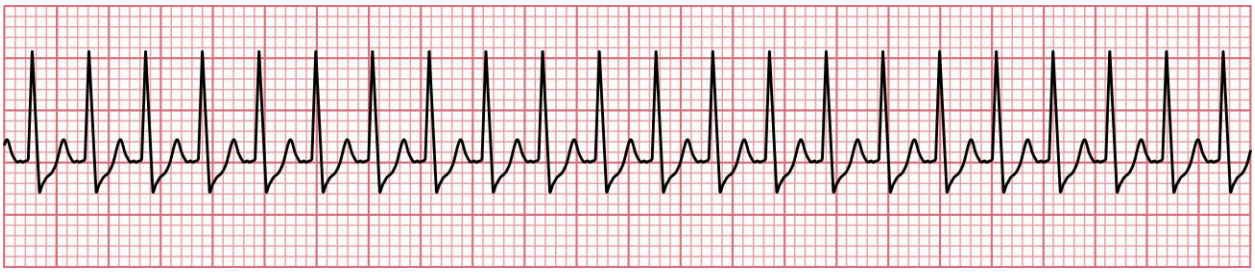


FIGURE 12.14 With supraventricular tachycardia (SVT), the P waves are difficult to distinguish, and without P waves, the PR interval is nonexistent. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

An **atrial flutter (A flutter)** is an atrial dysrhythmia related to AFib (Figure 12.15). It is a regular but tachycardic rhythm caused by electrical re-entry in the right atrial circuity. The classic "saw tooth pattern" is one of the hallmark features. The PR interval is indeterminate, the QRS interval is less < 0.12, and it is regular. A flutter rates may be 240 to 300 bpm.

FIGURE 12.15 This saw-tooth pattern is classic of A flutter. This rhythm shows a 4:1 ratio, meaning that there are four flutter waves per every QRS complex. There are no discernible P waves. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

The clinical manifestations of AFib and A flutter are very similar in nature; therefore, it is difficult to isolate which dysrhythmia is occurring based on symptom presentation only. Patients will report fluttering sensations, chest pain, palpitations, and dizziness, and may experience hypotension. The faster the tachycardia, the more severe the patient's symptoms will be.

Nurses must assess and evaluate the need for additional oxygenation support and monitor telemetry and vital signs.

The patient may need to refrain from eating to prepare for cardioversion (a procedure performed by a machine or medicine that restores a normal heart rhythm when the heart is beating too fast or irregularly) or ablation **(**a procedure that creates scars in the heart tissue which block the abnormal electrical impulses to help the heart maintain a normal rhythm). First-line therapies lean towards pharmacological therapies, which include digoxin, beta-blockers, amiodarone (cardiac glycosides), and calcium channel blockers (CCBs). Other concurrent therapies considered are anticoagulants for atrial dysrhythmias. Patients with comorbid congestive heart failure, hypertension, age over 65, stroke and diabetes, and AFib would require anticoagulation with heparin, warfarin, or the new oral anticoagulants (NOACs).

CLINICAL SAFETY AND PROCEDURES (QSEN)

Safety: Preparing the Patient for Cardioversion

In events where the patient's atrial dysrhythmia is non-responsive to pharmacological therapies, cardioversion is a procedure in which electricity is utilized to shock the atrial circuitry back to normal sinus rhythm. The dose of electricity varies by patient and provider preference; it may be as little as 50 joules to up to 100 to 150 joules.

1. The patient must be nothing by mouth (NPO) as monitored anesthesia care (MAC) is required, and to mitigate the risk of aspiration, the patient is advised to not have any solids before the procedure.
2. Prior to cardioversion, a transesophageal echocardiogram will be performed to isolate any possible blood clots that may be hiding in the atrial appendage. This diagnostic test is necessary because if there is an isolated blood clot and the patient is cardioverted, the clot can be expelled to the brain or lungs, risking a cerebrovascular accident or pulmonary embolism.
3. The nurse must ensure that the transcutaneous pads are connected correctly and that the defibrillator is turned to the "cardioversion" setting. The cardioverter will synchronize the shock delivery with the patient's QRS on their EKG rhythm. (Delivery of an unsynchronized shock risks sending the patient into cardiac arrest.)
4. After the delivery of the provider-ordered electricity, the nurse will monitor the patient's response to the cardioversion and note if the patient returned to a normal sinus rhythm.
5. Post-procedure, the patient will be monitored for a period of two hours, noting hemodynamics, rhythm response, and the patient's response to monitored anesthesia care.

Ventricular Dysrhythmias: Clinical Manifestations and Nursing Care

Ventricular disturbances are the most serious dysrhythmias and require prompt, emergent intervention. A **ventricular tachycardia** is when the ventricle beats rapidly at 150 to 200 bpm with wide QRS complexes (greater than 0.12 seconds) and no discernible PRs or P waves (Figure 12.16). A **ventricular fibrillation** is slightly faster than ventricular tachycardia with rates over 200 bpm (Figure 12.17). A classic finding in ventricular fibrillation is a chaotic baseline with no discernible QRS, PRs, or P waves. Patients with ventricular tachycardia may be able to report subjective feelings of fluttering, fatigue, and near syncope. The patient will be diaphoretic and have weak pulses. In severe cases, they can lose perfusion and have syncope. Ventricular fibrillation is considered a cardiac arrest as patients will lose consciousness and require advanced cardiac life support. Causation of these dysrhythmias can be from myocardial infarction, heart failure, electrolyte disturbance, illegal substance abuse, shock, or medications.

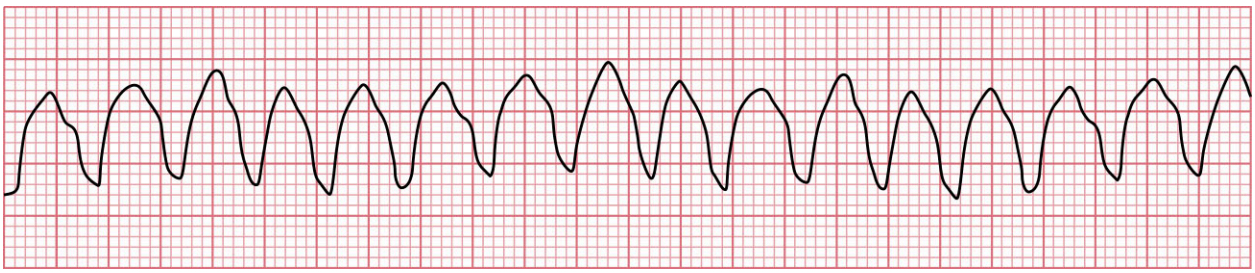


FIGURE 12.16 In ventricular tachycardia, the rate is fast, there are no discernible P waves, and the QRS is wide. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

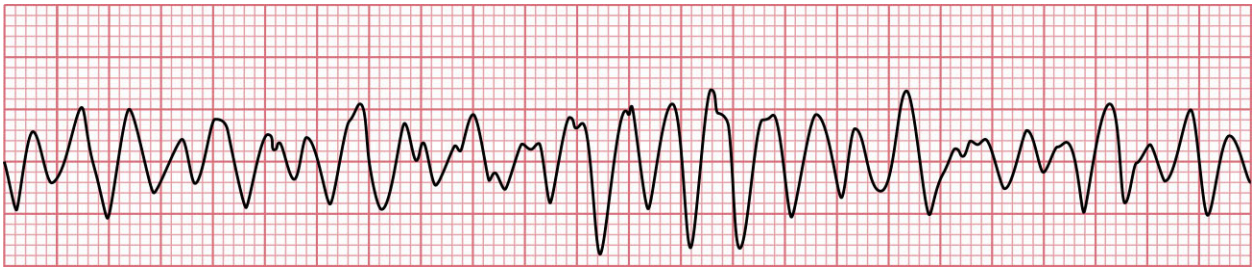


FIGURE 12.17 In ventricular fibrillation, there is no pattern, it is fast, there are no discernible P waves, the QRS waves are not well captured, and there is variation in the morphologies of the QRS complexes. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

The nurse must act quickly when ventricular tachycardia or ventricular fibrillation is occurring and recruit assistance as outcomes of survival increase with prompt intervention. Nursing actions include performing high-quality cardiopulmonary resuscitation (CPR) for pulseless ventricular tachycardia and pulseless ventricular fibrillation, utilizing an automated external defibrillator, and providing oxygen. When a pulse is present, only other restoration methods can be used. Restoration of perfusion is a team approach and requires health professionals to provide CPR, defibrillation, and oxygen, and to administer emergency medications (e.g., epinephrine, amiodarone, calcium gluconate). Once hemodynamic stability has been achieved, nursing interventions center around patient monitoring, laboratory trending, and implementing a clinical plan dependent on the cause.

CLINICAL SAFETY AND PROCEDURES (QSEN)

Safety: Interventions with CPR and the Defibrillator for Ventricular Fibrillation

1. The code team is activated per institutional policy.
2. High-quality CPR with a compression rate of 100 to 120 compressions per minute (note there is a full recoil of the chest at a depth of two inches). It is of utmost importance to step out after five cycles (two minutes) of CPR as rescuers may experience fatigue. This safety "tap out" is necessary to continue high-quality CPR until the return of spontaneous circulation.
3. The AED is retrieved, and pads are placed to initiate a dose of electricity. The machine will determine if a shock is advised and will prompt all rescuers to step away to avoid being shocked.
4. A team member begins bagging the patient with bag valve mask of 100% oxygen.
5. Medications may be administered during resuscitative efforts such as epinephrine, amiodarone, and lidocaine.
6. Assess for a carotid pulse and resume CPR if no pulse is palpated.
7. The longer the delay to high-quality CPR, the higher the mortality rate. To maximize outcomes, initial intervention should occur within the first three minutes of a witnessed cardiac arrest. In an acute care setting, members from the intensive care unit, emergency room, and respiratory therapy will assist in rescuing interventions. When the code team arrives, they will initiate advanced cardiovascular life-support (ACLS) following the protocol set forth by the American Heart Association.

Asystole

Lastly, there is **asystole**, also known as ventricular standstill, or "flatline" (Figure 12.18) (Jordan et al., 2024). Cardiac activity ceases to occur due to termination of electrical conduction. Clinical signs of asystole are determined by the rhythm showing a flat line with little to no evidence of cardiac rhythm.

FIGURE 12.18 The rhythm here begins as bradycardic and the T waves are not captured, until the strip goes flat, with no evidence of atrial or ventricular activity, indicated asystole. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

The mortality of asystole is approximately 90 percent (Khosla et al., 2024), with long term complications of brain death and high-demand needs for artificial life support. Asystole is often linked to unsuccessful attempts to correct bradycardia dysrhythmias, ventricular dysrhythmias, or pulseless electrical activity (Jordan et al., 2024). Like the presentation of ventricular fibrillation, the patient will be unconscious, with no evidence of breathing, weak pulses, and a low blood pressure that is unable to support cardiac physiological demands. Nursing actions align with a team member's roles in attempts to restore spontaneous circulation, performing high-quality CPR, administration of epinephrine, and airway protection with intubation or bag-mask ventilation. The advanced cardiovascular life-support providers will then attempt to determine the cause of the asystole by investigating the "Hs and Ts."

LINK TO LEARNING

Advanced cardiovascular life-support providers investigate the "Hs and Ts" (https://openstax.org/r/77Dysrhythmia) which are the twelve reversible causes of life-threatening dysrhythmias.

Evaluation of Nursing Care of the Patient with Dysrhythmia

Depending on the patient's dysrhythmia, stabilization of cardiac perfusion is a key component through normalization of heart rate and blood pressure. The patient's oxygenation will improve following stabilization of the dysrhythmia as evidenced by oxygen saturations greater than 92 percent and reduced complaints of shortness of breath. The patient's energy level will improve as evidenced by the ability to participate in self-care activities. Lifestyle modifications (e.g., smoking cessation, altered diet, weight management) and compliance with pharmacological therapies can control or minimize the effects of dysrhythmia. The patient's educational needs will vary depending on medical therapy and verbalized understanding of the condition, treatment, and interventions initiated (e.g., if the patient had a pacemaker).

Dysrhythmia management may pose challenges, as telemetry analysis is a skill that takes time to learn. Over time, the nurse will become more proficient and confident in the ability to identify and intervene when a dysrhythmia is observed. Acute care settings with cardiovascular specialty or medical-surgical units with a high level of care have institutional mentorship and programs to assist new nurses with skill mastery. The baseline of a strong foundational understanding of cardiovascular electrical physiology will assist the nurse with matching the dysrhythmia to symptom presentation.

INTERDISCIPLINARY PLAN OF CARE

Roles and Responsibilities of Pertinent Team Members During Cardiac Arrest

- Respiratory therapy: Respiratory therapists assist manually ventilating patients with a bag valve mask and assisting anesthesia or the health-care provider with intubation.
- Physicians/health-care providers: Providers typically take lead roles in ordering pharmacological interventions or diagnostics during cardiac arrest.
- Nursing: Nursing roles are diverse in the administration of emergency medications, recording the events of the cardiac arrest, and performing CPR.
- Pharmacists: Pharmacists will ensure doses and frequency of pharmacological therapies are safe and alignment with Advance Cardiovascular Life Support (ACLS) algorithms.
- Chaplain/social work: Religious and social support have become more popular in extending spiritual and emotional support to the patient's loved ones.

12.3 Heart Failure

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations of heart failure
- Describe the diagnostics and laboratory values in the disease of heart failure
- Apply nursing concepts and plan associated nursing care for the patient with heart failure
- Evaluate the efficacy of nursing care for the patient with heart failure
- Describe the medical therapies that apply to the care of heart failure

A chronic condition that reduces perfusion to the body because the heart is working inefficiently is known as **congestive heart failure (CHF)**. It is sometimes more simply referred to as heart failure (HF). HF not only affects quality of life but is costly in dollars and mortality. There are currently 6.2 million adults in the United States with congestive heart failure, costing the nation $30.7 billion each year (CDC, October 14, 2022).

Both modifiable and nonmodifiable risk factors have been identified for HF. Nonmodifiable risk factors include gender, age, and family history, whereas modifiable risk factors encompass certain lifestyle practices. The National Heart, Lung, and Blood Institute (2022) identified a myocardial infarction as a concurrent comorbidity that elevates the risk of developing HF. Damage to the heart muscle itself puts a person at risk for developing HF. Individuals who consume a diet high in sodium and fat, smoke, drink excessive alcohol, and are physically inactive have a propensity for heart disease. Disease prevalence of HF occurs in 65 percent of individuals with high blood pressure, 50 percent of individuals with ischemic heart disease, 41 percent of patients with atrial fibrillation, and 27 percent of individuals with diabetes mellitus (Lawson et al., 2020). Gender does not appear to be a factor, as the occurrence of HF is similar between females and males (Lam et al., 2019). Ethnicity does, however, impact the risk of developing HF, as Black people and Hispanic people have a higher occurrence of HF compared to White people (Breathett, 2020). Given the propensity of disease, nurses are tasked to understand the complexity of CHF and the lifespan considerations that apply to the patient.

Pathophysiology

The human heart delivers between two to four liters of newly oxygenated blood each minute from the left ventricle into the aorta and into the circulating blood supply. Oxygen-rich blood pulses through the blood vessels to supply tissues and cells with necessary nutrients for cellular metabolism. However, HF causes weakness in the ventricular muscle, resulting in lower pressure and thereby impeding the forward flow of blood. A fundamental understanding of myocardial physiology is necessary to understand HF. Recall that preload is the amount of stretch myocardial cells confront prior to contraction, or ventricular filling. In contrast, afterload is the force of blood the ventricle must overcome to eject the blood. A compensatory thickening of the ventricle, often referred to as **left ventricular hypertrophy**, ensues due to increased myocardial stretch from increased pressure resulting from uncontrolled high blood pressure. Over time, the myocardial muscle of the ventricle fatigues and struggles to maintain optimal pressures of blood and fluid. Consequently, valves become incompetent and create backflow of blood into the pulmonary and hepatic systems.

The American Heart Association (2022) differentiates classifications of right-sided heart failure and left-sided heart failure. A **right-sided heart failure** results when increased fluid pushes fluid back into the pulmonary system, and congests the right side of the heart, causing the right ventricle to fail. In contrast, **left-sided heart failure** develops when the left ventricle muscle is damaged and weak and can no longer pump enough blood through the body. Left-sided HF is further divided into systolic and diastolic failure (Figure 12.19). (See Figure 12.2 for the normal cycle of blood circulation.) Systole is ventricular contraction and the period in the cardiac cycle when blood is ejected from the ventricles into the lungs and aorta. Systolic failure results when the diseased ventricle is unable to eject blood forward, creating a backward flow. Diastole represents ventricular filling, caused by atrial contraction. With diastolic dysfunction, the ventricle is stiff and thick and cannot fully relax. As a result, inadequate filling of the chamber occurs.

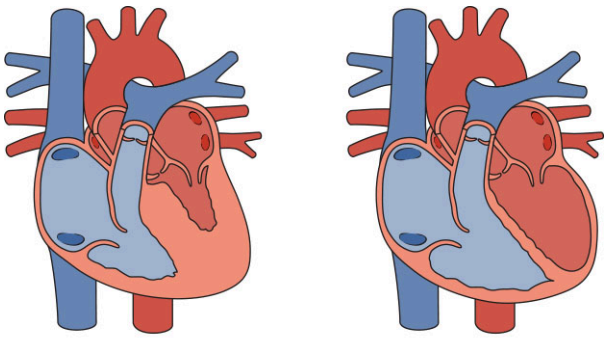


FIGURE 12.19 Left-sided heart failure is divided into diastolic and systolic heart failure. (a) Diastolic heart failure is indicated by thick heart walls. (b) Systolic heart failure is indicated by thin heart walls. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

HF can cause damage to other body systems when blood volume and flow to essential organs decreases. HF may impair the ability of the kidneys to appropriately excrete sodium and water as blood volume decreases in the kidneys. A nurse must understand the causes, clinical manifestations, diagnostic tests, medical treatment plans, and patient education for the patient with HF to help the patient achieve optimal outcomes.

Clinical Manifestations

The classic presentation of HF includes lower extremity edema, weight gain, cough, sputum production, and alterations in hemodynamics. Patients with fluid retention may have observable swelling in their digits and lower extremities. The patient may offer subjective complaints of poorly fitting socks, shoes, pants, or rings.

Upon assessment of the patient with HF, note any indentations from socks or shoes. Gently palpate the lower extremities observing for pitting or depth of residual finger marks, then grade it from 0 (no edema) to 4+ (pitting edema) (see Figure 10.9). Patients with edema often will have an elevated weight. It is best practice to have the patient void in the morning before obtaining weight, in the same garments or nude if possible. Weight gain of three pounds in a day or five pounds in a week is suggestive of HF. Other hemodynamic deviations may include blood pressure elevation due to fluid retention.

A recommended practice for the nursing assessment of HF is evaluating the patient's airway, breathing, and circulation (ABCs). The nurse may observe **dyspnea**, or difficulty breathing, or it may be reported by the patient. The nurse may observe, or the patient may report, breathlessness while completing activities of daily living. Patients may allude to difficulty sleeping due to struggles with breathing while lying flat, also called **orthopnea**. The patient may complain of the need to sleep on more than two pillows or upright in a recliner. Other assessment findings may be a frothy pink sputum or a productive wet cough. Oxygen saturation may be less than 92 percent due to fluid backing up into the pulmonary system. A lung assessment may reveal crackles in the pulmonary bases. The patient with HF may have some or all these findings; however, patients with pulmonary edema will demonstrate respiratory distress.

The nurse should inquire if the patient is experiencing any chest pain. Chest pain occurs due to poor coronary perfusion and could result from a previous myocardial infarction. The nurse should employ an organized, detailed manner when assessing the patient's chest pain. Utilization of the PQRST mnemonic is a recommended model to detail the patient's chest pain:

- P: what provokes or relieves the chest pain (chest pain from poor coronary perfusion is exacerbated by activity and relieved by rest),
- Q: what is the quality of your pain (chest pain from ischemia is described as a dull ache in the chest or in the arms),
- R: what region and does it radiate,
- S: have the patient identify the severity of pain, and
- T: timing, when did it begin? The patient may be experiencing ischemic chest pain or a myocardial infarction.

In addition to performing a thorough pain assessment, the nurse must determine if the patient is experiencing any fatigue, or tires easily during activities of daily living. Patients with HF have deficits with adequate perfusion, and reduced cardiac output can interfere with energy reserves. Due to poor ventricular blood output, the patient may

experience dizziness or palpitations. Lack of perfusion to the brain may manifest with dizziness or episodes of syncope from triggered tachycardic dysrhythmias that result from ventricular failure. As HF progresses with ventricular remodeling and weakening of the heart muscle, cardiac cells change and are more "excitable," making the patient vulnerable to tachycardic dysrhythmias. It is imperative the nurse shares with the provider the frequency of symptoms, as this suggests the severity of the disease.

Diagnostics and Laboratory Values

A comprehensive diagnostic and laboratory workup is indicated when there is a suspicion of HF. The gold standard for detecting HF is ultrasound visualization via **echocardiogram**. This digital image offers visualization of valve competency, filling pressures, measurements of ventricular thickness, and compliance of the ventricles. Coronary artery disease or blockages that prevent perfusion of the myocardium can cause HF. Diagnostic workup for coronary artery disease includes conducting an **electrocardiogram**. These tracings can detect a coronary blood defect or evidence of injury from myocardial infarction. Nuclear stress tests utilize radioactive isotopes to assess coronary patency.

The **ejection fraction** is a measurement of ventricular compliance that is obtained through an ultrasound done of the heart. In a healthy heart, the left ventricle's ejection fraction is 55 to 60 percent. A hyperdynamic ejection fraction exceeding 70 percent is strongly correlated with diastolic dysfunction and means the ventricle is overcompensating for a diseased ventricular muscle. Conversely, patients with ejection fractions less than 40 percent have a higher risk for developing serious dysrhythmias.

With a new diagnosis of HF, the suspicion of coronary artery disease is high and must be investigated. More invasive testing, such as percutaneous coronary intervention, can further confirm coronary artery blockage as causation. This procedure is an invasive procedure in which a catheter is threaded through the femoral artery, dye is injected, and coronary blockages can be detected through this dye. If the patient is experiencing an acute exacerbation of HF, chest X-rays assist with identifying pulmonary edema or **cardiomegaly**, which means ventricular enlargement to accommodate excess fluid (Figure 12.20). While diagnostic imaging is expansive in the work up of HF, other laboratory values assist with determining disease severity.

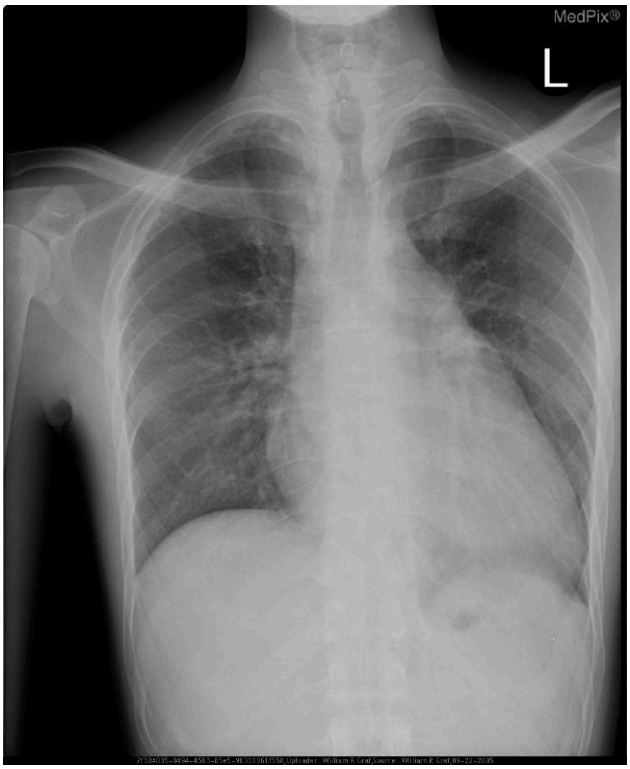


FIGURE 12.20 Due to enlargement, the apex of the heart is taking up the right-side field (the patient's left lung). (credit: "Graves Disease" by Naval Medical Center Portsmouth: William R Graf/National Library of Medicine, Public Domain)

While most diagnostics of HF rely on imaging and patient presentation, there is a sensitive and specific blood test to

identify an acute exacerbation of HF. Serum brain natriuretic peptide (BNP) is a prominent laboratory test utilized in diagnosing HF. The BNP hormone comes from a family of proteins that have a direct effect on blood vessels that affect constriction and dilation (Harvard Health Publishing, 2022). With the increased myocardial stretch in HF, the protein levels rise when the pressure gradients rise in the atria and ventricles. Normal levels of BNP should be less than 100 pg/mL, and may increase slightly due to age, but assessing levels along with the clinical presentations assists the nurse to evaluate the patient's response to treatment.

Additional testing includes electrolyte panels, hemoglobin A1C, liver enzymes, and thyroid-stimulating hormone. Electrolyte panels assist with providing baseline serum potassium and serum and creatinine to consider if there is renal insufficiency. An elevated hemoglobin A1C may indicate metabolic dysfunction; comorbid diabetes that is not well controlled may exacerbate underlying cardiovascular disease. With hepatic congestion from right-sided heart failure, liver function tests may be elevated. Thyroid disorders such as hypothyroidism may trigger an event of HF. Laboratory and serial diagnostics may continue over months or annually to monitor the patient's disease status.

READ THE ELECTRONIC HEALTH RECORD

Sample Laboratory Profile of Patient with HF

Mr. John Smith is admitted with a diagnosis of acute left-sided heart failure. The emergency room nurse has been caring for Mr. Smith as he awaits a bed on the telemetry unit. The nurse reviews his labs over the last 12-16 hours.

Time	0800	1700	2300
BNP	500 pg/mL	750 pg/mL	1500 pg/mL

Time: 2300
ALT: 230 units/L (normal: 7–56 units/L)
AST: 60 units/L (normal: 10–40 units/L)
LDH: 362 units/L (normal: 140–280 units/L)

4. What explains the trend of the BNP rising? What cues would the nurse recognize to support these trends in the BNP?
5. What do the other levels suggest? What does it indicate to the nurse? What assessment findings would the nurse expect to find consistent with these laboratory values?

Nursing Care of the Patient with Heart Failure

Nurses who practice in the cardiovascular specialty are challenged to understand and think critically about the therapies administered to the patient with HF. Most therapies center around pharmacological interventions to control blood pressure, promote diuresis, and reduce preload. Nursing responsibilities include monitoring hemodynamic stability with blood pressure and pulse assessments. It is imperative to monitor the patient's response to the medication, including any side effects, and use clinical judgment to question if the medication should be held, for example, if a pulse is less than 60 bpm. Additionally, education in modifiable risk factors and recognizing signs of cardiac decompensation are integral in the care of a patient with HF.

Recognizing and Analyzing Cues

A general assessment begins by looking at the position of the patient, the breathing pattern, and noting the color of the patient's skin. Note any pallor if it is appropriate for the patient's ethnic background. Note the patient's mentation, if they are alert and oriented, and if they are at baseline for their mental status. Auscultate anterior and posterior lung fields, noting any adventitious sounds, an associated cough (sputum color, consistency, amount), and where the adventitious breath sounds are heard. During a heart assessment, patients with HF may have murmurs, S1/S2 abnormalities, and rate irregularities. During the peripheral vascular assessment, observe for edema in the extremities and for qualities of the peripheral pulses. A gastrointestinal assessment may reveal fluid accumulation in the abdominal unit, noted as ascites, as well as **hepatosplenomegaly** (liver and spleen enlargement) from right-

sided heart failure. Any new changes or deviations from the prior assessment would cue the nurse to consider a new complication of HF or worsening disease.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Oxygenation is the nurse's top priority when planning care for a patient with HF. Often, the patient will report shortness of breath and dyspnea. Putting the patient in high Fowlers will alleviate dyspnea, and ordered supplemental oxygen may be necessary to maintain oxygen saturations greater than 92 percent. For the patient's circulatory support, the administration of ordered beta-blockers, angiotensin converting enzyme (ACE) inhibitors/angiotensin-receptor blockers (ARBs), diuretics, and nitrates requires frequent hemodynamic assessment. The patient's response to diuretic therapy is monitored by daily weights, adhering to strict intake and output. In severe cases of HF, compliance with fluid restrictions may be required. Advise the patient to rest frequently to conserve energy; clustering nursing care around the patient's energy level will assist with reduced fatigue.

Education is critical for the patient being discharged home from an HF hospitalization. The patient should be instructed on modifiable risk factors such as smoking cessation, as nicotine is a vasoconstrictor and applies undue stress on the heart. Reduced or no alcohol consumption is recommended, as alcohol elevates blood pressure. Dietary reduction of high fatty foods and cholesterol will mitigate the development of coronary artery disease. Diets high in sodium increase fluid retention, as water molecules follow sodium molecules into the vascular space and can leak into the interstitial tissue, creating edema. The American Heart Association strongly encourages patients with HF to reduce sodium intake. Encourage the patient to keep sodium intake to less than two grams a day. Weight loss and a gradual increase in physical activity with aerobic exercise promote cardiac conditioning. Primary prevention with immunization for pneumococcal pneumonia, COVID-19, and influenza is recommended to minimize HF recurrences, as infection can strain a failing heart. The nurse must be supportive, nonjudgmental, and patient with the patient.

LINK TO LEARNING

My Healthfinder from the Office of Disease Prevention and Health Promotion has put together a shopping list of lower-sodium foods (https://openstax.org/r/77LowSaltFoods) that can be useful to share with patients who need to limit their sodium intake.

Evaluation of Nursing Care of the Patient with Heart Failure

Creation and evaluation of patient outcomes for HF should align with SMART considerations (specific, measurable, attainable, relevant, and timely). Goal development should center around secondary prevention interventions to prevent exacerbation of HF, and tertiary interventions to stabilize acute HF.

Evaluating Outcomes

A patient who demonstrates adequate oxygenation with a heart failure illness will be able to complete clustered activities of daily living without reporting shortness of breath and maintain oxygen saturations greater than or equal to 92 percent. For circulatory stabilization, several objective measurements may be used to evaluate to ascertain goal achievement. Patients will demonstrate reduced edema (2+ or less) and maintain blood pressure (norms may be patient-individualized) with pharmacological therapies. Other evaluation parameters may consider fluid status, stable weight, or verbalizing understanding of fluid and sodium restriction. Lastly, in consideration of safety, the patient's medication regimen will reconcile with the provider's orders (Table 12.2).

Outcome Area	Goals	Evaluation Criteria
Oxygenation	Patient will complete clustered activities of daily living without shortness of breath. Maintain oxygen saturation ≥ 92%.	• Ability to perform activities without shortness of breath • Oxygen saturation levels ≥ 92%
Circulatory stabilization	Patient will demonstrate reduced edema (2+ or less) and maintain individualized blood pressure norms with pharmacological therapies.	• Edema level ≤ 2+ • Blood pressure within individualized norms
Fluid status	Patient will maintain stable weight and verbalize understanding of fluid and sodium restrictions.	• Stable weight • Verbalization of understanding fluid and sodium restrictions
Medication safety	Patient's medication regimen will reconcile with the provider's orders.	• Medication regimen matches provider's orders

TABLE 12.2 Evaluating Outcomes for a Patient with Heart Failure

A comprehensive, holistic approach is necessary to evaluate the therapeutic response of the patient. HF requires continued maintenance of medication adherence, modifiable risk factor management, and self-monitoring of disease. Acute exacerbations of HF require stabilization of symptoms and, if hospitalized, management of disease to be safely discharged to the community.

Medical Therapies and Related Care

Many pharmacological therapies directed at HF are indicated to reduce symptom burden and prevent disease progression. Pharmacological agents utilized in the treatment of HF include beta-blockers, diuretics, ACE inhibitors/ARBs, and nitrates.

Beta-blockers are utilized to reduce myocardial oxygen demand, vasodilate, and reduce heart rate. Cardio-selective beta-blockers such as metoprolol work exclusively on the beta (1) sites in the heart, whereas carvedilol, a nonselective beta-blocker, works on both beta (1) and beta (2) sites. Patients with a history of asthma or broncho-constrictive disease should have a thorough lung exam, and these medications should be used cautiously, as non-cardio-selective beta-blockers may trigger bronchospasm and may be problematic for the patient. Most beta-blockers are well-tolerated by patients and are administered in long-acting forms or intermediate release. Patients should be educated on compliance with taking the medication and should contact their provider if there is a reason to stop or hold the medication.

Diuretics assist in the facilitation of fluid removal via the renal system. Considered preload reducers, potent diuretics such as furosemide work on the loop of Henle and increase fluid excretion. Nursing assessments include strict intake and output, serial potassium monitoring, and daily weight monitoring. A therapeutic response would include reduction of weight gain and edema, and increased ease of breathing. Electrolyte monitoring of serum potassium and blood tests for blood urea nitrogen and creatinine is necessary with intravenous diuretics, as potassium wasting is increased and there is a risk of acute kidney injury. If diuretics are too potent for the patient, dehydration and hypotension may complicate the patient's response. Also, intravenous push furosemide must be administered slowly to avoid ototoxicity.

Many pharmacological therapies address the changes in preload and afterload in a failing heart. The American College of Cardiology (2016) gives a Class 1 recommendation that patients with reduced ejection fraction should be on daily ACE inhibitors or ARBs (Table 12.3). Angiotensin is converted by the lungs from angiotensinogen originating from the kidneys. Angiotensin is a hormone that is responsive to decreased perfusion to the nephrons. When perfusion to the kidneys is decreased, the angiotensin I hormone converts to angiotensin II and activates renin, which stores extra fluid and reduces excretion. While HF pathophysiology operates with a disequilibrium of fluid balance, ACE inhibitors and ARBs are indicated to combat this effect. A common example of an ACE inhibitor is lisinopril, while valsartan is an ARB.

Nursing assessments include monitoring for hyperkalemia, blood pressure response, and side effects. A new onset of cough is a common complaint with ACE inhibitors. While unpleasant, it does terminate a few months after initiation of therapy or may resolve only after discontinuation of the medication. Common practice is to switch to an ARB or another class of antihypertensive. Nurses must educate the patients on the side effects and self-monitoring of blood pressure at home.

Class	Drug	Dosing
ACE inhibitor	Lisinopril	2.5/5/10/20/40 mg per day
	Benazepril	10/20/40 mg per day
	Enalapril	2.5/5/10/20 mg per day
	Captopril	6.25-12.5 mg PO every 8 hours
Angiotensin-receptor blocker	Losartan	25/50/100 mg per day
	Valsartan	40/80/160/320 mg per day
	Irbesartan	150/300 mg per day
	Olmesartan	10/20/40 mg per day

TABLE 12.3 Common ACE Inhibitors and ARBs

Nitrates, potent coronary vasodilators, are another example of preload reduction. They may be administered as a patch, orally, sublingually, or spray-routed into the mouth. Patients on chronic nitrates should monitor blood pressure closely, as orthostatic hypotension may occur as a complication. Caregivers or family members who apply patches for patients should be directed to wear gloves. Passive absorption of the topical cream onto the administrator's hands may produce hypotensive side effects.

12.4 Hypertension

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations of hypertension
- Describe the diagnostics and laboratory values in the disease of hypertension
- Apply nursing concepts and plan associated nursing care for the patient with hypertension
- Evaluate the efficacy of nursing care for the patient with hypertension
- Describe the medical therapies that apply to the care of hypertension and the Joint National Committee (JNC 8) guidelines for the treatment of hypertension

The Centers for Disease Control (2022) notes that almost half of individuals in the United States are afflicted with hypertension (HTN). According to the American Heart Association (2023), HTN costs the United States between $131 and $198 billion each year. Men (50%), Blacks (56%), non-Hispanic White adults (48%), non-Hispanic Asian adults (46%), and Hispanic (39%) adults are more likely to have HTN (CDC, 2022). Age, gender, and ethnic and

racial disposition are nonmodifiable risk factors. Modifiable risk factors for HTN include diabetes, a diet high in sodium and low in potassium, physical inactivity, obesity, excessive alcohol use, and tobacco use. Uncontrolled blood pressure can result in stroke, heart disease (coronary heart disease, congestive heart disease), arrhythmia, and kidney disease.

Pathophysiology

There are two types of HTN. Though the cause for these types varies, the manifestations and sequelae do not. The two classifications are primary or essential hypertension and secondary hypertension. Often multi-factorial, **primary hypertension** does not have one distinct cause, while **secondary hypertension** is caused by another medical condition, such as thyroid issues or adrenal or kidney disease.

In the early stages of HTN, increased cardiac output creates high blood velocity to counteract the tightened arterioles. Activation of the renin-angiotensin hormonal system is highly correlated with renal endocrine function. When perfusion is decreased in the kidneys, renin is released and converts angiotensin I to angiotensin II (released from the kidneys), which increases blood pressure. Also, physiological influences from the autonomic nervous system (sympathetic nervous system) activation influence arteriolar constriction and dilation. Other factors that contribute to the pathophysiology of HTN include hypercoagulability, in which viscous blood is created from endothelial dysfunction and results in increased pressure. Peripheral resistance is increased from tight endothelial intimal thickening in small arterioles (Gallo et al., 2021). Hemodynamic cutoff parameters with systolic pressures ≥ 140 mm Hg/diastolic ≥ 90 mm Hg are consistently elevated in hypertensive patients (World Health Organization, 2023).

Clinical Manifestations

Blood pressure will periodically rise during moments of stress, anxiety, or physical activity. While there are transient rises in blood pressure during these moments, readings do not remain consistently high. Consistent high blood pressure may not cause any symptoms. Often referred to as the "silent killer," elevated readings may be discovered during routine physical exams. Symptomatic hypertension may cause headaches, nose bleeds, fatigue, nausea, chest pain, and shortness of breath. In severe cases, patients with **hypertensive urgency** may report chest pain, shortness of breath, blurred vision, and headaches (resulting from elevated intracranial pressure), but do not exhibit target organ damage (American Heart Association, 2024). In contrast, patients with **malignant hypertension** will exhibit similar symptoms with target organ damage, such as kidney failure or pulmonary edema (Naranjo et al., 2023).

The American Heart Association (2022) notes blood pressure readings may rise as high as 180/120 mm Hg to be considered a hypertensive urgency or emergency; however, some patients will experience severe symptoms with readings 160/90 mm Hg or greater. It is prudent for nurses to recommend patients proceed to an inpatient facility for treatment and evaluation. Table 12.4 demonstrates the progression of high blood pressure based on systolic readings.

Classification	Criteria
Normal blood pressure	120-129/80 mm Hg
Stage I hypertension	130-139/80-90 mm Hg
Stage II hypertension	140/90 mm Hg or higher
Hypertensive urgency	160/90 mm Hg or higher

TABLE 12.4 Classification of Blood Pressure (Mayo Clinic, 2024)

Diagnostics and Laboratory Values

Assessment begins with a thorough medical history inquiring about genetics, comorbid conditions (elevated lipids, diabetes, obesity), and lifestyle practices. The nurse assessing the blood pressure must take two blood pressure

readings on two different occasions, using a properly sized cuff (Figure 12.21). The patient should be positioned in a comfortable environment and should be instructed to sit with legs uncrossed. They should abstain from eating and smoking a minimum of 30 to 45 minutes prior to testing. If the patient demonstrates anxiety, permit rest first, as being in medical facilities may cause elevated readings. This is also known as "white coat syndrome." Hypertension is diagnosed for patients with high blood pressure that is seen in two separate clinic visits at least two weeks apart, and on both visits.

FIGURE 12.21 Selecting the correct blood pressure cuff size is necessary to get an accurate reading. The pediatric size is often green, adult size is black or blue, and maroon is for patients with large arms. (credit: Amanda Mills/CDC, Public Domain)

Manual blood pressure readings are always the best practice; therefore, if automated noninvasive blood pressure monitoring yields elevated measurements, the nurse should follow up with a manual reading.

Other diagnostic tests include a 12-lead electrocardiogram (EKG). Twelve lead EKGs may demonstrate ischemia, heart failure, or dysrhythmia to explain organic causes of HTN. The provider may order laboratory values such as a basic metabolic panel, lipid profile, fasting blood sugar, and urine test (protein) (Unger et al., 2020). The clinical work up of other chronic comorbidities is considered when there is a new diagnosis of HTN. It is of utmost importance that the blood pressure readings are taken correctly and in a consistent manner. The nurse must also note if the patient is demonstrating any symptoms of elevated blood pressure, which may include headache, chest pain, blurred vision, shortness of breath, fatigue, or dizziness. Patient presentation is paramount to consider the effects of the elevated blood pressure, not the abnormal value in isolation.

CLINICAL SAFETY AND PROCEDURES (QSEN)

Evidence-Based Practice: The Correct Technique for Taking a Blood Pressure

1. The patient must refrain from eating or smoking for 30-45 minutes.

2. Seat the patient in a comfortable environment with both feet on the ground and arm resting on a table or on the lap.
3. Ask patients if there are limb restrictions due to mastectomy or lymph node removal from a history of breast cancer.
4. Ensure the patient's blood pressure is taken with a correctly sized cuff.

Nursing Care of the Patient with Hypertension

In the medical-surgical inpatient setting, nurses will be treating chronic HTN or acute HTN. The accessibility and ease of recognizing trends of hemodynamic changes is to the benefit of the inpatient nurse. Although most of the current nursing literature centers around diagnosing HTN in the outpatient setting, more streamlined practices are in development to accurately diagnose HTN in the acute care setting (Armitage et al., 2019).

Recognizing Cues and Analyzing Cues

The nurse begins the physical assessment by taking a proper BP assessment, noting the position and size of the cuff. The nurse must perform a thorough heart and lung assessment, noting any extra heart sounds, gallops, murmurs, irregularities, or crackles. Note the patient's pulse and assess for edema. Patients with uncontrolled HTN may retain fluid and have an underlying diagnosis of congestive heart failure. Have the patient keep a journal of blood pressure readings to self-monitor medication effects; the nurse should analyze the readings and determine if they are consistently high or low. Note if the patient has any associated symptoms with elevated blood pressure such as headache, chest pain, blurred vision, or shortness of breath.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

First-line interventions with newly diagnosed HTN aim to reduce modifiable risk factors and should be tailored to the individual. If appropriate, encourage the patient to abstain from alcohol and quit smoking. Chronic alcohol use will elevate blood pressure and interfere with pharmacotherapeutics. Nicotine is a vasoconstrictor and contributes to elevated readings. Provide education to the patient on long-term effects from these modifiable risk factors. Patients may have to reduce or eliminate caffeine as needed to avert elevated blood pressure readings.

Educate the patient on physical activity recommendations. The American Heart Association recommends at least 150 minutes of physical activity per week. Sodium reduction in the diet is recommended, as excess sodium leads to fluid retention and will result in elevated readings. Diets high in saturated fats and sugar are linked with endothelial intimal dysfunction. Patients may benefit from interprofessional referral to a registered nutritionist or physical trainer to assist with goal development in aerobic activity.

Lastly, the patient must be made aware of the symptoms of symptomatic hypertensive readings. If the nurse suspects that the patient is having an acute hypertensive event, assess the patient's blood pressure and document symptoms and onset. Therapies will be initiated inpatient per the provider's order (intravenous hydralazine, intravenous beta-blockers), labs to assess for target organ damage, and telemetry to monitor for serial blood pressures and rhythm. Oftentimes, patients trivialize symptoms with elevated blood pressure measurements; nurses can assist patients with safe triage and access to care. When planning goals for patients with HTN, they must align with the patient's preferences and intended clinical responses. Goals may include a demonstration of knowledge of symptoms of hypertensive crisis, adherence to medication therapy, increase in physical activity, alteration in modifiable risk factors, and normalization of blood pressure readings. The nurse must understand goals may have to be adjusted based on the patient's condition.

Evaluation of Nursing Care of the Patient with Hypertension

In most cases with acute presentations of HTN, goal creation will focus on secondary and tertiary prevention of complications. Goals will have to be tailored to the degree of symptom burden and risk factors.

Evaluating Outcomes

With HTN, patient goals center around SMART concepts. The following outcomes are measurable and can be adjusted to reflect short-term or long-term outcomes.

- The patient's blood pressure should be reduced below 120/80 mm Hg with medication adherence.
- The patient will comply with the therapy and efforts to modify lifestyle choices that are risk factors.

- The patient will demonstrate knowledge of sodium discretion and make appropriate menu choices that are low-fat and low-glycemic.
- The patient will participate in a moderate exercise program for 30 minutes (five times a week).
- The patient will maintain a healthy BMI (target < 30%, anything over 30% is obese).

Collectively, patient empowerment through education and adherence to medical therapy will yield the desired responses. Patients may struggle to accept the disease and restrictions; however, patient-centered care with realistic goals will prove effective.

Medical Therapies and Related Care

Recently released guidelines endorsed by the Joint National Committee updated guidelines for the pharmacological therapies for patients with HTN (Cifu & Davis, 2017), which will be referred to as the JNC 8 in this text. For the non-Black population (with or without diabetes), initial therapy should include thiazide diuretics, CCBs, ACE inhibitors, or ARBs. In contrast, the Black population (with or without diabetes) should be started on thiazide diuretics or CCBs. Current guidelines encourage ACE inhibitor/ARB therapy for Black individuals with HTN to reduce the risk of stroke. Upward titration of medications should occur with proper assessment of blood pressure response. If these initial therapies do not achieve a therapeutic response, the addition of CCBs, ACE inhibitors, or ARBs will be considered. Other agents to consider are beta-blockers or aldosterone agents. While nurses are not responsible for the prescribing of the medication, they must consider whether their patients are at high risk of heart-related complications such as HF, heart attack, and stroke. The most recent developments endorse closer outpatient monitoring of blood pressure, adding potassium supplementation, and adhering to lifestyle recommendations. New recent guidelines endorse the implementation of sodium-close cotransporter-2 inhibitors (SGLT-2) for patients with HF and HTN. Nursing responsibilities include monitoring hemodynamic response, monitoring for side effects, and teaching correct techniques for at-home self-monitoring of antihypertensive therapies. Hemodynamic monitoring may be conducted by the nurse, or the patient will be educated on home monitoring. With the integration of sophisticated technology, current software permits telemonitoring and the use of smartwatches or tablets to assist patients with monitoring therapies.

12.5 Myocardial Infarction

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations of myocardial infarction
- Describe the diagnostics and laboratory values of myocardial infarctions
- Apply nursing concepts and plan associated nursing care for the patient with myocardial infarction
- Evaluate the efficacy of nursing care for the patient with myocardial infarction
- Discuss the medical therapies that apply to the care of myocardial infarction

Coronary disease afflicts 7.1 percent of adults aged 45-65, 10.9 percent of adults aged 45 years and older, and 17 percent of adults 65 and older (CDC, 2019). Coronary heart disease (CHD) affects White people the most, followed by Black people, Hispanic people, and Asian and Pacific Islander people. Social determinants of prevalence include a lack of higher education, physical inactivity, smoking, and lack of disease surveillance. Patients with comorbid conditions such as diabetes, chronic kidney disease, chronic obstructive pulmonary disease, cerebrovascular disease, and peripheral artery disease have a 26 percent increased risk for mortality following myocardial infarction (MI) (Baechli et al., 2020).

Pathophysiology

The four major coronary vessels are the right coronary artery, the left main coronary artery, the left circumflex artery, and the left anterior descending artery (LAD) (Figure 12.22). The right coronary artery branches off the aorta, where oxygen-rich blood perfuses the right ventricle and assists with right ventricular contraction. It also perfuses the native sinoatrial node, which is the “pacemaker” of the heart. The left circumflex artery supplies blood to the left atrium, whereas the LAD perfuses the anterior wall. The LAD is not only solely responsible for perfusing the anterior wall of the heart but also perfuses other cardiac landmarks such as the septum and lateral anterior wall. Due to the high demand of the left atrium and left ventricle to perfuse the body, the left main coronary artery assists with perfusion to these chambers. Cardiac cells are sensitive to coronary perfusion, in that cells do not function properly

under periods of blood flow deprivation or, in worse cases, myocyte death (infarction) with prolonged perfusion defects.

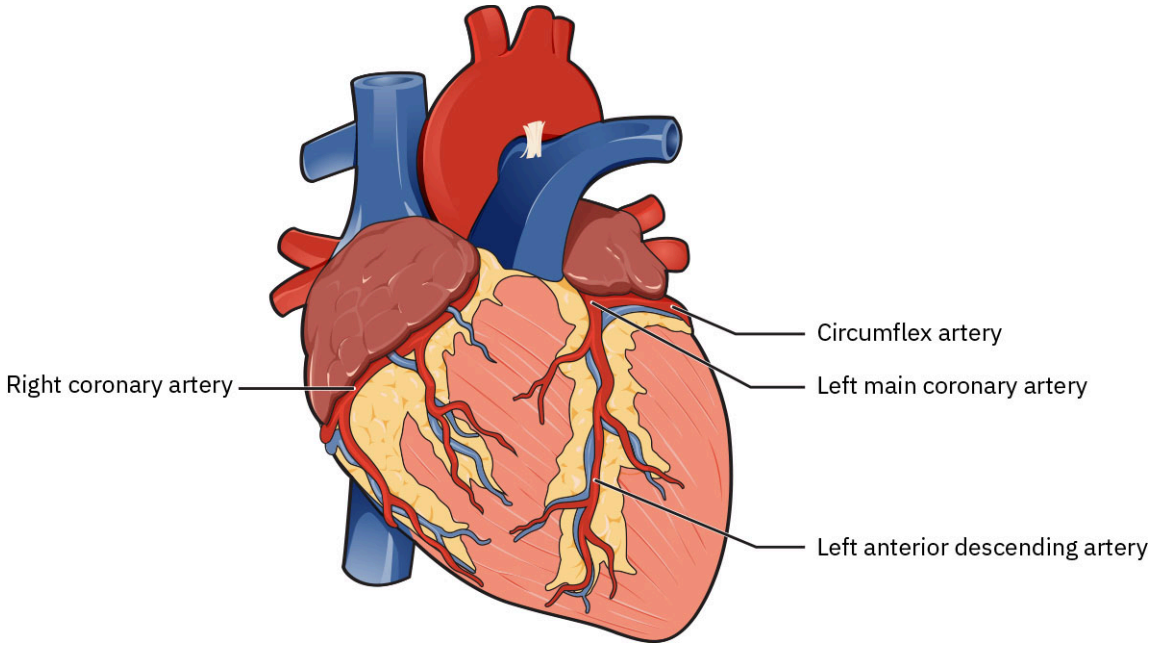


FIGURE 12.22 The coronary arteries supply blood to the heart muscle. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Clinical Manifestations

The clinical presentation of myocardial infarction can be very vague and not every clinical presentation is the same. Typically, patient interviews and clinical diagnostics cue the nurse for a high index of suspicion if a myocardial event has occurred or is occurring.

Age-related changes and lifestyle influences may influence the diameter and plaque occlusions of a diseased coronary artery. Initially, endothelial intimal thickening is compounded by plaque formation, whose composite is from high concentrations of low-density lipoprotein (LDL). Traveling platelets and red blood cells aggregate at the sites of plaque build-up and start to form a clot or a thrombus. Two physiological insults may happen. Under the first condition of physical duress, called **ischemia**, the coronary artery becomes constricted to the point where blood flow is temporarily stopped but resumes with medication or rest. If the same conditions occur, but blood flow to the myocardium is cut off completely, the cells die, called **infarction**. Symptom presentation and lethality may depend on the degree of infarction and which coronary artery is involved.

CLINICAL SAFETY AND PROCEDURES (QSEN)

Evidence-Based Practice: Intervention Time for Myocardial Infarction

1. Note the onset of chest pain for a patient with a high suspicion of myocardial infarction.
2. Patients who have no relief of chest pain after three doses of nitrates that are dosed at 5-minute intervals apart have a high risk of acute coronary syndrome.
3. Evidence recommends activating the emergency medical system to assist with a 90-minute window from the onset of chest pain to angioplasty intervention to maximize perfusion outcomes from a myocardial infarction.
4. Administer 325 mg aspirin for platelet aggregation.

Diagnostics and Laboratory Values

Chest pain or discomfort that occurs when blood flow to the heart is reduced is called **angina**. Stable angina is typically reversed with rest or pharmacological intervention, whereas unstable angina requires both rest and pharmacological support and can last several minutes. Classic symptoms include chest pain; pain radiating to the jaw, arms, neck, back, or stomach; shortness of breath; lightheadedness; and excessive sweating, also known as

diaphoresis. A diagnostic workup entails the measurement of serum troponins and creatine kinase MB to rule out myocardial infarction. Serum **troponin** is a protein secreted when cardiac tissue is damaged, typically six to eight hours following a myocardial infarction (British Heart Foundation, 2024). The enzyme **creatine kinase MB (CK-MB)** is secreted in the presence of damaged cardiac tissue (Medline Plus, 2023). Its levels will peak in a few hours and decrease in two days. Most emergency departments will measure troponins every six to eight hours for three levels to fully rule out myocardial infarction.

Other diagnostic tools besides blood work are necessary to complete the workup. An EKG may demonstrate abnormalities with the T waves, in which the T waves will be flipped or the ST segment will be depressed (Figure 12.23). If a patient is asymptomatic, an echocardiogram may demonstrate ventricular wall motion abnormalities. Invasive procedures such as angiography may reveal coronary blockages, which will be further discussed.

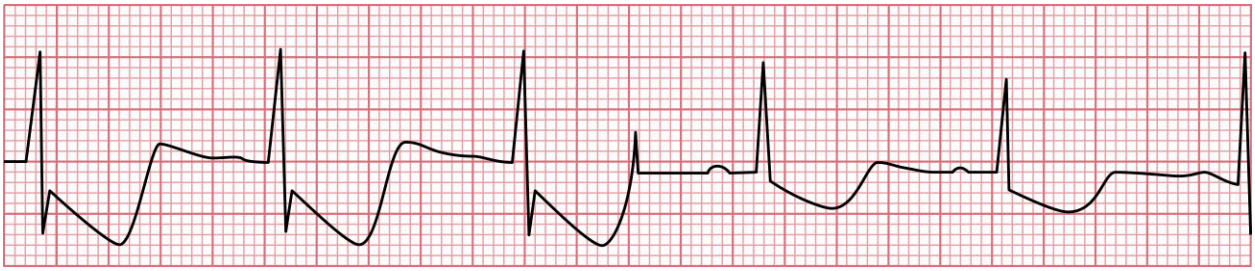


FIGURE 12.23 Depression of the ST segment will be seen in angina. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

In the acute phase of an anginal episode, nursing care focuses on maximizing the re-initiation of oxygenation to the blocked coronary vessel. Patients will have their chest pain managed, receive supplemental oxygen, and maintain bed rest. The nurse will monitor hemodynamics by applying telemetry monitoring.

An umbrella term, **acute coronary syndrome (ACS)** includes the following: non-ST-elevated myocardial infarction (NSTEMI), ST-elevated myocardial infarction (STEMI), and unstable angina (Figure 12.24). With an NSTEMI, there are no abnormal changes in the EKG; however, there would be a rise in the troponins and CK-MB levels. In contrast, with a STEMI, there are abnormal EKG changes with elevation of the ST segment in a 12-lead EKG with an upward trend in the troponins and CK-MB. Lastly, unstable angina presents with symptomatic chest pain that radiates to the jaw or down the left side with associated nausea, diaphoresis, dizziness, and fatigue that does not resolve with rest or with three doses of nitroglycerin administered five minutes apart. STEMIs require prompt, emergent intervention with angiography, as damage is more likely to extend deeper into the cardiac muscle.

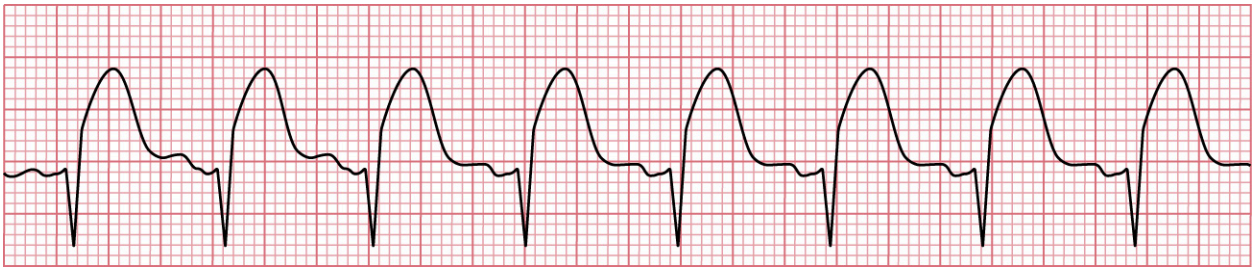


FIGURE 12.24 With a STEMI, there are EKG changes with elevation of the ST segment in a 12-lead ECG. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Nursing Care of the Patient with Myocardial Infarction

The care of the patient experiencing an MI differs whether it is in the acute phase or post-recovery phase. The best outcomes occur when nurses recognize “muscle is time,” and prompt identification is the key. Rapid treatment will vary in the acute interventional phase compared to the post-recovery phase of myocardial injury.

Recognizing and Analyzing Cues

The very first assessment the nurse must initiate is a set of vital signs, noting any deviation from normal parameters. Findings will vary: a patient experiencing MI may be hypotensive or hypertensive or will have bradycardia or tachycardia. A low pulse oxygenation of < 92 percent will indicate the patient has hypoxia. The nurse will inspect the patient’s skin, noting any evidence of cyanosis or evidence of dyspnea. The patient’s capillary refill and a distal pulse

assessment of the radials and dorsalis pedis are necessary to monitor distal perfusion and to obtain a baseline if the patient proceeds to angiography. Peripheral pulse assessments are required in the post-care of a patient undergoing angiography, and baseline assessment is required. A subjective assessment inquiring about chronic health conditions, lifestyle practices, and medication reconciliation is required.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Associated acute nursing care for the patient with MI includes the concepts of oxygenation, perfusion, and pain management. With oxygenation, the nurse must maintain pulse oximetry over 92 percent and apply telemetry with frequent hemodynamic monitoring to assess perfusion difficulties. The nurse promotes a quiet environment to decrease elevations in blood pressure and decrease oxygen demand. If the patient undergoes angiography, the patient must lie flat for a minimum of four to six hours post-procedure to reduce bleeding risk at the femoral artery puncture site. If the patient is experiencing any further chest pain, note the onset of chest pain, as ideal outcomes improve if the time from symptom onset to angiography is reduced. If the patient requires a coronary artery bypass graft (CABG) (Figure 12.25), a higher level of care in the intensive care unit level is required, as the patient is likely to be ventilated, have chest tubes, and require surgical incisional management.

Once stabilization of MI has been achieved, education is a core component of disease management. Education is directed at dietary adjustments (low saturated fat, low cholesterol, monitor processed foods), smoking cessation, and limiting/omitting alcohol. Following an MI event, the patient will participate in cardiac rehabilitation with a program to increase aerobic activity. Nurses must educate patients about sexual intimacy; often cardiologists will recommend safe resumption of intimacy if the patient can ascend a flight of stairs without chest pain, fatigue, or shortness of breath. Education should also include information about stress reduction strategies such as meditation, guided imagery, or yoga. Compliance with medications and follow-up with provider care are also necessary.

UNFOLDING CASE STUDY

COVID Complications: Part 2

Refer to COVID Complications: Part 1 for the first part of this patient's medical history. He has now been transferred to the ICU.

Nursing Notes	**2/20/2024, 12:30, Triage Assessment** Patient presents to ICU. Increased agitation, increased VS, increased effort to breathe. Dry non-productive cough. Lung sounds with diminished bases and mid-lung field, with increasing crackles from baseline. Tachycardia, repeat ABG demonstrating respiratory acidosis with lower pH, decreased PO_2, and increased PCO_2 from baseline. Weak, bodily fidgeting has decreased. Not following all appropriate commands. **Intervention** Obtain coagulation profile Initiate isolation precautions for COVID Placed on ventilator per provider's settings: positive end-expiratory pressure support of 5 cm/H_2O IV rate of 75 ml/hr Continuous cardiac monitor and pulse oximetry Albuterol nebulizer ×1 via ET tube, administered by respiratory therapy Sputum culture obtained via ET tube ABG stat Acetaminophen 650 mg suppository PR for temperature > 100.7 Sedation, diprivan IV drip 1 mg/kg Labetalol 5 mg IV initial IV push dose for a BP > 160/90. May repeat 5 mg dose IV push ×2 administered every 10 minutes until the systolic blood pressure is within the desired range Notify provider if ineffective according to parameters provided Initiate hyperglycemic protocol as indicated Heparin drip IV 5,000 U bolus and heparin drip continuous at 1,000 U/hr Troponin Cardiac enzymes ×3 Cefazolin 1.5 mg IV every 6 hr Continuous reassessments VS: BP, HR, RR, temperature, O_2 saturation Monitor blood sugars every 4 hr **02/20/24, 13:00, Assessment** Physical Examination: HEENT: pupils equal and reactive to light, mucus membranes dry, no thyroid enlargement. Lymphatic: lymphatic nodes were not swollen or enlarged. Respiratory: increased agitation, increased VS, increasing effort to breathe. Lung sounds with diminished bases and mid-lung field, with increasing crackles from baseline. Cardiovascular: tachycardia, repeat ABG demonstrating respiratory acidosis with lower pH, decreased PO_2, and increased PCO_2 from baseline. Abdomen: soft, denies pain by shaking head no, not distended, bowel sounds present all four quadrants. Musculoskeletal: weak, bodily fidgeting has decreased. Not following all commands. Skin: pale, warm, and moist; patient sedated. **02/21/2024, 00:00** Patient sedated, remains on ventilator. Skin cool and moist. Hypotensive, initiate IV norepinephrine drip. ET tube suctioned with yellow secretions, remains febrile. **02/21/24, 04:00** Physical Examination: HEENT: pupils equal and reactive to light. Respiratory: increased agitation, remain on ventilator with positive end expiratory pressure lung sounds with diminished bases and mid-lung field, with increasing crackles from baseline Cardiovascular: tachycardia, repeat ABG demonstrating respiratory acidosis with lower pH,

	decreased PO_2, and increased PCO_2 from baseline. Abdomen: soft, denies pain by shaking head no, not distended, quiet bowel sounds present all four quadrants. Musculoskeletal: weak, bodily fidgeting has decreased. Not following all commands to move extremities. Skin: warm and moist. Renal: hourly urine output 5 ml past 3 hours **Intervention** Hemodynamic monitoring initiated with frequent hemodynamic monitoring to assess for perfusion difficulties. Quiet environment to decrease elevations in blood pressure and decrease oxygen demand. Continued monitoring of oxygenation, perfusion, and pain management, including hemodynamic values, VS. ABG to assure adequate tissue perfusion and oxygenation. Antiplatelet and/or anticoagulation therapy according to provider's orders (based on lab reports). Increase IV rate to 125 ml/hr (fluid resuscitation).
Flow Chart	**02/20/24, 12:30 Assessment** Blood pressure: 100/98 Heart rate: 110 Respiratory rate: 16 per min rate per ventilator Temperature: 102.3 Oxygen saturation: 89 % on 4 Lpm Patient intubated on ventilator. Ventilator setting ordered per provider. **02/21/2024, 00:00** Vital signs: BP: 100/60 HR: 140 RR: 16 per ventilator-positive end expiratory pressure support of +10 cm/H2 (PEEP) Temp: 102.5

Lab Results	**02/20/24, 13:00** ABG pH: 7.30 PCO_2: 62 mm Hg PO_2: 70 mm Hg HCO_3: 30 mEq/L BS: 100 mg/dL Blood culture: positive for *Pseudomonas aeruginosa* Sputum culture: positive for *Staphylococcus aureus* Troponin elevated: 40 ng/l CK-MB-Cardiac enzymes elevated **02/20/24, 18:00** CBC with differential, pending WBC: 14.5 cells/mm^3 Hgb: 15 g/dl Hct: 40% INR: 1.0 BUN: 19 mg/dl Creatinine: 1.09 mg/dl Lactic acid: 3 mmol/L Na: 140 mEq/L K+: 3.8 mEq/L Cl: 100 mEq/L Pulse oximetry: 92% ABG: pH: 7.31 PCO_2: 55 mm/Hg PO_2: 60 mm/Hg HCO_3: 30mEq/L **02/21/24, 03:00** ABG: pH: 7.32 PCO_2: 50 mm/Hg PO_2: 75 mm/Hg HCO_3: 22 mEq/L BS: 180 mg/dL Lactic acid: 4.0 mmol/L

Diagnostic Tests/ Imaging Results	**02/20/24, 16:00** EKG: acute anterior lateral myocardial infarction CXR: profuse infiltrates and opacities Echocardiogram: left ventricular dysfunction (decreased wall motion and contractility) Ejection fraction: 40% Temperature: 102.5 **02/21/24, 04:00** Echocardiogram: diffuse LV hypokinesis. Other findings included isolated right ventricular dysfunction. Ejection fraction: 40% CXR: bilateral peripheral and basal; multifocal air space and consolidation of increasing opacities (ground-glass) opacity
Provider's Orders	**02/20/24, 16:00** Initiate isolation precautions for COVID On ventilator per provider's settings IV started left antecubital, #20 gauge of Ringers Lactate rate of 125 ml/hr Continuous cardiac monitor and pulse oximetry Albuterol nebulizer ×1 via ET tube, administer by respiratory therapy Coagulation profile Coagulation profile, then begin repeat heparin 5,000 U IV bolus followed by 1,000 U/hr Troponin Cardiac enzymes ×3 Cefotaxime 1 mg IV every 12 hours Discontinue cefazolin 1.5 mg IV Sedation, diprivan IV drip 1 mg/kg Labetalol 5 mg IV initial IV push dose for a B/P > 160/90. May repeat 5 mg dose IV push ×2 administered every 10 minutes until the systolic blood pressure is within the desired range. Notify provider if ineffective according to parameters provided Initiate hyperglycemic protocol as indicated Continuous monitoring VS: BP, HR, RR, temperature, O_2 saturation **02/21/24, 04:00** Insertion of hemodynamic monitoring. Following readings every 4 hours: Cardiac output Pulmonary wedge pressures Pulmonary arterial pressure Discontinue cefotaxime 1 mg IV every 12 hours Vancomycin 500 mg IV every 6 hours over a period of 60 minutes Vasopressin IV: 0.6-2.4 units/hr (0.6-2.4 mL/hr): consult critical care provider for dosing

1. At this time, the nurse would prioritize which cue as the most likely to be the most critical?

CUE	Acute MI	Possible sepsis	Bacterial pneumonia
Respiratory failure			
Decreased cardiac contractility and dysfunction			
Lactic acid increased			

2. After the nurse prioritizes the patient's clinical problems and needs, identify the correct interventions with the correct rationale from the choices provided.

Intervention	Rationale
Administer vasopressors IV	Hypotension Decreased cardiac contractility
Administer antiplatelets/ anticoagulants	Patient is hypotensive
Increase PEEP on ventilator	Bacterial pneumonia
Administer IV diuretics	Prevents formation of vascular clots (thrombus/embolus)
Hemodynamic monitoring	Monitor effectiveness of therapeutics for pulmonary and heart function

Evaluation of Nursing Care of the Patient with Myocardial Infarction

Patient recovery differs depending on the degree of damage from MI and the interventional treatment. Resumption of activities, returning to work, and restoration of stamina varies from person to person. The American Heart Association (2023) notes individuals will require several months to return to pre-disease levels with physical activity. All goals should be tailored to the patient's physiological abilities.

In the immediate, acute, and tertiary phase of treatment of MI, the nurse must implement pharmacological therapies and prepare the patient for medical or surgical intervention for revascularization. Overall goals include optimizing oxygenation, relieving chest pain, stabilizing dysrhythmias, and preserving myocardial tissue. Once the patient is stabilized, the goals will be directed more toward discharge and cardiac rehabilitation:

- demonstrating adequate oxygenation by maintaining SPO_2 > 92%
- hemodynamic stability with normal parameters for pulse and blood pressure
- resolution of chest pain
- employing rest periods with activities of daily living to conserve oxygen demands
- demonstrating understanding of adherence to medication therapy

Evaluating Outcomes

The nurse must reinforce the importance of staying on a full dose of aspirin and/or antiplatelet therapy as prescribed. Patients recovering from MIs must continue with beta-blockers to reduce the risk of reinfarction. Having the patient verbalize understanding and teach back are effective methods to evaluate understanding. The nurse will monitor the patient's willingness to make lifestyle modifications through smoking cessation and reduction of alcohol intake.

Survival from MI has increased greatly over the years with the advancement of pharmacological and interventional methods. Acceptance of this diagnosis will be life-changing for the patient and family members. The nurse should approach the care of the family unit with a nonjudgmental approach. Interprofessional referral for social services, nutrition, and case management will be considered in the planning of nursing care.

Medical Therapies and Related Care

Medical and surgical interventions include angiography and coronary artery bypass graft. In **angiography**, a catheter is threaded into the femoral artery and fluoroscopy dye is injected into the patient's coronary arteries to assess the presence of coronary blockages. If deemed safe by the provider, a stent, which resembles a coil, will be deployed following an opening of the blockage with ballooning equipment. Angiography is preferred, as the patient will be

under monitored anesthesia care and it is the least invasive. Major risks associated with the procedure include dislodging any clots proximal to the blockage elsewhere, dysrhythmia, or bleeding (Malik & Tivakaran, 2023).

If there are multiple blockages, cardiothoracic surgeons will perform surgical revascularization through **coronary artery bypass graft (CABG)**, a more aggressive form of restoring perfusion, as the patient will require general anesthesia and a higher level of care (Figure 12.25). A CABG is a surgical procedure that relocates vasculature from other vessels in the body, such as the saphenous vein in the leg, into the cardiac vasculature to restore perfusion to the heart muscle. These bypasses may be single, double, triple, or quadruple, depending upon how widespread the blockages are that need to be bypassed.

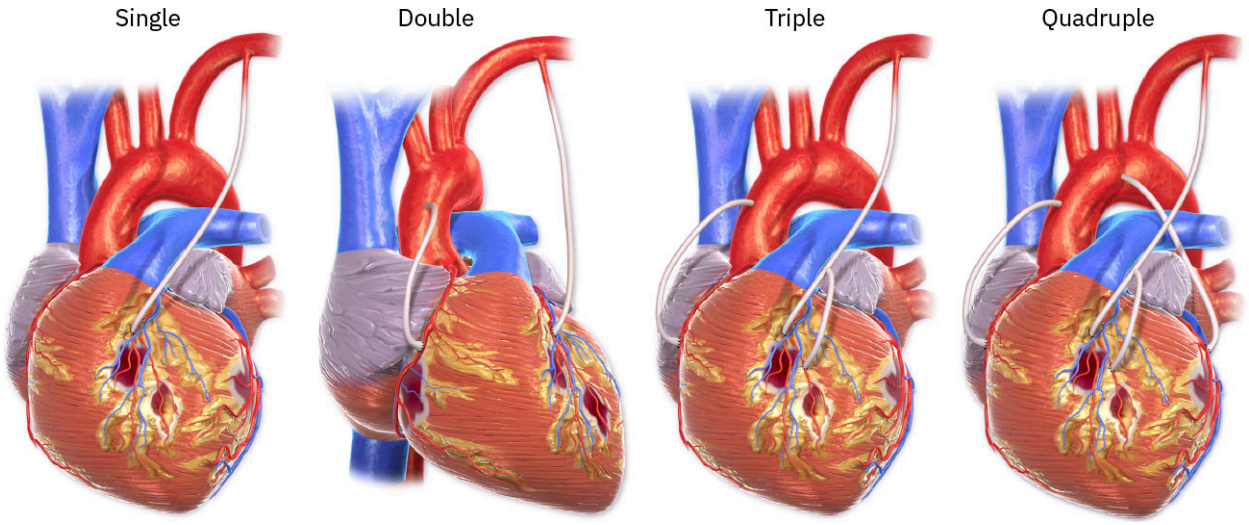


FIGURE 12.25 A coronary artery bypass graft is a surgical procedure that relocates vasculature from other vessels in the body to restore perfusion to the heart muscle. (credit: modification of "Blausen 0152 CABG All" by BruceBlaus/Wikimedia Commons, CC BY 3.0)

Acute pharmacological therapies may include antiplatelets/anticoagulants, nitrates, and beta-blockers. The most common antiplatelet therapy is aspirin 325 mg. Another antiplatelet, clopidogrel 75 mg, reduces the aggregation of a thrombus. Nursing interventions include monitoring for gastrointestinal upset, excessive bruising, and blood in the urine or stool. Anticoagulants, such as heparin, may be administered intravenously as a bolus and continuous drip. Titration of anticoagulants is weight-based and assists with thrombus reduction. The nurse is responsible for monitoring for bleeding and monitoring serum/PTT/anti-factor Xa heparin (institution specific).

Nitrates cause coronary vasodilation which helps to maximize coronary perfusion and reduce ischemia. These medications can be administered via a spray into the mouth, wearable patch paste, or sublingual pills. Nursing assessments include monitoring for hypotension, headache, and response of chest pain resolution. The nurse must use gloves when administering nitro paste to avoid undue side effects.

Beta-blockers are critical to reducing infarct involvement by reducing oxygen demand and lowering heart rate, blood pressure, and contractility, and ideally, improving myocardial oxygenation. The nurse must monitor hemodynamics closely and withhold in cases of symptomatic bradycardia (less than 50 bpm or at the provider's discretion) or low blood pressure (less than 90/50 mm Hg or at the provider's discretion).

Chronic medication therapies include antiplatelets, beta-blockers, and statins. Anti-hyperlipidemic agents are indicated to reduce endothelial inflammation and reduce plaque formation. The nurse must educate a patient taking statins about the importance of avoiding grapefruit juice due to food-drug interaction. The patient must be monitored for hepatotoxicity and educated that myalgias are a common side effect. A month following an MI, an echocardiogram will be completed to assess the left ventricular ejection fraction (EF). If the patient has a depressed EF (less than 40%), ACE inhibitors/ARBs will be initiated to reduce the risk of congestive heart failure.

Lastly, morphine, oxygen, nitrates, and aspirin were previously a therapy for ACS but are no longer practiced. Morphine is not endorsed by the American Heart Association and American College of Cardiology. Oxygen therapy and aspirin are recommended for both NSTEMI and STEMI, but nitrates are only effective for NSTEMI.

12.6 Vascular Disorders

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology and risk factors for vascular disease
- Identify the common laboratory and diagnostic tests for vascular disease
- Apply nursing concepts and plan associated nursing care for the patient with a vascular disease
- Evaluate the efficacy of nursing care for the patient with a vascular disease
- Discuss the medical therapies that apply to the care of vascular disease

The two most commonly occurring forms of vascular disease are carotid artery disease and abdominal aortic aneurysm (AAA). Also referred to as carotid artery stenosis, **carotid artery disease** is a condition that occurs when the carotid arteries, which supply blood to the brain, become narrowed or blocked by the presence of plaque. An **abdominal aortic aneurysm (AAA)** develops when plaque clogs the aorta in the abdomen, causing it to balloon out in an attempt to keep blood flowing through it. Currently, 3 percent of Americans are diagnosed with carotid artery disease (Dossahboy & Ayra, 2021), and 4 to 8 percent of Americans have AAA (Chung, 2021). Individuals with carotid artery stenosis are at high risk for stroke.

When carotid artery disease is identified, it is presumed that vascular disease is also present in the aortic and renal arteries, leading to the risk of AAA and renal disease. Untreated carotid artery disease with significant occlusion can lead to a cerebral vascular accident. A lifestyle of active nicotine use, a diet high in saturated fats, and physical inactivity all add risk to vascular disease. While the majority of AAAs remain stable, AAA dissection, in which the vessel wall tears and hemorrhages blood, occurs annually in approximately 5 to 30 cases per 1 million people (Mancini, 2022).

Pathophysiology

It is important to understand the fundamental terminology and pathophysiology associated with vascular disease. A widespread hardening of the arteries is called **arteriosclerosis,** and **atherosclerosis** is a form of arteriosclerosis in which there is narrowing and reduced blood flow through the arterial wall due to plaque formations (Mayo Clinic, 2022).

An **aneurysm** is an enlargement of an artery, due to a weakened wall from high-velocity flows of blood. An AAA will occur with an endothelial stretching of the aorta due to a stiff and sclerotic arterial narrowing. Eventually, the vessel wall out-pouches and the continued pressures from the high-pressure left ventricle will compromise the vessel wall, and it dissects with blood leaking or, in lethal cases, fully tears through the intima (Figure 12.26).

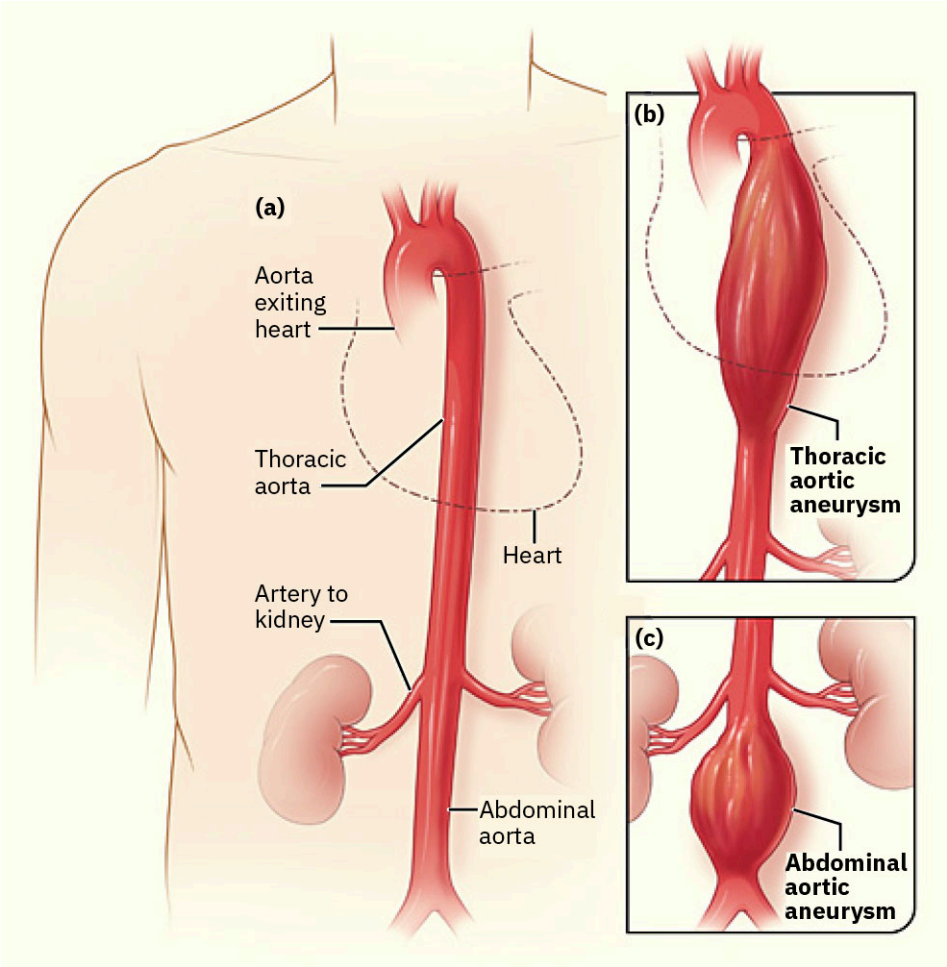


FIGURE 12.26 An AAA will occur with an endothelial stretching of the aorta due to a stiff and sclerotic arterial narrowing. (credit: modification of "Aortic aneurysms. " by NIH: National Heart, Lung and Blood Institute, Public Domain)

Clinical Manifestations

Vascular disease may not be easily identifiable, as some patients may be asymptomatic. Patients with small aneurysms may not even know they have one. Larger aneurysms will cause diaphoresis, dizziness, fainting, tachycardia, nausea and vomiting, shortness of breath, and severe, sudden abdominal pain. A ruptured AAA will manifest as a pulsation in the stomach with pain. In severe cases when it tears, the patient will experience intra-abdominal bleeding. It is important that the nurse asks about the onset of new symptoms and when they began.

Carotid artery disease may or may not cause symptoms depending on the severity of the blockage, or if it is one vessel or both. The patient may report visual changes, experience confusion, memory impairment, "brain fog," or experience numbness or weakness on the side with severe disease (Qaja et al., 2024). With more severe blockages, syncope and passing out may ensue.

Diagnostics and Laboratory Values

The first step in diagnosing carotid artery disease is an ultrasound of the great neck vessels to assess for blood flow velocity abnormalities. Carotid artery blockage greater than 50 percent will likely require pharmacological or surgical intervention. An abdominal or pelvic ultrasound or abdominal computed tomography (CT) is typically sensitive to detect AAA. Diagnostic angiography may be utilized in dual workup of coronary artery disease and AAA. While laboratory values do not directly detect the presence of vascular disease, their abnormal values may suggest its presence. Elevated calcium levels and high lipid levels will lead to diagnostic suspicion of calcium deposits and plaque formation in the arterial intima. An elevated hemoglobin A1C will suggest a background diagnosis of diabetes mellitus, which further increases the risk of vascular disease.

Nursing Care of the Patient with Vascular Disease

While clinical judgment and interventions have similarities of pertinent cardiovascular assessments, brief focused assessments centralize around the diseased vessel. Perfusion alterations may change slowly over time if the diseased vessel has persisted but will normalize if an interventional approach has been taken.

Recognizing and Analyzing Cues

The nurse will begin by performing a focused heart and lung assessment. While assessing the carotid pulse, do not occlude the diseased artery, as this will advance to a syncopal episode. Utilizing the bell of a stethoscope, gently press against the carotid arteries to listen for a **bruit**, which is a "swooshing" sound. Note the presence of the bruit and if it is soft or harsh. For AAA, assess for a non-tender pulsatile mass. Avoid pressing down firmly as this can advance a rupture. A bruit can be heard over the epigastric region as well.

A set of vital signs will identify any episodes of uncontrolled high blood pressure, as this may make a ruptured aneurysm worse. If the AAA ruptures, the patient will manifest with hypotension and tachycardia. The patient must maintain bed rest, and the nurse must call for help by alerting the rapid response team if the patient is hemodynamically unstable. It is likely the patient will be sent to the operating room for intervention. Once the AAA has been repaired, a peripheral vascular assessment will change after a revascularization; if perfusion is restored after correction of a tight vessel or a compromised artery in AAA, it is expected pulses will improve. The nurse must note the quality and character of distal pulses. Blockages from carotid artery stenosis may affect blood flow to the affected limb. Radial pulses and pulses in the feet need to be monitored for post-procedure evaluation so that the blood is not compromised in the limbs.

For safety, patients with occlusions in the carotid artery should change position slowly to avoid dizziness, dangle feet before standing up, or maintain bed rest if unable to safely ambulate. The patient will receive a statin, antiplatelets, antihypertensives, and anti-diabetic agents as necessary. Reinforce lifestyle modification with smoking cessation and healthy eating.

Evaluation of Nursing Care of the Patient with Vascular Disease

Disease stability and improvement in circulation are the main outcomes when evaluating the efficacy of nursing care. The following goals should be incorporated:

- Circulation goals for patients with stable disease are to maintain hemodynamic stability with blood pressures less than 120/90 mm Hg.
- In cases of AAA dissection or carotid artery occlusion, the patient will receive appropriate revascularization therapies.
- The patient's pulses will remain unchanged or improve following revascularization therapies.
- For skin integrity, if the patient is to have a CEA, the incision will remain open to air and will be free of redness, edema, and discharge. Endovascular repair access sites may require the patient to keep the limb straight or remain flat dependent on the access site.

Evaluating Outcomes

Following stabilization, secondary prevention strategies are created to avert further vasculopathy events. The Joint Task Force from the European Atherosclerosis Society and European Society of Vascular Medicine (2023) recommend the patient's low-density lipoprotein target levels less than 70 mg/dL, controlled diabetes with an A1C less than 7 percent, and blood pressure will remain within normal parameters. Patients with vascular disease are likely to have knowledge gaps. Teaching about lifestyle modifications may center around the patient's understanding of the effects of nicotine on vascular health and making healthy nutrition choices.

Vascular disease is a very preventable disease; however, the nurse's role in the care of the patient with these illnesses is influenced by secondary and tertiary preventive strategies. The medical emergent implications with AAA and the progressive features of carotid artery disease require astute physical assessment, knowledge of the vascular system, and the wellness requirements to delay disease. Disease management can be successful with nursing support and informed education.

LINK TO LEARNING

This article discusses the relationship between cigarette smoking and carotid artery disease (https://openstax.org/r/77CigsHeartDis) in Hispanic, Black, and White patients.

Medical Therapies and Related Care

The degree of intervention for AAA will depend on the measurement of the endovascular aneurysm size. The Society for Vascular Surgery recommends annual monitoring for AAAs measuring 4 to 4.9 cm in diameter. For AAAs measuring larger than 5.5 cm, elective (planned) endovascular surgery is indicated; in severe cases with rupture, an open approach is necessary (Chiakof et al., 2018) (Figure 12.27). Similar to the 90-minute door-to-angioplasty time (or "door-to-balloon" time) for coronary reperfusion, the Society for Vascular Surgery recommends the same timeframe for vascular repair of a ruptured AAA (Chiakof, 2018).

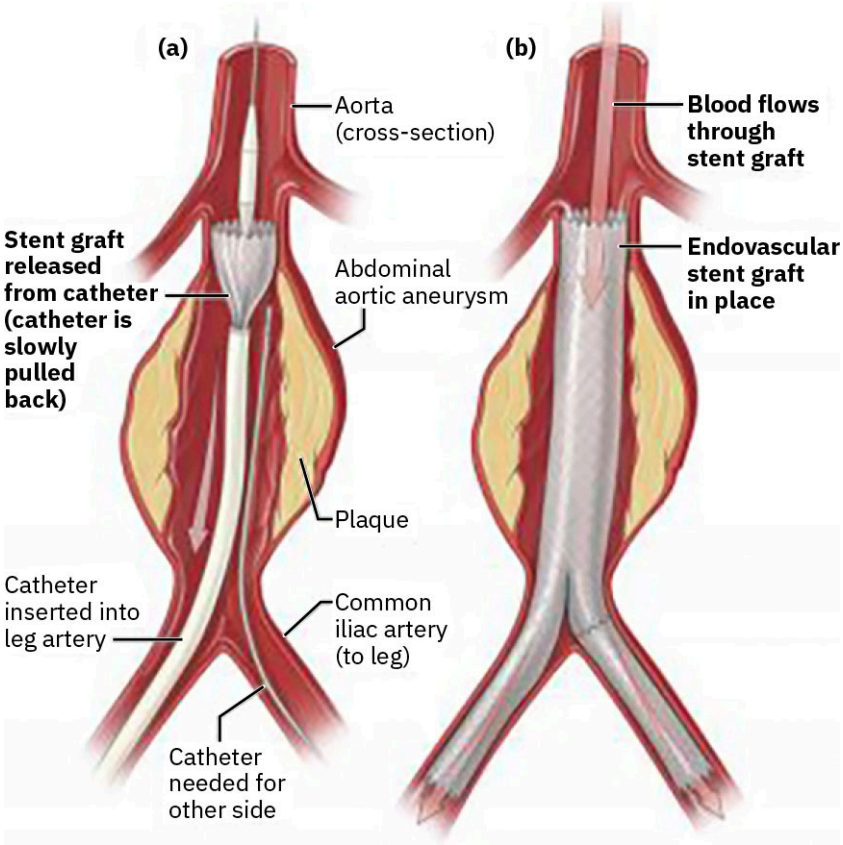


FIGURE 12.27 To perform an endovascular repair, (a) a stent is placed using a guidewire inserted through the femoral artery. (b) It is then grafted in place. The procedure is minimally invasive, and the stent provides stability in avoiding further stretching the abdominal aorta. (credit: modification of "Endovascular repair" by NIH: National Heart, Lung and Blood Institute/Public Domain)

Endovascular intervention is similar in procedure to angiography. A guidewire is inserted into the femoral artery and an expandable stent graft is threaded through the guidewire. The stent permits blood flow and creates stability in the arterial wall, avoiding continued strain on the outpouching (Schanzer, n.d.).

Carotid artery stenosis with less than 50 percent blockage requires medical monitoring. Revascularization with a surgical carotid endarterectomy (CEA) (Figure 12.28) is indicated for symptomatic blockages of 50 to 99 percent and asymptomatic blockages of 70 to 99 percent.

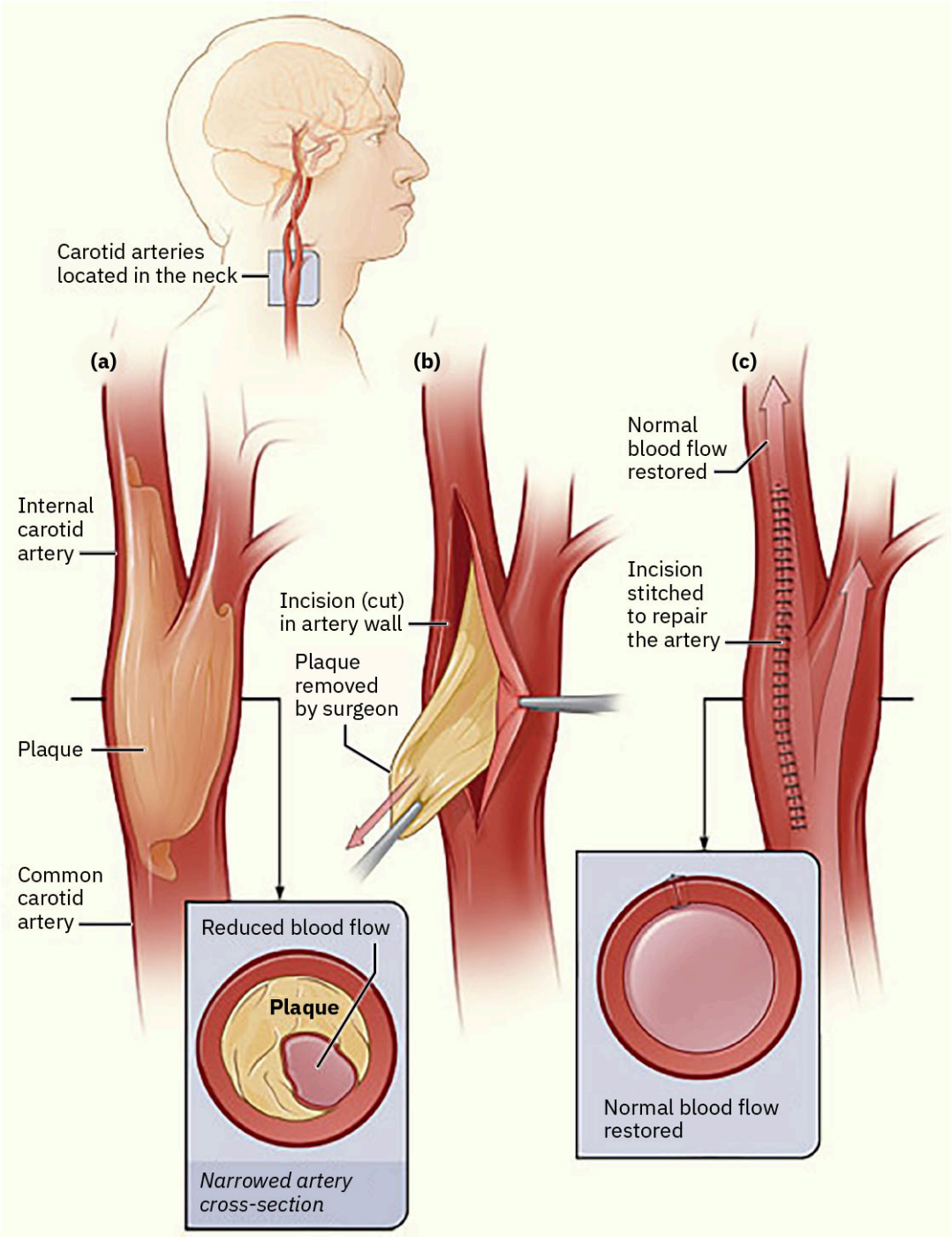


FIGURE 12.28 (a) A carotid endarterectomy is indicated for plaque blockages of 50 to 99 percent. (b) A vascular surgeon makes an open incision, removes excess plaque, and (c) stitches the vessel to close the surgical incision with a mesh closing. (credit: modification of "Cad endarterectomy" by National Heart Lung and Blood Institute (NIH)/Wikimedia Commons, Public Domain)

Pharmacological therapies for both carotid artery disease and AAA are similar in that patients will receive lipid-lowering therapies with statins (e.g. atorvastatin), antihypertensive therapy, and antiplatelet therapy (i.e., chronic aspirin therapy) as necessary. Diabetes control, when applicable, is also important. Lifestyle modifications such as smoking cessation, a low fat/low cholesterol diet, limiting or omitting alcohol, and exercise are also recommended to reduce the risk of further plaque formation.

12.7 Peripheral Vascular Disease

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations of peripheral vascular disease
- Identify the common laboratory and diagnostic tests for peripheral vascular disorders
- Describe the clinical manifestations and nursing care for venous insufficiency
- Describe the clinical manifestation and nursing care for arterial insufficiency
- Evaluate the efficacy of nursing care for the patient with peripheral vascular disease
- Discuss the medical therapies that apply to the care of peripheral vascular disease

Peripheral vasculature is the vasculature extending beyond the heart. It includes the arteries, arterioles, capillaries, venules, and veins (Figure 12.29). Understanding this anatomy and physiology is important to the understanding of peripheral vascular disease.

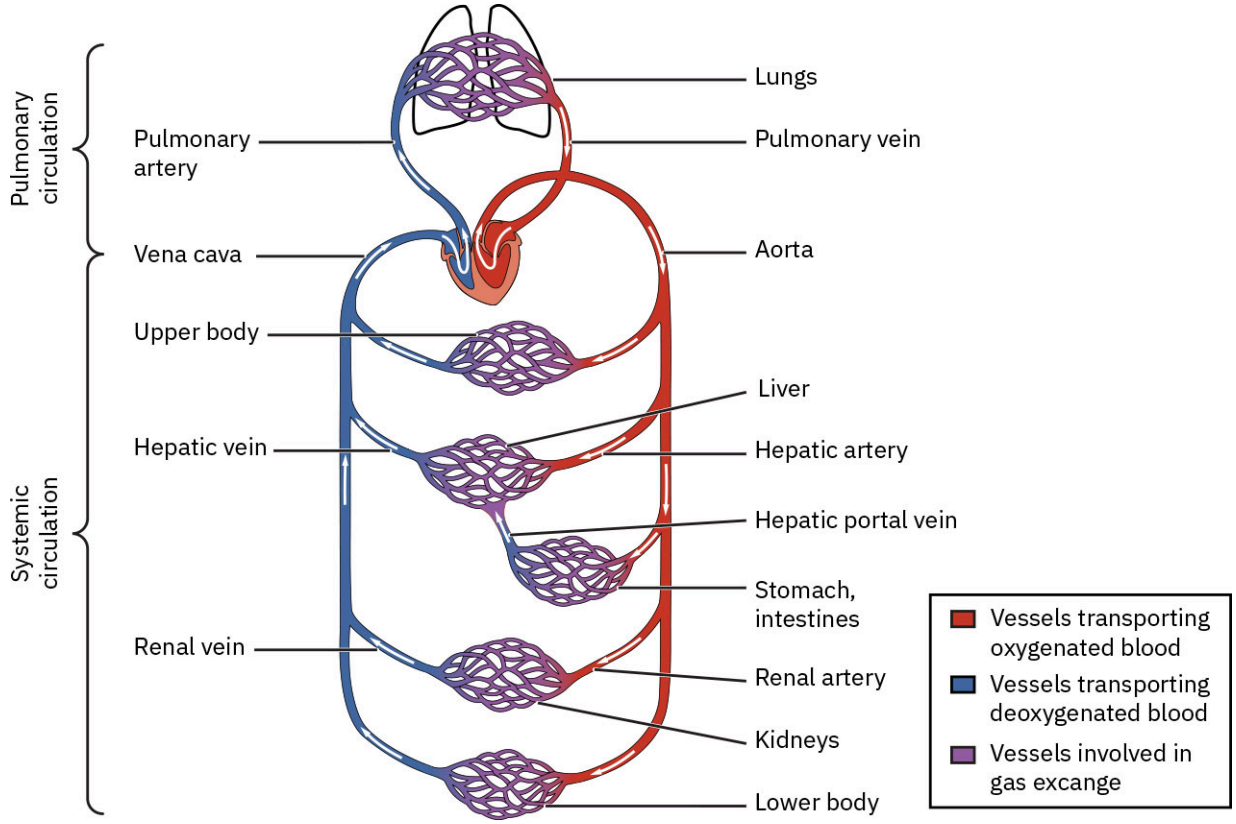


FIGURE 12.29 Peripheral vasculature supplies blood to the body and consists of pulmonary circulation and systemic circulation. (modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Arterioles direct blood flow to organs. They respond to systemic vascular resistance through dilation and constriction in response to the autonomic nervous system. Capillaries are very thin, fragile, single endothelial layered vessels that are the conduit between arterioles and venules. One example of capillary sites is fingers and toes. Venules connect from the capillaries to the veins, which assist in the return of deoxygenated blood to the heart (Tucker et al., 2023).

Pathophysiology

A chronic, progressive disorder, **peripheral vascular disease (PVD)** causes blood vessels outside of the heart and brain to narrow, block, or spasm; it affects both venous and arterial circulation. Chronic venous insufficiency, or **peripheral venous disease**, is compromised blood flow of the venous system, and peripheral arterial disease is compromised blood flow of the arterial system (Figure 12.30). Peripheral venous disease is more common in females and those who are older and have obesity (Rabe et al., 2020). While veins are supposed to return blood flow to the heart for re-oxygenation, noncompliant veins confront a flow issue and valvular incompetence causes

backward reflux into the vasculature of the legs (Weiss, 2020).

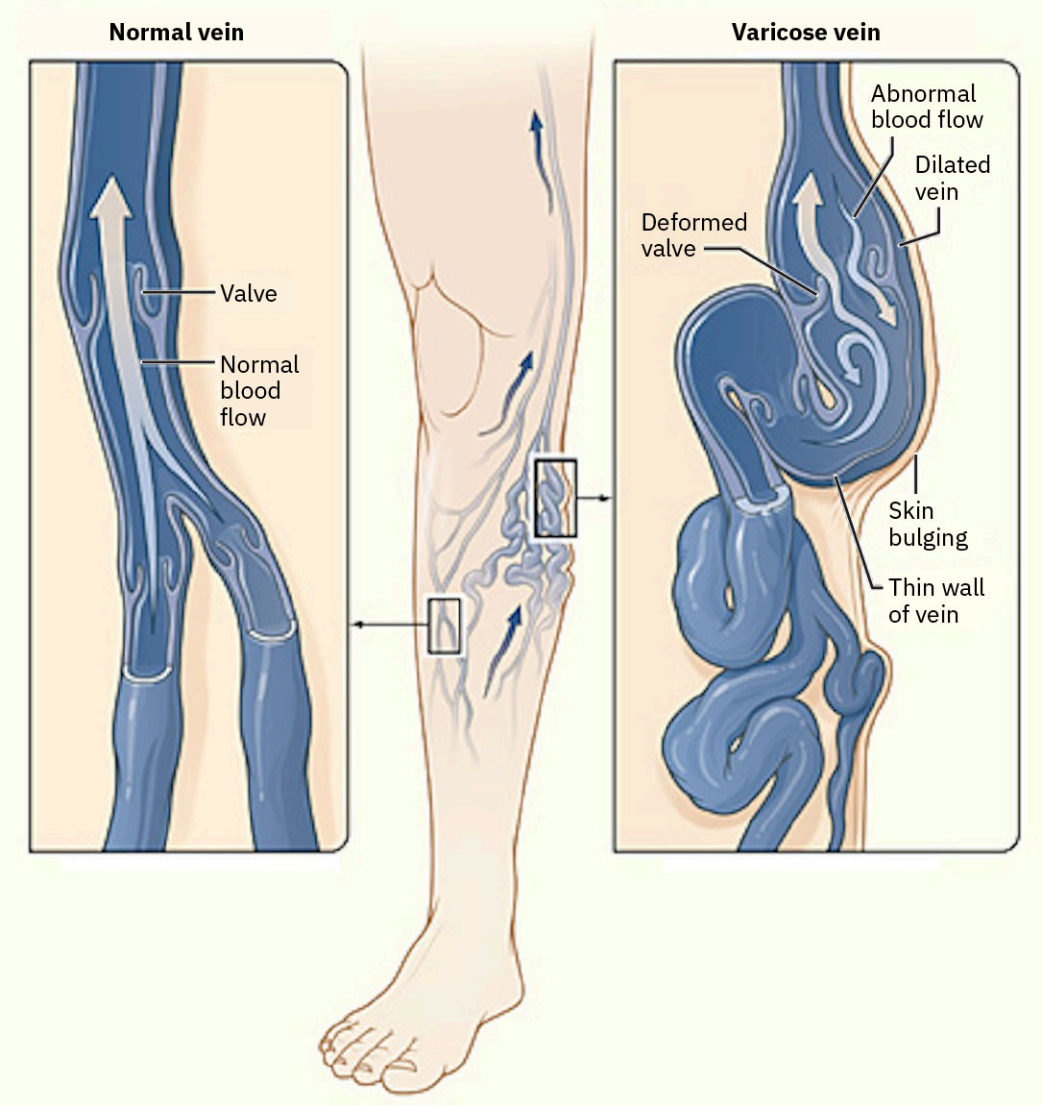


FIGURE 12.30 Venous insufficiency occurs when valvular incompetence causes blood flow back to the heart to be impeded. (credit: modification of "Varicose veins" by NIH: National Heart, Lung and Blood Institute, Public Domain)

Reduced blood flow from atherosclerotic blockages is known as **peripheral arterial disease**. When arterial blood is obstructed by narrowed, constricted vessels (Figure 12.31, the legs encounter a perfusion defect, and the patient may experience pain during ambulation, which is known as **intermittent claudication**. Peripheral arterial disease afflicts over 230 million people, who are older, smoke, and have other comorbidities of heart disease and diabetes (Aday & Matsushita, 2021). Both males and females over age 60 are affected equally by peripheral arterial disease (CDC, 2022). In patients with diagnosed coronary artery disease, aortic disease, or carotid artery disease, there is a high likelihood of peripheral arterial disease.

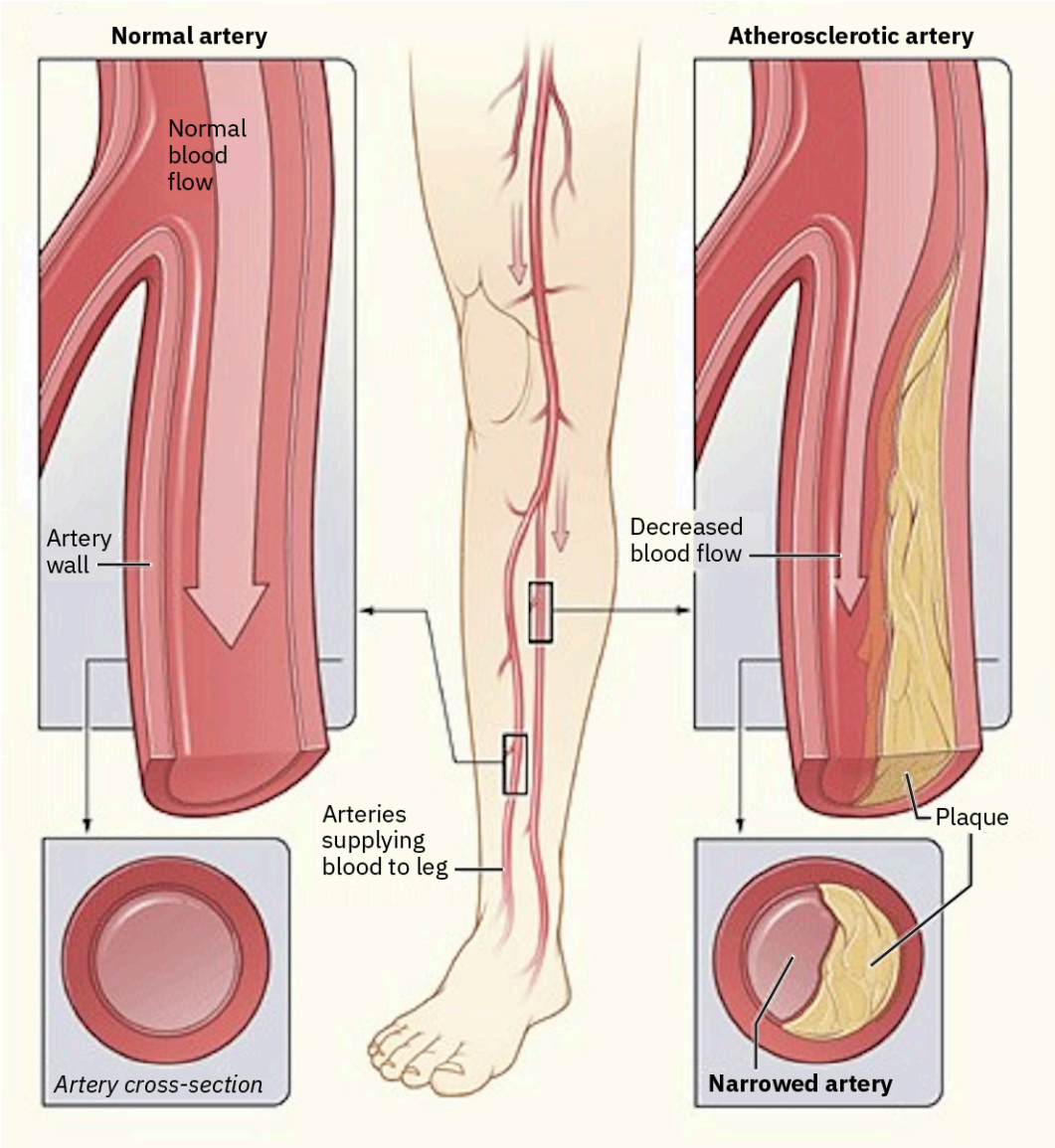


FIGURE 12.31 Arterial insufficiency occurs when arterial blood flow is reduced due to atherosclerotic blockages. (credit: modification of "Atherosclerosis in the leg arteries" by NIH: National Heart, Lung and Blood Institute, Public Domain)

Diagnostics and Laboratory Values

A patient with suspected peripheral vascular disease will first undergo noninvasive imaging with an ultrasound to visualize flow in the vessels. Another noninvasive method utilized is the ankle-brachial index (Figure 12.32), in which blood pressures are evaluated in the legs and arms at rest and after the patient walks on a treadmill on a slight incline. Discrepancies in the blood pressure will suggest a blood flow abnormality that is reproduced with activity. There are also invasive diagnostic tests, such as a peripheral angiogram, that may be performed. Risk stratification in identifying disease prevalence will be supported by elevated lipids (hyperlipidemia) and elevated hemoglobin A1C (diabetes).

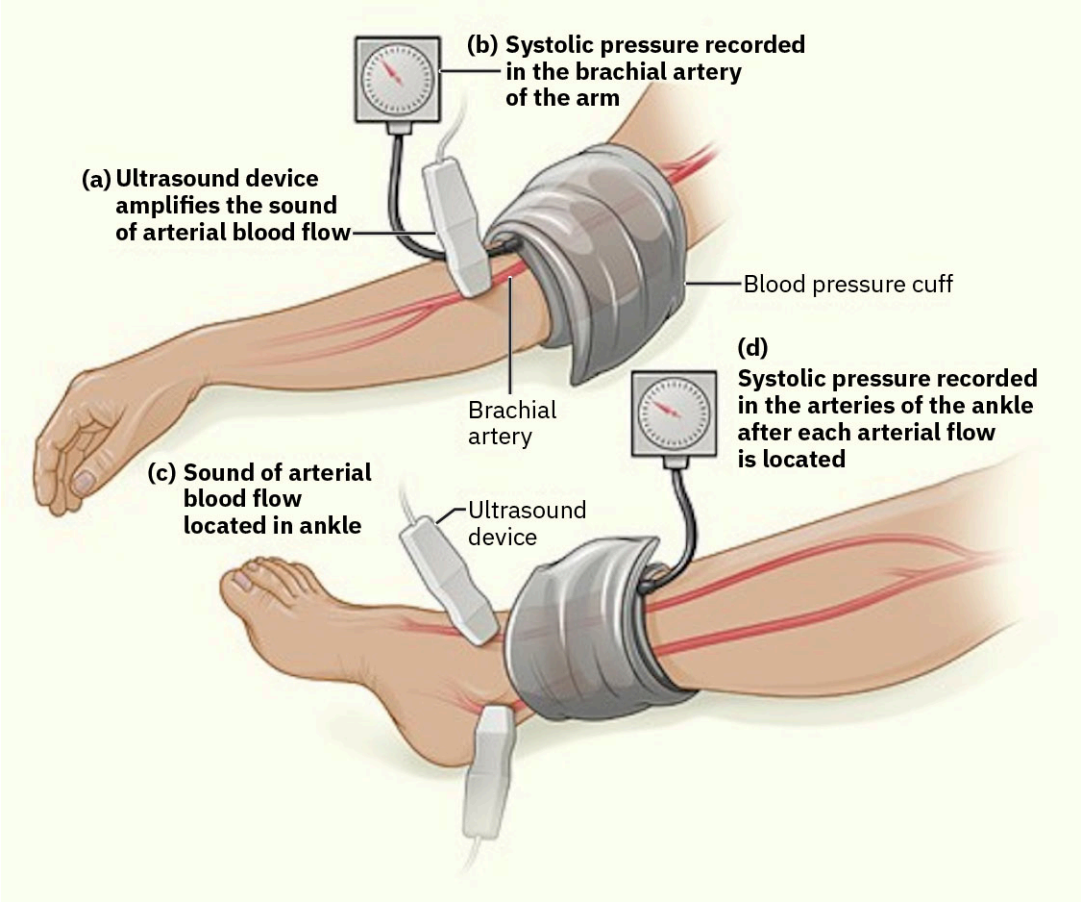


FIGURE 12.32 For the ankle-brachial index, blood pressure cuffs are applied to a patient's arms and legs. These pressures are taken after intermittent increases in incline and speed on a treadmill. The nurse will document if the patient has any pain in the legs as the test progresses. (credit: modification of "Atherosclerosis in the leg arteries" by NIH: National Heart, Lung and Blood Institute, Public Domain)

CLINICAL SAFETY AND PROCEDURES (QSEN)

QSEN Competency: Safety: Ankle Brachial Index

Disclaimer: Always follow the agency's policy for medication administration.

Definition: Minimize risk of harm to patients and providers through both system effectiveness and individual performance.

Knowledge: Examine human factors and other basic safety design principles as well as commonly used unsafe practices (such as workarounds and dangerous abbreviations).

Skill: Use appropriate strategies to reduce reliance on memory (such as forcing functions and checklists). The nurse will:

1. Take a baseline blood pressure of the patient's bilateral arms and legs.
2. Have the patient walk for several minutes on a treadmill with a slight incline.
3. Take another series of blood pressure measurements.
4. Have the patient repeat the treadmill walk at a slightly faster pace and higher incline.
5. Document any symptoms of intermittent claudication. In a positive result, the pressures will reduce with incremental increases in the incline and speed of the treadmill, while also noting if the patient reports pain in the legs with activity.

Attitude: Value the contributions of standardization/reliability to safety.

(QSEN Institute, n.d.)

Venous Insufficiency: Clinical Manifestations and Nursing Care

Veins in the lower extremities that struggle to return blood back to the heart for reoxygenation and recirculation likely have incompetent valves causing venous blood to pool. When this occurs, the patient may report cramping and aching in the legs, or pain that worsens with standing and relieved with rest. Edema may be observed, and **varicose veins** may be evident on assessment (Figure 12.33). The nurse must assess the warmth of the extremity, noting the character of the pulses and the color of the extremity. Note the patient's hair distribution, the presence of varicose veins, and nail integrity; nail beds may be raised, thick, and discolored. In patients with darker skin tone, assessing for capillary refill in the great toe may assist with identifying a vascular compromise. At times, a **venous stasis ulcer** may surface along the medial and lateral distal part of the leg (Figure 12.34). These wounds may have a shallow depth and irregular shape with a periwound of brown or yellow and may be painless.

FIGURE 12.33 Varicose veins may be visible in the lower legs of patients with venous insufficiency. The skin may be discolored, and nails may be thick and discolored. (credit: "Varicose veins affecting the lower leg Wellcome L0061800" by Wellcome collection: St Bartholomew's Hospital Archives & Museum/Wikimedia Commons, CC BY 4.0)

FIGURE 12.34 A venous stasis ulcer may occur in venous insufficiency. The yellow periwound tissue indicates necrotic tissue. (credit: "Archivo:Venous ulcer dorsal leg" by Jonathan Moore/Wikimedia Commons, CC BY 3.0)

The patient is encouraged to change positions often to avoid prolonged standing. Wearing compression stockings will assist with venous return; if not, the patient may have to rest and elevate their legs on a pillow. Hydration is critical to avoid pooled venous blood from aggregating. The patient may need an interprofessional referral to a wound care or vascular specialist for venous stripping of painful varicose veins. For edema of 3 to 4+, a diuretic may be recommended to assist with removal of excess fluid.

Arterial Insufficiency: Clinical Manifestations and Nursing Care

Decreased perfusion to the limbs due to atherosclerotic changes will create intermittent claudication. On assessment, the affected limb may feel cold to touch, pulses may be weak, and the skin will exhibit color changes such as pallor or decreased capillary refill due to insufficient blood getting to the limbs from arterial insufficiency. Shiny skin and a lack of hair will occur due to poor perfusion to the extremities. Similar to venous insufficiency, arterial ulcers may appear; however, they are centralized to the toes, heels, and ankles and other bony prominences. Arterial ulcers are rounder and more circular than venous ulcers and have minimal to no drainage (Figure 12.35).

FIGURE 12.35 Arterial ulcers are rounder and more circular than venous ulcers and have minimal drainage. They are more likely to appear on the toes, heels, ankles, and other bony prominences. (credit: "Arterial ulcer peripheral vascular disease" by Jonathan Moore/Wikimedia Commons, CC BY 3.0)

Interventions will be focused on educating the patient to limit excess ambulation to avoid intermittent claudication. Patients are encouraged to avoid high-cholesterol foods and stop smoking to prevent further vasoconstriction. Wound care may be ordered to assist with dressings and wound debridement. Chronic pharmacological management will consist of statin therapy to avoid further plaque formation.

Evaluation of Nursing Care of the Patient with Peripheral Vascular Disease

The following goals are examples the nurse may consider when evaluating care:

- The patient will report reduced pain or increased activity to physical limits with ambulation.
- The patient's wounds will reduce in size and be free of signs and symptoms of infection.
- The patient will participate in an exercise regimen.
- The patient will display reduced edema and report increased comfort.
- The patient will return a demonstration of elevating legs for pain management.
- The patient will demonstrate compliance with a healthy lifestyle and adherence to the medication regimen.

Depending on disease severity, goals may require adjustment to reflect the status of peripheral vascular disease. Ultimately, independence, physical capabilities and comfort will guide goal creation for the patient.

REAL RN STORIES

Nurse: Melinda, RN
Years in Practice: Four
Clinical Setting: Cardiovascular unit of a community hospital
Geographic Location: Midwestern U.S.

As a staff nurse for several years on a cardiovascular floor, I was familiar with patient presentation of peripheral vascular disease. I eventually transitioned to an outpatient women's health clinic, extending care to pregnant patients. Many of my patients reported painful swollen legs with evidence of varicose veins. Some of my patients were nurses as well. There was one patient who was 34 weeks-gestation and practiced as a critical care nurse. The patient found it difficult to stand for prolonged hours due to the swelling in her legs. I recounted my own experience, recalling similar struggles in my own pregnancy with painful varicose veins and swelling. With collaboration of my practice manager, we were able to collect compression stockings and circulate them to the patients who had venous insufficiency or varicose veins. I gave my patient, the critical care nurse, a pair of compression stockings. When the patient came in for her weekly follow up, she reported reduced swelling and pain in her legs. Simple education and personal experience were helpful for the patients I treated.

Medical Therapies and Related Care

Medical therapies include pharmaceuticals, including statins and antiplatelet/anticoagulation agents, hypertension management if present, diabetes management if present, exercise, and smoking cessation as necessary. More severe cases of arterial insufficiency may require surgical intervention such as angiography, endovascular repair, or arterial bypass (Figure 12.36).

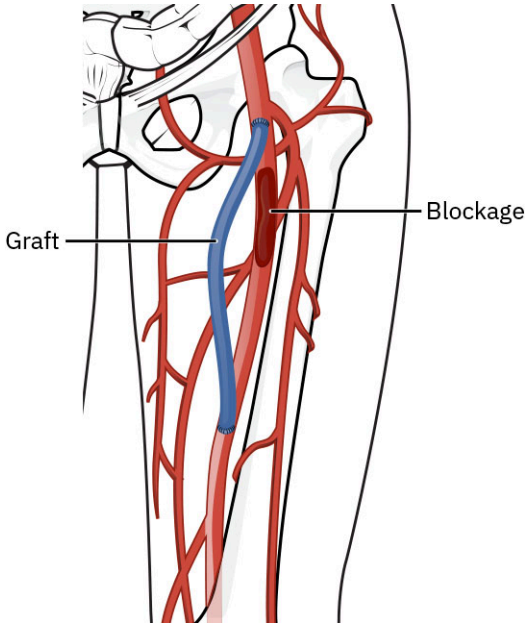


FIGURE 12.36 An arterial bypass restores blood flow by bypassing a diseased artery. (modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Summary

12.1 Cardiovascular Overview

- The coronaries perfuse the myocardial tissue with oxygen-rich blood. There are four chambers of the heart. Valves between the chambers communicate between the aorta and pulmonary veins.
- Blood starts on the right side of the heart, getting perfused to the lungs to get oxygenated, and returns to the left atrium, where it is expelled from the left ventricle to the body.
- Cardiac output is how much blood is exiting the aorta each minute.
- Stroke volume is the amount of blood that exits the left ventricle during systolic contraction.
- Preload and afterload are terms that encompass the amount of stretch and force that is required prior to contraction and during contraction, respectively.

12.2 Dysrhythmia

- Myocardial cells generate action potential and stimulate neurological impulses to cause contraction.
- Bradycardia is a slow heartbeat, less than 60 bpm. If slow enough, the patient may report dizziness or near syncope. Interventions may require discontinuing medications that are causing this issue. If the patient is asymptomatic, no intervention may be required.
- Tachycardia is a heart rate of over 100 bpm, and may be due to exercise, fever, stress, or pain. If a tachycardia dysrhythmia occurs, medications may be required.
- Ectopic beats are premature beats that occur in either the ventricles or atria. One common cause is excessive caffeine consumption.
- Heart blocks range from first, second, and third degree. Depending on the degree of heart block, monitoring of aggressive interventions such as pacing may be required.
- Atrial dysrhythmias are fast and can be regular or irregular. Treatments include medications, cardioversion, or ablation.
- Ventricular dysrhythmias are more life-threatening and require resuscitative efforts such as CPR and the use of the AED.
- Asystole rhythm shows a flat line with little to no evidence of cardiac rhythm and requires resuscitative efforts such as CPR.
- Nursing care will center around the type of dysrhythmia and if perfusion has been restored.

12.3 Heart Failure

- Pathophysiology of HF can be linked back to modifiable and nonmodifiable risk factors. The most common cause of HF is coronary artery disease and/or coronary artery blockage.
- Right-sided heart failure manifests when increased fluid pushes fluid back into the pulmonary system, congesting the right side of the heart and causing the right ventricle to fail. Left-sided heart failure manifests from left ventricular failure and cannot effectively pump blood throughout the body.
- Clinical manifestations of HF include dyspnea, edema, orthopnea, chest pain, cough, and weight gain.
- Nursing interventions of HF include daily weights, keeping the head of the bed in high Fowlers, clustering care, monitoring medication adherence, and educating patients on modifiable risk factors.
- Common pharmacological therapies include ACE inhibitors/ARBs, beta-blockers, diuretics, and nitrates.

12.4 Hypertension

- Hypertension, often known as the “silent killer,” is a preventable disease, but has paramount effects on overall health.
- Uncontrolled blood pressure has been linked with stroke, heart failure, myocardial infarction, kidney disease, and death.
- Hypertensive urgency includes symptoms of headache, blurred vision, and chest pain, while malignant hypertension are these symptoms plus target organ damage.
- To obtain accurate blood pressure readings, measurements should be taken on two different occasions using a properly sized cuff. The patient should be positioned in a comfortable environment and should refrain from eating or smoking for 30-45 minutes prior to the assessment.
- Interventions for hypertension center around the education of risk factors, medication compliance, lifestyle

changes, and evaluating appropriate responses to therapies. Therapies are initially aimed at diet, exercise, and weight loss. If lifestyle modifications are ineffective, pharmacological therapies are implemented.
- Nursing care includes teaching about reduced sodium intake, education on lifestyle modification, and assessment of medication effects.
- When evaluating outcomes, the patient should have a reduction of blood pressure readings or verbalization about making lifestyle modifications.

12.5 Myocardial Infarction

- MI events have a high mortality rate and morbidity rate if not appropriately addressed.
- Ischemia occurs when there is a temporary lack of blood flow, but is restored by medications and rest, whereas infarction is tissue death from a completely occluding thrombus.
- Risk stratification by identifying high-risk individuals, thorough medical history, and medication reconciliation (certain medications can cue the nurse if the patient has a history of MI) is paramount to eliminate occurrence of a cardiac event.
- Symptoms of MI include chest pain, shortness of breath, jaw pain, fatigue, palpitations, or nausea.
- Urgent interventions center around revascularization and administration of medications to dilate coronaries and prevent further platelet aggregation.
- Nursing interventions are gauged at optimizing oxygenation, reducing cardiac workload, and improving survivability.
- Evaluation of care is dependent on the patient's degree of infarction. More invasive and aggressive interventions may be required for STEMI compared to NSTEMI. The care and evaluation are tailored to the patient's diagnosis and clinical presentation.

12.6 Vascular Disorders

- Arteriosclerosis and atherosclerosis can cause narrowing of the arteries and reduced blood flow due to plaque formations.
- Carotid artery disease may or may not cause symptoms depending on the severity of the blockage, or the number of vessels blocked. Comorbidity management influences the risk of vascular disease incidence.
- Small AAA may be asymptomatic, but larger ones will cause cool clammy skin, diaphoresis, dizziness, fainting, tachycardia, nausea and vomiting, shortness of breath, and severe, sudden abdominal pain.
- Nursing responsibilities include hemodynamic stabilization, pre- and post-monitoring of patients undergoing revascularization procedures, and education on lifestyle adjustments.
- Medical management is first-line therapy with lifestyle modifications and adherence to medications. Surgical intervention is necessitated when blockages advance or vascular rupture is evident.

12.7 Peripheral Vascular Disease

- The peripheral vascular system comprises veins that return blood to the heart, arteries that bring blood away from the heart, and arterioles.
- The pathophysiology of venous insufficiency is that blood cannot return to the heart as efficiently and pools with bluish discoloration, whereas in arterial insufficiency, blood is not getting to the limbs efficiently, manifesting with pain, altered pulses, and diminished hair growth.
- Comorbidity management influences the risk of peripheral vascular disease incidence.
- Diagnostics include ultrasound, ankle-brachial index, and labs to identify risk factors.
- Nursing responsibilities include pain management, activity restriction, medication management, wound care, and surgery if indicated.
- Evaluation of goals center around reduction of wounds, ability to participate in exercise, and adherence to healthy lifestyle.
- Medical management is first-line therapy with lifestyle modifications and adherence to medications. Surgical intervention is necessitated when blockages advance.

Key Terms

abdominal aortic aneurysm (AAA) aorta in the abdomen is clogged with plaque, so it balloons out in an attempt to keep the blood flowing

ablation procedure that creates scars in the heart tissue that block the abnormal electrical impulses to help the heart maintain a normal rhythm

acute coronary syndrome (ACS) umbrella term that includes the following: non-ST-elevated myocardial infarction (NSTEMI), ST-elevated myocardial infarction (STEMI), and unstable angina

afterload amount of pressure the heart needs to exert during ventricular contraction

aneurysm enlargement of an artery, due to weakened wall from high velocity flows of blood

angina chest pain or discomfort that occurs when blood flow to the heart is reduced

angiography procedure in which a catheter is threaded into the femoral artery and fluoroscopy dye is injected into the patient's coronaries to assess the presence of coronary blockages

arteriosclerosis widespread hardening of the arteries

asystole cardiac activity ceases to occur due to termination of electrical conduction

atherosclerosis form of arteriosclerosis in which there is narrowing and reduced blood flow through the arterial wall due to plaque formations

atrial depolarization interval between the P wave and the R wave in the QRS complex; measurement of the time needed for electricity to travel from the atria to the ventricles

atrial fibrillation (AFib) irregular, fast cardiac rhythm originating from the atria with multiple impulses being fired

atrial flutter (A flutter) atrial dysrhythmia that has a regular but tachycardic rhythm caused by electrical re-entry in the right atrial circuity; classic "saw tooth pattern"

bruit "swooshing" sound

cardiac output number of liters of blood that exit the aorta in a minute

cardiomegaly ventricular enlargement to accommodate excess fluid

cardioversion procedure performed by a machine or medicine that restores a normal heart rhythm when the heart is beating too fast or irregularly

carotid artery disease condition that occurs when the carotid arteries become narrowed or blocked by the presence of plaque; also known as carotid artery stenosis

congestive heart failure (CHF) chronic condition that reduces perfusion to the body because the heart works inefficiently; commonly called heart failure (HF)

coronary artery bypass graft (CABG) surgical procedure in which veins from other parts of the body are placed over diseased coronaries to restore blood flow

creatine kinase MB (CK-MB) enzyme that is leaked during a myocardial infarction and is a blood test used in the diagnosis of a myocardial infarction

diaphoresis excessive sweating

dyspnea difficulty breathing

echocardiogram digital image that offers visualization of valve competency, filling pressures, measurements of ventricular thickness, and compliance of the ventricles

ectopic beat occasional, singular, irregular beat that may originate from the atria or the ventricles

ejection fraction measure of ventricular compliance, expressed as a fraction

first-degree heart block cardiac rhythm in which the PR interval is consistently greater than 0.20 seconds while QRS is normal and regular

hepatosplenomegaly liver and spleen enlargement from excess fluid

hypertensive urgency when a patient has a blood pressure over 160/90 mm Hg and has symptoms of headache, shortness of breath, blurred vision, or chest pain

infarction death of tissue due to a lack of perfusion

intermittent claudication leg pain during ambulation caused by a perfusion defect due to narrow, constricted arteries

ischemia temporary blockage of blood through an artery due to blockage

left ventricular hypertrophy compensatory thickening of the ventricle due to increased myocardial stress and increased pressure

left-sided heart failure left ventricle muscle is damaged and weak and can no longer pump enough blood through the body

malignant hypertension the same features as hypertensive urgency, but with signs of target organ disease, such as kidney failure or heart failure

Mobitz I second-degree heart block cardiac rhythm in which the PR interval gets longer with each beat until a

QRS is dropped, and the pattern repeats

Mobitz II second-degree heart block heart rhythm in which the PR interval remains constant, but some of the QRSs are randomly dropped

normal sinus rhythm cardiac rhythm originating from the sinus node that describes the characteristic rhythm in the healthy human heart

orthopnea difficulty breathing while lying flat

pacemaker electrical device surgically implanted to regulate an abnormal heartbeat

peripheral arterial disease compromised blood flow of the arterial system

peripheral vascular disease (PVD) chronic, progressive disorder that causes blood vessels, both venous and arterial, outside of the heart and brain to narrow, block, or spasm

peripheral venous disease compromised blood flow of the venous system

preload initial stretch of the cardiac cells prior to contraction

premature atrial contraction (PAC) ectopic beat originating from the atrium that causes an early, irregular occurrence of P and QRS waves

premature ventricular contraction (PVC) ectopic beat originating from the ventricle that causes an early, irregular occurrence of a wide QRS wave

primary hypertension hypertension that is multi-factorial and does not have one distinct cause; also called essential hypertension

right-sided heart failure increased fluid pushes fluid back into the pulmonary system, and congests the right side of the heart, causing the right ventricle to fail

secondary hypertension hypertension caused by another medical condition, such as thyroid issues or adrenal or kidney disease

sinus bradycardia cardiac rhythm with a rate less than 60 bpm, with regular PR and QRS intervals

sinus tachycardia cardiac rhythm with a rate greater than 100 bpm, with regular PR and QRS intervals

stroke volume amount of blood pumped out of the left ventricle during systolic contraction

supraventricular tachycardia (SVT) umbrella term utilized to discuss rhythm disturbances that occur above the ventricles

third-degree heart block loss of electrical impulses between the atria and the ventricles

transcutaneous pacing noninvasive procedure that uses electrical impulses to temporarily pace a patient's heart

troponins proteins that leak during a myocardial infarction, can be measured from a blood test

varicose veins due to venous insufficiency, veins may "pop" out more and can be painful

venous stasis ulcer ulcer that can form due to venous insufficiency

ventricular depolarization measurement of time electricity travels through the ventricles to conduct a ventricular contraction and is represented by the QRS complex

ventricular fibrillation potentially life-threatening cardiac rhythm in which the ventricle beats rapidly at over 200 bpm; chaotic with no discernible QRS, PRs, or P waves

ventricular tachycardia potentially life-threatening cardiac rhythm in which the ventricle beats rapidly at 150 to 200 bpm, with wide QRS complexes and no discernible PRs or P waves

Assessments

Review Questions

1. From what heart chamber will deoxygenated blood be delivered to the lungs for oxygenation?

a. right atrium
b. right ventricle
c. left atrium
d. left ventricle

2. What term defines the amount of stretch myocardial cells must employ prior to a contraction?

a. stroke volume
b. automaticity
c. preload
d. afterload

3. What factors affect cardiac output? Select all that apply.

a. gender
b. age
c. heart failure
d. education level
e. previous hospitalization

4. In an ECG, what would represent electrical activity conducted by the atria?

a. QRS
b. PR interval
c. T wave
d. P wave

5. What is not a risk factor for bradycardia?

a. opioid overdose
b. third-degree heart block
c. avid distance runner
d. smoking

6. What would most likely trigger an ectopic dysrhythmia?

a. potassium 4.0 mmol/L
b. magnesium 2.2 mg/dL
c. decaffeinated tea
d. coffee

7. A patient was found pale, short of breath, and in rapid atrial fibrillation at 120 beats per minute. The patient successfully cardioverted. What evaluation would the nurse anticipate to know the treatment was effective?

a. Patient reports dizziness upon standing.
b. The patient's blood pressure is 88/48 mm Hg.
c. The patient's apical pulse is regular.
d. The patient's capillary refill is 3+.

8. A patient has been newly diagnosed with atrial fibrillation. What factor would put the patient at risk for developing a blood clot? Select all that apply.

a. history of hyperlipidemia
b. age 76 years
c. history of heart failure
d. history of hypertension
e. female gender

9. What comorbidity most commonly elevates the risk of HF development? Select all that apply.

a. MI
b. HTN
c. aortic dissection
d. obstructive sleep apnea

10. What is a gold standard test for diagnosing HF?

a. echocardiogram
b. chest X-ray
c. electrocardiogram
d. cardiac catheterization

11. What response should a patient display if they are having a therapeutic response to diuretics?
   a. potassium 4.0 mmol/dl
   b. weight increase of 2 lbs
   c. unchanged orthopnea
   d. increased ease of breathing

12. How do nitrates assist patients with HF?
   a. preload reduction
   b. afterload reduction
   c. coronary vasoconstriction
   d. ventricular remodeling

13. What cue would the nurse expect to recognize in heart sounds for a patient in HF?
   a. murmur
   b. regular rate and rhythm
   c. bradycardia
   d. pericardial click

14. What outcome would the nurse expect for the patient on diuretic therapy for HF?
   a. The patient's weight will be reduced by 2 lbs.
   b. The patient will liberally drink fluids.
   c. The patient will have to work through moments of fatigue during activities of daily living.
   d. The patient will take the medication with a blood pressure of 88/48 mm Hg.

15. What is a modifiable risk factor that places a patient at risk for developing hypertension?
   a. diabetes insipidus
   b. a low-sodium diet
   c. obesity
   d. female

16. What is the pathophysiological function that causes the blood to be hypercoagulable?
   a. endothelial dysfunction
   b. arteriolar dilation
   c. increased autonomic nervous system activity
   d. reduced serum angiotensin

17. What medication therapy is indicated for Black patients for hypertension?
   a. loop diuretics
   b. alpha receptor blockers
   c. ACE inhibitors
   d. beta-blockers

18. What is an example of a statement made by the nurse that demonstrates education about modifiable risk reduction to control high blood pressure?
   a. "You're all set because you quit smoking."
   b. "It's okay to continue with excessive coffee since that does not affect blood pressure."
   c. "It is recommended to abstain from alcohol."
   d. "Completing sixty minutes of physical activity per week should help with your blood pressure."

19. A nurse is conducting an educational session on dietary changes for a patient newly diagnosed with hypertension. What statement made by the patient would indicate the teaching was effective?
   a. "I will reduce my intake of 2 bowls to one bowl of ice cream every night."
   b. "I will continue to drink red wine."

c. "I will monitor how much salt I am eating."
d. "I will increase my fluid intake."

20. What coronary artery perfuses the sinoatrial node, known as the "pacemaker" of the heart?
a. right coronary artery
b. left circumflex artery
c. left main coronary artery
d. left anterior descending artery

21. What is true about stable angina?
a. worsens with rest
b. lasts several minutes
c. reversed with rest
d. worsens despite pharmacological intervention

22. What finding or findings represents STEMI? Select all that apply.

a. there are no ECG changes
b. elevation in troponins
c. there are ECG changes
d. elevation in CK-MB levels
e. does not require emergent angiography

23. A patient has acutely ruled in for NSTEMI and will be proceeding to angiography in a few hours. What medications would the nurse anticipate for this patient? Select all that apply.

a. Simvastatin
b. Losartan
c. Metoprolol
d. Heparin
e. Clopidogrel

24. What cue would the nurse recognize to be consistent with MI?
a. pulse 64 bpm
b. normal sinus rhythm
c. 120/64 mm Hg
d. 82/40 mm Hg

25. What clinical manifestation represents carotid artery disease?
a. nausea
b. vomiting
c. leg pain
d. vision changes

26. What populations are at risk for venous insufficiency? Select all that apply.

a. males
b. females
c. obese
d. thin
e. Age 65 years old or older

27. What is the noninvasive diagnostic test for identifying peripheral vascular disease?
a. ankle-brachial index

b. angiography
c. blood pressure
d. CT scan

28. What would the nurse want to include in the education for a patient with venous insufficiency?
a. avoid wearing compression stockings
b. movement will relieve leg pain
c. elevate their legs on a pillow
d. avoid hydration to minimize edema

29. What are the characteristics of arterial ulcers? Select all that apply.

a. present on heels and toes
b. round
c. large amounts of serous drainage
d. shallow
e. minimal to no drainage

Check Your Understanding Questions

1. Differentiate between preload and afterload.

2. What is the difference between a bradycardic and tachycardic dysrhythmia?

3. Describe the nursing interventions when a patient goes into asystole.

4. What is the term for the force of blood the ventricle must overcome to eject the blood?

5. What is the term for a compensatory thickening of the ventricle?

6. If a patient's ejection fraction is over 70%, what is this known as?

7. When the diseased ventricle is unable to eject blood forward, what is this known as?

8. What nonmodifiable risk factor has a similar prevalence for hypertension?

9. What may a patient with hypertension and evidence of edema have an underlying diagnosis of?

10. What is widespread, systemic hardening of the arteries is known as?

11. What pharmacological therapy would the nurse anticipate using to prevent further plaque formation in the intima layer of the vessel?

Reflection Questions

1. How would a nurse discuss the difference between a cardio-selective versus a non-cardio-selective beta blocker to a graduate nurse?

2. A patient calls their primary care clinic stating home blood pressure readings have been elevated with an average of 164/98 mm Hg. How should a nurse counsel the patient?

3. A patient 30 days following an MI and placement of a stent in the LAD is following up with a cardiologist. How would the nurse evaluate the patient recovering from MI?

4. A patient with a diagnosed AAA is scheduled to go for a diagnostic angiography. How would a nurse preceptor explain the purpose of this test to a new graduate?

5. A patient has recently undergone a carotid endarterectomy three months earlier. The clinic nurse is reviewing the labs. How would the nurse evaluate the laboratory values responding to pharmacological therapies?

6. How would the nurse educate the patient on the difference between varicose veins and venous stasis wounds?

Critical-Thinking Questions about Case Studies

1. Refer to COVID Complications: Part 2.
   Which of the choices is the patient at risk of developing? Select all that apply.

   A. fever
   B. dysrhythmias
   C. decreased cardiac output
   D. seizures
   E. deceased ejection fraction
   F. hemorrhagic stroke

2. Refer to COVID Complications: Part 2.
   Explain why troponins are being measured in this patient.

Competency-Based Assessments

1. Based on the following rhythm strip, what is the nurse's first intervention?

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   A. Administer atropine.
   B. Administer lidocaine.
   C. Continue to monitor.
   D. Continue to monitor with pacer pads close by.

2. Review the literature and find an article on how nurses assist a patient with HF and evaluate the patient's response in cardiac rehab.
3. Conduct a literature search and look at the clinical manifestations of angina between males and females.
4. Consult the literature and find a current article that discusses the outcomes of wound care of peripheral vascular wounds.

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CHAPTER 13
Musculoskeletal System

FIGURE 13.1 The musculoskeletal system includes bones, joints, muscles, tendons, and ligaments. It is responsible for protecting internal organs and facilitating body movements. (credit: daverose215/flickr, CC BY 2.0)

CHAPTER OUTLINE

INTRODUCTION You are a nurse assessing a 65-year-old female patient, Ms. Chen, in a nursing home. Ms. Chen recently experienced a hip fracture that required a total hip-replacement surgery. She was discharged back to her original facility from the hospital two days ago and has been struggling with mobility. She reports being nervous to use her walker because that is how she fell and fractured her hip. You reassure Ms. Chen that you are here to assess her needs and provide care that will help her regain comfort with ambulation, mobility, and performing activities of daily living (ADLs). This chapter will help you learn how to support patients like Ms. Chen by completing a nursing assessment of the musculoskeletal system and managing common disorders of the musculoskeletal system.

13.1 Osteoporosis and Osteopenia

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for osteoporosis and osteopenia
- Describe the diagnostics and laboratory values of osteoporosis and osteopenia
- Apply nursing concepts and plan associated nursing care for patients with osteoporosis and osteopenia
- Evaluate the efficacy of nursing care for patients with osteoporosis and osteopenia
- Describe the medical therapies that apply to the care of osteoporosis and osteopenia

The musculoskeletal system comprises bones, joints, muscles, tendons, and ligaments. Its major function is promoting body **mobility**, the ability of a patient to change and control their body position. Physical mobility requires sufficient muscle strength and energy, along with adequate skeletal stability, joint function, and neuromuscular synchronization. Anything that disrupts this integrated process can lead to impaired mobility or immobility. Mobility exists on a continuum ranging from no impairment (i.e., the patient can make major and frequent changes in position without assistance) to complete immobility (i.e., the patient is unable to make even slight changes in position without assistance) (Figure 13.2). Functional mobility assessment tools can help determine the level of a patient's mobility.

FIGURE 13.2 Mobility varies over time and can be affected at any time due to injury or illness. (credit: modification of "Retirement Image" by Ben Baligad/Flickr, CC BY 2.0)

LINK TO LEARNING

The Johns Hopkins Highest Level of Mobility (JH-HLM) Scale (https://openstax.org/r/77JH-HLMScale) measures the patient's highest level of mobility achieved.

The bone disease **osteoporosis** is caused by caused by a significant decrease in bone density and mass. This disease presents a major threat to public health, with almost 54 million Americans affected (International Osteoporosis Foundation, 2023). A decrease in bone mineral density, **osteopenia** is the precursor condition to osteoporosis; it currently affects nearly 34 million Americans. Females are four times more likely to be affected than males, and the incidence is higher in postmenopausal females (Varacallo et al., 2023). The prevalence of these conditions is significant, as they often result in serious bone fractures, which can pose significant health problems, especially to already at-risk populations such as older adults.

Pathophysiology

The underlying pathophysiology of osteoporosis involves too much **resorption**, or the breakdown and reabsorption over time of small amounts of minerals from the bone; the minerals are broken down and reabsorbed into the systemic circulation. Without replacement and remodeling of the removed parts, bone weakness and fragility occur, resulting in osteopenia and eventually osteoporosis (Figure 13.3). Risk factors for the development of osteopenia

and osteoporosis include

- advanced age,
- certain medical conditions (e.g., cancer, HIV, anorexia nervosa),
- chronic alcohol use,
- cigarette smoking,
- family history of osteoporosis,
- female sex,
- hormonal changes (e.g., low estrogen levels after menopause),
- long-term use of certain medications (e.g., corticosteroids, proton pump inhibitors, antiepileptic medications),
- low body mass index (BMI),
- physical inactivity or prolonged immobility, and
- poor dietary habits (e.g., inadequate calcium, vitamin D, or protein).

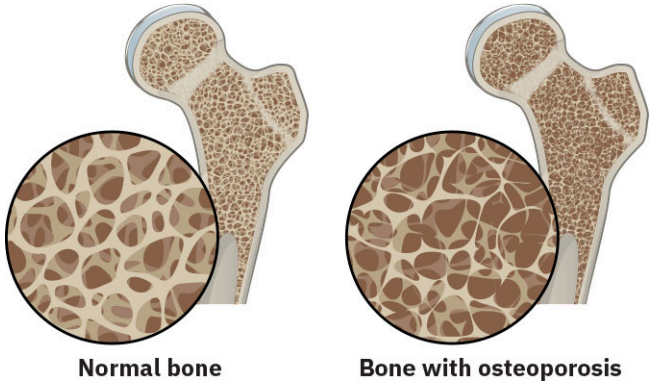


FIGURE 13.3 This diagram illustrates osteoporosis by comparing a normal leg bone and a leg bone with missing bone fragments. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

LIFE-STAGE CONTEXT

Osteoporosis Risk in Older Females

The risk of developing osteoporosis is significantly higher in females when compared to males. Most of this risk is associated with estrogen levels. Estrogen acts as a bone protectant, so when hormonal levels decrease dramatically, such as during menopause, the rate of bone breakdown is accelerated, resulting in the development of osteoporosis (National Health Service, 2022).

Clinical Manifestations

Due to the progressive bone weakness that occurs with osteopenia and osteoporosis, clinical manifestations may not become evident until the individual experiences a bone fracture. The most common fractures associated with osteoporosis include fractures of the hip, lumbar spine, and wrist. Another common clinical manifestation of osteoporosis, especially in older adults, is a loss of height (usually an inch or two) due to **kyphosis**, or excessive curvature of the upper spine. This occurs secondary to the gradual breakdown of the vertebrae over time, causing the individual to stand with a "hunched over" posture (Figure 13.4). Other clinical manifestations include pain in the lower back and shortness of breath, both related to vertebral body compression (National Institute of Arthritis and Musculoskeletal and Skin Diseases, 2022).

FIGURE 13.4 Kyphosis, an abnormal curvature of the upper spine, is commonly associated with osteoporosis. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Assessment and Diagnostics

The physical assessment of a patient with osteopenia or osteoporosis often reveals a kyphotic posture, as well as a decrease in total height over the course of several years. This highlights the importance of obtaining baseline measurements and completing accurate documentation so that data collected on subsequent visits may be compared to the earlier assessments. Additionally, it is important to complete a risk assessment for fractures for any patient who has been diagnosed with or is at risk for osteoporosis. A commonly used risk assessment tool is the Fracture Risk Assessment Tool (FRAX), which analyzes risk factors including age, sex, height, weight, family history, and alcohol use, among others. This tool helps calculate the risk for experiencing a bone fracture in patients with osteoporosis and is used to guide treatment planning.

LINK TO LEARNING

The Online Fracture Risk Assessment (FRAX) Tool (https://openstax.org/r/77FRAXTool) allows a patient to input data directly into the calculator and obtain a risk-assessment score.

Diagnostics and Laboratory Values

There are several diagnostic tests that can be used to confirm a diagnosis of osteopenia or osteoporosis. The gold standard test is the dual-energy x-ray absorptiometry (DEXA or DXA) scan. This procedure uses low-dose–radiation x-rays to determine bone density of the hip, wrist, or spine (Figure 13.5). Once a value is obtained, it is compared to standard values for an individual with similar demographic characteristics to determine the presence and severity of osteoporosis. It is currently recommended that all individuals assigned female at birth who are over the age of 65 have a DXA scan; females with specific risk factors should consider obtaining a scan before the age of 65 so that early intervention and treatment may be initiated (U.S. Preventative Services Task Force, 2018). In the later stages of osteoporosis, regular x-rays may be used to monitor the progression of the disease. While no laboratory values are specific to confirming a diagnosis of osteoporosis, several laboratory tests—such as testing vitamin D, calcium, albumin, and phosphate levels—can be used to rule out other medical conditions.

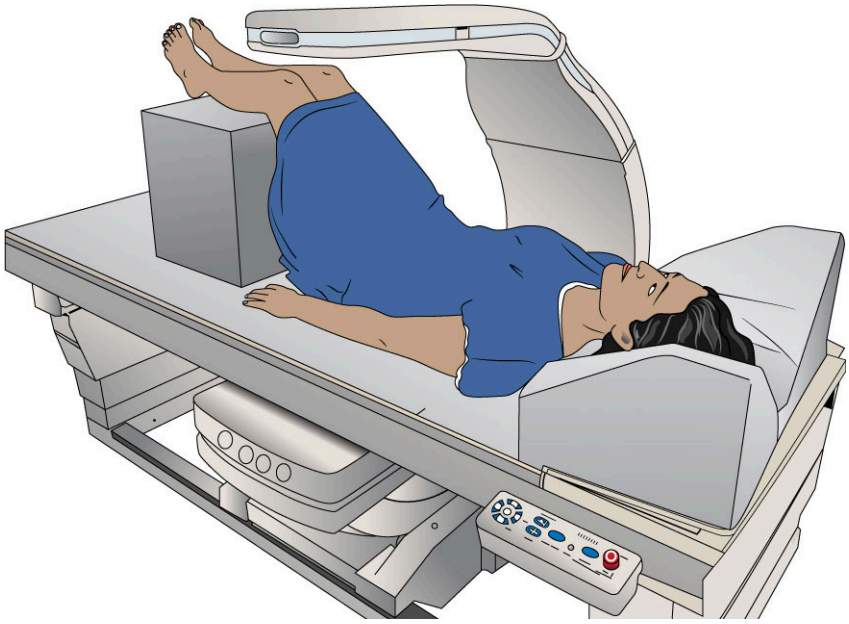


FIGURE 13.5 The DXA scanner machine scans the bone density of a patient's hip bones and spine. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Nursing Care of the Patient with Osteoporosis and Osteopenia

Nursing care of patients with osteopenia or osteoporosis occurs in many areas, including both outpatient and inpatient settings. Typically, this condition can be managed on an outpatient basis, but there may be a need for inpatient hospitalization, especially in the later stages of the disorder if major bone fractures occur.

Recognizing Cues and Analyzing Cues

First and foremost, nurses must be able to recognize risk factors specific to osteoporosis—such as sex, age, and medical history—when obtaining a complete health history from their patients. Upon recognition of these risk factors, the nurse can make appropriate recommendations and referrals for further testing and treatment as needed. The nurse should also be mindful of physical symptoms of osteoporosis, including kyphosis, loss of height, and patient-reported back pain.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

If any risk factors or physical assessment findings indicate the development of osteoporosis, the nurse will mention them to the provider, and it is likely that further diagnostic testing will be conducted. Once these tests have confirmed the diagnosis of osteoporosis, the nurse will assist in implementing treatment interventions, providing patient education, and ensuring appropriate follow-up appointments. One of the main nursing interventions for patients with osteoporosis is providing education, especially as it relates to lifestyle changes that the patient can make to slow the progression of the disorder. Common nursing interventions for patients with osteoporosis include

- promoting patient independence,
- assisting with activities of daily living (ADLs) as needed,
- encouraging physical mobility as tolerated,
- providing education regarding the importance of calcium and vitamin D intake as well as dietary sources
- referring the patient to a dietician as needed,
- encouraging smoking cessation, and
- implementing fall-risk precautions as needed.

Evaluation of Nursing Care for the Patient with Osteoporosis and Osteopenia

It is important for nurses to follow up with patients to ensure that treatment outcomes are achieved. If they are not, the nurse will work closely with the provider and other members of the health-care team to revise the patient's plan of care.

Evaluating Outcomes

The nurse will evaluate several outcomes that indicate treatment goals for osteoporosis are being met. These outcomes include

- improved patient knowledge regarding the condition and its associated treatments,
- pain relief (especially in the back), and
- no new bone fractures.

To evaluate these outcomes, the nurse will employ the following strategies:

- conduct pre- and post-education knowledge assessments to determine whether the patient has gained knowledge about their condition and treatments;
- implement a validated pain assessment tool to measure pain intensity before and after pain management interventions; and
- review medical records to track and identify any new fractures or signs of fractures since the initiation of treatment.

Medical Therapies and Related Care

Treatment options for osteopenia and osteoporosis often involve a combination of lifestyle modifications and pharmacological interventions (Table 13.1).

Treatment	Rationale
• Lifestyle modifications • Smoking cessation • Reduced alcohol consumption • Regular, weight-bearing, physical activity as tolerated • Increased dietary intake of calcium and vitamin D	Risk factors for osteoporosis should be addressed through lifestyle modifications because most of the risk factors are modifiable.
Vitamin supplements (if not enough are obtained from dietary intake)	Calcium and vitamin D may help reduce the risk of bone fractures.
• Bisphosphonates (e.g., alendronate risedronate, ibandronate) • Typically the first-line pharmacological treatment option	These medications work by inhibiting osteoclasts to slow the progression of osteoporosis. (An **osteoclast** is a cell that breaks down bones.)
Selective estrogen receptor modulators (SERMs) (e.g., raloxifene)	These medications mimic the effects of estrogen in the body to preserve bone marrow density.
RANKL inhibitors (e.g., denosumab)	This monoclonal antibody increases bone marrow density and inhibits the action of osteoclasts.

TABLE 13.1 Treatment Options for Osteopenia and Osteoporosis

LINK TO LEARNING

Bisphosphonates are typically the first line treatment for osteoporosis, so it is important for nurses to educate patients about their potential side effects (https://openstax.org/r/77bisphosphon) and other care conditions. For example, this type of medication should be taken with a full glass of water, and the patient should remain upright for one hour after taking it to prevent upper-GI conditions such as esophagitis and dyspepsia.

13.2 Osteoarthritis

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for osteoarthritis
- Describe the diagnostics and laboratory values of osteoarthritis
- Apply nursing concepts and plan associated nursing care for patients with osteoarthritis
- Evaluate the efficacy of nursing care for patients with osteoarthritis
- Describe the medical therapies that apply to the care of osteoarthritis

The most common form of arthritis, **osteoarthritis (OA)**, is a degenerative joint disorder that involves the wearing down of joint cartilage and tissue over time. OA currently affects over 32.5 million Americans (Arthritis Foundation, n.d.). The joints most often affected include those in the hands, knees, spine, neck, and hips (Figure 13.6). Though joint damage cannot be reversed or cured, symptoms can usually be managed effectively with a combination of pharmacological and lifestyle interventions. In more severe cases, surgical intervention may be required. OA can be diagnosed at any age, but it is more common in individuals over the age of 50.

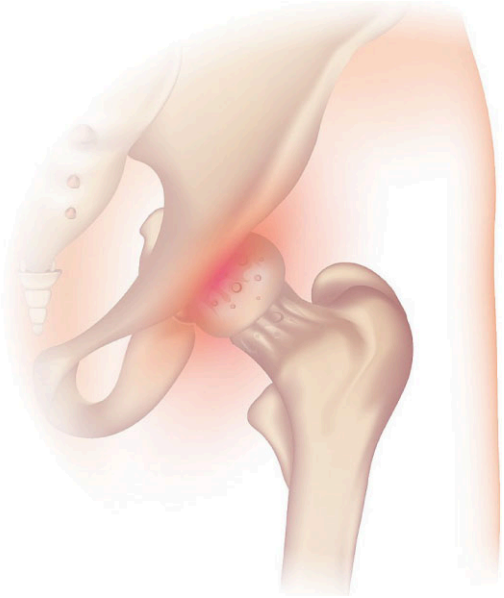


FIGURE 13.6 Osteoarthritis of the hip joint involves the wearing down of the joint cartilage over time, causing pain. (credit: Hip Osteoarthritis by Injurymap/Wikimedia Commons, CC BY 4.0)

Pathophysiology

The pathophysiology of OA is somewhat unknown, but it appears to involve inflammation that results in the breakdown of joint cartilage over time. OA causes the cartilage to gradually become thinner, and as the cartilage layer wears down, more pressure is placed on the bones. The joint responds by increasing production of the synovial fluid for more lubrication, but this can cause swelling of the joint cavity. The bone tissue underlying the damaged articular cartilage also responds by thickening and causing the articulating surface of the bone to become rough or bumpy. As a result, joint movement results in pain and inflammation. Certain factors have been linked to an increased risk of developing OA, including

- advanced age,
- family history of OA,
- female sex,
- history of joint injury,
- obesity,
- overuse of joints (e.g., from sports or repetitive motions), and
- sedentary lifestyle.

Clinical Manifestations

The main clinical manifestation of OA is joint pain, which is often more apparent during activity or at the end of the day. Other common clinical manifestations of OA include

- joint stiffness, most often occurring first thing in the morning or after long periods of immobility;
- limited joint range of motion or flexibility;
- muscle weakness;
- joint instability (e.g., knee "giving out");
- "grating" sensation with joint movement, which may be accompanied by a "popping" or "clicking" sound;
- a bony projection that develops along bone edges, known as a **bone spur** (Figure 13.7); and
- joint swelling.

FIGURE 13.7 This x-ray image shows a bone spur that has developed on the heel of the foot. (credit: "Achilles insertional calcific tendinosis" by Mikael Haggström/Wikimedia Commons, CC0)

Assessment and Diagnostics

The first step of diagnosing OA is to conduct a thorough physical examination. It is important to obtain a subjective report from the patient about their symptoms. Specifically, the nurse should ask about any joint pain or stiffness, as this may indicate the presence of OA. The nurse will also perform passive range of motion exercises and assess for pain, limited movement, and abnormal popping or clicking sounds. If symptoms of OA are present, other diagnostic tests may be indicated. Certain imaging tests such as x-ray or magnetic resonance imaging (MRI) can be used to visualize the joint space and determine the presence of cartilage breakdown and changes in the bone associated with OA. Joint aspiration, also known as **arthrocentesis**, is another diagnostic test that may be indicated in some cases. This procedure involves the insertion of a needle into the joint space to remove fluid, which is then tested for infection or crystals. Arthrocentesis may assist in ruling out other conditions such as gout, rheumatoid arthritis, or lupus (Figure 13.8).

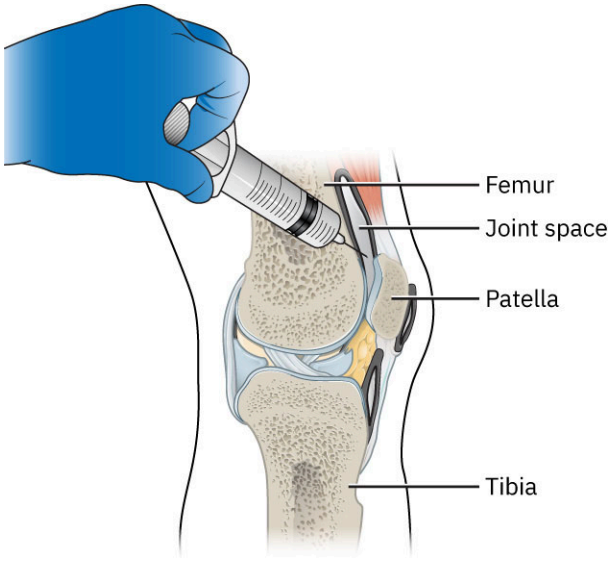


FIGURE 13.8 This arthrocentesis procedure is being performed on a knee joint. After using a needle to remove fluid from the joint space, the fluid is tested for infection or crystals. (credit: modification of work from *Anatomy and Physiology*, 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Diagnostics and Laboratory Values

Because OA is an inflammatory condition, laboratory values indicating the presence of general inflammation can be used to assist in the diagnosis. Specifically, there is usually an elevation in both C-reactive protein and erythrocyte sedimentation rate (ESR). These laboratory tests cannot determine specifically where the inflammation is occurring, but they do confirm that inflammation is occurring somewhere in the body.

Nursing Care of the Patient with Osteoarthritis

Most of the nursing care for patients with OA centers around providing pain control and ensuring patient comfort. This includes administering analgesics as ordered by the provider and implementing comfort measures such as heat or cold application, position changes, and range of motion (ROM) exercises. ROM exercises can be classified as active or passive; active movements are achieved voluntarily by patients, without assistance, while passive movements are performed by the nurse or other practitioners because patients are unable or not permitted to move the body parts themselves.

Recognizing Cues and Analyzing Cues

When caring for a patient with OA, the nurse will monitor closely for symptoms indicating that the condition is becoming more severe or requires more intensive treatment. In addition to patient-reported joint pain, the nurse should regularly assess for joint swelling or tenderness. OA can occur in any joints, but swelling is usually most obvious in the hands (Figure 13.9).

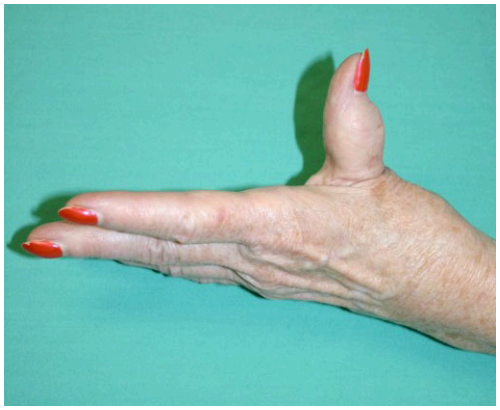


FIGURE 13.9 Osteoarthritis can cause swelling of the finger joints. (credit: thumb arthritis - radial abduction by handarmdoc/Flickr, CC BY 2.0)

Prioritizing Hypotheses, Generating Solutions, and Taking Action

In addition to medication administration and implementation of comfort measures, the nurse also provides emotional support for the patient with OA. Living with OA can be difficult and may negatively affect many aspects of life, including the patient's ability to perform their own ADLs. This results in diminished independence and a need for assistance, something that may be hard for the patient to come to terms with. The nurse should help the patient create a plan of care that emphasizes independence and allows for the patient to perform as many personal care activities and ADLs as possible to increase their quality of life. The nurse could consult occupational therapy for adaptive devices to help the patient perform their ADLs.

Evaluation of Nursing Care for the Patient with Osteoarthritis

It is important for the nurse to follow-up with the patient to ensure their plan of care and treatments are effective. In some cases, medications or comfort measures may not be adequately providing pain relief, indicating the need for more invasive interventions such as surgical joint replacements.

REAL RN STORIES

Nurse: Ansu
Years in Practice: Twenty-one
Clinical Setting: Inpatient rehab
Geographic Location: Florida

Skin integrity prevention is easy to implement: offload any pressure area to avoid breakdown. However, there are many factors at play that can interfere with a plan for prevention, such as medications, a patient's mobility, and pain. One preventative measure is to engage the patient, which allows you to get a little creative.

One time I was caring for an 87-year-old female. She was in the unit for rehab after a fall. She had been experiencing osteoarthritis for the last 12 years. She was shaken up and very nervous about being able to move around without assistance and unable to simply reposition due to chronic pain, which can increase the risk of skin breakdown. If her pain prevented her from repositioning frequently, however, then her skin would break down. I explained to her the importance of repositioning and movement for not only her skin care but also her overall health and recovery. We discussed why she was fearful and devised a plan we called a safety-first plan. The first day, our goal was that every time she was in the chair, she would reposition every 30 minutes by leaning to the side and then back again to the other side, three to four times. I also educated her on how to use a walker for additional support, which helped empower her to move and slowly gain confidence for the larger-scale rehab required.

Evaluating Outcomes

The nurse should evaluate patient outcomes to determine whether the current plan of care is appropriate. Outcomes indicating that the plan of care is appropriate and the patient is improving include

- pain relief,
- decreased joint swelling,
- increased ROM of affected joint,
- increased muscle strength, and
- patient usage of effective coping strategies.

Medical Therapies and Related Care

Treatment for OA involves a combination of pharmacological and nonpharmacological lifestyle interventions (Table 13.2).

Medication	Rationale
Acetaminophen (e.g., Tylenol)	Assists with mild to moderate pain associated with OA
Nonsteroidal anti-inflammatory drugs (NSAIDs)	Assists with mild to moderate pain associated with OA and has anti-inflammatory effects
Duloxetine (e.g., Cymbalta)	Shown to improve chronic pain associated with OA
Glucocorticoid joint injections	thought to improve joint inflammation, though the benefits of chronic, long-term use are controversial

TABLE 13.2 **Pharmacological Treatment Options for OA**

CLINICAL SAFETY AND PROCEDURES (QSEN)

QSEN Competency: Safety

Definition: Minimize risk of harm to patients and providers through both system effectiveness and individual performance.

Skill: Demonstrate effective use of strategies to reduce risk of harm to self or others. The nurse will

- provide education to patients with OA about the use of NSAIDs, as overuse of NSAIDs has been linked to an increased risk of GI bleeding, especially in OA patients; and
- provide education to patients to mitigate the risk of this adverse effect.

(QSEN Institute, n.d.)

Certain nonpharmacological lifestyle changes are also indicated in the treatment of OA. These include

- weight loss,
- regular physical activity and exercise,
- ROM exercises,
- use of assistive devices (e.g., braces, shoe inserts),
- use of adaptive devices (e.g., elevated toilet seats, hygiene devices),
- physical and occupational therapy, and
- relaxation and stress-reduction techniques.

If lifestyle and pharmacological interventions are not effective, surgery may be indicated. Specifically, joint replacement surgery has been shown to be effective for the treatment of OA. Hip and knee joint replacements are the most-performed surgical procedures for OA.

13.3 Bone Fractures

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for bone fractures
- Describe the diagnostics and laboratory values associated with bone fractures
- Apply nursing concepts and plan associated nursing care for patients with bone fractures
- Evaluate the efficacy of nursing care for patients with bone fractures
- Describe the medical therapies that apply to the care of bone fractures

A break in the bone structure, or a bone **fracture**, is one of the most common types of musculoskeletal traumas. Worldwide in 2019, 178 million fractures occurred, in addition to 455 million existing cases of acute or chronic symptoms related to a fracture (GBD 2019 Fracture Collaborators, 2021). Fractures affect the entire population, regardless of demographic factors such as age or sex. However, certain risk factors are associated with different

types of fractures. For example, older adults are at higher risk for experiencing hip fractures than their younger counterparts.

Pathophysiology

The underlying pathophysiology of fractures involves stress placed on a bone that results in a break in the bone's structure. Several different forces can result in bone fractures, including direct trauma, twisting movements, and crushing forces. Some of the most common causes of fractures include motor vehicle accidents, sports injuries, and falls. Usually when a bone fracture occurs, the soft tissue surrounding the bone is also affected. This can result in edema, hemorrhage, tendon damage, and severed nerves—all collectively referred to as soft tissue injuries.

Types of Fractures

Fractures are classified by their complexity, location, and other features (Figure 13.10; Table 13.3). Some fractures have the features of more than one type of fracture and therefore may be described using more than one term (e.g., an open transverse fracture).

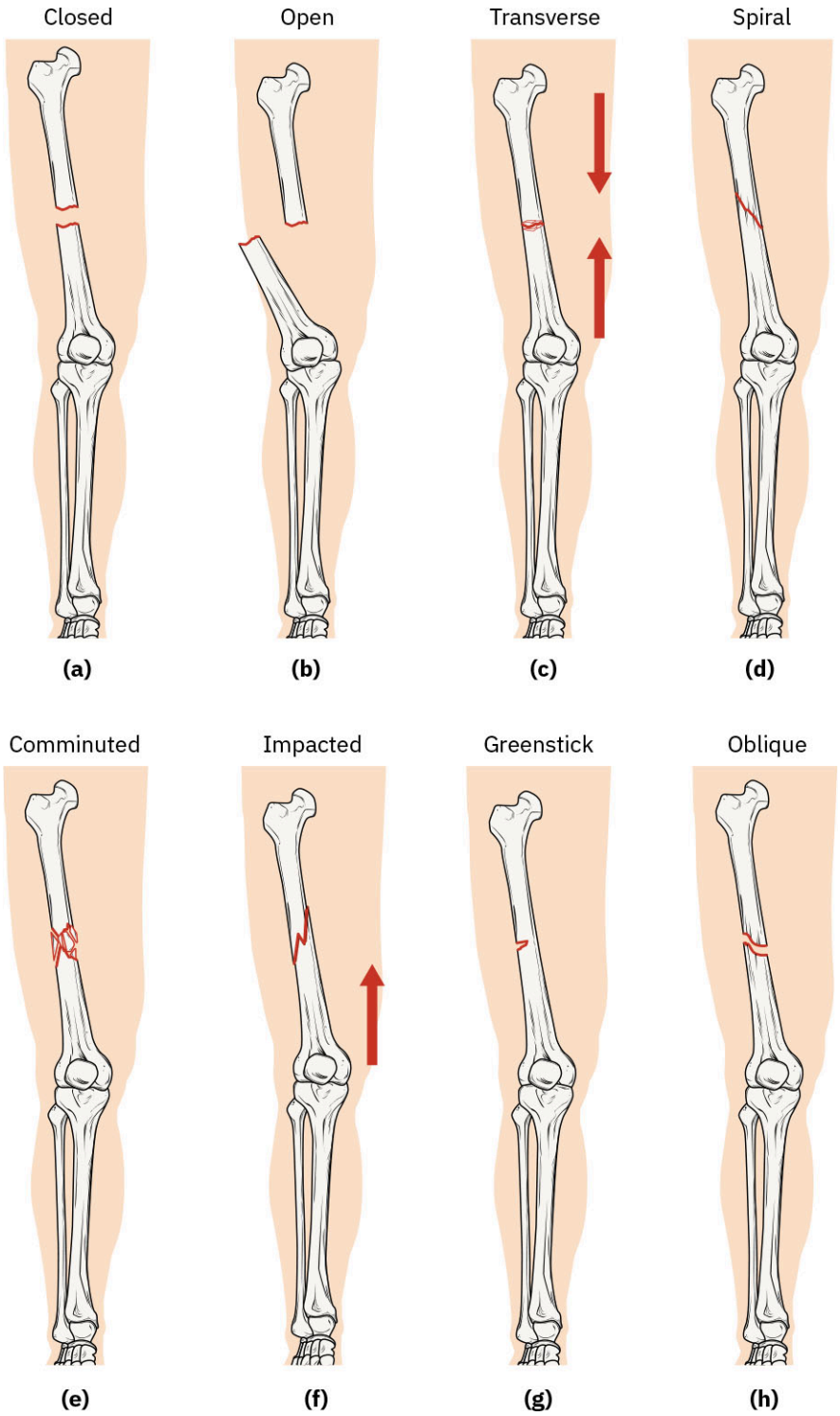


FIGURE 13.10 There are several types of fractures: (a) closed fracture, (b) open fracture, (c) transverse fracture, (d) spiral fracture, (e) comminuted fracture, (f) impacted fracture, (g) greenstick fracture, and (h) oblique fracture. (credit: modification of work from *Anatomy and Physiology*, 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Type of Fracture	Description
Closed (or simple)	Fracture in which the skin remains intact
Comminuted	Fracture with several breaks, resulting in many small pieces between two large segments
Greenstick	Partial fracture in which only one side of the bone is broken
Impacted	Fracture in which one fragment is driven into the other, usually as a result of compression
Oblique	Fracture that occurs at an angle that is not 90 degrees
Open (or compound)	Fracture in which at least one end of the broken bone tears through the skin; carries a high risk of infection
Spiral	Fracture in which bone segments are pulled apart by a twisting motion
Transverse	Fracture that occurs straight across the long axis of the bone

TABLE 13.3 Types of Fractures

Clinical Manifestations

The specific clinical manifestations of fractures will vary depending on the anatomic location affected, but there are certain symptoms associated with nearly all fracture types, including

- pain and tenderness,
- edema,
- inability to move the affected body part,
- bruising or hematoma formation, and
- deformity of the affected extremity.

Assessment and Diagnostics

The only definitive way to diagnose a bone fracture is to visualize the break in the bone structure. This can be done with several different types of imaging tests, including x-ray, magnetic resonance imaging (MRI), and computed tomography (CT) scanning. X-rays are typically performed first, as they can quickly and easily visualize bone structure. A CT scan or MRI may be used if there are suspected soft tissue injuries that the provider or surgeon needs to see in more detail.

READ THE ELECTRONIC HEALTH RECORD

Assessment of a Patient with a Tibia Facture

Patient's Name: Jaun
Age: 17 years
Sex: Male
Chief Complaint:

- pain in the left lower leg after collision playing hockey
- presents with the inability to bear weight and deformity of the left lower leg

Medical History:

- diagnosed with concussion two years ago: sport (hockey) injury
- forty-two stitches applied to chin last year: sport (hockey) injury
- tonsillectomy at age four

Vital Signs:

- temperature: 93.3 °F
- heart rate: 132 bpm
- blood pressure: 152/94 mm Hg
- respiratory rate: 32 breaths per minute
- oxygen saturation: 98 percent on room air
- BMI: 28

Recent Laboratory Results:

- WBC count: 10,000/µL (normal)
- hemoglobin: 13.5 g/dL (normal)
- hematocrit: 40.5 percent (normal)
- platelets: 250,000/µL (normal)
- electrolytes:
- sodium: 138 mmol/L (normal)
- potassium: 4.0 mmol/L (normal)
- chloride: 102 mmol/L (normal)

Imaging Results:

- Imaging includes full-length AP and lateral views of the affected area; also AP, lateral, and oblique views of the ipsilateral knee and ankle.
- Fracture noted to left distal tibia.

Progress notes:

- Patient reports sudden onset of sharp pain in lower leg after colliding with another player in a hockey game, followed by throbbing when attempting to walk.
- Mild diaphoresis was observed upon admission.
- Patient otherwise presents as an active young adult with no other health disparities.

Current medications:

- acetaminophen: 500 mg every night as needed for pain

1. What information in the patient's chart concerns you?
2. What is an expected finding?
3. What information should you obtain from the patient? What should you educate the patient about?

Nursing Care of the Patient with Bone Fractures

Most of the nursing care for patients with fractures focuses on controlling pain and ensuring patient comfort. It is also important for the nurse to assess for and intervene if complications develop such as **compartment syndrome**, a condition caused by increased pressure within an area of tissue and resulting in muscle and nerve damage (discussed more later in this section).

Recognizing Cues and Analyzing Cues

There are several key assessments the nurse should perform on patients with bone fractures. First, it is important for the nurse to perform frequent neurovascular examinations on the affected extremity. Neurovascular checks involve assessing the extremity for the 5 P's:

- pain (on a scale of 1 to 10);
- pulse (weak pulses may indicate insufficient blood supply to the affected extremity);
- pallor (pale, blue, or purple tone in the affected extremity may indicate compromised blood flow);
- paresthesia (numbness or tingling in the extremity may indicate nerve damage); and
- paralysis, or inability to move the affected extremity.

LINK TO LEARNING

Review this article to learn more about the 5 P's acronym (https://openstax.org/r/77FivePs) for circulation assessment.

In addition to frequent neurovascular checks, the nurse must also assess for signs and symptoms of an embolism. With fractures, especially those in the long bones like the femur, there is an increased risk that a fat embolism, or clot, will form. This occurs because the break in the bone allows pieces of fatty tissue to leak out into the systemic circulation. The fat embolism can travel through the body's systemic circulation, get lodged in the brain or lungs, and quickly cause a life-threatening ischemic stroke or pulmonary embolism. These clots most commonly develop between 24 and 72 hours after the initial fracture, so the nurse should monitor closely for signs of neurological changes or shortness of breath (Adeyinka & Pierre, 2022).

Prioritizing Hypotheses, Generating Solutions, and Taking Action

If the nurse assesses symptoms such as shortness of breath, chest pain, or neurological changes following a fracture, the nurse will hypothesize that the patient is potentially experiencing a fat embolism. If this condition is suspected, the nurse must act quickly to mitigate complications. Priority actions would include notifying the provider, calling a rapid response team if indicated, and applying oxygen as necessary. Additionally, the nurse should carefully follow orders given by the treating provider, such as administering medication or providing other interventions.

There are many important nursing interventions that should be implemented as part of the care provided to patients with bone fractures. First, the nurse will attempt to promote mobility of the affected extremity as much as possible. Though the patient may be in a cast or splint, there are typically certain exercises the patient should perform to maintain as much mobility as possible. The nurse can help educate patients about these exercises and ensure that the patient is prepared to perform them on their own at home upon discharge.

Another important aspect of nursing care for these patients is education about how to care for their cast at home. If the cast is not made of a water-safe material, the nurse should demonstrate how to wrap the cast with plastic before taking a shower so that the plaster does not get wet and re-mold itself. The nurse will also counsel the patient on the importance of not sticking any foreign objects inside the cast. The skin underneath the cast tends to become dry and itchy, and patients are often tempted to stick items inside to scratch the skin and relieve the itching. This can result in skin breakdown and should be avoided while the cast is in place.

Evaluation of Nursing Care for the Patient with Fractures

After removal of the cast or splint, the nurse should perform a thorough assessment of the fractured extremity to determine whether the treatment was successful. In some cases, the patient may require another cast or splint placement, but in most cases the bone will have healed completely.

Evaluating Outcomes

While evaluating the patient after cast removal, the nurse will assess for signs indicating that the treatment was effective. These signs include

- lack of deformities to the bone or extremity,
- decreased swelling,
- improved pain,
- ability to move distal parts of the affected extremity,
- normal skin color, and
- strong pulse distal to the fracture.

Additionally, a follow-up x-ray will be performed to evaluate the healing status of the fracture and determine whether further treatment is indicated.

Medical Therapies and Related Care

The specific treatment plan for a bone fracture depends on the anatomic location of the affected area. In some

cases, the fracture will heal on its own; in other cases, more invasive interventions such as immobilization, reduction, fixation, or surgery may be required. In addition to the manual treatments mentioned in subsequent sections, it is also important for the nurse to promote a diet that will aid in the healing of the bone fracture. Encouraging the patient to consume a well-rounded, healthy diet that is high in protein, which assists in bone and tissue healing.

Immobilization

For mild fractures, immobilization of the fracture with a cast or splint may be all that is required. The duration of the immobilization varies depending on the affected bone, but it typically ranges anywhere from three to eight weeks. Splints cover only part of the affected area and typically do not have to be worn as long as hard casts.

Closed Reduction

More-severe fractures may require the use of a closed reduction procedure. The goal of this procedure is to set the fractured bone and realign it into a normal position. The provider manually adjusts the bone from the outside to line up the broken parts of the bone correctly (Figure 13.11). Because this procedure can be quite painful, the patient will often receive a combination of local anesthesia, sedatives, and analgesics. After closed reduction is performed, a cast or splint for immobilization is applied.

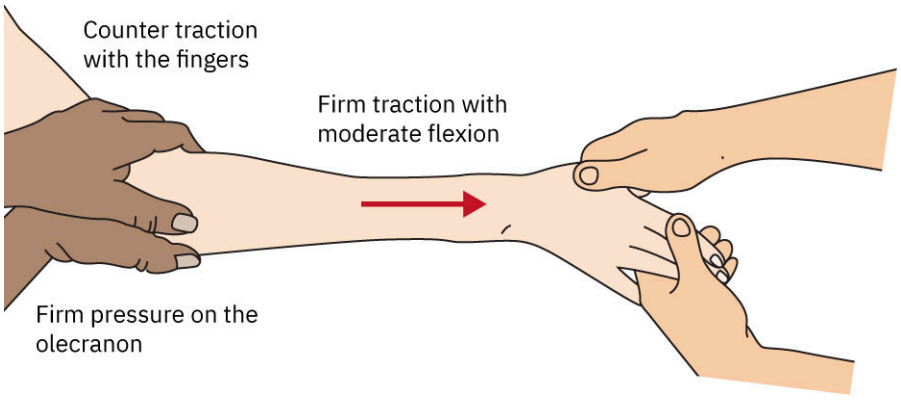


FIGURE 13.11 Closed reduction of a fracture of the lower arm requires traction and pressure on both ends to bring the bones in line. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Surgical Care

The most-severe fractures usually require surgical intervention. There are several types of surgery for fractures, including internal and external fixation and arthroplasty.

Internal Fixation

A surgery of **internal fixation** involves the placement of metal pieces into the bone to help it heal as it grows back together (Figure 13.12). The types of metal pieces vary depending on the fracture's location and size, but they can be rods, plates, screws, or pins. In some cases, the metal pieces are removed after healing occurs; in other cases, the metal pieces are left in place forever.

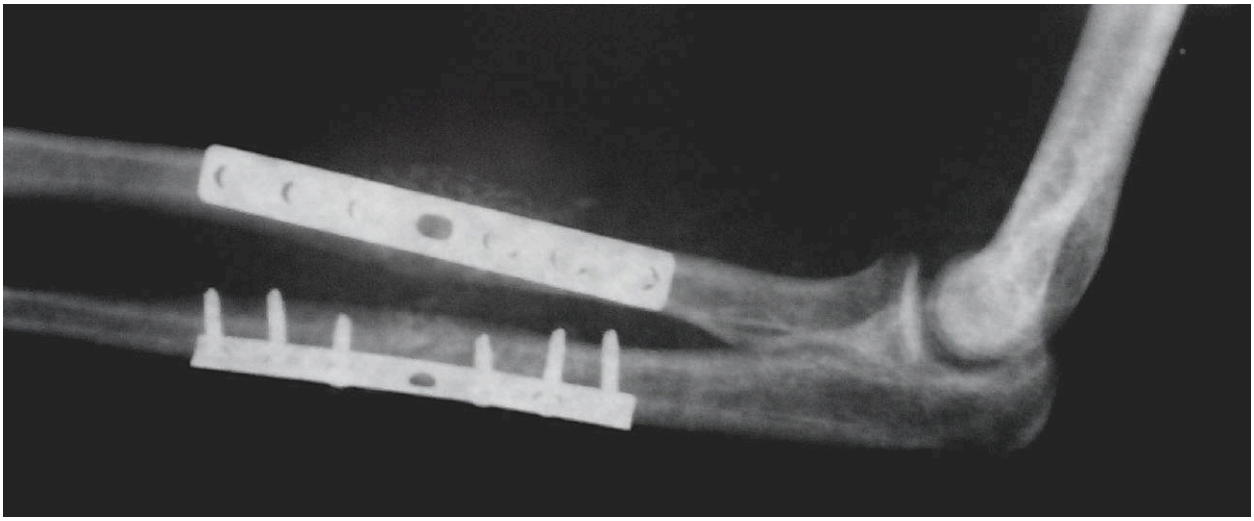


FIGURE 13.12 This x-ray shows an internal fixation of the radius and ulna. (credit: "X-ray3" by Mikael Haggström/Wikimedia Commons, Public Domain)

External Fixation

Another surgical procedure that can be performed to treat fractures is an **external fixation**, which involves the internal placement of screws on either side of the fracture by drilling pins into the bone and then connecting them to an external brace or bracket (Figure 13.13). The external brace is temporary but stays in place long enough for the fractured bone to heal. Typically, an internal fixation procedure is performed after removal of the external device to complete the healing process.

FIGURE 13.13 External fixation often requires a brace around the limb to stabilize the fracture and allow it to heal. ("Clinical picture showing the soft tissue defect healed at 6 months after the Papineau technique" by Koutsostathis et al./*Diabetic Foot and Ankle*, CC BY 2.0)

One of the most important aspects of nursing care for a patient with an external fixation device is performing meticulous pin care to prevent infection. The nurse should clean the pin sites daily with soap and water and dab to dry, as rubbing can create friction and skin breakdown. It is important for the nurse to monitor the pin sites carefully for signs of infection including redness, drainage, swelling, or pain. The nurse will follow any provider orders regarding special care, such as physical therapy or follow-up with the external fixator.

Arthroplasty

Joint replacement, known as **arthroplasty**, may be required if the fracture occurs in a joint such as the shoulder, elbow, hip, or knee. The fractured joint is removed from the body and replaced with an artificial joint, which is usually made of metal, plastic, or ceramic materials.

Compartment Syndrome

A common and serious complication that may occur with bone fractures and soft tissue injuries is compartment syndrome. With a fracture or injury to the surrounding tissue, pressure builds within the skin and muscles, leading to

decreased blood flow to the affected extremity (Figure 13.14). Without adequate blood supply, the extremity becomes malnourished and can quickly become necrotic without medical intervention. In severe cases, a **fasciotomy**, or incision into the skin and fascia to relieve pressure, will be required.

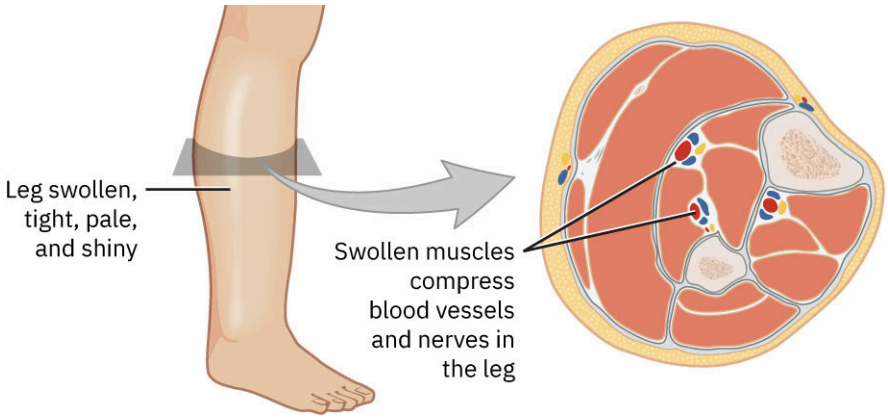


FIGURE 13.14 Compartment syndrome of the lower leg causes pressure to build within the skin and muscles, leading to decreased blood flow to the affected extremity. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Signs and symptoms of compartment syndrome include

- diminished distal pulses in the affected extremity,
- swelling and taut skin in the extremity,
- numbness or "pins and needles" feeling in the extremity, and
- difficulty moving the extremity.

If the nurse suspects that the patient is experiencing compartment syndrome, they must alert the treating provider immediately. If quick intervention does not take place, the limb is at risk of necrosis because the internal pressure of the extremity results in a diminished blood supply to the extremity.

13.4 Muscular Dystrophy

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for muscular dystrophy
- Describe the diagnostics and laboratory values of muscular dystrophy
- Apply nursing concepts and plan associated nursing care for patients with muscular dystrophy
- Evaluate the efficacy of nursing care for patients with muscular dystrophy
- Describe the medical therapies that apply to the care of muscular dystrophy

A **muscular dystrophy (MD)** is a rare genetic disorder that causes progressive muscle weakness over time (Figure 13.15). With over 30 specific types, MD has a wide range of variability in terms of age of diagnosis, severity, and affected muscles. However, all types are progressive, meaning they get more severe over time. Some of the more common types are briefly described in Table 13.4. In most cases, individuals diagnosed with MD will eventually be unable to walk and perform their own ADLs such as toileting or bathing.

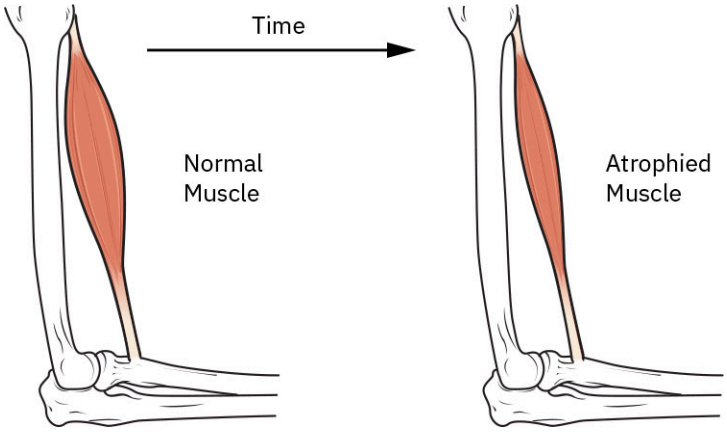


FIGURE 13.15 Progressive muscle weakness and atrophy occur over time with muscular dystrophy. (credit: modification of work from *Anatomy and Physiology*, 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Type	Description
Duchenne muscular dystrophy (DMD)	• DMD is the most-common type, affects 14 in 100,000 male individuals between the ages of 5 and 24. • It accounts for approximately half of the cases of MD. • It is an X-linked recessive genetic disorder, meaning that it primarily affects the male population. • It results from a complete absence of **dystrophin**, a protein involved in maintaining muscle strength and function. • Symptoms often become apparent during toddler years, when the child is beginning to walk.
Becker muscular dystrophy (BMD)	• BMD is less severe than DMD. • It results from insufficient function of dystrophin. • It usually appears around age 11, but it may occur as late as one's mid-twenties.
Myotonic dystrophy	• This is the most-common MD that is first diagnosed during adulthood (usually between 20 and 30 years of age). • It prevents muscles from relaxing following contraction.
Facioscapulohumeral muscular dystrophy (FSHD)	• FSHD affects the face, shoulders, and upper arms. • It often causes symptoms that affect the eyes first (e.g., difficulty opening eyelids). • Its onset is typically during adolescence, but it can be later. • Most affected individuals live a normal lifespan.
Limb-girdle muscular dystrophy (LGMD)	• LGMD results in progressive muscle loss and weakness, especially in the hips and shoulders. • Several different subtypes with varying levels of severity exist.

TABLE 13.4 Types of Muscular Dystrophies (Muntoni et al., 2023; National Institute of Neurological Disorders and Stroke, n.d.)

LIFE-STAGE CONTEXT

Muscular Dystrophy Diagnosis During Childhood

Most MDs are diagnosed during childhood, which increases the complexity of the disorder. The parents or caregivers of the child will be tasked with providing most of the care to the child in the home setting, highlighting the need for adequate education and training. Additionally, caregivers will likely need emotional support, as receiving a devastating diagnosis for their child can be life-altering. Nurses must not only treat the patient but also consider the needs of the parents and other involved caregivers and family members, such as siblings or grandparents.

Pathophysiology

The underlying pathophysiology of MD is caused by genetic mutations, either inherited or spontaneous. In most cases, the mutation that causes MD is inherited, meaning that it came from one or both parents. Though the specific pathophysiologic mechanism is still somewhat unknown, the mutation negatively affects muscle function, resulting in the degeneration of muscle fibers, decreased muscle mass, and progressive muscle weakness over time.

Clinical Manifestations

Clinical manifestations of MD vary depending on the specific type, but some of the more common findings include

- loss of reflexes,
- abnormal gait,
- frequent falls or clumsiness,
- difficulty standing from a sitting position or climbing stairs,
- posture changes,
- muscle weakness and atrophy,
- contractures,
- an abnormally curved spine, known as **scoliosis**,
- impaired breathing,
- enlarged calves, and
- inability to open or close the eyes.

Because most MDs are diagnosed in childhood, it is often the child's parents who notice the first signs that may indicate a muscular problem. Parents often report that their child is unable to run or jump, is "toe walking," falls frequently, or has trouble standing up from a sitting position on the floor.

Assessment and Diagnostics

The first step in diagnosing MD involves a thorough review of the patient's medical history. It is especially important to assess the patient's family history, as many MDs are known to be genetically inherited. Additionally, a comprehensive physical examination may reveal clinical manifestations associated with MD, including muscle weakness, abnormal gait, or posture changes.

Diagnostics and Laboratory Values

Because MD often occurs secondary to genetic mutations, genetic testing is one of the most definitive diagnostic tests for the condition. In some cases, muscle biopsies can be conducted to examine muscle tissue more closely for signs of the condition. Beyond genetic testing and muscle biopsies, there are no diagnostic tests specific to MD, but several other laboratory and diagnostic tests can be used to assist in making the diagnosis (Table 13.5).

Diagnostic Test	Expected Finding with Muscular Dystrophy
Serum creatine kinase (CK)	CK may be elevated due to muscle breakdown and damage.
Electrocardiogram (ECG)	Heart function may be altered or arrythmias may be present, especially in myotonic dystrophy.
Electromyography (EMG)	Changes in the pattern of muscular electrical activity may indicate a muscular disorder such as MD.
Pulmonary function tests (PFTs)	In more severe cases, PFTs reveal a suboptimal functioning of the lungs due to diaphragmatic muscle weakness.

TABLE 13.5 Diagnostic Tests Used to Assist in the Diagnosis of Muscular Dystrophy

Nursing Care of the Patient with Muscular Dystrophy

Most of the nursing care for patients with MD centers around maintaining the highest quality of life possible and minimizing the negative effects associated with progressive muscle weakness. While there is no definitive cure for MD, many nursing interventions seek to address specific challenges associated with muscle weakness, mobility issues, and potential complications (LaPelusa et al., 2024).

Recognizing Cues and Analyzing Cues

Because most cases of MD are diagnosed in childhood, it is often the parents who notice muscle abnormalities and bring in their children for further assessment and diagnosis. It is important for the nurse to communicate effectively with the parents and allow them to fully express their feelings and concerns. In addition to the information provided by the parents, the nurse will conduct a full physical assessment to determine if the child is exhibiting symptoms consistent with MD or a similar disorder. Cues that would indicate the child may have MD include an abnormal gait, muscle weakness, contractures, and an inability to stand from a sitting position.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Most of the nursing interventions for patients with MD center around maintaining muscle function and slowing the progression of the disorder. These interventions include

- assisting with ADLs as needed,
- promoting as much independence as possible,
- helping with range of motion (ROM) exercises,
- alternating rest and activity periods to combat fatigue and muscle weakness,
- teaching deep breathing and relaxation techniques,
- implementing fall-risk precautions as needed,
- providing emotional support and teaching patient positive coping skills, and
- coordinating care with other members of the health-care team, including physical and occupational therapists.

Evaluation of Nursing Care for the Patient with Muscular Dystrophy

Though MD is progressive, medical and nursing interventions can help slow the trajectory of the disorder. The nurse will need to evaluate the interventions to determine if the plan of care should be revised to ensure optimal patient outcomes.

Evaluating Outcomes

When evaluating outcomes for the patient with MD, the nurse will look for specific findings indicating the interventions have been successful. These findings include

- improved muscle strength,
- normal cardiac rhythm,

- adequate oxygenation status, and
- positive coping skills.

Medical Therapies and Related Care

There is no cure for MD, but some treatments may help with symptom relief. In many cases, long-term corticosteroids are used to help maintain muscle strength for as long as possible. However, the side effects of steroids include weight gain, weakened bones, and a decrease in immune function, all of which can be detrimental to the health of the patient. In these cases, the benefits of using long-term steroids must be weighed against the risks.

In recent years, several new medications have been developed specifically for the treatment of MD. One of these medications, eteplirsen (Exondys 51), works by targeting the specific genetic mutations that cause MD. In addition to these medications, patients with MD who have experienced heart damage may also require treatment with cardiac medications such as angiotensin-converting enzyme inhibitors (ACEIs) or beta blockers. Beyond pharmacological interventions, patients with MD also require therapy to prolong muscle function for as long as possible. Therapy interventions to prolong muscle function include

- physical and occupational therapy,
- ROM exercises,
- low-impact aerobic exercise (e.g., swimming, walking),
- braces, and
- mobility aids (e.g., canes, walkers, wheelchairs).

For patients with cardiac or respiratory issues secondary to MD, use of a ventilator or insertion of a pacemaker may eventually be required.

INTERDISCIPLINARY PLAN OF CARE

Interdisciplinary Care for Patients with MD

Nurses work with an interdisciplinary team and coordinate care for patients with MD.

- The provider orders the treatment plan, including medications and any specialty referrals needed to manage the patient's care.
- The nurse implements the provider's orders and educates the patient about their condition.
- The respiratory therapist provides set-up, maintenance, and instructions for any pulmonary machines, such as a sleep apnea or ventilator; they also educate the patient on pulmonary exercises, such as incentive spirometer, and breathing treatments.
- The case manager coordinates ancillary departments needed for a comprehensive plan of care, such as wound care or nutrition; they also coordinate resources and follow-up for the family once the patient is discharged.

13.5 Connective Tissue Disease

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for connective tissue disease
- Describe the diagnostics and laboratory values of connective tissue disease
- Apply nursing concepts and plan associated nursing care for patients with connective tissue disease
- Evaluate the efficacy of nursing care for patients with connective tissue disease
- Describe the medical therapies that apply to the care of connective tissue disease

Connective tissue, as its name implies, binds the cells and organs of the body together and functions in the protection, support, and integration of all parts of the body. Connective tissue performs many functions in the body; most importantly, it supports and connects other tissues. It is found in many places in the body, from the connective tissue sheath that surrounds muscle cells, to the tendons that attach muscles to bones, to the skeleton that

supports the positions of the body. Protection is another major function of connective tissue, in the form of fibrous capsules and bones that protect delicate organs. Specialized cells in connective tissue defend the body from microorganisms that enter the body. Transport of fluid, nutrients, waste, and chemical messengers is ensured by specialized fluid connective tissues, such as blood and lymph.

There are several disorders that affect connective tissues. In an **autoimmune** disorder, the body's immune system mistakenly attacks healthy cells. Two autoimmune disorders involving connective tissue, systemic lupus erythematosus and rheumatoid arthritis, are discussed in more detail in this section.

Systemic Lupus Erythematosus

The most common form of lupus, **systemic lupus erythematosus (SLE)** is an autoimmune disorder that results in widespread inflammation and tissue damage. Currently, about 1.5 million Americans have some type of lupus, with 70 percent of cases classified as SLE (Lupus Foundation of America, 2016). This disorder is most often diagnosed in female patients during their childbearing years, but it can affect anyone regardless of age or sex. Lupus is two to three times more common in underrepresented racial and ethnic groups, including Hispanic and Asian/Pacific Islander populations (Hasan et al., 2022).

Pathophysiology

The underlying pathophysiology of SLE is not well understood, but it has been shown to have an autoimmune cause. Specifically, the body develops antibodies that attack healthy body cells. Additionally, the body forms many antigen-antibody complexes that can get stuck in capillaries, resulting in **vasculitis**, or inflammation of the blood vessels, and eventual tissue damage. In addition to autoimmune causes, several environmental factors increase the risk for developing SLE, including:

- exposure to ultraviolet (UV) radiation,
- viral infections,
- cigarette smoking, and
- emotional or physical stress.

LIFE-STAGE CONTEXT

SLE and Pregnancy

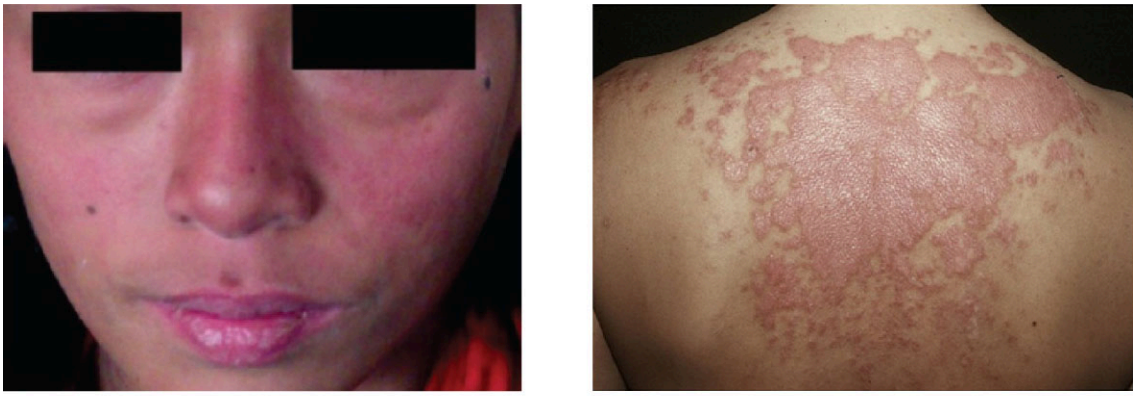
Patients diagnosed with SLE are often of childbearing age, which can cause severe anxiety and stress about their chances of having a healthy pregnancy and childbirth. Patients with SLE who become pregnant often require more intensive monitoring throughout the pregnancy to ensure the safety of both patient and child. Many of the medications prescribed for SLE are not safe during pregnancy, so it is important for the patient to maintain frequent communication with their primary care provider and obstetrician to find a suitable treatment plan.

Clinical Manifestations

The organs most-commonly damaged by SLE include the skin, joints, heart, lungs, kidneys, and brain, so most clinical manifestations will involve these body systems. Additionally, most cases of SLE involve alternating periods of illness ("flares") and improvement in symptoms ("remissions"). Common clinical manifestations of SLE include

- joint pain and swelling;
- fever;
- fatigue;
- cognitive impairment and neurological manifestations (e.g., headaches, personality changes, ischemic stroke, seizures);
- abnormal hair loss, or **alopecia**;
- mouth sores;
- "butterfly" rash on the face or "discoid" rash, usually on the face or trunk (Figure 13.16);
- inflammation of the nephrons of the kidneys, or **nephritis**, which causes renal damage and may lead to the development of hypertension;
- inflammation of the pleural tissue around the lungs, or **pleuritis**, which causes chest pain and pain with

respiration;
- inflammation of the pericardial sac around the heart, or **pericarditis**, which causes substernal chest pain;
- **Raynaud's syndrome**, a condition that occurs when the fingers become pale when exposed to cold or stress states;
- enlargement of the spleen, or **splenomegaly**; and
- swelling of the lymph nodes, or **lymphadenopathy**.



(a) (b)

FIGURE 13.16 (a) Butterfly rash across the nose and cheeks and (b) discoid rash on the back are commonly associated with SLE. (credit: (a) "Butterfly rash of lupus erythematosus" by Mikael Haggström/Wikimedia Commons, CC BY 4.0); (b) "Subacute cutaneous lupus erythematosus" by Uva et al./*Autoimmune Diseases*, CC BY 3.0)

Assessment and Diagnostics

Several conditions have similar clinical manifestations to SLE, so if any symptoms of SLE are assessed, further diagnostic and laboratory testing is warranted to rule out the other potential diagnoses. Many health-care providers and facilities use a standardized diagnostic tool to assess symptoms and laboratory values associated with SLE and assist in making a definitive diagnosis. One of these tools is the EULAR/ACR criteria.

LINK TO LEARNING

This table lists the EULAR/ACR Criteria (https://openstax.org/r/77EULAR_ACR) for classifying systemic lupus erythematosus (SLE).

Diagnostics and Laboratory Values

The most specific diagnostic test for SLE is the antinuclear antibody (ANA) test. This blood test looks for autoantibodies. An **autoantibody** is an antibody that attacks its own body cells; they are commonly associated with SLE. Though the presence of these autoantibodies does not always indicate SLE, they are present in most cases, so a positive test indicates the need for further diagnostic workup (LaPelusa et al., 2024). Though not specific to lupus, a complete blood count (CBC) is also indicated during the diagnostic process for SLE. Certain findings from the CBC, such as leukopenia and thrombocytopenia, may help confirm the diagnosis of SLE.

Nursing Care of the Patient with Systemic Lupus Erythematosus

The main goals of nursing care for patients with SLE are to manage symptoms, prevent or limit the effects of disease flares, and improve the patient's overall quality of life. Additionally, the nurse will often need to provide mental and emotional support for the patient because SLE can negatively affect many different aspects of the patient's life.

Recognizing Cues and Analyzing Cues

The nurse must remain attentive for clinical signs indicating the patient with SLE may be experiencing a disease flare. Most often, this is exhibited with changes in the skin, such as butterfly rash across the face, discoid rash on the trunk, or Raynaud's syndrome in the fingers. It is also important for the nurse to obtain a thorough subjective report of symptoms from the patient, as they may experience fatigue, joint pain, or hair loss as part of a flare. The nurse should immediately report any significant symptoms indicating a flare so the provider can initiate treatment, thereby slowing the progression of the disease and preventing organ and tissue damage.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

One of the main nursing interventions for patients with SLE is the administration of medications to treat symptoms. These include NSAIDs, corticosteroids, immunosuppressants, and biologic medications. The nurse will also provide the patient with extensive education about the prescribed medications. Most of the medications prescribed for SLE have negative side effects; the nurse must teach the patient about these side effects while still stressing the importance of taking the medications as prescribed. Because SLE is a lifelong condition, the nurse will also provide education about the importance of maintaining regular follow-up appointments and self-monitoring for symptoms of disease flares.

Evaluation of Nursing Care for the Patient with Systemic Lupus Erythematosus

Because there is no cure for SLE, it is important that the nurse, provider, and patient maintain frequent communication about the patient's health status to determine the effectiveness of the plan of care. In some cases, the medications prescribed for SLE may no longer be effective, warranting the need for changes to the type, dose, or frequency of the drug or for more-intensive treatment options.

Evaluating Outcomes

When evaluating a patient with SLE to determine the effectiveness of their plan of care, the nurse should assess for signs indicating the treatment interventions are working. These signs include

- less-frequent disease flares or fewer severe symptoms during flares,
- improved skin appearance,
- less (or no) joint pain,
- hair regrowth, and
- normal kidney function, as evidenced by normal serum creatinine and blood urea nitrogen (BUN) levels.

Medical Therapies and Related Care

There is currently no cure for SLE, but there are several supportive treatments for symptoms that will assist in improving the patient's quality of life. First and foremost, anti-inflammatory medications such as NSAIDs are used to help reduce associated pain, fever, and inflammation. Corticosteroids are also often prescribed to limit inflammation associated with SLE. These can be prescribed orally but may also be administered as a topical cream to directly treat rashes or other skin conditions that occur with SLE. Because SLE is an autoimmune disorder, immunosuppressant medications may also be prescribed. These medications work by suppressing the patient's immune system to keep it from attacking its own healthy body cells. Lastly, B-lymphocyte stimulator (BlyS) protein inhibitor is often used to decrease the lifespan of abnormal antibodies, helping to prevent the autoimmune attacks that occur with the condition. In some cases, medications lose their effectiveness and organ damage becomes too severe; when this happens, organ transplantation—most often involving the kidneys—may be necessary.

Rheumatoid Arthritis

The autoimmune disorder that causes inflammation of the synovial joints in the body is called **rheumatoid arthritis (RA)**. This condition affects about 1 percent of the global population, including about 1.3 million American adults—a significant number, considering this disorder is a major cause of work disability and can substantially impact overall quality of life (Xu & Wu, 2021). Though RA can affect both sexes, it is two times more prevalent in females than in males (Chauhan et al., 2023).

Pathophysiology

RA is a chronic inflammatory disease of the joints. It is thought to be genetic in nature. Certain genetic mutations predispose individuals to developing this condition, and these mutations can be passed from generation to generation. In an individual with genetic mutations that put them at risk for developing RA, certain environmental triggers such as cigarette smoking or asbestos exposure can result in the development of the disorder. The environmental trigger starts the process of the body making autoantibodies that begin to attack and destroy the body's joints, causing widespread inflammation.

Clinical Manifestations

This condition can affect all the joints in the body, but the most-commonly affected joints are in the hands. Clinical manifestations associated with RA include

- joint pain and swelling,
- joint stiffness that is typically worse in the morning,
- limited range of motion, and
- rheumatoid nodules (Figure 13.17).

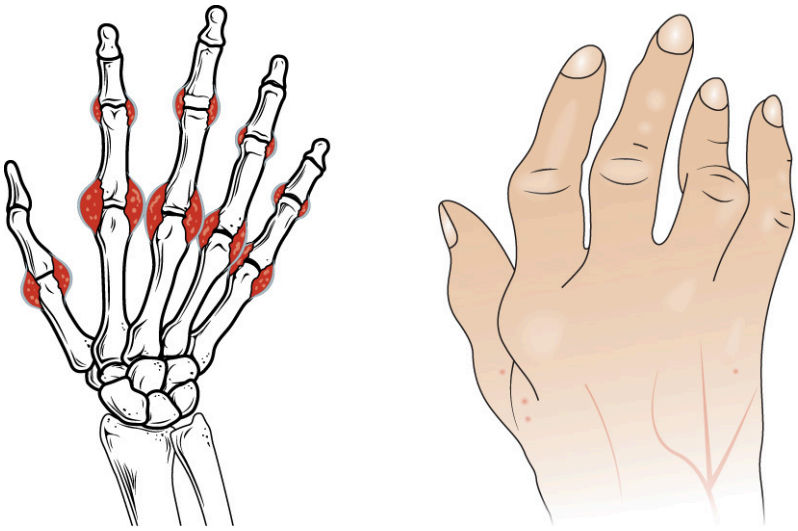


FIGURE 13.17 Nodules can form on the knuckle joints of the hands in rheumatoid arthritis. (credit: modification of work from *Anatomy and Physiology*, 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Assessment and Diagnostics

During the physical assessment, the nurse should first ask the patient about their symptoms, including any joint pain, swelling, or stiffness, and confirm that these symptoms are more severe upon waking in the morning. After gathering a history of the patient's symptoms, the nurse should perform a visual inspection of the hands and feet to look for the presence of RA nodules. As part of the physical assessment, the nurse should check the patient's range of motion and determine whether it is limited in any joints. Bilateral grip strength should also be assessed to see if the arthritis has diminished the patient's ability to use their hands effectively. During palpation of the joint, the nurse will note any areas that feel "boggy," which may indicate the presence of RA.

Diagnostics and Laboratory Values

A few different laboratory tests can assist in diagnosing RA. First, a blood sample can be taken to determine the presence or absence of rheumatoid factor (RF), which is an antibody found in nearly 90 percent of patients with RA (Chauhan et al., 2023). Additionally, the blood can be tested for erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP), both of which indicate elevated systemic inflammation. In addition to blood tests, imaging such as x-ray, ultrasound, or MRI may be used to look for bone erosion associated with RA. However, it is important to note that imaging tests will not show bone damage until the disorder has progressed significantly, so a normal imaging test does not rule out RA.

Nursing Care of the Patient with Rheumatoid Arthritis

Unfortunately, there is no cure for RA. The main goals of nursing care are to manage symptoms, limit damage to joint tissue, and improve overall quality of life.

Recognizing Cues and Analyzing Cues

First and foremost, it is important for the nurse to conduct a thorough physical examination to assess for joint pain or swelling and other symptoms that may indicate the presence of RA. The main cue that the nurse should assess for is the hallmark sign of RA: joint pain and stiffness that are worse in the morning.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

After analyzing the aforementioned cues, the nurse may hypothesize that the patient has RA. One of the main nursing interventions for patients with RA involves the administration of disease-modifying antirheumatic drugs (DMARDs), nonsteroidal anti-inflammatory drugs (NSAIDs), and corticosteroids. The nurse will work with the provider and patient to determine an effective dose and tapering plan and provide counseling about the negative side effects associated with long-term use of corticosteroids (e.g., weight gain, infections). A tapering plan for

corticosteroids is important to prevent adrenal insufficiency, which can result in severe fatigue and other side effects. Other nursing interventions to promote patient comfort include the application of cold and heat, the initiation of physical therapy and other exercises as tolerated, and alternating rest and activity periods to limit stress on the joints.

Evaluation of Nursing Care for the Patient with Rheumatoid Arthritis

It is important for the nurse, provider, and patient to maintain frequent communication about the patient's health status to determine the effectiveness of their treatment plan and disease management. Each nursing intervention will be evaluated for effectiveness or the need for revision.

Evaluating Outcomes

When evaluating a patient with RA to determine the effectiveness of their plan of care, the nurse should assess for signs indicating the treatment interventions are working. These signs include

- improved range of motion,
- decreased joint pain, swelling, and stiffness,
- improved grip strength, and
- lack of reported side effects of medications.

Medical Therapies and Related Care

The main pharmacological treatments for RA involve DMARDs, NSAIDs, or corticosteroids. DMARDs are the only kind of medication that act to slow the progression of the disease; they interfere with inflammatory pathways that cause disease symptoms. The main concern associated with this class of medications is that it greatly increases the patient's risk for developing infections. NSAIDs are used to treat the pain and inflammation associated with RA, but they have no effect on the progression of the disease. Corticosteroids are used to reduce the inflammation associated with disease flareups; long-term use should be avoided when possible, as their side effects include weight gain, osteoporosis, and increased risk of infection.

13.6 Soft Tissue Injuries

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for soft tissue injuries
- Describe the diagnostics and laboratory values associated with soft tissue injuries
- Apply nursing concepts and plan associated nursing care for patients with soft tissue injuries
- Evaluate the efficacy of nursing care for patients with soft tissue injuries
- Describe the medical therapies that apply to the care of soft tissue injuries

Soft tissue injuries affect multiple parts of the body, including muscles, tendons, and ligaments. These types of injuries are common because they occur by many different mechanisms, including athletics, trauma, falls, and normal aging. There are several different types of soft tissue injuries, including sprains, strains, contusions, tendinitis, and bursitis (Table 13.6).

Type of Injury	Description	Areas Commonly Affected
Sprain	Overstretching or tearing of a ligament	• Ankles • Knees • Wrists
Strain	Overstretching or tearing of a muscle or tendon	• Back • Leg (most often the hamstring)

TABLE 13.6 Common Soft Tissue Injuries

Type of Injury	Description	Areas Commonly Affected
Contusions (bruises)	Direct blow(s) to a body part (often with a blunt object), causing damage to underlying muscle and tissue without breaking the skin	• Any part of the body that is hit with the object
Tendinitis	Inflammation or irritation of a tendon from overuse	• Shoulders • Elbows • Feet • Knees • Ankles
Bursitis	Inflammation of a bursa, producing small, fluid-filled sacs (often co-occurs with tendinitis)	• Shoulders • Elbows • Hips • Knees • Heels

TABLE 13.6 Common Soft Tissue Injuries

Pathophysiology

The underlying pathophysiology of soft tissue injuries varies depending on the specific type of injury. Strains and sprains are most often the result of playing sports, as movements such as twisting, turning, and pulling may stretch or tear muscles, ligaments, or tendons. Bruising, or **contusion**, typically occurs from direct blows to the body, such as those obtained from falling or while playing contact sports. The overuse of a tendon causes **tendinitis**, inflammation of a tendon, so this injury is commonly seen in athletes who repeatedly use the same muscles and tendons: for example, tennis players swinging a racquet or baseball pitchers throwing a ball. Usually, a co-occurring condition with tendinitis is bursitis. As the overused tendon becomes inflamed, fluid builds up in the neighboring bursa, resulting in **bursitis**, which is inflammation of the bursa.

Clinical Manifestations

Clinical manifestations of soft tissue injuries vary depending on the area of the body affected and the type of injury that occurred. Some of the most common clinical manifestations associated with soft tissue injuries include

- swelling,
- redness or bruising on the skin,
- pain,
- muscle spasms, and
- muscle weakness.

Assessment and Diagnostics

Most often, physical assessment of the affected part of the body is enough to confirm a diagnosis of a soft tissue injury. For injuries that are less obvious upon visual inspection, imaging studies such as CT or MRI may be indicated. X-rays may be used if bone damage is suspected, but they do not show soft tissue injury as well as other imaging modalities do. There are no specific diagnostic tests that are used to confirm soft tissue injury. In some cases, such as traumas or falls, tests such as hemoglobin and hematocrit may be indicated to monitor for blood loss.

Nursing Care of the Patient with Soft Tissue Injuries

The main goals of nursing care for patients with soft tissue injuries are to manage symptoms and heal the affected part of the body. Patient education is a large component of nursing care for these patients to assist in the healing of the affected muscle, tendon, or ligament.

Recognizing Cues and Analyzing Cues

The nurse must remain attentive for clinical signs indicating the patient is experiencing a soft tissue injury. Most often, the patient will present with pain and swelling of the affected area and report having recently participated in an athletic event or experienced a fall or other trauma. With these cues present, the nurse will hypothesize that the patient has experienced some kind of soft tissue injury; the nurse can then ask more specific questions to determine which kind of injury they have. For example, if a patient experiencing shoulder pain reports they are an avid tennis player, the nurse may hypothesize that they have tendinitis in the shoulder from overuse.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

One of the main nursing interventions for patients with soft tissue injuries is using the "RICE" acronym, which stands for rest, ice, compression, and elevation. The nurse will encourage the patient to take a break from the activity that caused the injury and apply ice packs for 20 minutes at a time several times per day. Additionally, the nurse should apply a compression bandage to limit swelling and elevate the affected injury higher than the level of the patient's heart to reduce swelling and promote circulation to the joint. For sprains, the patient may require application of a brace to stabilize the joint. The nurse should assist the patient in applying the brace for the first time and make sure the patient is able to do it themselves upon discharge home.

Evaluation of Nursing Care for the Patient with Soft Tissue Injuries

Most types of soft tissue injuries are self-limiting, meaning they will improve over time on their own. To ensure the injury is improving, the nurse should schedule a follow-up appointment after discharge. In some severe cases where improvement is not seen at the follow-up appointment, surgery or other intervention may be required, but typically using RICE is enough to produce significant improvement.

Evaluating Outcomes

When evaluating a patient with a soft tissue injury to determine the effectiveness of their plan of care, the nurse should assess for signs indicating that the treatment interventions are working. These signs include

- decreased swelling,
- less self-reported pain,
- improved bruising, and
- improved range of motion.

Medical Therapies and Related Care

In addition to RICE, treatment for soft issue injuries often involves the administration of NSAIDs, which aim to help reduce swelling and pain. In more severe cases of pain, opioid medications may be prescribed, but this is not common. Most importantly, the patient should be educated on strategies to prevent these kinds of injuries in the future. Prevention strategies include

- using proper equipment (e.g., weights, shoes, other sports equipment),
- warming up before participating in physical activity,
- staying hydrated,
- cooling down after physical activity,
- stretching before and after physical activity, and
- resting during physical activity as needed.

Summary

13.1 Osteoporosis and Osteopenia

Osteoporosis is a bone disease in which a person's bone mineral density and bone mass decreases, causing changes to the quality or structure of the bone. Osteopenia, a decrease in bone mineral density, is the precursor condition to osteoporosis.

The underlying pathophysiology of osteoporosis involves too much resorption of small amounts of minerals from the bone over time. Common clinical manifestations of osteoporosis include bone fractures, back pain, kyphosis, and a loss of total height over several years. The gold standard diagnostic test for osteopenia and osteoporosis is the dual-energy x-ray absorptiometry (DEXA or DXA) scan, which uses low-dose radiation x-rays to determine bone density of the hip, wrist, or spine. Treatment options for osteoporosis involve a combination of modifying lifestyle risk factors and prescribing pharmacological interventions.

13.2 Osteoarthritis

OA is a degenerative joint disorder that causes the cartilage to gradually become thinner. As the cartilage layer wears down, more pressure is placed on the bones, causing pain. Common clinical manifestations of OA include joint pain and swelling, limited range of motion, muscle weakness, and "grating" sensations with joint movement. Diagnostic tests for OA include physical examination and assessment, imaging, arthrocentesis, and serum inflammatory markers. Treatment for OA includes both pharmacological interventions (e.g., NSAIDs, analgesics) and nonpharmacological interventions (e.g., exercise, assistive devices).

13.3 Bone Fractures

Fractures, or breaks in the bone structure, are one of the most common types of musculoskeletal traumas. When a bone fracture occurs, the soft tissue surrounding the bone is also usually affected, potentially resulting in soft tissue injuries such as edema, hemorrhage, tendon damage, or severed nerves. The specific clinical manifestations of fractures will vary depending on the anatomic location affected, but they usually include pain, edema, inability to move the affected part, bruising, and extremity deformities. The only definitive way to diagnose a bone fracture is to visualize the break in the bone structure, which can be done with imaging studies including x-ray, CT scan, and MRI. In some cases, the fracture will heal on its own; in other cases, more invasive interventions such as immobilization, reduction, fixation, or surgery may be required.

13.4 Muscular Dystrophy

Muscular dystrophy (MD) is a rare genetic disorder that causes progressive muscle weakness over time; over 30 specific types exist. The underlying pathophysiology of MD is caused by genetic mutations, either inherited or spontaneous. Clinical manifestations of MD vary depending on the specific type, but common findings include muscle weakness and atrophy, contractures, and frequent falls or clumsiness. Because most MDs are diagnosed in childhood, it is often the child's parents who notice the first signs that may indicate a muscular problem. Treatment for MD involves a combination of pharmacological interventions (e.g., long-term corticosteroids) and nonpharmacological interventions (e.g., physical and occupational therapies).

13.5 Connective Tissue Disease

Systemic lupus erythematosus (SLE) is the most common form of lupus, an autoimmune disorder that results in widespread information and tissue damage. The organs most-commonly damaged by SLE include the skin, joints, heart, lungs, kidneys, and brain, so most clinical manifestations will involve these body systems. The most specific diagnostic test for SLE is the antinuclear antibody (ANA) test, which looks for autoantibodies commonly associated with lupus. The main goals of nursing care for patients with SLE are to manage symptoms, prevent or limit the effects of disease flares, and improve the patient's overall quality of life. Treatment for SLE includes the use of anti-inflammatory medications such as NSAIDs and corticosteroids, as well as immunosuppressants and biologic medications.

Rheumatoid arthritis (RA) is an autoimmune disorder that causes inflammation of the synovial joints in the body. RA can affect all the joints in the body, but it most-commonly affects the joints in the hands. Symptoms include joint pain, swelling, and stiffness that is worse in the morning. Diagnostic tests for RA include rheumatoid factor (RF),

erythrocyte sedimentation rate (ESR), and C-reactive protein (CRP), in addition to imaging such as x-ray, ultrasound, or MRI. Pharmacologic treatment for RA includes use of disease-modifying antirheumatic drugs (DMARDs), nonsteroidal anti-inflammatory drugs (NSAIDs), and corticosteroids.

13.6 Soft Tissue Injuries

There are several different types of soft tissue injuries, including sprains, strains, contusions, tendinitis, and bursitis. The most common clinical manifestations associated with soft tissue injuries include swelling, redness, pain, muscle weakness, and spasms. Most often, physical assessment of the affected part of the body is enough to confirm a diagnosis of a soft tissue injury. For injuries that are less obvious upon visual inspection, imaging studies such as CT or MRI may be indicated. The main goals of nursing care for patients with soft tissue injuries are to manage symptoms and heal the affected part of the body. One of the main nursing interventions for patients with soft tissue injuries is using the "RICE" acronym, which stands for rest, ice, compression, and elevation.

Key Terms

alopecia abnormal hair loss
arthrocentesis joint aspiration
arthroplasty joint replacement
autoantibody antibody that attacks its own body cells
autoimmune disorder condition in which the body's immune system mistakenly attacks healthy cells
bone spur bony projection that develops along bone edges
bursitis inflammation of the bursa
compartment syndrome condition caused by increased pressure within an area of tissue and resulting in muscle and nerve damage
contusion bruising
dystrophin protein involved in maintaining muscle strength and function
external fixation internal placement of screws on either side of a fracture by drilling pins into the bone and then connecting them to an external brace or bracket
fasciotomy incision into the skin and fascia to relieve pressure
fracture break in bone structure
internal fixation placement of metal pieces into the bone to help it heal as it grows back together
kyphosis excessive curvature of the upper spine
lymphadenopathy swelling of the lymph nodes
mobility ability of a patient to change and control their body position
muscular dystrophy (MD) rare genetic disorder that causes progressive muscle weakness over time
nephritis inflammation of the nephrons of the kidneys
osteoarthritis (OA) degenerative joint disease disorder that involves the wearing down of joint cartilage and tissue over time
osteoclast cell that breaks down bones
osteopenia decrease in bone mineral density
osteoporosis bone disease caused by a significant decrease in bone density and mass
pericarditis inflammation of the pericardial sac around the heart
pleuritis inflammation of the pleural tissue around the lungs
Raynaud's syndrome condition that occurs when the fingers become pale when exposed to cold or stress states
resorption breakdown and reabsorption over time of small amounts of minerals from the bone
rheumatoid arthritis (RA) autoimmune disorder that causes inflammation of the synovial joints in the body
scoliosis abnormally curved spine
splenomegaly enlargement of the spleen
systemic lupus erythematosus (SLE) autoimmune disorder that results in widespread inflammation and tissue damage
tendinitis inflammation of a tendon from overuse
vasculitis inflammation of the blood vessels

Assessments

Review Questions

1. The nurse is caring for a patient who is concerned about developing osteoporosis. What risk factor for osteoporosis should the nurse mention to the patient?
    a. male sex
    b. high body mass index
    c. regular exercise
    d. postmenopausal status

2. What assessment finding should the nurse anticipate when assessing a patient diagnosed with osteoporosis?
    a. scoliosis
    b. headache
    c. lower-back pain
    d. tachycardia

3. The nurse is reviewing medications with a nursing student before administering them to a patient. When asked about alendronate, a bisphosphonate, what statement by the nursing student indicates an understanding of how this medication treats osteoporosis?
    a. “This medication acts as a calcium supplement.”
    b. “Alendronate inhibits cells that break down my bones.”
    c. “This drug mimics effects of estrogen to protect my bones.”
    d. “This medication works by increasing bone marrow density.”

4. What factor increases the risk for developing osteoarthritis (OA)?
    a. male sex
    b. adolescent age
    c. underweight status
    d. overuse of finger joints

5. The nurse is caring for a patient who presents to the clinic and reports swelling and pain in their fingers over the last few months, which is worse in the mornings. What diagnostic test would the nurse anticipate being ordered?
    a. CT scan
    b. urinalysis
    c. lumbar puncture
    d. C-reactive protein

6. Nursing care of a patient with osteoarthritis should include what action?
    a. limit range of motion (ROM)
    b. promote dependence for ADLs
    c. implement comfort measures
    d. use opioids for pain control

7. What type of fracture results in the formation of several small bone fragments?
    a. spiral
    b. oblique
    c. greenstick
    d. comminuted

8. What terms are included in the 5 P’s of neurovascular assessments? Select all that apply.
    a. pain
    b. position

c. paresthesia
d. pregnancy
e. pallor

9. What treatment option for bone fractures involves the insertion of screws that are attached to a metal brace outside the body?
a. immobilization
b. closed reduction
c. internal fixation
d. external fixation

10. After removal of a cast, what finding does the nurse recognize to indicate that the treatment was effective?
a. increased pain
b. no visible bone deformities
c. skin pallor
d. strong pulses proximal to the fracture

11. What is the most common cause of muscular dystrophy (MD)?
a. viral infections
b. genetic mutations
c. immunosuppression
d. childhood cancers

12. What type of MD results in an inability to relax the muscles after contraction?
a. myotonic dystrophy
b. Duchenne muscular dystrophy
c. limb-girdle muscular dystrophy
d. facioscapulohumeral muscular dystrophy

13. What is the main function of connective tissue?
a. neurological regulation
b. protection of internal organs
c. cardiovascular support
d. bone formation

14. What factor increases the risk of developing SLE?
a. bacterial infections
b. history of cancer
c. exposure to UV radiation
d. vasculitis

15. What is the priority diagnostic test for SLE?
a. hemoglobin
b. white blood cell count
c. antinuclear antibody
d. muscle biopsy

16. The nurse is collecting a medical history from a patient who presents with new-onset joint stiffness and swelling. The nurse suspects RA. What information, if provided in the patient's medical history, would help confirm this diagnosis?
a. history of breast cancer
b. occupational exposure to asbestos
c. previous exposure to Epstein-Barr virus

d. history of systemic lupus erythematosus (SLE)

17. The nurse is reviewing lab results for a patient being worked up for RA. What abnormal lab finding would be most consistent with a diagnosis of RA?
a. decreased C-reactive protein (CRP)
b. elevated erythrocyte sedimentation rate (ESR)
c. decreased red blood cell count
d. elevated hemoglobin and hematocrit

18. What medical therapy is priority for treating SLE?
a. NSAIDs
b. corticosteroids
c. immunosuppressants
d. B-lymphocyte stimulator (BlyS) protein

19. The nurse is caring for a patient who has presented to the emergency room after a soccer game and reported a sore ankle. What condition does the nurse suspect is most likely?
a. sprain
b. contusion
c. bursitis
d. tendinitis

20. The nurse is caring for a patient admitted for a back muscle strain. What medication does the nurse anticipate is most likely to be ordered for the patient?
a. penicillin
b. ibuprofen
c. oxycodone
d. azithromycin

21. Due to the self-limiting nature of soft tissue injuries, how can the nurse evaluate efficacy of home therapies like RICE?
a. Assume the patient is better if they do not call back.
b. Ensure follow-up appointments are scheduled.
c. Connect the patient with a home care nurse.
d. Call the patient daily to monitor symptoms.

Check Your Understanding Questions

1. What components of the Fracture Risk Assessment (FRAX) Tool indicate that a patient is at higher risk for experiencing a fracture related to osteoporosis?

2. What assessment findings would indicate that interventions have been effective for a patient being treated for osteoarthritis?

3. What lifestyle modifications would you suggest to a patient with osteoarthritis?

4. What assessment findings would cause you to worry about the development of common complications after a bone fracture?

5. What clinical manifestations would the nurse anticipate being reported by the parents of a child with suspected MD?

6. What diagnostic tests would you anticipate being ordered for a patient with suspected MD?

7. What clinical manifestations would display to the nurse the efficacy of nursing care for a patient with MD?

8. What assessment findings would you anticipate in a patient who presents with SLE?

9. The nurse is providing discharge education to a patient newly diagnosed with RA. The patient has been prescribed a course of corticosteroids. What information should the nurse include in the teaching?
10. The nurse plans to revise the plan of care for a patient with RA based upon their evaluation findings. What clinical findings might the nurse see in the evaluation that prompt this revision?
11. What assessments will the nurse perform on a patient with a suspected soft tissue injury?
12. What education is important for the nurse to provide to a patient upon discharge after being treated for a sprained ankle?

Reflection Questions

1. What assessment findings would indicate that a patient with osteoporosis is benefiting from their treatment plan?
2. What is the significance of females having a higher prevalence of osteopenia than males?
3. What is the most definitive diagnostic for MD?
4. How would you handle a conversation with a young female patient with SLE who is concerned about the chances of having a healthy pregnancy?
5. What joints are commonly affected with tendonitis, and what are the likely causes?

What Should the Nurse Do?

You are caring for a 27-year-old male patient who presents to the emergency room after a fall during a soccer game. The patient reports that they cannot move their ankle, which has been becoming progressively more swollen in the last hour since the fall. Upon assessment, you notice that the patient's foot is turning purple and the patient is losing the ability to wiggle their toes on command.

1. What kind of injury do you suspect the patient has?
2. What kind of diagnostic test do you anticipate for the patient?
3. Based on the assessment findings, are you concerned about anything at this point?

The nurse is caring for a 2-year-old patient who is brought to the clinic by their parents for frequent falls at home. After assessing the patient and running diagnostic tests, the patient is diagnosed with Duchenne muscular dystrophy (DMD).

4. What other clinical manifestations would you warn the parents that the child may experience over the course of their life?
5. What resources would you provide to the parents to assist them with their child's new diagnosis?
6. The parents fear that since the disease cannot be cured, their child will suffer. What can you mention as possible treatments?

The nurse is caring for a 32-year-old female patient recently diagnosed with SLE.

7. What treatments would the nurse anticipate being ordered for the patient?
8. What considerations and side effects of the treatment options should the nurse discuss with the patient?

Competency-Based Assessments

1. Create a care plan for a patient with osteoporosis. The care plan should include at least three specific nursing interventions and expected outcomes.
2. Develop a chart outlining the diagnostics used to diagnosis and monitor treatment of osteoarthritis.
3. Develop a presentation outlining and describing the medical therapies for a patient with a long bone fracture.
4. Develop a brief presentation outlining interventions a patient can do in their home to reduce RA flare-ups.
5. Develop a flyer with the acronym commonly used as a nursing intervention for the treatment plan of a soft tissue injury.

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CHAPTER 14
Integumentary System

FIGURE 14.1 Dermatological conditions often produce symptoms of itching and rashes. (credit: modification of "Woman Scratching Skin" by NIAID/Flickr, CC BY 2.0)

CHAPTER OUTLINE

INTRODUCTION A nurse is admitting a patient with an unknown skin condition for further evaluation by the health-care provider. The patient's skin is red and flaking. What are the nurse's next steps when gathering pertinent information on this patient? When completing the physical assessment, what other information might the nurse need to assist the health-care provider with this patient's diagnosis? Once the cause and diagnosis are determined, what nursing interventions would the nurse implement for this patient? This chapter reviews common dermatological conditions encountered in the health-care setting. After reading this chapter, you will better understand how to recognize and analyze cues of a patient's integumentary conditions. Also, you will be able to determine a priority nursing diagnoses, create a nursing care plan, generate nursing interventions, and expected outcomes related to your interventions.

14.1 Integumentary Disorders

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations of atopic dermatitis and eczema
- Describe the diagnostic and laboratory values related to specific diseases of the integumentary system
- Apply nursing concepts and plan associated nursing care for the patient with various integumentary disorders
- Evaluate the efficacy of nursing care for patients with integumentary disorders
- Describe the medical therapies that apply to treating various integumentary disorders

The **integumentary system** is the body's largest organ. It comprises the skin, hair, nails, and integumentary (exocrine) glands. The **exocrine glands** secrete their substances through ducts onto the skin's epithelial surface, whereas endocrine glands release their substances directly into the bloodstream. Some examples of the skin's exocrine glands are sweat glands and sebaceous glands, which produce **sebum**, the oil that keeps the skin moisturized. More information about endocrine glands can be found in Chapter 21 Endocrine System and Endocrine System Disorders.

The main function of the integumentary system is to protect the body from outside organisms such as bacteria and viruses. It also helps regulate the body's temperature (MedlinePlus, 2023). Integumentary conditions may also be called dermatological conditions, given the layers of the skin being discussed. Nurses and health-care professionals encounter various dermatological conditions throughout their careers, and some conditions are more common than others. It is important to understand the causes behind these conditions, their clinical manifestations, and relevant nursing interventions.

Integumentary Anatomy Overview

The skin comprises three layers: the epidermis, the dermis, and the hypodermis (Figure 14.2). The **epidermis** is the outermost layer, made of epithelial cells, and is the body's first defense against organisms. The **dermis** is the middle layer, just below the epidermis, and is made up of connective tissue that supports the epidermis. Lastly, the **hypodermis**, commonly referred to as the subcutaneous tissue, is the bottom layer that is made of adipose and areolar tissue that cushions the underlying organs (Kim and Dao, 2023).

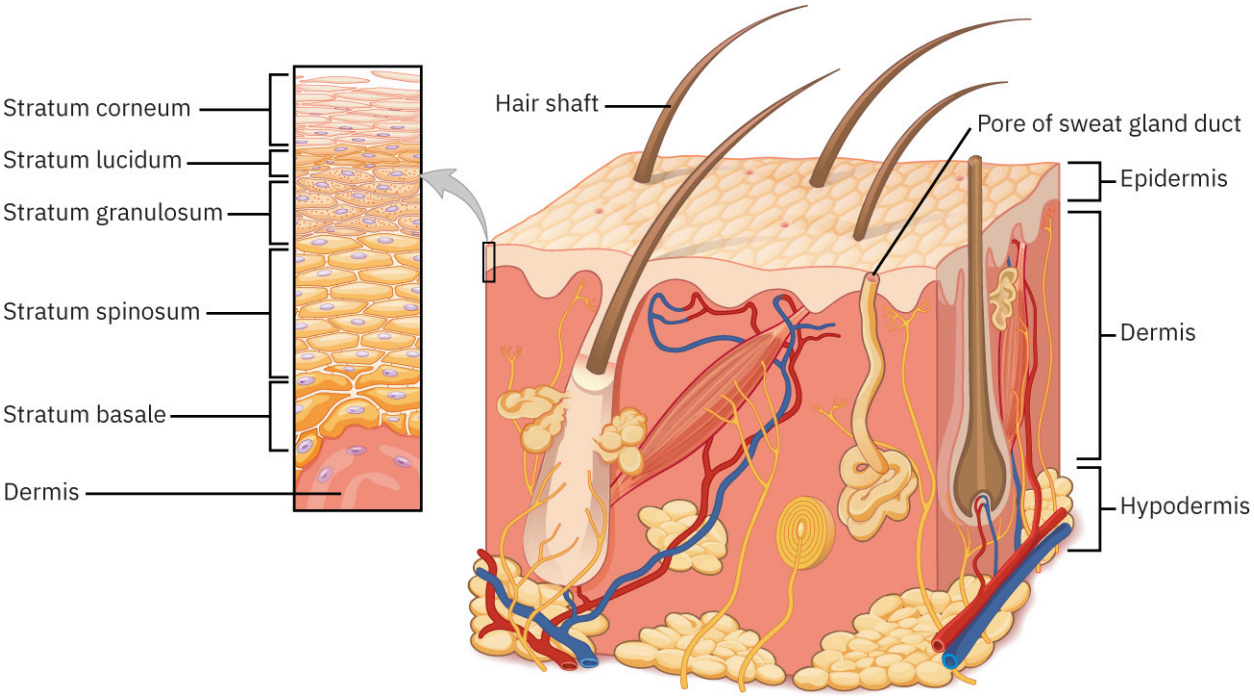

FIGURE 14.2 The three layers of the skin—the epidermis, the dermis, and the hypodermis—contain hair follicles, glands, vessels, and nerve endings. The skin also contains sweat glands that produce sweat and sebaceous glands that secrete sebum. (modification of work from OpenStax *Anatomy and Physiology*, 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

The hair shaft comes through the epidermis, from the roots in the dermis. Hair and nails are formed from **keratin**, a skin protein. Sebaceous glands excrete sebum to keep the skin soft and protect against water loss. The sweat glands excrete salt and water to cool the body when its temperature increases (Kim and Dao, 2023). For more information about the skin breakdown and healing, refer to Chapter 28 Inflammation and Healing.

Atopic Dermatitis (Eczema)

A type of eczema, **atopic dermatitis** (AD) is a chronic skin condition in which a person has a dysfunctional skin barrier that allows outside substances to penetrate the skin easily, which results in dry and red areas of skin. Because it is the most common type of eczema, the two terms are commonly interchanged. Although this condition is more common in children, it is also common in adults (Nemeth & Evans, 2022). According to the Centers for Disease Control and Prevention, 7.3% of adults and 10.8% of children in the United States have atopic dermatitis (Centers for Disease Control and Prevention, 2023).

Pathophysiology

In AD, the skin is more susceptible to pathogens (e.g., bacteria) and is easily irritated by allergens. The skin is also more susceptible to water loss (Nemeth & Evans, 2022).

There are several risk factors for AD, including genetics or a family history of AD, a compromised immune system, and epidermal dysfunction. The full disease process is not entirely clear, and research is ongoing (Kim et al., 2019). However, the prevailing opinion is that a specific gene is linked to development of AD, causing corneocytes (cells that make up the outer layer of skin) in the skin to not be as tightly packed and creating separation in the skin barrier (Nemeth & Evans, 2022). Looking at immune system dysfunction, there is often an imbalance of T cells, which causes cytokine release and inflammatory response. Epidermal abnormalities of the skin's epithelial cells also contribute to eczema and its symptoms (Kim et al., 2019).

Clinical Manifestations

The most common clinical manifestation of AD is itching, and the patient's skin may appear scaly (Figure 14.3), with small areas of **excoriation**, where the skin is broken from scratching and may bleed or ooze in severe cases. Other symptoms may be red and/or dry patches of skin, skin thickening, and **lichenification**, where the skin becomes thick and leathery over time in an area that is frequently scratched. Atopic dermatitis can occur anywhere on the body, but it is most commonly found where joints are flexed, such as behind the knees and the antecubital fossa, as well as the wrists, ankles, and elbows (Nemeth & Evans, 2022). An AD flare-up can be triggered by allergens or stress, or with no warning.

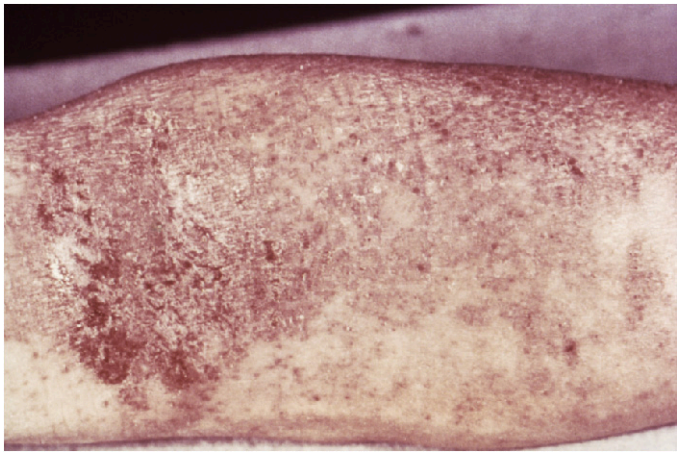

FIGURE 14.3 The erythematous, crusty rash that is typical of AD. In this image, the rash on the backside of the knee, which is a common location of AD. (credit: "ID# 4506" by CDC/Public Health Image Library, Public Domain)

Assessment and Diagnostics

The nurse will most likely notice small areas on the skin with abnormal redness. The nurse should ask the patient about a familial or personal history of AD and ask if the patient has any specific triggers that cause symptoms. The nurse should also ask about symptom onset, location, duration, and rash characteristics, as well as about alleviating or aggravating factors as well as timing and severity of symptoms.

Usually, a diagnosis of AD is based on the patient's symptoms and clinical presentation. Laboratory testing is not indicated unless allergens are suspected to be the cause (Nemeth & Evans, 2022). The health-care provider may ask about steroid use or environmental triggers, like cigarette smoke, soaps, or detergents. If a diagnosis is still not clear, the health-care provider may order a skin biopsy of the rash (National Institute of Arthritis and Musculoskeletal and Skin Diseases, 2022). If allergies are suspected, the health-care provider may order a scratch test for allergies. If health-care provider suspects immune system problems, tests for immunoglobins, an antinuclear antibody test, or other bloodwork may be helpful. The nurse can look for these results in the patient's chart.

Nursing Care of the Patient with AD

When caring for a patient with AD, it is important to understand the patient's past medical history. Be sure to ask the patient if they have a family history of atopic dermatitis, because the condition can be linked to a specific inheritable gene. The nurse can provide both pharmacological and nonpharmacological interventions, with a health-care provider's order, to assist with symptom relief and treating AD. Pharmacological interventions include topical emollients or antibiotics and oral antihistamines for itching. Nonpharmacological interventions include removing possible triggers and promoting hydration and skin integrity.

Recognizing and Analyzing Cues

The nurse may notice the patient is itchy and has areas of dry skin. Some areas may appear **erythematous** (abnormally red) and with mild to moderate excoriation. If the patient is scratching the areas frequently, the nurse may recognize skin thickening, oozing, weeping, or bleeding. The nurse should ask the patient the following questions:

- When did the symptoms start?
- Does anything aggravate the symptoms?
- Have you tried any treatments, and have they worked?
- Do you have any known environmental allergies?
- Does anyone in your family have similar symptoms or been diagnosed with eczema?

The patient may mention a specific trigger that causes their skin to break out, such as certain detergents or animal dander; however, there is not always a specific trigger. All the mentioned clinical manifestations can indicate AD, psoriasis, hives, skin allergies, or other skin disorders (Nemeth & Evans, 2022).

Prioritizing Hypotheses, Generating Solutions, and Taking Action

The priority nursing hypothesis related to AD is typically impaired skin integrity. If specific environmental allergens have been identified, the nurse should educate the patient to avoid these. If the triggers cannot be removed or the patient is experiencing itching, the nurse can request an order from the health-care provider for bedtime oral antihistamines. Oral antihistamines are preferred to be administered at bedtime because they act more as a sedative than itch relief; if administered during the daytime, they can cause unwanted drowsiness.

Because AD causes water loss from the skin, hydration is key. The nurse promotes a daily skin-moisturizing routine with oil-based ointments and lotions instead of water-based lotions. Water-based lotions do not hold the skin's moisture as long as oil-based ointment. Lotions should be fragrance-free because fragrances can sometimes be a trigger to AD. A daily moisturizing regimen may not be enough to help the patient's skin condition from worsening. Therefore, the nurse would discuss this with the provider and request an order for a topical anti-inflammatory or steroid (Kim, 2023).

Because AD is caused by dysfunction of the skin barrier, the patient is more likely to develop secondary fungal or bacterial infections, such as with *Staphylococcus aureus* (Nemeth & Evans, 2022). The nurse should frequently examine the patient's skin for signs and symptoms of infection. Signs and symptoms to look for include increased redness, swelling, and pus or unusual colored discharge from the areas; sometimes, yellow crusts will form over the areas of excoriation (MedlinePlus, 2023). If the nurse notes signs of infection, they should alert the health-care provider, and a topical and/or oral medication may be prescribed to treat for secondary infection. Topical mupirocin is commonly prescribed for bacterial infections and ketoconazole for fungal infections (Nemeth & Evans, 2022).

Evaluation of Nursing Care for the Patient with AD

After the nurse has implemented interventions, they must evaluate their effectiveness. The nurse observes for signs

of improvement to the patient's skin, including no new impairment of skin integrity.

CULTURAL CONTEXT

Skin Tone Variations and Symptom Presentation in Atopic Dermatitis

Atopic dermatitis (AD) can manifest differently depending on the patient's skin tone. In lighter skin tones, AD typically presents as red, inflamed patches. However, in darker skin tones, these patches may appear darker, greyish, or purplish rather than red. Postinflammatory hyperpigmentation, which leaves dark spots where the eczema was active, is more common in individuals with darker skin tones.

Hair Texture and Scalp Care

Patients with different hair textures may experience atopic dermatitis on the scalp differently. For those with coarser or curly hair, AD symptoms on the scalp might be overlooked due to the density and texture of the hair. Special attention should be given to thoroughly examining the scalp and providing tailored advice on managing scalp dermatitis without causing damage to the hair. This may include recommending specific hair-care routines or products that are gentle on both the skin and hair.

Cultural Practices and Treatment Adherence

Cultural beliefs and practices can influence how patients perceive and manage AD. Some cultures may prefer natural or home remedies versus prescribed medications, which can affect treatment adherence. Nurses should engage in open, respectful conversations to understand the patient's cultural preferences and integrate culturally acceptable treatment options. Providing education on the effectiveness and safety of prescribed treatments while also respecting traditional practices can enhance adherence and outcomes.

Effect on Nurse-Patient Communication

Effective communication is essential for understanding and addressing cultural differences in managing AD. Nurses should use culturally sensitive language and ask open-ended questions to better understand the patient's experiences and preferences. Providing educational materials in the patient's preferred language and considering literacy levels can also improve aid understanding and management of the condition.

Evaluating Outcomes

When evaluating desired outcomes, the nurse should ensure that the patient's AD is improving. The patient would report decreased itching, and the areas of healing AD would show decreased redness. If the patient had previous signs of infection, the nurse would expect the patient's skin to improve in appearance, showing decreased redness, swelling, and discharge from the infected areas. The nurse would still encourage a daily moisturizing regimen for the prevention of AD flares (National Institute of Arthritis and Musculoskeletal and Skin Diseases, 2022).

Medical Therapies and Related Care

Suppose symptoms do not seem to be improving or are worsening. In that case, the nurse can also recommend that the provider refer the patient to a dermatologist, who is a doctor specializing in treating skin disorders. If an allergy is suspected to be triggering AD flares, the nurse should be aware that the patient may need to see an allergist. Sometimes AD can lead to secondary infections; in those cases, the nurse should ask for help from a wound care or infectious disease provider (National Institute of Arthritis and Musculoskeletal and Skin Diseases, 2022). To promote wound healing, the nurse can also seek recommendations from a nutritionist. A high-protein diet can promote wound healing, as can dietary supplements. The nutritionist may also be able to identify foods that are causing skin reactions. Some common foods are wheat, eggs, and dairy products (Bemak, 2018).

Psoriasis

The chronic dermatological disorder characterized by the proliferation of skin cells and chronic inflammation is called **psoriasis** (Nair & Badri, 2023) (Figure 14.4). It affects more than 7.5 million people in the United States, about 3% of the population (Armstrong et al., 2021).

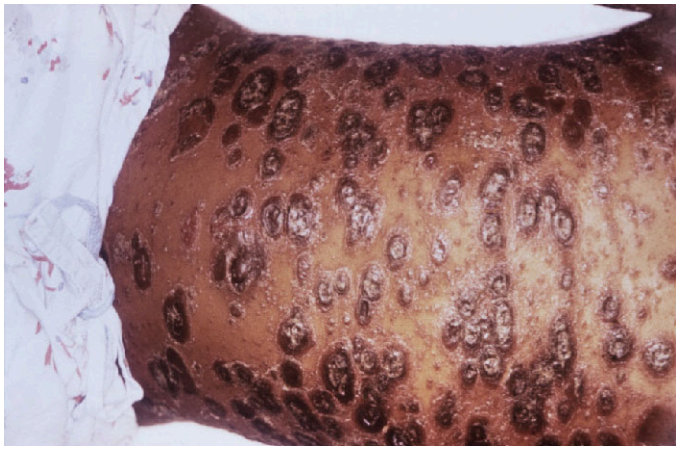

FIGURE 14.4 Numerous red, elevated, scaling lesions due to psoriasis. (credit: "ID# 5503" by CDC/Gavin Hart/Public Health Image Library, Public Domain)

Pathophysiology

Psoriasis is characterized by the proliferation of skin cells, specifically keratinocytes, which are activated by T cells infiltrating the skin. The proliferation of keratinocytes causes thickened skin or areas of thick plaques to form. A **plaque** is a raised lesion on the skin. This can lead to **epidermal** hyperplasia, thickening of the epidermis, and **parakeratosis**, a condition in which keratinocytes do not fully reach maturity. It also causes a skin inflammatory immune response through the cytokine response (Nair & Badri, 2023).

Psoriasis is an autoimmune disorder. An autoimmune disorder occurs when the body attacks its own cells and natural defenses. Because this condition affects the entire body, people with psoriasis may present not only with skin issues but also joint pain, nail changes, and poor sleep. It has also been linked to several inherited genes (Rendon & Schakel, 2019). The pathogenesis of psoriasis is unclear, although there is some indication that triggers (e.g., allergies, stress, dry skin, injuries) can potentiate a flare (MedlinePlus, 2022).

Clinical Manifestations

There are many types of psoriasis; the most common is plaque psoriasis. When observing plaque psoriasis, there are often well-defined thick patches of reddened skin with a silverly scale appearance. Common areas where plaque psoriasis is found are the elbows and knees, but it can be found anywhere on the body, like the scalp and soles of the feet (MedlinePlus, 2022). Other types of psoriasis will present with varying signs (e.g., itching, dry or scaly skin, joint achiness, thickened nails), depending on the type of psoriasis (Nair & Badri, 2023). These are summarized in Table 14.1.

Type	Clinical Manifestation	Common Location(s)	Image
Plaque psoriasis	Dry, itchy, raised skin plaques Varies in number Varies in color	Elbows, knees, lower back, scalp	 (credit: CDC/ Dr. N.J. Fiumara/Public Health Image Library, Public Domain)
Nail psoriasis	Nail pitting Abnormal nail growth Nail discoloration Nail separation from nail bed (**onycholysis**) Crumbling nails	Fingernails, toenails	 (credit: "Psoriasis fingernail" by "Fluzwup"/Wikipedia, Public Domain)
Guttate psoriasis	Small, drop-shaped scaling spots	Trunk, arms, legs	 (credit: modification of "Figure 1 Small, red, drop-like lesions of Guttate psoriasis located at the hand (A)" by Theocharis Koufakis and Ioannis Gabranis/National Library of Medicine, CC BY 2.0)
Inverse psoriasis	Inflamed, smooth patches	Groin, buttocks, breasts	 (credit: CDC/ Dr. Gavin Hart/Public Health Image Library, Public Domain)

TABLE 14.1 Type of Psoriasis (Mayo Clinic, 2024)

Type	Clinical Manifestation	Common Location(s)	Image
Pustular psoriasis	Pus-filled blisters Varies in patch size	Palms, soles	 (credit: Roland Tanglao/Flickr, CC BY 2.0)
Erythrodermic psoriasis	Peeling rash Itchy or burning Short or long-term	Entire body	 (credit: CDC/ Public Health Image Library, Public Domain)

TABLE 14.1 Type of Psoriasis (Mayo Clinic, 2024)

Assessment and Diagnostics

While assessing the skin, the nurse can recognize psoriasis by identifying well-defined thick patches of reddened skin with a silvery scale appearance. Because psoriasis has a genetic component, the nurse should ask the patient about any familial history of psoriasis or skin conditions. The nurse asks if anything triggers the patches to appear or itch and if the patient has any autoimmune disorders. Some laboratory tests the health-care provider may have already ordered are a complete blood cell count (CBC), rheumatoid factors, erythrocyte sedimentation rate (ESR), and uric acid level. The nurse can look for previous results in the patient's chart.

Typically, a diagnosis of psoriasis is based on the patient's symptoms, clinical presentation, and how the skin condition appears, such as whether it is macular or popular. A skin biopsy may be taken for an accurate diagnosis, because psoriasis can resemble other skin conditions. The health-care provider can order additional blood tests to help determine the cause or exact etiology; these tests may include renal and liver function panels, a pregnancy test, and hepatitis serology (Nair & Badri, 2023). Elevated rheumatoid factor level, uric acid levels, and ESR can indicate psoriasis.

Nursing Care of the Patient with Psoriasis

When caring for patients with psoriasis, the nurse recognizes and analyzes patient cues and implements nursing interventions. Nursing care for patients with psoriasis involves recognizing and analyzing various patient cues, including skin assessment, symptom severity, and psychosocial effects. Interventions focus on skin care management with moisturizers and topical treatments, systemic and phototherapy monitoring, and symptom-relief strategies for itching and pain. Nurses also provide education on trigger avoidance and healthy lifestyle modifications, and offer psychosocial support through counseling and support groups. By coordinating with interdisciplinary teams and advocating for patients, nurses ensure comprehensive care that improves patient outcomes and quality of life.

LINK TO LEARNING

Health-care providers often use the Psoriasis Area and Severity Index (PASI) tool (https://openstax.org/r/77Psoriasis) to determine the severity of a patient's psoriasis when prescribing medication and appropriate treatment. This helps determine and guide the appropriate treatment. Nurses can use this also use this tool as a reference to help guide their nursing interventions and expected outcomes. They can look through the health-care providers notes to determine the patient's PASI score.

Recognizing and Analyzing Cues

The patient may report itchy and dry skin. The nurse should assess the patient for psoriatic plaques on the elbows, knees, or other areas of the body and ask the patient about their family history of skin disorders. The nurse can ask the patient when the symptoms started, if they are reoccurring, and if there are any specific triggers. They can also ask what treatments the patient has tried and if they helped (Nair & Badri, 2023). If the patient reports a familial history of psoriasis and the nurse notices the silvery patches of skin, this may indicate the patient has a form of psoriasis.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

The priority nursing hypothesis for psoriasis is impaired skin integrity. Both pharmacological and nonpharmacological interventions are aimed at providing symptom relief and treatment. The nurse promotes a daily skin moisturizing routine with oil-based emollients and moisturizers to create a skin barrier and aid skin healing. Topical treatments, such as ointments or creams, are used in mild cases of psoriasis. Some examples include cortisone creams, coal tar, retinoids, or dithranol. Coal tar is a medicine used to help with skin itching and dryness by slowing skin cell growth (Nair & Badri, 2023).

Another treatment the provider might prescribe is **phototherapy**, which is ultraviolet light exposure to the skin. The nurse would ensure the patient receives this treatment by coordinating with the health-care team for phototherapy scheduling. For more severe cases of psoriasis, a systemic medication (e.g., methotrexate) may be prescribed by the provider to suppress the patient's immune system. Because psoriasis is an autoimmune condition, suppressing an inflammatory response with medications can help resolve symptoms. Some providers may also prescribe biologics, like infliximab or adalimumab (MedlinePlus, 2022). If the patient is prescribed any systemic medications, the nurse would administer these as prescribed and monitor the patient's liver and renal function, because these medications can increase values of biomarkers (e.g., alanine aminotransferase [ALT] levels, ESR). If the patient's immune system is impaired, infections are more likely to develop (Nair & Badri, 2023). Therefore, the nurse would also monitor for serious infections like tuberculosis and hepatitis.

LINK TO LEARNING

Read this article to learn more about biologics (https://openstax.org/r/77Biologics) and their role in treating psoriasis.

If the patient has identified specific triggers such as cold and dry conditions, drinking excessive amounts of alcohol, or stress, the nurse should educate the patient to avoid these. The nurse should educate the patient on stress-reducing techniques that can reduce psoriasis flares (MedlinePlus, 2022). The nurse should also educate the patient about worsening symptoms (e.g., redness, swelling, unusual discharge) to monitor that might indicate infection due to impaired skin integrity. If the patient or nurse notices any of these issues, the nurse should alert the health-care provider, who may prescribe topical antibiotics, such as mupirocin (Nair & Badri, 2023).

Evaluation of Nursing Care for the Patient with Psoriasis

Once the nurse has implemented pharmacological and nonpharmacological interventions, they must evaluate the effectiveness of the interventions. The nurse observes signs of improvement to the patient's skin and symptoms and assesses for no new or worsening signs of impaired skin integrity.

Evaluating Outcomes

Psoriasis is a chronic disease, meaning the patient will have periods of remission, when they have little to no symptoms. The nurse should see a desired outcome of treatment, including skin healing, improvement of patchy areas, and decreased skin thickness, redness, and scaly appearance. The patient's skin should also not show any signs or symptoms of infection, impaired skin integrity, or inflammation. If the patient was prescribed any medications, the nurse should reinforce medication compliance by educating the patient on the importance of continuing the treatment regimen. If the patient is taking systemic medications, the nurse would expect the patient's renal and liver function test results to be within normal limits. Renal function tests might include glomerular filtration rate (GFR) or creatinine level. Liver function tests include measuring ALT, aspartate aminotransferase (AST), and alkaline phosphatase (ALP) levels to make sure liver function is not impaired while the patient is receiving biologic medications. In addition, the patient would not show any signs of serious infection, like tuberculosis or hepatitis (Nair & Badri, 2023).

If additional areas of psoriasis form or worsening of symptoms or erythema are noted, the nurse should alert the health-care provider and suggest additional treatment, like adding systemic medication, if not already prescribed. The nurse would also evaluate the effectiveness of their education, ensuring the patient understands the importance of adhering to medications and avoiding triggers (Nair & Badri, 2023).

Medical Therapies and Related Care

Treatment of psoriasis often involves a dermatologist; if the patient has not already been referred to one, the nurse may suggest a referral. Psoriasis can cause secondary infections that may require assistance from a wound care nurse or infectious disease specialist, especially if the patient takes biologics or systemic medications. If an allergy is a suspected trigger, the nurse sends a referral to an allergist from the health-care provider. Depending on the area and type of psoriasis, additional referrals to a rheumatologist for autoimmune causes, and nephrologist, for kidney causes, may be warranted. If the patient's psoriasis is around or near the eyes, a referral to an ophthalmologist is needed (Nair & Badri, 2023).

14.2 Burns

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the incidence and prevalence of burn injuries
- Discuss the pathophysiology, risk factors, and clinical manifestations of burns
- Describe the diagnostic tests used and laboratory values observed for burn injuries
- Apply nursing concepts and plan associated nursing care for the patient with burns
- Evaluate the efficacy of nursing care for patients with burns
- Describe the medical therapies that apply to burn injuries

A **burn** is an injury to the skin from heat or chemicals. It can occur due to a variety of reasons, including hot liquids, electricity, fire, or heat or sun exposure. Depending on the type and severity of the burn, a patient can have life-threatening or serious complications, such as secondary infections, hypovolemia, hypothermia, and sepsis. As a nurse, you must understand the different types of burns, assessment techniques, and appropriate nursing care.

Incidence and Prevalence

As of 2023, the World Health Organization estimated that, globally, approximately 180,000 deaths occur every year from burn injuries (World Health Organization, 2023). The American Burn Association reported in their 2018 update that approximately 486,000 burn injuries occur every year in the United States (American Burn Association, 2018). Thermal injury is the main cause overall, accounting for 86% of burns, whereas electrical (4%) and chemical (3%) burns make up only a small portion of burn injuries.

Injuries from flames and scald burns are the most common across the population. Flame burns are more common in adults; children (aged <5 years) are more likely to suffer scald injuries. Notably, burn occurrences disproportionately affect individuals from low- and middle-income backgrounds, particularly in regions with fewer economic resources (Schaefer & Szymanski, 2023).

Severity and Survival

Burns can range from minor to severe, with the mortality rate increasing along with the severity of the burn. Mortality ranges from 3% to 55% with more severe burns leading to death. For adults, severe burns are usually those that cover more than 20% of the body or total body surface area (TBSA). For children, a burn covering more than 10% of their TBSA is considered severe (Gauglitz & Williams, 2023).

All burns must be thoroughly assessed to determine thickness, the percentage of TBSA involved, and if there are any life-threatening complications. Methods of calculating TBSA are discussed later in this chapter. Nurses should follow the ABCDE assessment method when initially triaging and caring for a burn patient. The ABCDE method stands for (in order of priority):

1. Airway: patency
2. Breathing: oxygen saturation and respiratory rate
3. Circulation: blood pressure, heart rate, and fluid resuscitation
4. Disability: neurological status
5. Exposure: temperature

For burns, ABC, followed by fluid resuscitation, take priority. More about the ABCDE can be found in the Chapter 33 Emergency Care chapter. For example, when using this method, the nurse would prioritize airway assessment and management ahead of any issues with circulation.

There are specialized burn injury hospitals and facilities throughout the country. However, not all patients come to burn centers for initial treatment. Therefore, a nurse in a typical emergency department should work with the health-care team to determine the severity of the patient's burn injuries and discuss if the patient needs to be transferred to a burn facility (Gauglitz & Williams, 2023).

LINK TO LEARNING

The American Burn Association has a website where you can find burn center locations (https://openstax.org/r/77BurnCenter) throughout the country.

Emergent Care

Following the ABCDE assessment method, the health-care team (i.e., nurse, respiratory therapist, health-care provider) will simultaneously assess the patient's airway for patency and then address the patient's breathing. Then, the team will assess the patient's respiratory rate and oxygen saturation, along with any other compromising issues (e.g., smoke inhalation) to determine if the patient requires oxygen treatment. Depending on the severity of the burn injury, the health-care provider may have to intubate the patient and provide respiratory support with a ventilator.

After establishing the patient's airway, the patient's circulation would be assessed, and fluid resuscitation may be indicated; obtaining intravenous (IV) access and controlling areas of hemorrhage are top priorities in burn care. Fluid resuscitation is necessary for the body and skin's hydration status because much of the vascular volume is lost through the skin with a burn. Adequate IV fluids are also needed to maintain vital signs within normal limits, including blood pressure support through intravascular volume. The nurse would then assess and address concerns related to disability or the patient's neurological status. Lastly, the nurse would collaborate with the health-care team to determine exposure. Exposure includes assessing the patient's temperature and skin, determining if warming measures are needed, assessing thickness of the burns, and calculating the TBSA (Gauglitz & Williams, 2023). For more information about the ABCDE triage method and interventions, see Chapter 33 Emergency Care.

Type of Burn Injuries

Burns can occur from different heat sources, causing different types of burn injuries. The main types of burns are thermal, chemical, electrical, and radiation. A **thermal burn** is the most common type of burn and is caused by an external heat source, like flames, steam, or hot liquids. A **chemical burn** is caused by hazardous chemicals, like acids or strong detergents. An **electrical burn** is caused by exposure to electricity or electrical currents. A **radiation burn** occurs from exposure to radiation sources, such as sunlight or machines that emit radiation, during some

cancer treatments (Warby & Maani, 2022). Burns are also classified by severity, ranking from least severe to most severe. These range from first-degree to sixth-degree burns and are further outlined in the following sections.

First-Degree Burns

A **first-degree burn** is the most superficial type of burn and is considered minor. It affects only the epidermis, or the outermost layer of the skin. First-degree burns are also called superficial thickness burns. An example of a first-degree burn would be a sunburn without any blisters, or one caused by touching a hot pot on the stove and quickly letting go (Warby & Maani, 2022).

Pathophysiology

First-degree burns affect only the skin's epidermal, or outermost, layer. When a burn source affects the skin, it causes protein denaturation or breaking of the protein linkages of the epidermis. Collagen, which helps the skin's elasticity, is also damaged. This causes the skin cells to die, a condition called necrosis (Pencle et al., 2022). After the burn injury occurs, three zones of injury arise: the zones of coagulation, statis, and hyperemia (Figure 14.5). The **zone of coagulation** is the central area of a burn where tissue has been irreversibly damaged and coagulated. The **zone of stasis** is the area surrounding a burn where the tissue has decreased perfusion, but the skin is still potentially viable. This is important for wound healing. Lastly, the **zone of hyperemia** is the outermost area of a burn where tissue is inflamed and has increased blood flow, typically recovering without intervention (Jeschke et al., 2020).

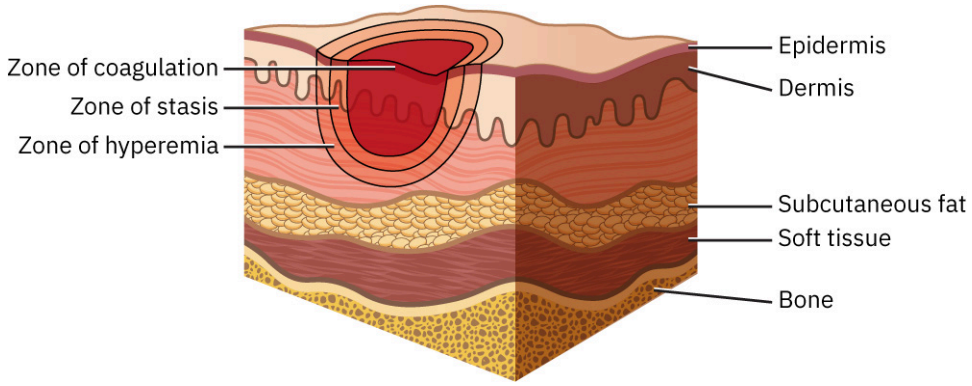

FIGURE 14.5 This image shows the zones of injury when a burn occurs. The zone of coagulation is the area with the most damage and is centrally located. The zone of stasis has decreased tissue perfusion, but the skin will still potentially heal. The zone of hyperemia is the outer layer, which is the extent of the tissue perfusion. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Clinical Manifestations

Clinical manifestations of first-degree burns include erythema, or redness, to the burned area, which can appear red or pink (Figure 14.6). Examples are a sunburn that does not blister or a minor burn from a stovetop. These burns may have minor skin swelling and are dry; they do not appear moist. First-degree burns will not form blisters and usually heal without scars. Pain associated with first-degree burns can be mild to moderate, depending on the area affected (Warby & Maani, 2022).

FIGURE 14.6 A first-degree burn appears pink, and the skin is dry. (credit: "Sunburn" by Beatrice Murch/Flickr, CC BY 2.0)

Assessment and Diagnostics

The nurse should assess the patient's skin for the characteristics of a first-degree burn. The nurse should ask the patient how and when they were burned, what caused the burn (i.e., source), and if they have any pain (Pencle et al., 2022).

Diagnosis of first-degree burns is based on clinical presentation. In a light-skinned patient, the nurse would note pink to red skin; if the patient's skin is darker, the burn may be reddish to brown. The burn will appear dry, without blisters, and only affects the top layer of skin. The nurse should also calculate the TBSA of first-degree burns using the Rule of Nines. The Rule of Nines is a quick tool that assigns a certain percentage to a body area, based on the surface area, so the person calculating can quickly estimate TBSA (Figure 14.7). Most first-degree burns are treated outside of the hospital setting and do not require additional diagnostic tests or laboratory and blood work (Pencle et al., 2022).

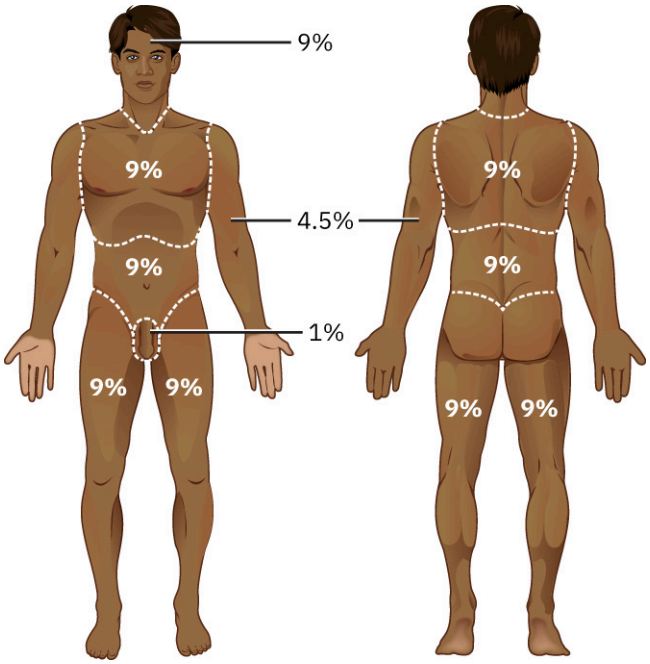

FIGURE 14.7 The Rule of Nines is used to calculate the TBSA that is covered in burns. Anterior and posterior portions are separate, and the areas are summed to a total score. For example, if a person is burned on their anterior and posterior bilateral upper arms, the TBSA would total 18% (4.5% for left anterior arm + 4.5% for left posterior arm + 4.5% for right anterior arm + 4.5% for right posterior arm). (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Nursing Care of the Patient with First-Degree Burns

When caring for a patient with a first-degree burn, it is important to understand how the burn occurred, the heat

source, and the patient's symptoms. The nurse will also assess and document the burn area(s) and calculate the TBSA affected by the burns, if extensive. The nurse will also provide pharmacological and nonpharmacological interventions and wound care education as ordered (Pencle et al., 2022). Nursing care for the patient presenting with a burn should follow these steps:

1. Identify heat source and take the patient's vital signs.
2. Address airway and breathing problems, if any.
3. Classify burns as first, second, or third degree.
4. Calculate the TBSA.
5. Provide remaining nursing interventions following the ABCDE model.

INTERDISCIPLINARY PLAN OF CARE

Interdisciplinary Care of the Burn Patient

Team members may include:

- Burn surgeon: Leads the medical management, performs surgeries for debridement and grafting, and oversees overall treatment plan
  - Interventions include surgical interventions, wound care, monitoring for complications, and coordinating with other team members for comprehensive care.
- Wound nurse or burn nurse: Provides specialized wound care, pain management, and education on burn care
  - Interventions include dressing changes, administering medications, monitoring vital signs, and patient and family education on wound care and prevention of infection.
- Physical therapist: promotes mobility, prevents contractures, and enhances functional recovery
  - Interventions include range of motion exercises, strength training, mobility aids, and positioning techniques to prevent deformities.
- Occupational therapist: Assists in regaining independence in daily activities and improving fine-motor skills
  - Interventions include activities of daily living (ADLs) training, splinting, adaptive equipment, and techniques to improve dexterity and coordination.
- Social worker: Provides psychosocial support, resources for coping, and assistance with discharge planning
  - Interventions include counseling, connecting with support groups, coordinating community resources, and addressing financial or housing concerns.
- Nutritionist: Ensures optimal nutritional support for wound healing and overall recovery
  - Interventions include nutritional assessment, high-protein diet plans, vitamin and mineral supplementation, and monitoring for malnutrition.
- Psychologist/psychiatrist: Addresses mental health issues such as anxiety, depression, and post-traumatic stress disorder (PTSD) related to the burn injury.
  - Interventions include psychological assessments, therapy sessions, support groups, and medication management if needed.
- Respiratory therapist: Manages respiratory complications, especially in patients with inhalation injuries
  - Interventions include monitoring respiratory status, providing oxygen therapy, ventilator support, and pulmonary rehabilitation exercises.

Recognizing and Analyzing Cues

When recognizing cues, the patient may report that they received a burn to their skin. Additionally, the nurse may notice a pink to red or brown area that appears dry and mildly swollen. Some skin conditions, like birthmarks, can be mistaken for burns, so the nurse should ask the patient about all areas. Also, the nurse analyzes these clues by asking the patient how they received a burn, when the burn occurred, and their pain level. If the patient can speak, the nurse can use the numeric pain scale. If the patient is unconscious or nonverbal, the nurse can assess the patient's vital signs (e.g., tachycardia or tachypnea) in conjunction with the approved facility pain scale, such as FACES or Pain Assessment in Advanced Dementia (PAINAD) Scale. The nurse should also ask the patient if they have tried any over-the-counter remedies or taken any medications for pain relief (Pencle et al., 2022).

Prioritizing Hypotheses, Generating Solutions, and Taking Action

The priority nursing hypothesis for first-degree burns is impaired skin integrity related to the burn injury. When generating solutions, the nurse can determine pharmacological and nonpharmacological interventions to promote impaired skin integrity with the outcome of the burn healing. First-degree burns are considered minor and can be treated mainly using the "Cs" of burn care (Schaefer & Szymanski, 2023):

- Cooling: In small areas, tap water or saline solution may help to prevent the burn from progressing burning and to reduce pain.
- Cleaning: Burns should be cleaned using a mild soap and water or a mild antibacterial wash. Large blisters are generally debrided. Small blisters and blisters involving the palms or soles are left intact.
- Covering: The burn may be covered using an absorbent dressing or specialized burn dressing over a topical antibiotic ointment or cream. A pharmacological intervention would be applying topical medications, such as silver sulfadiazine or aloe vera; an example of a nonpharmacological intervention is topical petroleum ointment.
- Comfort: For pain, over-the-counter pain medications (e.g., acetaminophen, ibuprofen) or prescription pain medications can be used. Some burned areas may be supported using splints, which may provide some comfort to the patient.

If the burn was due to sun exposure, the nurse educates the patient on preventive skin care, like applying sunscreen and avoiding sunlight during the hotter hours of the day.

Evaluation of Nursing Care for the Patient with First-Degree Burns

The nurse will evaluate the effectiveness of the pharmacological and nonpharmacological interventions related to impaired skin integrity. The nurse would expect a first-degree burn to fully heal within 5 to 10 days (Warby & Maani, 2022).

Evaluating Outcomes

The desired outcome is that the patient will not experience any signs of impaired skin integrity related to the burn injury. In a light-skinned person, the area would not be red or pink; in a dark-skinned person, erythema is not always apparent. In all patients, there should be no signs of infection. The skin would be completely healed, without a permanent scar in most cases. The patient would also note they have little to no pain to the area (Pencle et al., 2022).

Medical Therapies and Related Care

First-degree burns usually heal without complications. However, the health-care provider may refer the patient to wound care, if needed. Usually, this would be needed if the wound is not healing as expected or appears to become infected. Depending on the location of the burn, the patient may need home health assistance with wound care if they live at home alone. The nurse would recommend a referral to either home health or a case manager to coordinate wound care (Pencle et al., 2022).

Second-Degree Burns

A **second-degree burn** is a type of partial-thickness burn involving the epidermis and the dermis, which appears as red and blistering and can be very painful (Warby & Maani, 2022). Second-degree burns most often occur from hot liquids (e.g., hot grease, microwaved water), chemicals, or radiation.

Pathophysiology

Second-degree burns affect the skin's epidermis and part of the dermis. They can affect the superficial dermis or penetrate deeper. Similar to first-degree burns, protein denaturation—breaking of the protein bonds—occurs and collagen is damaged. Depending on how far the burn extends into the dermis, the skin can lose fluid and have decreased thermal regulation and sensation. With larger burns, covering greater than 20% of a person's body surface area, the body may produce a systemic inflammatory response, whereby fluid loss and shifts occur throughout the body. This can lead to septic or hypovolemic shock (Schaefer & Tannan, 2023).

Clinical Manifestations

Clinical manifestation of second-degree or partial-thickness burns includes erythema, blisters, and a wet appearance (Figure 14.8). The skin may swell and skin erythema will be blanchable with pressure. Blanching occurs

when the skin temporarily turns white after pressure is applied. Second-degree burns usually produce moderate to severe pain. This is because the patient's epidermis and dermis are damaged and nerve endings can be exposed and destroyed (Warby & Maani, 2022).

FIGURE 14.8 A second-degree burn appears wet. It will blister and be fluid-filled. (credit: "Second Degree Burn on Shoulder" by "Edge1665"/Wikimedia Commons, CC0 1.0)

Assessment and Diagnostics

The nurse should assess the patient's skin for the characteristics of a second-degree burn. The nurse gathers valuable information from the patient, detailing how and when the burn occurred, the heat source, and the patient's pain level (Pencle et al., 2022).

Assessment and diagnosis of burns are based on visualization of the skin and clinical presentation. The nurse would note the level of involvement of the patient's epidermal and dermal layers. The nurse would calculate the TBSA of second-degree burns to determine the percentage of the patient's body that is affected by burns (Schaefer & Szymanski, 2022).

Depending on the extent of the burns, the patient may require inpatient treatment. Additional laboratory and diagnostic tests may be ordered, including a CBC, comprehensive metabolic panel (CMP), arterial blood gases analysis, and other diagnostic tests. These tests assess the patient's overall condition, including oxygenation, kidney function, infection and other responses. If a smoke inhalation injury is suspected, chest X-rays and electrocardiograms (ECGs) may be ordered as well. The chest x-ray may show lung injury, whereas the ECG can show slight changes to cardiac function (Rice & Orgill, 2023).

Nursing Care of the Patient with Second-Degree Burns

When caring for a patient with a second-degree burn, the nurse must recognize and analyze patient cues. The nurse will carefully prioritize nursing hypotheses and generate both pharmacological and nonpharmacological solutions.

Recognizing and Analyzing Cues

The nurse will first start by recognizing patient cues and gathering relevant information. The nurse should obtain a history of the burn, take the patient's vital signs, and assess the patient's pain level, which will likely be moderate to

severe. When assessing the burns, the nurse would look for the characteristics of a second-degree burns. The nurse would then analyze these cues to determine a priority nursing hypothesis.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

After the nurse has gathered and analyzed cues, they will determine the priority nursing hypothesis. Typically, the priority nursing hypothesis is impaired skin integrity for second-degree burns. However, if the extent of the burns covers a large percentage of the patient's body or if their vital signs are unstable, other nursing hypotheses may be a priority, like airway, breathing, or circulation issues. The nurse would follow the ABCDE assessment method when prioritizing. For example, if the patient has experienced smoke inhalation, impaired gas exchange might be the priority nursing hypothesis over impaired skin integrity (Rice & Orgill, 2023).

The nurse should then generate solutions for the priority hypothesis of impaired skin integrity by providing pharmacological and nonpharmacological interventions. Some solutions are wound care, pain control, and infection prevention. Any clothing or jewelry should be removed from areas near the burn. The nurse would then cool the patient's skin by either applying water or a saline solution and gauze. This prevents the burn injury area from extending deeper and supports skin cell repair. The nurse would then cleanse the burn with an antibacterial wash. If the health-care provider orders it, the nurse may remove larger blisters by gently applying pressure with gauze while leaving smaller ones intact. The nurse will then apply a topical ointment, like silver sulfadiazine or mupirocin, as ordered, and a nonadherent dressing to the burn areas, serving as barriers and protectants (Schaefer & Szymanski, 2022).

The nurse can also provide pain relief with ordered pain medications, such as IV morphine or other opioids. Ideally, the nurse would administer pain medications at least 30 minutes before providing burn care or completing dressing changes, because second-degree burns can be extremely painful. The nurse would assess the patient's burn injuries during dressing changes, ensuring there are no signs and symptoms of infection, and alert the health-care provider of any changes. Symptoms of infection may include fever, increased erythema, or yellow and foul-smelling discharge from the wound. Depending on the TBSA percentage of burns, the nurse may also need to provide IV fluid replacement. Burns covering a larger portion of the patient's body can lead to hypovolemia or fluid volume deficit (Rice & Orgill, 2023).

Evaluation of Nursing Care for the Patient with Second-Degree Burns

Next, the nurse will evaluate the effectiveness of interventions related to impaired skin integrity. Second-degree (or partial-thickness) burns usually heal within 3 weeks, and scarring is minimal (Warby & Maani, 2022).

Evaluating Outcomes

When evaluating outcomes related to impaired skin integrity, the nurse determines if their interventions were effective. First, the nurse would expect the patient's pain level to be tolerable prior to dressing changes. They would assess this by asking the patient their pain level (using an appropriate pain assessment tool) before, during, and after wound care. Nurses can also look for physiological clues that can indicate pain for unconscious patients, like tachycardia or tachypnea. As the burn heals, the nurse would expect the patient's pain to reduce over time. The nurse would expect the burn to begin healing and show no signs of infection; the burn should appear pink, and dry, with healing blisters. Depending on the timing of the desired outcome, the nurse would expect the patient's burn to almost be completely healed within 3 weeks. There may be some scarring present (Schaefer & Szymanski, 2022).

Medical Therapies and Related Care

Usually, second-degree burns heal within 3 weeks. Depending on the extent of the patient's burns and related injuries, the nurse may need to collaborate on patient care with other health-care team members. If the patient had smoke inhalation, collaborative care with a respiratory therapist and pulmonologist will be needed. To aid with wound care, a referral for a wound care nurse and other specialists may be placed by the primary care provider. To promote wound healing, a nutritionist may be consulted for dietary recommendations. If a secondary infection develops, the health-care provider may order a consultation with an infectious disease specialist and/or a pharmacist. Lastly, if the patient is discharged and needs help with wound care at home, an order for home health, case management, or wound care clinic may be needed.

Third-Degree Burns

A **third-degree burn** involves the epidermis, dermis, and subcutaneous structures and appears white or black, dry,

and leathery. Because third-degree burns involve all layers of the skin, they are also referred to as full-thickness burns. These burns require immediate medical attention because they can be life-threatening (Warby & Maani, 2022). Common causes of third-degree burns are extremely harsh chemicals, flames, or scalding liquids.

Pathophysiology

Third-degree burns affect the entire epidermis and dermis of the skin, extending into the subcutaneous tissue. These burns may also extend to and damage the underlying bones, tendons, muscles, and nerves. Because the nerve endings in the skin are destroyed by the burn, patients do not have pain. Third-degree burns are severe, no matter the size, and require treatment at a specialized burn center and skin grafting (Warby & Maani, 2022). They can also lead to fluid loss and decreased thermal regulation, depending on the percentage of the body the burn covers (Schaefer & Tannan, 2023).

Clinical Manifestations

Third-degree (or full-thickness) burns can appear white, black, or brown, look dry or leathery, and be nonblanchable. They may produce **eschar**, which is a piece of dead tissue that is cast off from the surface of the skin, particularly after a burn injury. It is usually a dark color and can be hard or soft, depending on the type and cause of the injury. The patient will not have pain, due to the destruction of nerve ending in the skin, and there may be exposed bone, tendon, or muscle tissue (Warby & Maani, 2022) (Figure 14.9).

FIGURE 14.9 A third-degree burn may appear dark and leathery. (credit: “8-day-old-3rd-degree-burn” by “Craig0927”/Wikimedia Commons, Public Domain)

Assessment and Diagnostics

The nurse should assess the patient’s skin for the characteristics of a first-degree burn and assess the patient’s pain level. Many patients with third-degree burns also have second-degree burns, so they may experience pain. Therefore, the nurse should still assess the patients for pain using the appropriate tool for the patient’s level of consciousness.

Diagnosis of third-degree burns is based on presentation and appearance. The health-care provider may order additional bloodwork and testing based on the extent of the burn injuries, the source of the burn, and whether the patient experienced smoke inhalation. Additional tests may include a CBC, CMP, arterial blood gas analysis, and other diagnostic tests. If the patient received the burn from an electrical shock, they would require an initial ECG and continuous ECG monitoring (Rice & Orgill, 2023). The health-care provider reviews the WBC count for indicators of infection and kidney function, and hemoglobin and hematocrit for fluid volume status. Arterial blood gases provide an accurate picture of the patient’s respiratory status; thus, arterial blood samples are used to measure the levels of oxygen, carbon dioxide, and blood pH, and these indicate how well the lungs are oxygenating the blood and removing carbon dioxide.

Nursing Care of the Patient with Third-Degree Burns

When caring for patients with third-degree burns, the nurse should be able to differentiate among the degrees, based on the patient cues and assessment. They would then determine appropriate nursing care.

LIFE-STAGE CONTEXT

Burns in the Older Adult

For older patients, consider asking them more relevant information to how they received the burn. Did they forget to use a mitt when removing a hot pan from the oven? Did they leave an electric blanket on their bed, causing a burn due to sensory issues? Sometimes the exact cause of the burn can lead down the path to other potential patient conditions to assess, like dementia or neuropathy.

Recognizing and Analyzing Cues

The nurse will first start the nursing process by gathering information and recognizing cues. The nurse will follow the ABCDE assessment method to identify and address any areas of immediate concern first. During this assessment process, the nurse should ask questions about how and when the patient received the burn, what heat source was involved, and any associated symptoms. The nurse will also complete their initial vital signs assessment, have the patient rate their pain, and assess the skin.

The nurse must then analyze the patient cues. For example, if the patient is having difficulty breathing, they may have smoke inhalation. Alternatively, the burn may have restricted the patient's breathing, or the patient may be anxious; the nurse will need to determine the correct option. The nurse should also be looking for cues consistent with third-degree burns. For example, if the burn is black, dry, and leathery, and the patient denies pain at the burn injury site, these cues are consistent with a third-degree burn. Other findings might indicate a different severity of burn (Gauglitz & Williams, 2023).

Prioritizing Hypotheses, Generating Solutions, and Taking Action

After the nurse has analyzed cues, they will determine the priority nursing hypothesis following the ABCDE assessment method. If the patient has received burns to a large portion of their body or experienced smoke inhalation, the priority nursing hypotheses would be related to oxygen exchange or depleted fluid volume. However, typically, the priority nursing hypothesis for third-degree burns not covering a large portion of the patient's body is impaired skin integrity. The priority nursing interventions are dependent on the TBSA of burns (Rice & Orgill, 2023).

After the nurse determines the priority nursing hypothesis, they will generate solutions. Solutions related to impaired skin integrity are wound care, infection prevention, and care coordination with plastic surgery. Typically, patients do not have pain with third-degree burns, but pain medications may be needed for wound care; the nurse must consider this as a possible solution. A short-term outcome for impaired skin integrity may be preventing wound infection and compartment syndrome. The nurse would potentially set a long-term expected outcome of the patient's burn injury healing after 8 or more weeks (Schaefer & Szymanski, 2022).

The nurse then will act on the interventions they identified. If the patient is not already at a burn injury center, they should be transferred to a specialized burn center to provide quality care and resources. In the meantime, the nurse should work with the health-care provider to cleanse the wound and debride or remove dead tissue, and apply topical antimicrobial ointments. Depending on the extent of the burn injury, the nurse will also assess for signs of compartment syndrome around the burn site. This includes the taking patient's pulse and assessing skin color, along with any reports of numbness, tingling, or pain. If the nurse identifies signs of impending compartment syndrome, such as severe pain, pulselessness, swelling, or numbness and tingling, they should notify the health-care provider immediately. The nurse also must collaborate on patient care with other members of the health-care team because third-degree burns can require extensive **debridement**, which involves removal of damaged tissue around a wound to allow for new tissue to more easily grow. The nurse may need to coordinate consultations with general surgery, plastic surgery, and other surgical specialties, depending on the size and depth of the burn (Schaefer & Nunez Lopez, 2023).

As with other burns, the nurse would assess for signs and symptoms of infection and alert the health-care provider of any changes. Some common symptoms of infection include fever, increased erythema, or yellow and foul-

smelling discharge from the burn. Depending on the TBSA percentage of burns, the nurse may also need to provide IV fluid replacement, because burns covering a larger portion of the patient's body can lead to hypovolemia or fluid volume deficit (Rice & Orgill, 2023).

Evaluation of Nursing Care for the Patient with Third-Degree Burns

After the nurse has implemented their nursing care, they will evaluate the effectiveness of their actions. The nurse can evaluate both short- and long-term goals related to impaired skin integrity. Short-term goals may be to prevent infection and prevent any signs of compartment syndrome. A long-term goal may be for the wound to completely heal, which may take months to years, and will likely leave a permanent scar (Warby & Maani, 2022).

Evaluating Outcomes

For a short-term (and long-term) goal, the nurse would expect the patient's burn injury to show no signs and symptoms of infection. The patient may also require surgeries to help debride and cleanse the wound to prevent infection and promote healing. The nurse will also note no signs of compartment syndrome: no swelling, no decreased pulses to the affected area(s), or other signs. A short-term goal would be for the patient's WBC count to remain within normal range, indicating no signs of infection. A long-term goal would be evaluated after 8 weeks, when the nurse would expect the burn to be almost completely healed (Schaefer & Nunez Lopez, 2023).

Medical Therapies and Related Care

Typically, third-degree, or full-thickness, burns take at least 8 weeks to heal and may take even longer. The patient will require care from a collaborative health-care team. The nurse expects the patient to need referrals to wound care, plastic surgery, and potentially orthopedics if any underlying bone is involved. If the patient experiences smoke inhalation, the nurse should expect additional health-care team members to be involved in the patient's care, like a pulmonologist and respiratory therapist. Additionally, if a secondary infection develops, an infectious disease consultation may be ordered along with a nutritionist to promote wound healing. Once the patient is ready to be discharged home or another care facility, the nurse can potentially expect referrals for case management, home health, and wound care.

Toxic Epidermal Necrolysis and Stevens-Johnson Syndrome

Although not occurring from a burn injury, there are two disorders that can resemble partial-thickness burns and are often treated in similar ways. Both **Stevens-Johnson Syndrome (SJS)** and **toxic epidermal necrolysis (TEN)** are abrupt, rare skin reactions that involve loss of skin and sometimes mucosal membranes. In 80% of cases, medications cause these rare and life-threatening reactions. Some common medications that can cause these reactions include cephalosporins, allopurinol, phenytoin, among others (Oakley & Krishnamurthy, 2023).

Pathophysiology

The exact pathophysiology of SJS and TEN is unknown. The main theory is that the causative medication binds to the major histocompatibility complex type 1, causing a T-cell–mediated reaction. Another theory is that release of granulysin (a protein) and $CD8^+$ cells may lead to keratinocyte death and skin blistering (Bendetti, 2022).

The skin cell death that occurs causes the patient's skin to blister and slough off, which looks similar to a second-degree burn injury. Thus, patients with SJS or TEN are often treated at burn centers and burn units, because management is similar (Bendetti, 2022).

Clinical Manifestations

Usually, patients with SJS or TEN will present with fever and feeling generally unwell. They may also have upper respiratory symptoms. Over the course of a few days, they will develop a blistering skin rash, which can include mucosal membranes like the lips, mouth, and the gastrointestinal tract. Patients with TEN will likely develop widespread target-appearing, painful, blister-like erosions. Patients with SJS will have a similar, more localized, rash. Patients may also report a headache and sore throat. Because SJS and TEN can affect other body systems like the liver and kidneys, patients may also report symptoms related to the affected body system. Some symptoms may include nausea, vomiting, shortness of breath, or leg swelling (Oakley & Krishnamurthy, 2023). Multiorgan dysfunction syndrome (MODS) is also a possibility and is discussed in Chapter 23 Shock and Sepsis.

Assessment and Diagnostics

The skin of patients with SJS or TEN will appear similar to that of patients with second-degree burns. The

widespread rash looks like a target, and painful bister-like erosions often develop. The nurse should obtain the patient's history of illness and a personal history, including when their symptoms started, and ask the patient if they have started any new medications (Oakley & Krishnamurthy, 2023).

After the initial workup, the health-care provider may order laboratory tests, like a CBC, CMP, and liver and renal function panels. Patients with SJS or TEN usually have anemia, neutropenia, elevated transaminase levels, hyponatremia, and other abnormal laboratory values. To rule out other potential causes, the provider may order a skin biopsy and additional pulmonary or cardiac diagnostic tests, such as bronchoscopies, chest x-rays, and ECGs (Oakley & Krishnamurthy, 2023).

Nursing Care of the Patient with TEN or SJS

When caring for a patient with SJS or TEN, the nurse must recognize and analyze patient cues. Symptoms usually start with fever and malaise, with skin blistering appearing a few days later. The patient may have started taking a new medication or is taking one of the medications associated with developing TEN or SJS. The nurse will provide both pharmacological and nonpharmacological interventions to assist with symptom relief and treatment.

Recognizing and Analyzing Cues

The nurse will recognize cues by identifying relevant information and will start by asking the patient about symptom onset and current medications. The nurse will then take the patient's vital signs, ask about the patient's pain level, and assess the patient's skin. The patient's skin will likely have widespread blistering erosions that look like targets or bullseyes. The erosions can also affect the patient's mucosal membranes, like the mouth and lips, or the palms and soles of the feet; the nurse should examine these areas as well (Oakley & Krishnamurthy, 2023).

Prioritizing Hypotheses, Generating Solutions, and Taking Action

The nurse will determine the priority nursing hypothesis, which may be different for the acute and rehabilitation phases of SJS and TEN. However, the priority hypothesis is typically impaired skin integrity. If there is airway involvement, that takes priority, based on the ABCDE triage method. The nurse can generate pharmacological and nonpharmacological interventions to promote skin healing and prevent infection.

Of importance, the nurse would discontinue the administration of the medication causing SJS or TEN. The nurse can also provide daily skin care as ordered, which can include gently removing necrotic tissue, cleansing the wounds, and applying nonadherent dressings (Hanson & Bettencourt, 2020). The nurse should also assess for signs and symptoms of infection and collect wound cultures every 2 days of the skin lesions. If infection is present, the nurse would notify the health-care provider and administer antibiotics as ordered. The nurse should also frequently assess the patient's pain and provide pain medications as needed for pain relief. Depending on the condition of the patient, the health-care provider might include fluid replacement, monitor laboratory values, and provide supplemental oxygen, nutrition, and temperature control (Oakley & Krishnamurthy, 2023).

CLINICAL SAFETY AND PROCEDURES (QSEN)

Wound Care and Dressing Changes for Burn Patients

Purpose: To guide health-care providers in performing wound care and dressing changes for burn patients to prevent infection and promote healing.

QSEN Competencies: Patient-Centered Care, Safety, Evidence-Based Practice (EBP), Teamwork and Collaboration

Steps:

1. Gather supplies
    - Ensure all necessary supplies are available: sterile gloves, dressing materials, normal saline or wound cleanser, antibiotic ointment (if prescribed), and pain management medications.
2. Hand hygiene and PPE (Safety)
    - Perform hand hygiene thoroughly.
    - Don sterile gloves and other appropriate PPE to maintain a sterile field.
3. Assess the wound (Patient-Centered Care, Safety)
    - Inspect the burn wound for signs of infection, such as increased redness, swelling, warmth, or purulent

discharge.
    - Note the color, size, and depth of the burn.
4. Administer pain relief (Patient-Centered Care)
    - Provide prescribed analgesics prior to the dressing change to manage pain and minimize discomfort.
5. Clean the wound (Safety, EBP)
    - Gently clean the wound with sterile normal saline or an appropriate wound cleanser.
    - Use a gentle technique to avoid causing further trauma to the wound bed.
6. Apply antibiotic ointment (EBP):
    - Apply a thin layer of antibiotic ointment to the burn wound, if prescribed, to prevent infection.
7. Apply the dressing (Safety, EBP)
    - Cover the wound with a nonadherent dressing to protect the area and promote a moist healing environment.
    - Secure the dressing with appropriate bandaging materials, ensuring it is snug but not constricting.
8. Dispose of used materials (Safety)
    - Safely dispose of used dressing materials and gloves in accordance with infection control protocols.
    - Perform hand hygiene after disposing of materials.
9. Document the procedure (Teamwork and Collaboration, Safety):
    - Record the details of the wound care procedure in the patient's medical record, including wound appearance, any signs of infection, patient's pain level, and the type of dressing applied.
10. Educate the patient and family (Patient-Centered Care, Teamwork and Collaboration)
    - Provide education on wound care and signs of infection to the patient and their family.
    - Ensure they understand the importance of keeping the wound clean and dry and when to seek medical attention.

Evaluation of Nursing Care for the Patient with TEN and SJS

The nurse should evaluate the effectiveness of the pharmacological and nonpharmacological interventions related to impaired skin integrity. The course of SJS and TEN is divided into acute and rehabilitation phases, for which expected patient outcomes are different. The acute phase is the period when the patient is hospitalized, and the rehabilitation phase is the period after the patient is discharged from the hospital.

Evaluating Outcomes

When evaluating outcomes related to impaired skin integrity, the nurse would expect the patient's wounds to heal without any signs of infection. The patient's pain should also be controlled to a tolerable level. The nurse would expect the patient's laboratory values and thermoregulation to return to normal, with no fluid imbalances present (Oakley & Krishnamurthy, 2023).

Medical Therapies and Related Care

Care from a large interdisciplinary team is required for patients with SJS or TEN because these conditions affect multiple organ systems. Some specialists on the health-care team may include an intensivist and pulmonologist, dermatologist, urologist, gynecologist, ophthalmologist, and plastic surgeon. The patient will also need referrals to supportive services like wound care, nutrition, physical therapy, occupational therapy, and psychology (Oakley & Krishnamurthy, 2023).

Rehabilitation and Psychological Care for SJS or TEN

Patients with SJS and TEN usually require care in an intensive care setting and burn unit initially. This is because SJS and TEN affect multiple organ systems, requiring close patient monitoring. Once the patient has recovered from the acute phase, they will require rehabilitation. Rehabilitation can be completed either inpatient or outpatient, depending on the patient's ambulatory status at discharge. Patients who are not ambulatory will be transferred to an inpatient rehabilitation facility. Patients will require an extended period of physical and occupational therapy to gain strength and complete ADLs independently. The patient may also require pain management and care coordination for follow-up appointments and ongoing care (Shanbhag et al., 2020).

Additionally, patients with SJS and TENS will need psychological support because the illness can cause stress and PTSD. Patients may require a psychiatric evaluation and medications to help with stress symptoms. The nurse will help collaborate with inpatient psychiatric care while the patient is in the hospital and outpatient care when the

patient is discharged (Shanbhag et al., 2020).

14.3 Dermatologic Conditions

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations of various dermatologic conditions
- Describe the diagnostic tests used and laboratory values observed in dermatologic conditions
- Apply nursing concepts and plan associated nursing care for the patient with varying dermatologic conditions
- Evaluate the efficacy of nursing care for patients with various dermatologic conditions
- Describe the medical therapies that apply to treating various dermatologic conditions

Over the span of their careers, nurses will encounter various dermatologic disorders and conditions. Dermatologic disorders often only involve the skin and its layers, whereas integumentary disorders can involve the skin and its accessories, like hair, nails, and glands. As a nurse, it is important to be able to differentiate and understand the treatment of common skin conditions to provide quality patient care. For any slight changes in the patient's condition, the nurse should think about the most likely cause or condition. The nurse will also educate patients on risk factors, prevention, treatment, and follow-up care.

Contact Dermatitis

Inflammation or irritation of the skin is called **dermatitis**. There are several different types of dermatitis, including contact, seborrheic, and generalized exfoliative dermatitis. Each has different signs and symptoms.

Inflammation of the skin caused by direct contact with an irritant or allergens is called **contact dermatitis**. Allergic contact dermatitis occurs in approximately one in five people, making it a very common skin disorder. Some common agents causing contact dermatitis are latex, poison ivy, metals, and certain plants (Adler & DeLeo, 2021).

Pathophysiology

When a patient's skin is exposed to irritants, cytokines are released, causing an inflammatory response and skin barrier disruption. In allergic contact dermatitis, exposure to an allergen causes the skin's T cells to activate and the skin to react (Litchman et al., 2023). The allergic reaction is discussed in greater detail in Chapter 24 Management of Patients with Allergic Disorders.

Clinical Manifestations

Clinical manifestations of contact dermatitis include itching, stinging, and pain at the site where the contact occurred. Contact dermatitis commonly occurs on the hands but can occur anywhere on the body if an irritant is exposed to the skin. Depending on the stage of exposure (i.e., acute, subacute, chronic), contact dermatitis may appear differently (Figure 14.10). In the acute phase, the skin will be erythematous and have vesicles, or blisters, which are small, thin-walled sacs with filled with clear fluid. In the subacute phase, crusts may have formed over the acute lesions. During the chronic phase, lichenification (thick and leathery appearance of the skin) occurs (Litchman et al., 2023).

FIGURE 14.10 This patient has contact dermatitis after coming in contact with poison ivy. Notice the erythematous vesicles, which indicate contact dermatitis. (credit: "The aesthetic joys of poison ivy outweigh any pains of itching" by Danjo Paluska/Flickr, CC BY 2.0)

Assessment and Diagnostics

Depending on the stage of the contact dermatitis, the patient's skin will look different. The nurse can determine the stage based on the assessment.

Diagnosis of contact dermatitis is often made by presenting symptoms and a thorough history. Usually, the patient will state they have a new exposure to a certain allergen or irritant. To fully diagnose contact allergic dermatitis, patch testing is the gold standard. Patients have several patches applied to their back with common or possible irritants and, after 48 hours, the patches are removed. The health-care provider or allergist then determines the allergy based on the skin test results (Litchman et al., 2023).

Nursing Care of the Patient with Contact Dermatitis

When caring for a patient with contact dermatitis, it is important to obtain a thorough history because this often points to an irritant or allergen. After the patient is diagnosed with contact dermatitis by the health-care provider, the nurse will provide pharmacological and nonpharmacological interventions. Some interventions are identifying the allergen, alleviating itching, and applying topical creams for inflammation and itching.

Recognizing and Analyzing Cues

When recognizing cues, the patient may report recent exposure to a new chemical, irritant, or allergen (e.g., dermatitis develops after wearing latex gloves for the first time). The nurse may look at the affected area and note erythematous and swollen skin. There may also be vesicles or pustules present, and the patient may complain of itching (Litchman et al., 2023). When analyzing these cues and reviewing the patient's history, the nurse may find that the patient had a new exposure to a known or unknown irritant.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Typically, the priority nursing hypothesis for contact dermatitis is impaired skin integrity. The nurse will generate solutions related to impaired skin integrity, starting with eliminating the known or suspected irritant or allergen. The nurse would also apply prescribed topical corticosteroids to the affected area(s). To help with itching, the nurse may administer antihistamines, like cetirizine. If the contact dermatitis is from an allergen, the nurse would anticipate patch testing and potentially apply or assist with applying the patches. The nurse would also instruct the patient to avoid any friction to prevent further irritation to the area and to wear clothing to cover the affected area (Litchman et al., 2023).

Evaluation of Nursing Care for the Patient with Contact Dermatitis

After the nurse has implemented their actions, they will evaluate the effectiveness of the interventions. An expected

outcome would be for the irritant to be identified and the patient's skin to begin to heal and appear less irritated.

Evaluating Outcomes

When evaluating outcomes, the nurse would expect the patient's skin to appear nonerythematous, with no swelling or itching present. The vesicles or pustules should be resolved or in various stages of healing. The nurse should also anticipate the irritant to be identified and the patient to discontinue use of or contact with the known substance.

Medical Therapies and Related Care

Once the irritant or allergen is removed and treatment is initiated, the patient's symptoms will resolve and no further referral is needed. However, if an allergen is suspected, the patient may need to be referred to an allergist for testing. Depending on the severity of the rash, the patient may need a referral to a dermatologist.

Generalized Exfoliative Dermatitis (Erythroderma)

Inflammation of the skin causing erythema and scaling covering 90% of the body's surface area is called **generalized exfoliative dermatitis**, or erythroderma. When severe enough, this condition is life-threatening. Although rare, this skin condition can be caused by many factors, including underlying skin disorders, infection, medications, or malignancy (Austad & Athalye, 2023).

Pathophysiology

The exact pathophysiology of exfoliative dermatitis is not known. Underlying skin conditions, such as psoriasis, atopic dermatitis, and contact dermatitis, seem to be major contributing factors to the development of this disorder. Generalized exfoliative dermatitis is thought to be an inflammatory-mediated response, resulting in rapid epithelial cell turnover (Harper-Kirksey, 2018).

Clinical Manifestations

Clinical manifestations of erythroderma are red patches that appear on the skin, covering 90% of the body. After they appear, the skin starts to scale and flake off. Because this condition affects a large portion of the body skin, it is considered life-threatening, and the patient's condition should be managed in a hospital setting. The patient will also complain of itching and may have a fever, along with an enlarged spleen, liver, and lymph nodes. In some cases, patients lose their hair, and their nails will shed and become ridged (Austad & Athalye, 2023).

Assessment and Diagnostics

When assessing a patient, the nurse will notice diffuse erythematous skin with scaling and peeling. The nurse will obtain a thorough patient history, including information about when the symptoms started. Information about the patient's medications, allergies, present skin conditions, and other related information may be helpful in determining the underlying cause (Harper-Kirksey, 2018). The nurse will also complete any diagnostic tests ordered by the health-care provider, such as a CBC, CMP, ESR, and C-reactive protein (CRP) level.

After completing a thorough history, the nurse can expect the health-care provider to order several diagnostic and laboratory tests. The provider may order a skin biopsy, histology, blood cultures, CBC, CMP, and imaging to help identify the underlying cause. Depending on the underlying condition, the patient may have an elevated WBC count, CRP level, and ESR. The laboratory tests may also show anemia, eosinophilia (excess eosinophils), or other abnormal values. Skin biopsy samples may show mites or other organisms. Imaging, like a chest x-ray, may show malignancies or sarcoidosis, an inflammatory disease in which the immune system overreacts. Blood cultures may reveal infections or viruses (Harper-Kirksey, 2018).

Nursing Care of the Patient with Generalized Exfoliative Dermatitis

When caring for a patient with generalized exfoliative dermatitis, it is important to complete a thorough history of the patient. The nurse must also be aware that this condition is potentially life-threatening and interventions must be provided as ordered.

Recognizing and Analyzing Cues

The patient may report skin itching and may reveal underlying skin conditions like psoriasis or eczema, malignancy, or new medications. The nurse will notice a bright red rash, covering almost the entire body. The patient's skin will flake and peel, even on the palms of the hands and soles of the feet, and they may have hair loss or brittle and ridged nails. When examining the patient's abdomen, the nurse may palpate an enlarged liver or spleen. The nurse may also note lymphadenopathy. When analyzing these cues, the nurse will help the health-care provider by

assessing the patient's skin and then narrow down potential diagnoses based on the laboratory results (Austad & Athalye, 2023).

Prioritizing Hypotheses, Generating Solutions, and Taking Action

The priority nursing hypothesis for the nurse is potential hemodynamic stability, because the patient's skin barrier is almost completely absent. The nurse will generate solutions related to maintaining hemodynamic stability and prevent fluid loss. The nurse will provide adequate hydration through IV fluid replacement and replace electrolytes (e.g., potassium, magnesium, calcium) when indicated. The nurse will monitor the patient's hemodynamic status, ensuring the patient's blood pressure and heart rate are within normal limits, and monitor the patient's temperature, providing cooling or warming measures when needed (Harper-Kirksey, 2018).

Another nursing hypothesis related to generalized exfoliative dermatitis is impaired skin integrity. The nurse will provide oral antihistamines (e.g., diphenhydramine) and topical corticosteroids for any itching. The nurse may provide an oatmeal bath and wound care, as needed. Blood cultures may also be needed for identifying bacterial or fungal skin-infection organisms, and nurses can administer antibiotics or antivirals, as ordered, to prevent skin infections (Harper-Kirksey, 2018).

Evaluation of Nursing Care for the Patient with Generalized Exfoliative Dermatitis

After the nurse has generated solutions and taken action related to the nursing hypotheses, they will evaluate outcomes. An expected outcome for a patient with erythroderma is to maintain hemodynamic stability and for the patient's skin disorder to resolve.

Evaluating Outcomes

When evaluating hemodynamic stability and impaired skin integrity, the nurse would expect the patient's vital signs to be within normal limits, without fluid imbalance or electrolyte disturbances, and for the patient's skin to begin healing, with decreased peeling and itching, and eventually heal entirely. The time frame for resolution of symptoms will vary depending on when the underlying cause and any complications. The nurse would also expect the patient's skin to not have any signs of infection and return to a normal appearance (Harper-Kirksey, 2018).

Medical Therapies and Related Care

Because generalized exfoliative dermatitis can be life-threatening, a large interdisciplinary health-care team is needed to properly care for the patient. The nurse can expect collaborative care from a dermatologist (a specialist in skin disorders), an infectious disease specialist, and a pharmacist to help determine underlying etiology. To maintain hemodynamic stability, consultations from a cardiologist and pulmonologist may be indicated. Lastly, if malignancy is found or suspected, an oncologist would collaborate with the health-care team (Austad & Athalye, 2023).

Seborrheic Dermatitis

The skin condition that usually affects the scalp or areas with sebaceous glands, such as the face or areas with skin folds, is called **seborrheic dermatitis**. This condition mainly affects infants and people in middle age but can affect anyone. The noninflammatory type of seborrheic dermatitis is more commonly called dandruff and occurs in adults. In infants, this condition is known as "cradle cap" (Tucker & Masood, 2023).

Pathophysiology

The exact pathophysiology of seborrheic dermatitis is not entirely known. Some theories state that the skin's microbiota becomes disturbed or there is an increase in fatty acids on the skin. Other theories point to a weakened immune system that may allow yeasts to overgrow, or a genetic predisposition to the condition (Tucker & Masood, 2023).

Clinical Manifestations

Clinical manifestations of adult seborrheic dermatitis include itching and burning, usually on the scalp or chin, where hair grows. However, this condition can appear anywhere on the body where sebaceous glands are present. There will be small flakes of skin and, when examining the scalp, there will be light-colored papules with greasy crusts and scales. In infants, seborrheic dermatitis will appear as greasy crusts that can be yellow to brown (Tucker & Masood, 2023)

Assessment and Diagnostics

Diagnosis of seborrheic dermatitis is often made clinically on the basis of the patient's presenting symptoms. In an

adult patient, the nurse will note the clinical manifestations, usually the scalp.

Although routine laboratory tests are not typically ordered to diagnose seborrheic dermatitis, the health-care provider may order them in cases of severe or sudden onset symptoms. Some additional tests may include potassium hydroxide (KOH) skin scraping, histology, HIV testing, antinuclear antibody (ANA), ESR, and several others, although they are not commonly needed (Tucker & Masood, 2023). A positive KOH result can mean a fungal infection has developed. Elevated ANA and ESR results could indicate an underlying autoimmune response or condition.

Nursing Care of the Patient with Seborrheic Dermatitis

When caring for a patient with seborrheic dermatitis, the nurse will recognize and analyze patient cues to create a priority nursing hypothesis. Once they generate a priority hypothesis, the nurse will generate solutions, take action, and then evaluate their interventions.

Recognizing and Analyzing Cues

The nurse will begin by recognizing patient cues for seborrheic dermatitis. The patient may report itching to the scalp, beard area, or another area where many sebaceous glands are present. When examining the affected area, the nurse will note the characteristics of seborrheic dermatitis. In infants, the caregiver may be concerned about the child's scalp and notice yellow to brown crusts.

When analyzing cues, the nurse should ask the patient or caregiver if the patient has any preexisting skin conditions or has had this condition before. The nurse should gather a full medical history for the patient, including any immune disorders like HIV or systemic lupus erythematosus (Tucker & Masood, 2023).

Prioritizing Hypotheses, Generating Solutions, and Taking Action

The nurse will prioritize hypotheses based on the patient's cues, generate solutions, and take action. The priority nursing hypothesis for seborrheic dermatitis is impaired skin integrity. When generating solutions and taking action, the nurse can provide both pharmacological and nonpharmacological interventions.

For both infants and adults, the nurse can promote skin care routines that include moisturizing the skin. The nurse can anticipate the health-care provider ordering topical shampoos or creams that contain antifungals combined with anti-inflammatory and anti-itch components, or these medications alone. Many medications for seborrheic dermatitis can be found over the counter; examples are selenium sulfide, ketoconazole, zinc pyrithione, and salicylic acid plus sulfur in sorbelene cream. With infants, the nurse should gently assist with removing the crusts with forceps or saline-soaked gauze before applying creams. The nurse can educate the parents on removing crusts with a loofah or mildly abrasive sponge. In severe cases, oral antifungals such as fluconazole or terbinafine may be prescribed by the health-care provider (Tucker & Masood, 2023).

Evaluation of Nursing Care for the Patient with Seborrheic Dermatitis

After the nurse has implemented the chosen actions, they can evaluate effectiveness. An expected outcome would be for the affected area to present without flaking or crusts.

Evaluating Outcomes

When evaluating outcomes, the nurse would expect the patient's skin to show decreased scaling or flaking, and a decrease in the number in the papules. The adult patient would also report decreased or no itching. In infants, greasy crusts are not present, or are resolving.

Medical Therapies and Related Care

Most cases of seborrheic dermatitis are self-limiting; usually, adult patients will have acute flares. In chronic or severe cases, the patient may be referred to a dermatologist for further evaluation or a pharmacist for special shampoo formularies. In addition, if the patient has any new or underlying medical conditions that may be contributing to the seborrheic dermatitis, they will be referred to the appropriate specialist. For example, the health-care provider may refer a patient to an infectious disease specialist if they have an underlying condition, to an immunologist if they have HIV, or to a rheumatologist if they have an autoimmune disorders like systemic lupus erythematous (Tucker & Masood, 2023).

Pruritus

Itching, or **pruritus**, can occur due to a variety of reasons or underlying medical conditions. Many skin disorders, like atopic dermatitis and psoriasis, present with symptoms of itching. Other diseases, like chronic kidney disease or substance use disorders, can cause pruritus as well (Fazio & Yosipovitch, 2022).

Pathophysiology

Generalized pruritus is a symptom more common in patients over age 65 years, and the pathophysiology is generally unknown. Underlying conditions may contribute to pruritus in the older adult, such as skin disorders like psoriasis or AD, or neurological disorders, like postherpetic neuralgia. Systemic diseases, like Hodgkin's lymphoma, thyroid imbalances, and anemias can also contribute to pruritus. Sometimes dehydration or liver problems can also cause pruritus (Chung et al., 2021).

Clinical Manifestations

The patient will report generalized itching. The nurse may also note reddened or dry and scaly skin. If there are underlying skin conditions present, the nurse may also notice skin lesions indicative of that particular skin disorder (Fazio & Yosipovitch, 2022).

Assessment and Diagnostics

After initial assessment of the skin, the health-care provider will initially order CBC, CMP, ESR, CRP, liver, and thyroid function tests to help determine an underlying cause. The provider may also look for anemias and allergies, or perform HIV testing if there is a suspicion of any of these conditions (Roh et al., 2022). The health-care provider will also complete a thorough medical history and review the patient's list of medications.

Depending on the patient's underlying condition, laboratory values will be different. For instance, if the patient has underlying hypothyroidism, their thyroid function tests would be abnormal, whereas if the patient has iron-deficiency anemia, their blood counts would be abnormal and iron levels would be low.

Nursing Care of the Patient with Pruritus

When caring for a patient with pruritus, it is important to understand the underlying cause. After the patient is diagnosed by the health-care provider, the nurse will provide pharmacological and nonpharmacological interventions.

Recognizing and Analyzing Cues

When recognizing cues, the nurse will assist the health-care provider. The patient will report itching and the nurse may notice the skin is dry, scaling, and red (Fazio & Yosipovitch, 2022). If the nurse recognizes the patient has these symptoms, they may ask the following questions:

- Do you have any known allergies?
- Does anything aggravate the symptoms?
- Have you tried any treatments?
- What is your medical history, or do you have any health conditions?
- What medications are you taking?
- When did the symptoms start?

Prioritizing Hypotheses, Generating Solutions, and Taking Action

When prioritizing hypotheses for pruritus, treating the underlying cause usually takes priority. For example, if the underlying medical condition is hypothyroidism, the nurse would expect the patient to be prescribed levothyroxine. Another priority hypothesis is to impaired skin integrity. The nurse's goal or expected outcome would be to help keep the patient's skin intact.

When generating solutions and taking action, the nurse would promote the use of emollients and moisturizers to help relieve dry skin. The health-care provider may also prescribe topical steroids or oral antihistamines, like diphenhydramine or fexofenadine, to help relieve itching. In patients with chronic kidney disease, ultraviolet light therapy may be ordered. Selective serotonin reuptake inhibitors, like sertraline or fluoxetine, may help with generalized pruritus. The nurse would administer these as indicated or collaborate with other members of the health-care team (Chung et al., 2021).

Evaluation of Nursing Care for the Patient with Pruritus

After the nurse has implemented interventions, they will evaluate effectiveness. An expected outcome is to keep the patient's skin intact. The nurse can assist the health-care provider identify the underlying health condition by collecting specimens for the ordered diagnostic tests.

Evaluating Outcomes

When evaluating the outcome for skin integrity, the nurse would expect the patient's skin to be moist and intact without areas of excoriation, lesions, or signs of infection.

Medical Therapies and Related Care

Depending on the underlying cause, the patient may require care from a collaborative health-care team and internal medicine. If the patient's underlying condition is neurological, the nurse would collaborate with the neurology department. Other specialties might include oncology, pharmacy, infectious disease, nephrology, and psychiatry (Chung et al., 2021).

Acne

Pustules or nodules on the face, neck, and sometimes upper back and arms is called **acne**. It is a very common skin disorder that frequently occurs during the adolescent years from bacteria in the genus *Cutibacterium* (formerly, *Propionibacterium*); however, it can occur at any age. Acne can be caused by medications such as anticonvulsants or steroids, or by endocrine problems such as polycystic ovarian syndrome (PCOS). Genetics and puberty are factors in developing acne as well (Sutaria et al., 2023).

Pathophysiology

Any hormonal changes can contribute to acne. An increase in androgen levels leads to more sebum production in the skin. Acne can also be caused by increased keratinocyte production leading to an increase in sebum. In addition, colonization with the bacteria *C acnes* promotes an inflammatory response of the skin, causing acne to appear. Some foods and cosmetics can trigger acne as well (Sutaria et al., 2023).

Clinical Manifestations

Acne can come in different forms. It may be open or closed, or it can consist of comedones, red papules, pustules, or nodules and cysts (Figure 14.11). A **comedone** is a small bump on the skin that may be flesh-colored, white, or dark. A **papule** is a small, raised bump that is well defined. A **pustule** is a larger acne lesion that contains pus. A **nodule** or **cyst** is a bump that forms below the epidermal layer of the skin; it is filled with keratin and typically lined with squamous epithelium. Patients may report mild pain, swelling, and tenderness at the sites where acne is present.

FIGURE 14.11 Acne is most common during adolescence and can cause cysts and pustules. (credit: "Akne-jugend" by Ellywa assumed (based on copyright claims)./Wikimedia Commons, Public Domain)

Assessment and Diagnostics

Typically, acne is diagnosed by its clinical presentation. The nurse may note comedones, red papules, pustules, or nodules and cysts on the patient's skin. If the health-care provider suspects an underlying contributor, like PCOS or other hormonal disorder, they may order additional laboratory testing, including for follicle-stimulating hormone (FSH), luteinizing hormone (LH), and dehydroepiandrosterone levels (Sutaria et al., 2023). These labs are further discussed in the chapter on reproductive systems.

A diagnosis of acne is often made based on presenting symptoms. In cases of patients with PCOS, the nurse may note an increase in LH and a decline in FSH levels. There may be an increase in androgen levels contributing to acne (Sutaria et al., 2023).

Nursing Care of the Patient with Acne

When caring for a patient with acne, the nurse can provide pharmacological and nonpharmacological interventions, as ordered. Acne is treated on an outpatient basis and usually resolves with treatment.

Recognizing and Analyzing Cues

When recognizing cues, the patient will report areas of redness and tenderness to the face, neck, chest, or upper back. The nurse will observe either comedones, pustules, cysts, or erythematous papules on the patient's skin. When analyzing these cues, the nurse may ask the patient if they have any skin or medical conditions. The nurse should also consider the patient's age and onset of the condition, because hormonal changes can lead to acne, especially in adolescents (Sutaria et al., 2023).

Prioritizing Hypotheses, Generating Solutions, and Taking Action

The priority nursing hypothesis for acne is impaired skin integrity, for which the nurse will generate solutions and take action. With acne, the health-care provider may prescribe topical retinoid (e.g., retinoic acid, tretinoin) or topical gels and lotions (e.g., clindamycin, benzoyl peroxide, azelaic acid) depending on the type of acne. In addition, health-care providers may prescribe oral medications (e.g., doxycycline, spironolactone, isotretinoin) to help control the patient's acne. Oral contraceptives may also be prescribed to address acne in a female patient. The nurse should help administer these medications and teach the patient the importance of daily use and the importance of washing their face. The nurse may also reinforce education about diet changes, like avoiding fatty foods that can trigger acne.

Patients who are prescribed spironolactone need monitoring of their potassium levels because this medication can cause them to increase. The nurse should educate the patient about this requirement, if necessary. The nurse should also teach all patients about medication side effects and when to report them, especially with isotretinoin, because it can lead to serious complications, including birth defects, vision loss, or diabetes (Sutaria et al., 2023).

Evaluation of Nursing Care for the Patient with Acne

After the nurse has implemented their actions, they will evaluate the effectiveness of the interventions. An expected outcome of treatment would be improved appearance of the patient's skin, with less irritation and without signs of acne.

Evaluating Outcomes

When evaluating outcomes, the nurse would expect the patient's skin to appear less irritated and red. Comedones, pustules, cysts, and erythematous papules would be absent or healing. Additionally, the patient would understand the education about face washing, diet, and medication side effects or laboratory values that would need to be monitored.

Medical Therapies and Related Care

Usually, once treatment is initiated the patient's symptoms will resolve and no referral is needed. However, if symptoms continue or worsen, the patient may need a referral to dermatology. If the patient is being treated with isotretinoin, they will need to be closed monitored by a health-care provider for complications, like diabetes or vision loss.

Bacterial Skin Infections

Bacterial skin infections are common. They are usually caused by bacteria that live on the skin, like *Staphylococcus* and *Streptococcus*. Depending on the type and location of the bacterial infection, symptoms may look a little

different (Rehmus, 2023). Two common bacterial infections the nurse will encounter are impetigo and folliculitis.

Impetigo

A bacterial skin infection commonly caused by gram-positive bacteria is called **impetigo**. There are two types of impetigo: bullous impetigo and nonbullous impetigo (Figure 14.12). Bullous impetigo begins with a small vesicle, which then leaks clear to dark fluid. Nonbullous impetigo, the more common type, starts with a small vesicle or pustule that forms and ruptures, causing a honey-colored crust to form. The nurse may provide treatment as ordered by the health-care provider, which usually includes applying topical antibiotics (e.g., mupirocin). Before applying the antibiotic, the nurse should remove the crust and wash the area with soap and water. If the infection worsens, the nurse will alert the health-care provider, and the provider may prescribe an oral antibiotic (e.g., cephalexin, amoxicillin-clavulanate). For children, the nurse would also educate caregivers on the importance of personal hygiene and avoiding contact with other children during treatment, because the infection can easily spread (Nardi & Schaefer, 2022).

(a) (b)

FIGURE 14.12 (A) Bullous impetigo begins with vesicles that leak clear fluid. (B) Nonbullous impetigo occurs when a vesicle ruptures, causing a yellow crust to form. (credit a: CDC/Public Health Image Library, Public Domain; credit b: CDC/ Dr. Thomas F. Sellers; Emory University/ Public Health Image Library, Public Domain)

Folliculitis

Infection and inflammation of a hair follicle are called **folliculitis** (Figure 14.13). It is most commonly caused by bacteria (*Staphylococcus*) but can also be caused by fungi and viruses (e.g., herpes) (Rehmus, 2023). Patients with bacterial folliculitis often present with itching and a mildly erythematous rash. The nurse may also note small pimples or pustules surrounding the hair follicles. Bacterial folliculitis usually resolves on its own without treatment. However, if it worsens, the first-line treatment is topical antibiotics, like clindamycin or mupirocin. If the nurse notes increased redness, swelling, or discharge, the health-care provider may prescribe oral cephalexin or another antibiotic (Winters & Mitchell, 2022).

FIGURE 14.13 Folliculitis is an infection of a hair follicle and can occur anywhere on the body. (credit: "Folliculitis2" by Da pacem Domine/ Wikimedia Commons, CC0 1.0)

Viral Skin Infections

Viruses can cause viral skin infections. Some examples of viruses that can cause skin infections are herpes zoster, COVID-19, human papillomavirus (HPV), and herpes simplex (MedlinePlus, 2023). A nurse must be able to recognize these skin infections and provide appropriate treatment as prescribed by the health-care provider.

Herpes Zoster

Reactivation of the chicken pox virus (varicella zoster) causes a disorder called **herpes zoster** or shingles. Although it can affect anyone at any age, it more commonly affects older adults who likely contracted varicella zoster in childhood, before vaccination was an option. However, chicken pox during childhood is less common now, due to the introduction of the vaccine (Centers for Disease Control and Prevention, 2024). With herpes zoster, patients will typically present with a viral prodrome or feeling unwell and will often have symptoms like fever and a burning sensation where a rash will appear several days later. Once the skin rash develops, it will have a vesicular appearance, follow a dermatome (i.e., areas of skin innervated by a spinal root), and will be unilateral, never crossing the midline (Figure 14.14). Patients will complain of itching and a burning sensation, and pain is often moderate to severe.

FIGURE 14.14 The herpes zoster rash is vesicular, follows a dermatome, and does not cross the midline. (credit: "Shingles Rash" by NIAID/ Flickr, CC BY 2.0)

Once the patient is diagnosed with herpes zoster, the nurse can expect the health-care provider to prescribe oral antivirals (e.g., acyclovir, valacyclovir). The provider may also prescribe antibiotic ointments to prevent the

development of secondary infections. If the nurse notes any lesions on the patient's face, especially near the eye or ear, they should inform the health-care provider immediately. This is because herpes zoster follows the dermatomes and can affect the patient's hearing and eyesight (Nair & Patel, 2023).

Herpes Simplex

There are two types of herpes simplex viruses. The first, **herpes simplex virus type 1 (HSV-1)**, causes vesicular rashes on the skin and face, near the mouth and lips, but it can also occur on the genitalia. The second, **herpes simplex virus type 2 (HSV-2)** is the most common cause of genital herpes (Kaye, 2021).

Patients with HSV-1 or HSV-2 will usually complain of itching and a tingling sensation in the affected area before a vesicular rash appears. When the rash erupts, it appears as small vesicles with an erythematous base. The health-care provider will usually prescribe oral antivirals like valacyclovir or acyclovir for treatment. A viral culture may also be ordered, which the nurse would collect by removing the top portion of the vesicle and swabbing the clear fluid, to determine if the cause is herpes simplex or another virus. Lesions that are near or affect the eye can cause a condition known as keratitis, and the patient should be referred to an ophthalmologist for treatment (Kaye, 2021).

COVID- 19

Although COVID-19 usually causes respiratory symptoms in patients, it can also cause skin manifestations. The most common rash that develops with a COVID-19 skin infection is usually itchy and maculopapular; however, urticarial rashes (e.g., hives), petechiae, and vesicular rashes may also develop on the body. Another prominent manifestation is "COVID toes," which are also known as chilblain lesions. This condition causes the patient's toe(s) to become discolored and inflamed. If a patient who is diagnosed with COVID-19 develops a rash, the nurse should inform the health-care provider so the provider may evaluate the patient. Most skin eruptions associated with COVID-19 are self-limiting and resolve on their own. However, in some cases, the health-care provider may order topical steroids or antibiotics to help open lesions heal or manage symptoms (Singh et al., 2020).

REAL RN STORIES

Nurse: Amanda MSN, FNP-C
Years in Practice: 5
Clinical Setting: Urgent Care
Geographic Location: Nevada

When the COVID-19 pandemic first started, I was working in an urgent care setting as a nurse practitioner. COVID-19 was new, and many patients had different symptoms, including nonrespiratory ones, making it difficult to diagnose. Plus, testing protocols were changing daily due to the lack of in-house testing at the time. Every PCR [polymerase chain reaction] specimen had to be sent to the health department and then to the CDC [Centers for Disease Control and Prevention] for testing.

During this time, I had a patient present with toe redness and tenderness that started a few days prior. He had no other symptoms. His primary care doctor had sent him to urgent care for further workup because they were concerned about a blood clot or other disorder. I ran several blood tests on the patient, which all returned negative. I collaborated with a vascular physician to determine any additional underlying etiology I may have overlooked. When I was taking the patient's history, he had mentioned he may have been exposed to COVID-19 the week prior. When speaking to the vascular physician, he mentioned COVID toes, which had been a potential new finding with COVID-19–positive individuals. We decided to test the patient for COVID-19 and discovered the patient was positive. This was a lesson learned to always complete a thorough history and document it, even if you think it's something irrelevant. You never know where it might lead you or when it will help you diagnose a patient.

Fungal Skin Infections

Fungal skin infections are caused by fungus, yeasts, or dermatophytes. Common organisms are *Candida*, *Microsporum*, and *Epidermophyton*. Fungal infections do not penetrate past the epidermis and usually occur in moist areas, like the feet and genital area. Usually, patients with fungal infections (e.g., candidiasis) will have itching and mild swelling around the affected area. A patient with athlete's foot, or tinea pedis, the patient may present with

itchiness and scaling of the skin. In cases of ringworm, the nurse may notice round patches with a raised border that is scaly and central clearing (Aaron, 2021).

Fungal infections may have slightly different presentations, but treatment is often the same. Treatment usually involves topical or oral antifungals, such as ketoconazole or fluconazole. However, the health-care provider may also order a skin scraping to confirm the diagnosis, and the nurse may need to collect the sample.

Parasitic Skin Infections

Parasitic skin infections are caused by parasites, like protozoa or helminths. Although parasites flourish in areas with inadequate sanitation, they can survive anywhere and usually enter the body through the skin or mouth (Marie & Petri, Jr., 2023). Some examples of common parasitic skin infections that a nurse may encounter are pediculosis and scabies.

Pediculosis

A parasitic skin infection of lice, called **pediculosis**, can affect anywhere there is body hair, including the pubic region. This condition is caused by a tiny insect, a louse, and is extremely transmissible through close contact. In all cases of pediculosis, the patient will present with itching. Upon examination, the nurse may note adult lice or baby lice (nits) on the affected area. For treatment of head lice, the health-care provider will usually order oral ivermectin or topical shampoos like lindane 1%. After shampooing, a fine-toothed comb is used to remove the nits. Pubic lice are typically treated with creams and shampoos, like permethrin or lindane. When lice affect the eyelashes, fluorescein drops are given, or oral ivermectin.

The nurse also should educate the patient to inform any sexual partners or those with whom they have had in close contact; these people would need to be treated as well. The nurse also instructs the patient to clean towels and bedding in hot water and to not share any personal items like hairbrushes or towels until they are sanitized and clean (Dinulos, 2021).

FIGURE 14.15 When looking at a patient's hair sometimes you can see tiny nits, which are baby lice. (credit: "Head Infested With Louse" by Aditya Suseno/Wikimedia Commons, CC0 1.0)

Scabies

The parasitic skin infection caused by a mite that usually affects the spaces between the fingers, wrists, axillae, and abdomen along the belt line is called **scabies**. Patients with scabies will report intense itching that is usually worse at night. When examining the patient with the health-care provider, the nurse may notice erythematous papules with small scaly lines or burrows. For treatment, the health-care provider will order topical treatments like permethrin or may prescribe oral ivermectin. When caring for the patient, the nurse should follow contact precautions and wear proper personal protective equipment because scabies can be easily transmitted (Dinulos, 2021).

Benign Tumors

Benign tumors are those that are noncancerous and can grow anywhere on the skin. Common types of benign tumors are cysts, angiomas, keloids, moles, warts, and dermatofibromas. As a nurse, you will encounter many benign tumors; it is important to recognize their appearance, symptoms, and recommended treatment options from the health-care provider.

Cysts

Cysts can appear anywhere on the body. If a patient has a cyst, the nurse may note a small mass or nodule that is hard and nonfluctuant. Rarely, cysts can become infected, and the nurse would note redness, swelling, and potential discharge around the site. If the cyst is large enough or bothersome to the patient, the provider can surgically remove it. Depending on its appearance, the provider may order a biopsy to determine the exact etiology. After the cyst is removed, the nurse would educate the patient on signs and symptoms of infection at the incision site and to avoid strenuous activity for 7 to 10 days after the procedure to prevent infection and maximize skin healing (Zito & Scharf, 2023).

Angiomas

Another type of benign tumor is an **angioma**, which is a small collection of blood vessels or lymphatic tissue. There are different types of angiomas (e.g., cherry hemangiomas), and they can occur anywhere on the body. In patients with cherry angiomas, the nurse may note a red, dome-shaped area (Figure 14.16). Trauma to an angioma typically causes it to bleed. To determine the depth of larger angiomas, the health-care provider may order imaging, like tomography, before determining if the angioma can be removed. Removal can be done by electrocauterization, cryotherapy, or laser treatment (Qadeer et al., 2023).

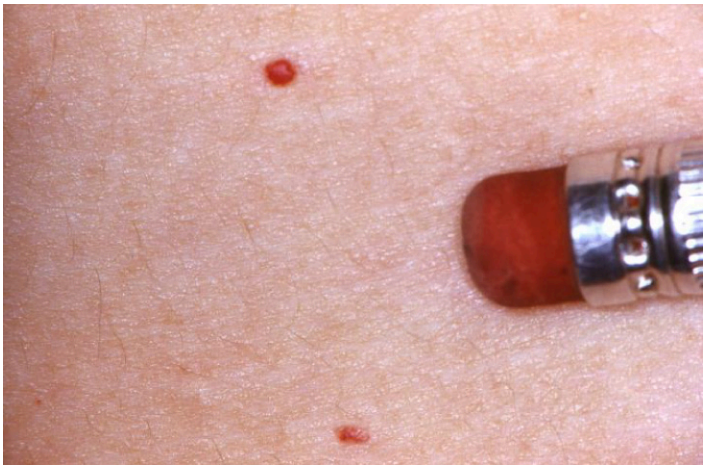

FIGURE 14.16 This patient has a cherry hemangioma, which results from a small collection of blood vessels. (credit: "ID# 17608" by CDC/Dr. F. Gilbert/Public Health Image Library, Public Domain)

Keloids

A **keloid** is a firm and rubbery area of skin that can appear flesh-colored or hyperpigmented. It can appear as a response to skin inflammation that causes abnormal wound healing and increased skin cell proliferation or hypertrophy. Treatment methods include topical corticosteroids and compression devices to reduce keloid development while wounds are healing. Some patients require more extensive care to remove keloids, including cryotherapy, surgical excision, and laser treatment; the nurse can help coordinate care for these procedures (McGinty & Siddiqui, 2022).

Pigmented Nevi (Moles)

A **pigmented nevus** or **melanocytic nevus**, also called a mole, is a macule or papule on the skin. Moles can range in color from the patient's skin tone to a deep brown. Because moles can resemble skin cancer (specifically, melanoma), the provider will assess the mole for asymmetry, irregular borders, color, diameter, and changes to determine if the area is concerning. If any issues are present, the nurse would anticipate the provider to order a skin biopsy. The provider may also remove the mole completely for histology or for cosmetic reasons (Aaron, 2022).

Verrucae (Warts)

A **verruca**, or a wart, is a lesion caused by the human papillomavirus (HPV) that is generally flesh-colored, raised, with an irregular surface and can occur anywhere on the skin, including the soles of the feet and palms of the hands. Human papillomavirus causes warts, and warts do not generally cause any symptoms. However, plantar warts that occur on the bottom of the feet can become painful due to friction.

After diagnosis, treatment depends on the size of the warts. Methods might include observation (many warts resolve on their own within 24 months), topical salicylic acid, retinoic acid, or cryotherapy. Verrucae are sometimes biopsied to determine the exact etiology, and the nurse may anticipate the provider ordering a biopsy procedure (Al Aboud & Nigam, 2023).

Dermatofibroma

A **dermatofibroma**, also called a benign fibrous histiocytoma, is a small, benign papule made of fibroblastic tissue (the skin's connective tissue) and can range in color from red to brown. Patients may complain about itching in the area, but this is not common. Because dermatofibromas can resemble forms of skin cancer, biopsies are often performed by the health-care provider to confirm diagnosis. For treatment, the nurse can expect the provider recommend surgical excision or cryotherapy (Aaron, 2022).

Malignant Tumors

Malignant tumors are cancerous and can form anywhere on the skin. Common types of malignant tumors are melanoma, basal cell carcinoma, and squamous cell carcinoma. As a nurse, you may encounter malignant tumors; it is important to recognize their appearance and be knowledgeable about recommended treatment options from the health-care provider.

Basal Cell and Squamous Cell Carcinoma

The most common form of skin cancer, **basal cell carcinoma**, arises from the lowest layer (basal) of the epidermis. The condition may appear as patches of shiny pink skin to clear bumps that sometimes break open and form a scab. The nurse can expect the health-care provider to order a biopsy of the lesion to confirm the diagnosis of basal cell carcinoma. Treatment involves removal by cauterization, cryosurgery, excision, or Mohs surgery. During Mohs surgery, the provider removes small portions of the lesion and views them under a microscope to determine if the borders have been completely removed (Wells, 2022).

Another form of skin cancer, **squamous cell carcinoma** originates from the squamous layer of skin and may be preceded by actinic keratosis. When inspecting the patient's skin, the nurse may notice irregular, scaly, and thickened growths that do not heal. As with basal cell carcinoma, the nurse would anticipate a skin biopsy to be ordered to confirm the diagnosis. The lesion will then be removed using the same techniques as for basal cell carcinoma. After the carcinoma is removed, the nurse can reinforce prevention measures, like avoiding sunlight, using sunscreen, and wearing long-sleeved clothes while outdoors (Wells, 2022).

Melanoma

Another form of skin cancer, **melanoma** arises from melanocytes and can appear flat or raised and vary in color, including red, brown, black, or blue (Figure 14.16). Lesions often appear in areas where the skin is exposed to sunlight. The main treatment is removal; the health-care provider will biopsy the lesion to confirm the diagnosis. Because melanoma is an aggressive form of skin cancer and can spread to other parts of the body, adjunct therapies like cryotherapy, radiation, and immunotherapy may also be ordered.

FIGURE 14.17 Melanoma is a form of skin cancer. Notice its irregular border and color, which can be indicative of skin cancer. (credit: "Melanoma"/National Cancer Institute, Public Domain)

Nurses should also reinforce education by instructing patients about skin cancer prevention and the ABCDEs of melanoma. The ABDCEs of melanoma or any skin cancer are:

- A = Asymmetry: Is the lesion asymmetrical?
- B = Borders: Are the borders irregular?
- C = Color: Are there changes in skin color or has the skin become significantly darker?
- D = Diameter: Is the lesion greater than one-quarter of an inch?
- E = Evolution: Has the mole changed?

Answering yes to any of these ABCDEs may indicate the patient potentially has a form of skin cancer (Wells, 2022).

Cutaneous Procedures and Treatment

Benign and malignant skin lesions and tumors are often removed via cutaneous procedures or treatment. Some common cutaneous treatments are laser treatment, cosmetic procedures, and wound flaps or grafts.

Laser Treatment of Lesions

Laser treatment of skin lesions involves using laser light therapy. The skin absorbs laser light, and the affected skin cells repair and heal themselves. Laser treatments are used most commonly on pigmented skin or nevi but can also be used on vascular abnormalities, angiomas, granulomas, and other skin conditions. During this procedure, patients and anyone on the health-care team must wear safety goggles and eye shields to protect themselves from the laser light. The patient should also receive local anesthesia to the area through topical agents like 4% lidocaine. After the laser treatment, the nurse should provide skin-cooling measures (e.g., ice packs) to the treatment area. The nurse should also instruct the patient to avoid sunlight exposure to the area for a certain amount of time (Gaffey & Johnson, 2022).

Cosmetic Procedures

Depending on the type of skin lesion or tumor, the health-care provider may order cosmetic procedures like facial reconstruction or dermabrasion. Facial reconstruction is plastic surgery on the face that is often performed after skin cancer lesions removal or after Mohs surgery. After facial reconstruction, the nurse would administer pain medications and provide wound care as ordered. The nurse may also apply topical antibiotics to the surgical incision to promote wound healing (Cottrell & Raggio, 2023).

Dermabrasion is resurfacing the skin; it promotes remodeling and wound healing by using abrasive materials. This process is often used to treat actinic keratosis and acne scars but can also be used for scar revisions and after Mohs surgery. During the procedure, the nurse may apply local anesthesia ointments (e.g., lidocaine) to help relieve pain

and may assist the health-care provider with holding the skin taught. After the procedure, the health-care provider may order saline-soaked gauze or an occlusive ointment, like petroleum, to promote skin healing (Bedford & Daveluy, 2023).

Wound Coverage with Flaps and Grafts

Skin flaps and skin grafts are two common types of skin closure and wound coverage techniques. A **skin flap** is created when healthy skin is only partially detached to cover a nearby wound, whereas a **skin graft** involves transferring skin and related blood vessels from one area of the body to another and is used to cover larger wounds. Skin flaps are often the preferred closure technique because the flaps have an adequate vascular supply.

Skin flaps and grafts are often used to close areas where skin cancers or large tumors have been removed, often after surgical excision or Mohs surgery (Prohaska et al., 2022). After a skin flap or graft procedure is performed, the nurse would perform wound care as ordered and assess the site for signs and symptoms of infection. They would also administer pain medication as needed. The nurse can also reinforce postprocedure patient education, such as limiting contact with water at the site of the procedure or avoiding strenuous activity, because it can cause the wound to stretch. Wash your hands thoroughly before changing a dressing, to prevent possible spread of bacteria. If the patient has a vacuum dressing, make sure the tubing is attached and correct pressure is set, because this promotes wound healing and removes excess moisture from the wound bed (Hoss, 2022).

Summary

14.1 Integumentary Disorders

- The skin has three major layers: the dermis, epidermis, and hypodermis. Each layer serves a particular function regarding the integumentary system.
- Atopic dermatitis (eczema) occurs when a person has a dysfunctional skin barrier, allowing the body to be more susceptible to pathogens. Atopic dermatitis is linked to genetics, the immune system, and epidermal dysfunction. Symptoms are itching, skin redness and dry patches, and skin thickening.
- Psoriasis is the proliferation of skin cells and chronic skin inflammation. The most common is plaque psoriasis. This autoimmune disorder is linked to several genes and is inheritable. Symptoms include itching and well-defined thick patches of reddened skin with a silver scale appearance.
- Atopic dermatitis and psoriasis are diagnosed by clinical presentation and symptoms. A skin biopsy specimen can be taken, if necessary. Additional blood tests for psoriasis may be ordered and include a CBC, renal and liver function panels, ESR, rheumatoid factor level, and others.
- The priority nursing diagnosis for AD and psoriasis is impaired skin integrity. Nurses should monitor for signs of infection and promote pharmacological and nonpharmacological interventions, such as topical medications and, when indicated, systemic medications. If the patient was administered immunosuppressants, the nurse would monitor for signs of serious infection and for renal and liver function.
- When evaluating outcomes, the desired outcome is no signs and symptoms of infection. The nurse would evaluate the patient's compliance with medications and treatment. If the patient was administered immunosuppressants, the nurse would expect no serious infections and for renal and liver function to remain normal.
- For patients with AD, the nurse would promote referrals to a dermatologist, wound care specialist, and an allergist, if needed.
- For patients with psoriasis, the nurse would encourage referrals to a dermatologist, wound care specialist, and an allergist. Additional referrals to a nephrologist, ophthalmologist, or rheumatologist may be needed, depending on the type and severity of psoriasis.

14.2 Burns

- Depending on the degree of severity, a burn can destroy the epidermal and dermal layers of the skin. A burn causes protein denaturation and damage to collagen. After a burn injury occurs, three zones of injury arise: the zones of coagulation, statis, and hyperemia.
- The type of burn injury a patient has is based on appearance. First-degree burns are pink to red and brown, and dry; second-degree burns are moist and blistering; and third-degree burns are dry, leathery, and white or brown/black.
- The priority nursing hypothesis for most burn injuries is impaired skin integrity. Nurses will provide supportive measures such as wound care, infection prevention, pain control, fluid resuscitation, and airway management as needed.
- When evaluating the effectiveness of nursing care, the nurse would expect wound healing within the typical healing time with no signs of infection. The nurse should expect the patient's pain to be tolerable.
- Patients with burn injuries require interdisciplinary care that can include wound care specialists, dermatologists, nutritionists, infectious disease specialists, and plastic surgeons. Additional care from other specialists may be required depending on smoke inhalation or conditions such as SJS and TENS, including pulmonologists, intensivists, and others health-care professionals.

14.3 Dermatologic Conditions

- Depending on the patient's skin condition, pathophysiology, risk factors, and clinical manifestations will differ. Pathophysiology typically involves a disruption of the skin barrier and an inflammatory response. Risk factors can be related to underlying health conditions, age, and exposure. Usually, patients with skin conditions will present with itching, erythema, and skin lesions.
- Diagnostic and laboratory values will vary depending on the patient's dermatological condition. Most skin conditions are diagnosed by clinical presentation and do not require additional diagnostic tests. However, some skin conditions may have underlying contributors, so the health-care provider will order tests

accordingly.

- For most dermatological conditions, the priority nursing diagnosis is impaired skin integrity. In some cases, the priority is to treat the underlying condition or remove the agent causing the rash first. Nurses will provide pharmacological and nonpharmacological interventions and may administer medications and monitor laboratory values as ordered by the health-care provider.
- When evaluating the effectiveness of nursing care, the nurse will expect optimal skin integrity as an outcome in most cases. The skin will appear normal or healing and without signs of infection.
- Depending on the underlying cause of the skin condition, the nurse can promote medical therapies and collaborative care. Patients may require referrals to various specialists, depending on the severity and specifics of the condition.

Key Terms

acne pustules or nodules on the face, neck, and sometimes upper back and arms
angioma small collection of either blood vessels or lymphatic tissue
atopic dermatitis chronic skin condition in which a person has a dysfunctional skin barrier that allows substances outside to penetrate the skin easily, causing dry and red areas of skin
basal cell carcinoma most common form of skin cancer; arises from the basal layer of the epidermis
burn injury to the skin from heat or chemicals
chemical burn burn that occurs from chemicals, like acids or strong detergents
comedone small bump on the skin that may be flesh-colored, white, or dark
contact dermatitis inflammation of the skin caused by direct contact with an irritant or allergens
cyst (also: **nodule**) bump that forms below the epidermal layer of the skin that is filled with keratin and is usually lined with squamous epithelium
debridement removal of damaged tissue around a wound to allow for new tissue to grow more easily
dermatitis inflammation or irritation of the skin
dermatofibroma (also: *benign fibrous histiocytoma*) small, benign papule made of fibroblastic tissue; can range in color from red to brown
dermis middle layer of the skin, just below the epidermis, made up of connective tissue that supports the epidermis
electrical burn burn that occurs from exposure to electricity or electrical currents
epidermal hyperplasia thickening of the epidermis
epidermis outermost layer of skin, made of epithelial cells
erythematous abnormal redness of the skin, often caused by a rash or skin irritation
eschar piece of dead tissue that is cast off from the surface of the skin, particularly after a burn injury
excoriation areas of skin that are broken from scratching and that may bleed or ooze in severe cases
exocrine gland gland that secretes substances through ducts onto the skin's epithelial surface instead of the bloodstream
first-degree burn superficial burn, only affecting the epidermis; appears pink to red and dry
folliculitis infection and inflammation of a hair follicle
generalized exfoliative dermatitis (also: *erythroderma*) inflammation of the skin causing erythema and scaling covering 90% of the body's surface area; when severe enough, is life-threatening
herpes simplex virus type 1 (HSV-1) virus that causes vesicular rashes on the skin and face, near the mouth and lips, but it can also occur on the genitalia
herpes simplex virus type 2 (HSV-2) virus that is the most common cause of genital herpes
herpes zoster (also: *shingles*) virus that is caused by reactivation of the chicken pox virus (varicella zoster)
hypodermis (also: *subcutaneous tissue*) bottom layer of skin that is made of adipose and areolar tissue that cushions the underlying organs
impetigo bacterial skin infection commonly caused by gram-positive bacteria
integumentary system largest organ of the body, comprising skin, hair, and nails
keloid firm and rubbery area of skin that can appear flesh-colored or hyperpigmented
keratin skin protein that makes up hair and nails
lichenification skin thickening over time in an area that is frequently scratched
melanocytic nevus (also: **pigmented nevus** or *mole*) macule or papule on the skin

melanoma form of skin cancer that arises from melanocytes; can appear flat or raised and vary in color, including red, brown, black, or blue
nodule (also: **cyst**) bump that forms below the epidermal layer of the skin that is filled with keratin and is usually lined with squamous epithelium
onycholysis nail separation from the nail bed
papule small, raised bump that is well defined
parakeratosis when the skin's keratinocytes do not completely mature
pediculosis parasitic skin infection of lice
phototherapy ultraviolet light exposure to the skin
pigmented nevus (also: **melanocytic nevus** or *mole*) macule or papule on the skin
plaque raised lesion on the skin
pruritus itching
psoriasis chronic dermatological disorder, characterized by the proliferation of skin cells and chronic inflammation.
pustule larger acne lesion that contains pus
radiation burn burn that occurs from exposure to radiation sources, such as sunlight or machines that emit radiation during some cancer treatments
scabies parasitic skin infection caused by a mite; usually affects the spaces between the fingers, wrists, axillae, and abdomen along the belt line
seborrheic dermatitis skin condition that usually affects the scalp or areas with sebaceous glands, such as the face or areas with skin folds
sebum oil produced by the sebaceous glands to keep the skin moisturized
second-degree burn partial-thickness burn affecting the epidermis and part of the dermis; appears as red and blistering and can be very painful
skin flap healthy tissue moved to a nearby wound to help with healing
skin graft surgical procedure in which healthy skin tissue is taken from one part of the body and moved to another that has a wound
squamous cell carcinoma skin cancer that originates from the squamous layer of skin
Stevens-Johnson Syndrome (SJS) abrupt, rare skin reaction usually caused by medications; involves loss of skin and sometimes mucosal membranes
thermal burn burn caused by an external heat source, like flames, steam, or hot liquids
third-degree burn full-thickness burn affecting the entire epidermis and dermis and extending into subcutaneous tissue; appears white or black, dry, and leathery
toxic epidermal necrolysis (TEN) abrupt, rare skin reaction usually caused by medications; involves loss of skin and sometimes mucosal membranes
verruca (also: *wart*) lesion caused by the human papillomavirus that is generally flesh-colored, raised, with an irregular surface and can occur anywhere on the skin, including the soles of the feet and palms of the hands
zone of coagulation central area of a burn where tissue has been irreversibly damaged and coagulated
zone of hyperemia outermost area of a burn where tissue is inflamed and has increased blood flow, typically recovering without intervention.
zone of stasis area surrounding a burn where the tissue has decreased perfusion but the skin is still potentially viable

Assessments

Review Questions

1. What is a risk factor for developing atopic dermatitis? Select all that apply.
   a. family history of atopic dermatitis
   b. history of asthma
   c. taking antihistamines
   d. recent contact with an irritant, such as poison oak

2. A nurse is caring for a patient with plaque psoriasis. What intervention is the priority for this patient?

a. Ask for a referral to an allergist for skin testing.
b. Promote showering daily with hot water.
c. Educate the patient on stress-reduction techniques.
d. Apply daily topical antibiotics.

3. A nurse is assessing a patient with a second-degree burn. What would the nurse expect the wound to look like?
a. dry and leathery
b. black and moist
c. wet and blistering
d. dry and pink

4. A patient has sustained a burn while using paint thinner. What is the most likely source of the burn?
a. thermal
b. radiation
c. electrical
d. chemical

5. You are caring for a patient with third-degree burns covering 50% of their body sustained during a house fire. What would be a priority intervention for this patient?
a. control pain before wound care
b. skin to begin healing with wound care
c. oxygen support
d. check for signs of infection

6. What virus causes shingles?
a. herpes simplex virus
b. varicella zoster
c. human papillomavirus
d. herpes zoster

7. Actinic keratosis is a precursor to what skin disease?
a. melanoma
b. basal cell carcinoma
c. squamous cell carcinoma
d. angioma

8. What is a description of a rash caused by herpes zoster?
a. vesicular rash, not crossing the midline
b. maculopapular, not crossing the midline
c. pustular, following a dermatome
d. macular, following a dermatome

9. What clinical manifestations would an infant have with seborrheic dermatitis?
a. vesicular rash on the head
b. greasy, crusting appearing rash
c. maculopapular rash on the skin folds
d. pustular rash surrounding the hair follicles

10. What skin condition is caused by a parasite?
a. scabies
b. dermatofibromas
c. verrucae

d. pruritus

Check Your Understanding Questions

1. Explain the diagnostic and laboratory tests required to diagnose atopic dermatitis.
2. You are caring for a patient with TENS. What diagnostic tests might be ordered for this patient? What laboratory values might be abnormal?
3. Explain medical therapies a patient with SJS may need during the rehabilitation phase of care.
4. How do the pathophysiological changes seen in burn injuries influence the choice of medical and nursing interventions?
5. When caring for a patient with generalized exfoliative dermatitis, which diagnostic tests and laboratory values might you expect?
6. What medical therapies might a nurse implement when caring for a patient with contact dermatitis?

Reflection Questions

1. After providing wound care and dressing changes for a patient with second-degree burns, what indicators would the nurse use to evaluate the efficacy of the nursing care provided?
2. What medical therapies might the nurse anticipate for the treatment of a patient with extensive third-degree burns, and how do these therapies support recovery?
3. A patient presents to the clinic with pruritus. What interventions and outcomes might the nurse expect for this patient?

What Should the Nurse Do?

Sarah, a 45-year-old female, presents to the dermatology clinic with complaints of persistent itching and rash on her lower legs for the past 2 weeks. She reports a history of atopic dermatitis and seasonal allergies. On examination, Sarah's lower legs exhibit erythematous, raised, and scaly patches with excoriation marks due to scratching. Her vital signs are within normal limits. Sarah mentions she has tried over-the-counter hydrocortisone cream without relief. Further assessment reveals no signs of infection or systemic illness. Sarah expresses frustration and discomfort due to the persistent symptoms affecting her daily life.

1. What specific cues from Sarah's medical history and presenting symptoms suggest a potential exacerbation of her underlying eczema rather than an unrelated dermatological condition?
2. What nursing interventions and patient education strategies would be appropriate to address Sarah's symptoms and improve her management of atopic dermatitis?

Ms. Jones, a 45-year-old female, presents to the emergency department after sustaining burns from a kitchen accident at home. She reports experiencing intense pain and redness over her left forearm and hand. Ms. Jones has no significant past medical history except for mild hypertension, for which she takes amlodipine. On assessment, her vital signs are as follows: heart rate 110 bpm, blood pressure 140/90 mmHg, respiratory rate 20 breaths per minute, and temperature 38.5°C (101.3°F). There are partial-thickness burns covering approximately 15% of her total body surface area, concentrated on the left upper extremity. She is also visibly distressed and anxious.

3. Given Ms. Jones's symptoms and vital signs, what are the primary concerns regarding her burn injury management?
4. What nursing interventions can be implemented to address Ms. Jones's pain and anxiety?
5. When caring for a patient with impetigo, what nursing interventions might you implement?

Competency-Based Assessments

1. A nurse is caring for a patient who is taking methotrexate for plaque psoriasis. Their laboratory test values returned today and showed elevated AST and ALT levels and white blood cell (WBC) count. What interventions might this nurse implement and what other laboratory tests might this nurse want to monitor?

2. As a clinical nurse, what strategies can you use to evaluate the efficacy of care provided to patients with integumentary disorders?
3. How do nurses incorporate knowledge of medical therapies into the management of integumentary disorders?
4. You are caring for a patient with a burn injury. What strategies can you implement to ensure infection prevention while caring for this patient?
5. Explain the rationale behind ordering specific diagnostic tests and interpreting laboratory values for patients with burns. How do these assessments help determine the severity of burns and guide treatment decisions?
6. When working with a patient, how would you identify the pathophysiological mechanisms underlying psoriasis and eczema? How do these conditions differ in terms of their etiology and inflammatory pathways?
7. Interpret the significance of elevated eosinophil counts in a patient presenting with dermatitis. How might this finding guide the diagnostic process?

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CHAPTER 15

Cerebrovascular System

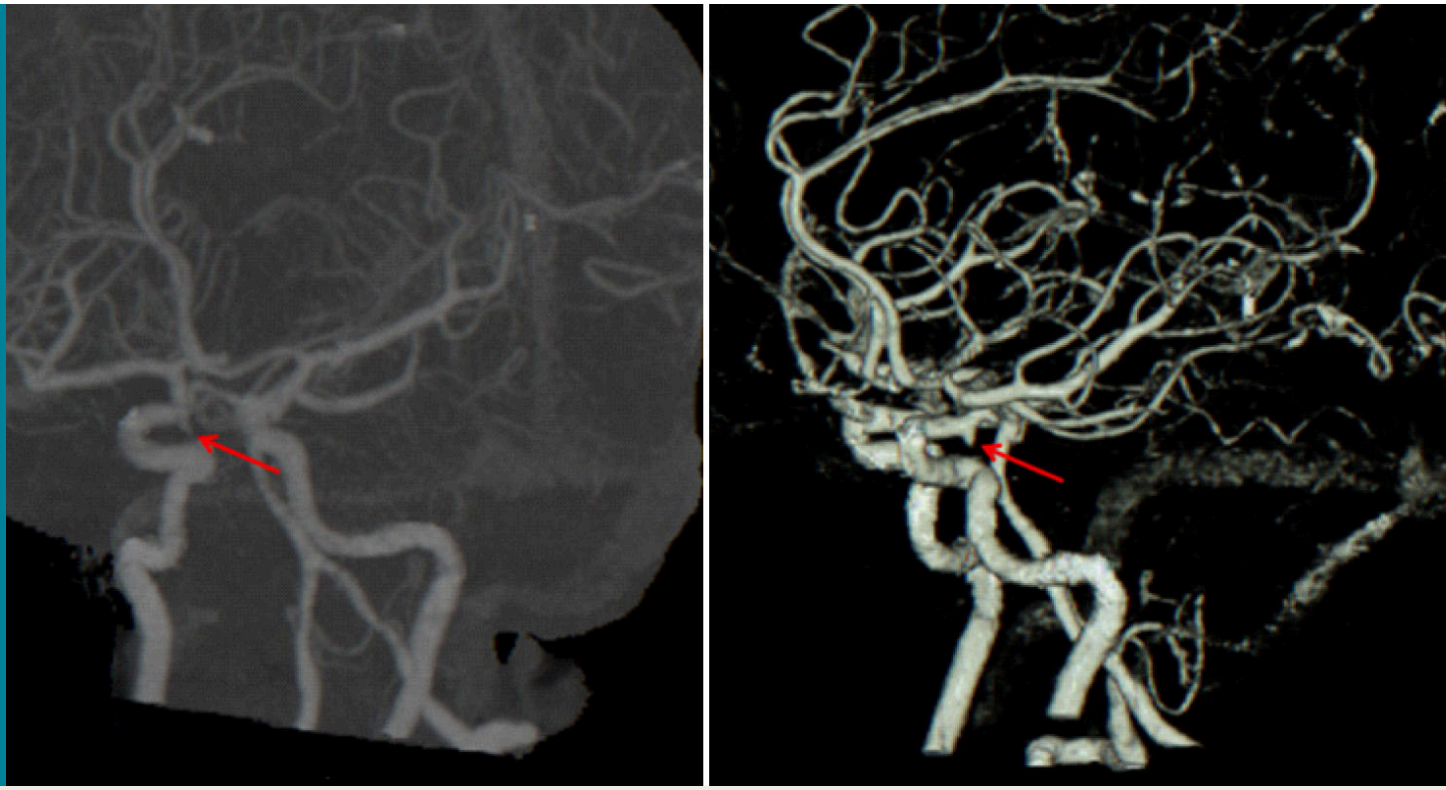

FIGURE 15.1 Computed tomography angiography can give an effective visualization of the cerebral vasculature, such as the aneurysm indicated by the red arrows. (credit: "Volume_rendered_CT_angiography_of_posterior_communicating_artery_aneurysm.png" by Shazia Mirza and Sankalp Gokhale/Wikimedia Commons, CC BY 4.0)

CHAPTER OUTLINE

INTRODUCTION The brain is one component of the central nervous system (CNS). This crucial organ controls or interprets everything we do: our movement, breath, emotional reactions, vision, experience of hot and cold. The brain's functioning requires a continuous supply of glucose and oxygen; consequently, its vasculature is complex. However, what if there is a disruption in the perfusion of the brain? What happens when the brain cells, which control our every voluntary and involuntary movement, do not receive the oxygen and nutrients they need to function? The result is a stroke.

Treating patients who have had a stroke—or cerebrovascular accident (CVA), as strokes are commonly called—is quite complex. It requires an understanding of the cerebral vasculature and the brain. There are two distinct types of strokes: ischemic and hemorrhagic. Differentiating the two will help guide nursing care to recognize cues, prioritize interventions, and evaluate outcomes.

15.1 The Cerebrovascular System and Cerebral Vascular Accidents

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Describe the anatomy of the brain
- Explain how the areas of the brain are perfused by the circle of Willis
- Discuss the recognition and emergency treatment of cerebrovascular accidents

The cerebrovascular system includes the brain and the vessels that supply and circulate blood within the brain. The brain is a very active organ, and adequate perfusion is necessary to support brain function. In fact, the brain receives between 15 percent and 20 percent of the resting cardiac output of the heart (Hickey & Strayer, 2020). A disruption in the blood supply to the brain—that is, a stroke—can have catastrophic results; a lack of perfusion in an area of the brain can cause irreversible damage to the tissue in minutes. Time is of the essence in responding to such an insult to the brain's tissues, as prompt treatments and procedures can restore perfusion and lessen the severity of or completely eliminate cellular damage.

Stroke is the fifth-leading cause of death and the leading cause of disability in the United States (American Stroke Association, 2023); worldwide, it is the leading cause of acquired, permanent disability (Grefkes & Fink, 2020). Although the treatment of acute strokes has improved considerably, the majority of patients will still have lasting disabilities. Many patients are left with considerable impact on functional independence and quality of life. Early recognition and treatment of a stroke can save a person's functionality and even their life.

Review of Brain Anatomy

The human brain, although about only 2 percent of the body's weight, is the most complex organ. The brain processes and controls information, allowing for movement, memory, sensation, behavior, language, balance, and much more. It is necessary to first appreciate the anatomic structure of the brain to understand how a stroke can impact the brain and impair functionality.

Areas of the Brain

The structure of the brain itself can be broken down into three main areas: the cerebrum, the brainstem, and the cerebellum. These areas contain multiple structures that work in concert to control almost every aspect of life. The cranial nerves are a critical component of the **central nervous system (CNS)**, the body's processing and functional control center; they transfer motor and sensory information between the brain and different areas of the face and trunk. It is imperative for the nurse to understand the structure and function of the brain to allow for early recognition of cues for impaired function.

The Cerebrum

The cerebrum is comprised of the left and right cerebral hemispheres (Figure 15.2). The hemispheres are mirror images of each other, each containing half of the frontal, parietal, temporal, and occipital lobes.

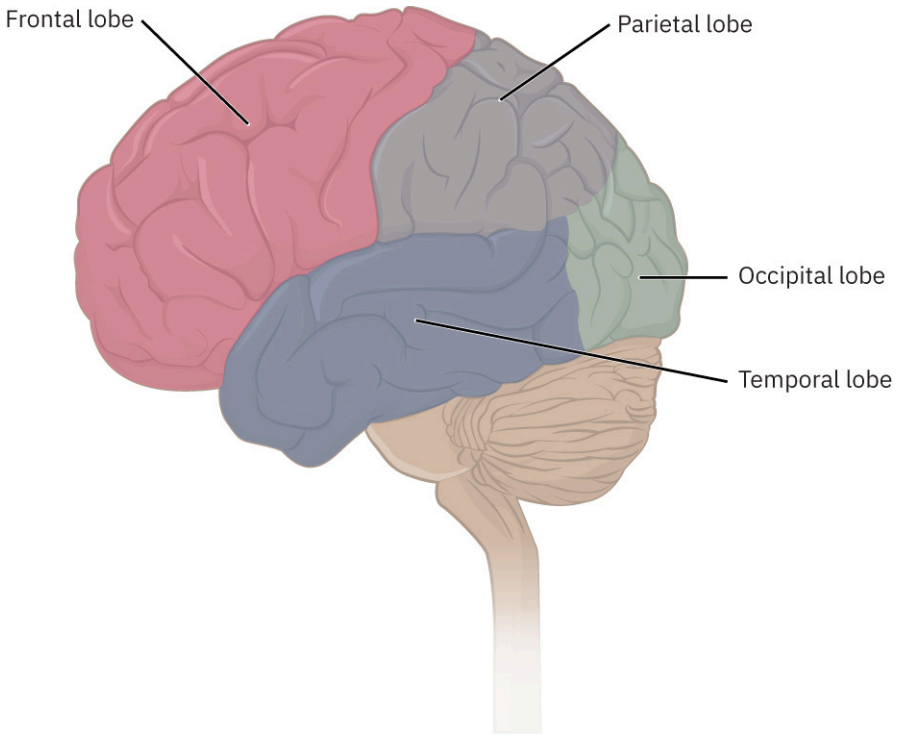

FIGURE 15.2 The four lobes of the cerebrum are the frontal, parietal, temporal, and occipital. (credit: modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

The frontal lobe, the largest area of the brain, found at the front of the cerebrum, is responsible for many higher-level functions such as:

- reasoning
- abstract thought
- executive function
- concentration
- information storage for memory
- personality
- inhibition
- judgment

Also under the control of the frontal lobe is some voluntary motor function, particularly that of speech (e.g., Broca's area). The frontal lobe contains a motor strip that controls the motor coordination of the corresponding parts of the body (Figure 15.3). Finally, the frontal lobe plays a role in the involuntary functions of respiration, gastrointestinal movement, and blood pressure.

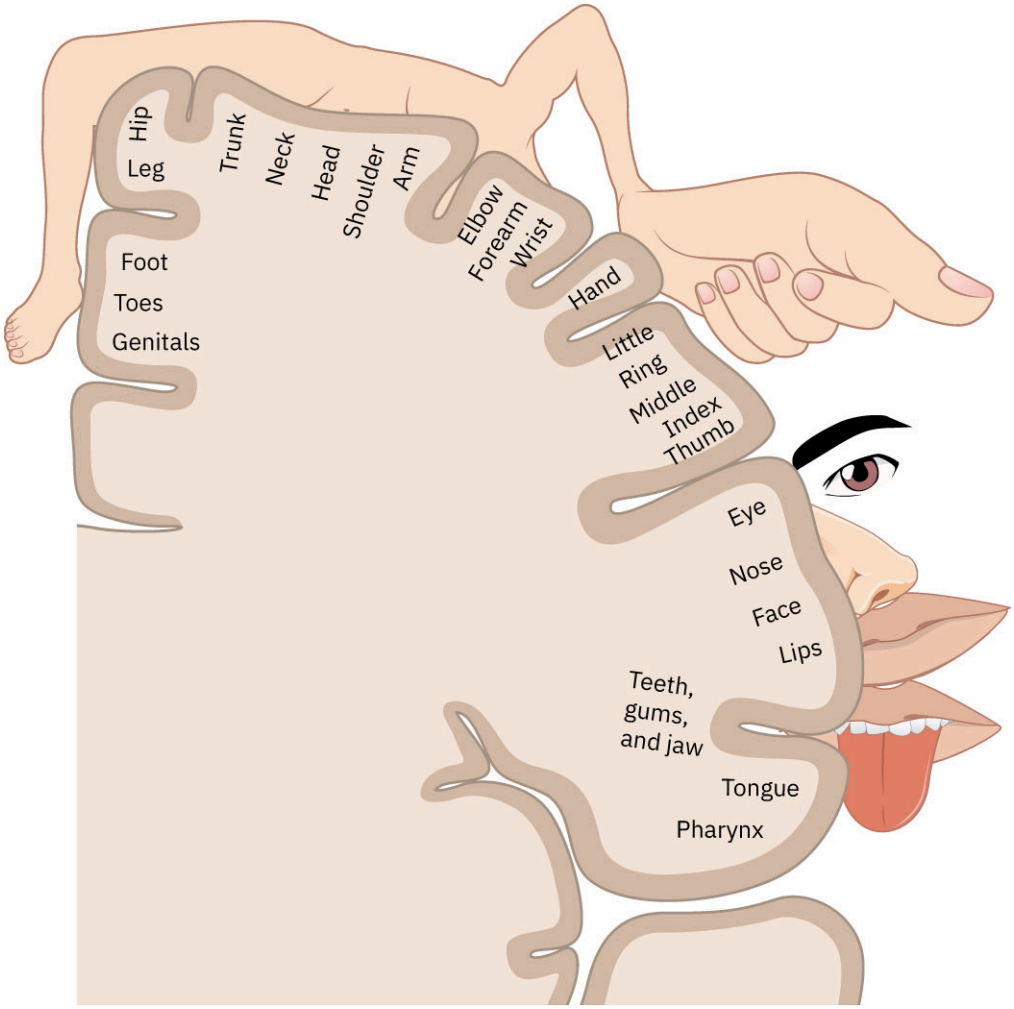

FIGURE 15.3 This image illustrates the motor strip of the frontal lobe and the corresponding areas of the body over which it has control. (credit: modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

The parietal lobe houses the sensory cortex and is responsible for sensory recognition in the same areas as the motor strip. Sensory awareness consists of touch, pressure, vibration, and a person's **proprioception**, or awareness of their own body position and movement in relation to the space around them.

The temporal lobe is primarily for auditory association. It is important for memory and language interpretation. This lobe also houses Wernicke's area, which encompasses the auditory cortex on the lateral sulcus. Past experiences with music, art, conversation, and taste are stored here. The temporal lobe is responsible for multi-modal sensory integration.

Last, the occipital lobe is where visual perception, interpretation, and memory take place. The occipital lobe also has a role in visual reflexes and smooth eye movement.

The thalamus, hypothalamus, and pituitary area are housed deep within the cerebrum. They are key players in vital functions such as the stress response, thermal regulation, hormone regulation, sleep-wake cycle, emotional response, blood pressure regulation, appetite control, and general control of the autonomic nervous system.

The Brainstem

The brainstem comprises the midbrain, pons, and medulla (Figure 15.4). The midbrain coordinates sensory representations of the visual, auditory, and somatosensory perceptual spaces. The pons is the main connection with the cerebellum. The pons and the medulla regulate several crucial functions, including heart rate and respiratory rate.

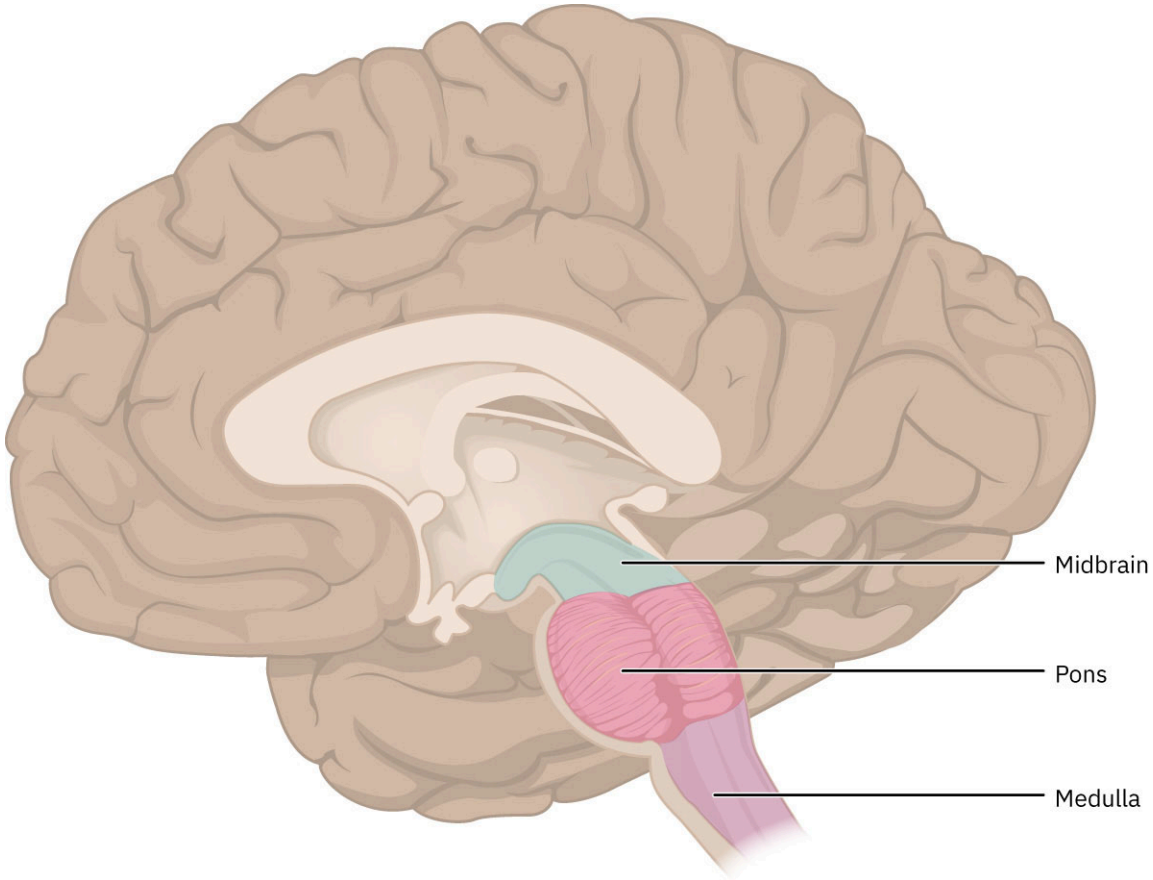

FIGURE 15.4 The brainstem comprises three regions: the midbrain, the pons, and the medulla. (credit: modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

The Cerebellum

The final structure of the brain is the cerebellum, or "little brain," aptly named because it is small and resembles the cerebrum it sits behind. The cerebellum is largely responsible for integrating sensory feedback for the body to produce coordinated movements. It plays a role in proprioception, along with the parietal lobe, and helps control balance and fine motor movement.

The Cranial Nerves

The cranial nerves (Figure 15.5) are primarily responsible for the sensory and motor functions of the head and neck. (One of these nerves targets organs in the thoracic and abdominal cavities as part of the parasympathetic nervous system.) There are twelve cranial nerves, which can be classified as sensory nerves, motor nerves, or a combination of both (Table 15.1). The nurse can recognize deficits in specific cranial nerve function when brain vasculature has affected tissue where the nerve originates.

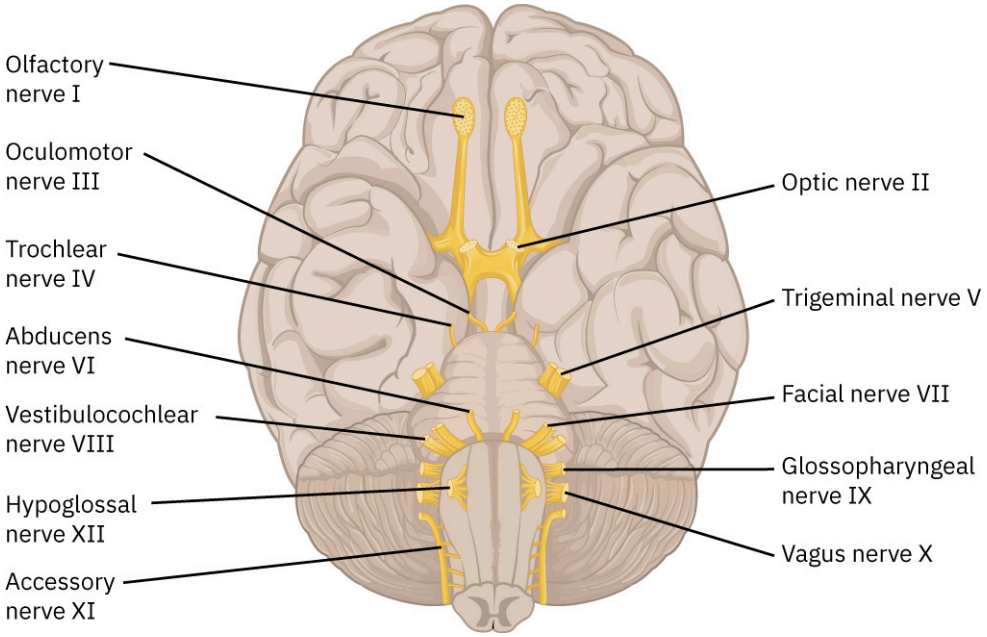

FIGURE 15.5 The cranial nerves originate from the base of the brain. (credit: modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Number	Name	Responsible for . . .
I	Olfactory nerve	• Sense of smell
II	Optic nerve	• Vision
III	Oculomotor nerve	• Eye movements (by controlling four of the extraocular muscles) • Lifting the upper eyelid when the eyes point up • Pupillary constriction
IV	Trochlear nerve	• Eye movement and ability to track
V	Trigeminal nerve	• Sensations of the face • Controlling the muscles of mastication
VI	Abducens nerve	• Eye movement (different extraocular muscle from the trochlear nerve)
VII	Facial nerve	• Muscles involved in facial expressions • Anterior part of the tongue • Production of saliva
VIII	Vestibulocochlear nerve	• Senses of hearing and balance

TABLE 15.1 Cranial Nerves

Number	Name	Responsible for . . .
IX	Glossopharyngeal nerve	• Controlling muscles in the oral cavity and upper throat • Posterior part of the tongue • Production of saliva
X	Vagus nerve	• Contributing to homeostatic control of the organs of the thoracic and upper-abdominal cavities
XI	Spinal accessory nerve	• Controlling the muscles of the neck to allow for shrugging of the shoulders and rotation and tilting of the head
XII	Hypoglossal nerve	• Controlling the muscles of the lower throat and tongue

TABLE 15.1 Cranial Nerves

Protecting the Brain

From superior to inferior, the layers of the dura mater, arachnoid mater, and pia mater comprise the meninges, which are membrane layers of connective tissue. The skull and meninges are designed to protect the vital and dynamic brain. The skull is a rigid, skeletal structure encasing the brain in a finite space (Figure 15.6).

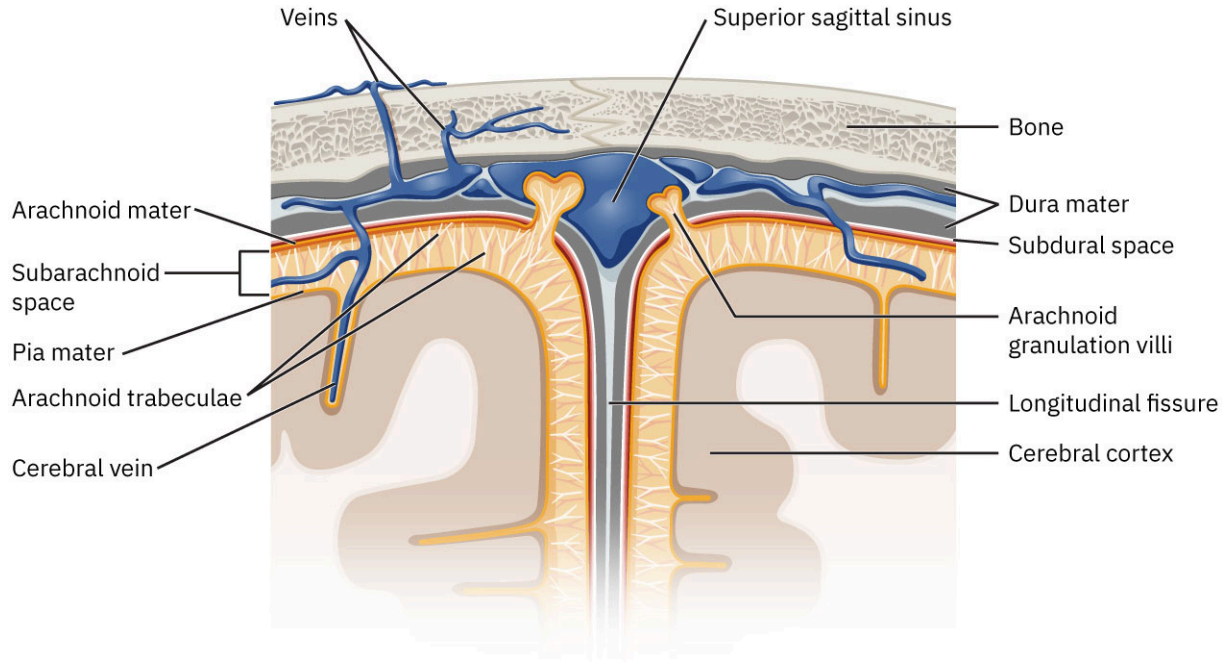

FIGURE 15.6 The three connective tissue layers of the meninges protect the brain: the dura mater, arachnoid mater, and pia mater. The subdural and subarachnoid spaces are the small areas below the respective layers. This image also includes the skull bone, directly above the dura mater. (credit: modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

- The dura mater is a thick, fibrous layer that acts as a strong protective sheath over the entire brain. The name comes from the Latin for "tough mother," to represent its physically protective role.
- The middle layer is the arachnoid mater, which is a membrane of thin, fibrous tissue that forms a loose sac around the brain. The name also comes from Latin; it means "spiderweb-like mother" because the layer looks like a spiderweb. It is filled with circulating cerebrospinal fluid (CSF), which provides a liquid cushion to the brain.
- Finally, directly adjacent to the surface of the brain is the pia mater, which is Latin for "tender mother." This innermost layer is a thin fibrous membrane that fits into the grooves and indentations of the brain's surface. It

is thought to have a continuous layer of cells providing a fluid-impermeable membrane.

Of note, the meninges surround the entire CNS, which includes the brain and spinal cord.

The Circle of Willis

The cerebral vasculature system is complex for good reason. The anatomical structure contains the **circle of Willis (CoW)**, which is a place where cerebral arteries meet and divide in a way aimed to maintain perfusion of the brain: If narrowing or a blockage limits flow through one part, blood can still flow through other parts (Figure 15.7). Knowing the basics of cerebral blood flow will help the nurse understand which areas may be impacted by an occlusion in a specific vessel of the brain and assist in understanding how collateral perfusion may help certain occlusions from causing a more devastating injury. The external carotid arteries supply blood to the tissues on the surface of the cranium. The internal carotid arteries are responsible for the blood flow to most of the cerebrum (frontal, parietal, lateral, and temporal lobes, as well as the anterior part of the deep cerebral hemisphere). This is considered the anterior circulation. The posterior circulation, supplying the brainstem, cerebellum, occipital lobes, and part of the deep hemisphere (thalamus), is fed by the vertebral arteries. The vertebral arteries meet to make the basilar artery.

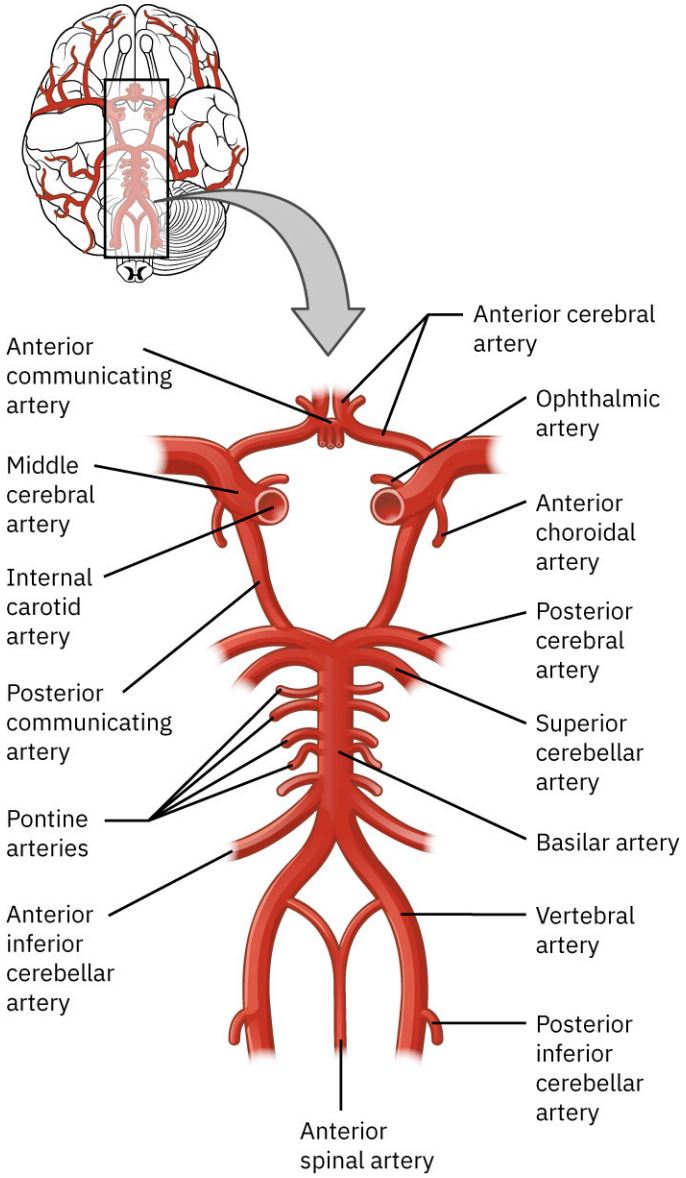

FIGURE 15.7 The blood supply to the brain enters through the internal carotid arteries. (credit: modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

The left and right internal carotid arteries and branches of the basilar artery all become the CoW. The anterior

portion of the CoW is joined by the anterior communicating artery and continues to form the middle cerebral arteries, which connect to the posterior communicating artery. This connects with the basilar artery. The basilar artery splits to the bilateral vertebral arteries, also responsible for supplying the posterior part of the brain (Rosner et al., 2023). Essentially, blood supply enters the brain through one of the main vessel routes, anteriorly (carotids) or posteriorly (vertebral arteries), but circulation is connected from there by the CoW to provide means for collateral blood flow should one vessel become damaged.

Recognizing and Responding to a Cerebrovascular Accident

Any time there is an obstruction of the arteries responsible for blood flow to the brain, perfusion becomes limited, thereby causing brain cells to be deprived of vital oxygenation. Ischemia, deprivation of oxygen, and infarction as the result of decreased perfusion cause diminished function but not always cellular death. This is considered a **cerebrovascular accident (CVA)**, or stroke. It is important to be familiar with the anatomy and function of the brain, as well as the organization of the vessels supplying the brain with blood, to be able to understand how strokes can damage certain areas, resulting in varying deficits. The nurse who is knowledgeable about the brain and cerebral blood flow will be better able to recognize symptoms and care for patients who experience a CVA.

A cerebrovascular accident is a medical emergency requiring immediate hospital care. If signs and symptoms are recognized in a hospitalized patient, the appropriate steps to obtain immediate assistance should be taken right away.

CLINICAL SAFETY AND PROCEDURES (QSEN)

QSEN Competency: Evidence-Based Practice (EBP)

Disclaimer: Always follow the facility policy for medication administration.

Definition: Use best practice standards and current evidence-based research with clinical judgment and patient/family preferences to provide optimal quality health care.

Knowledge: The nurse will describe primary, evidence-based sources for locating best practice standards and current clinical practice guidelines.

Skill: The nurse will use clinical judgment and critical thinking to implement individual plans of care.

Attitude: The nurse will place emphasis on evidence-based guidelines when determining current practice techniques. The nurse will value the need for continuous, lifelong learning.

Goal: Stroke Phase III guidelines outline the treatment of ischemic stroke with medication, as door-to-needle time. Evidence suggests the best practice is for treatment to begin within 60 minutes for 85 percent or more patients. For surgical clot removal, evidence suggests the procedure should take place within 90 minutes in 50 percent of patients. Research concludes achieving the identified time improves the quality of care and decreases the risk of long-term disability from a stroke

(American Heart Association, 2019)

At some institutions, a rapid response team may be activated. Some facilities have a specific stroke response team. Knowing the policy and protocol for your hospital is imperative. When signs and symptoms of a stroke are recognized outside of the hospital, emergency response should be activated. This most often involves calling 911 for a quick response, initiation of treatment, and transfer to the appropriate hospital for providing the needed care. Hospitals can receive different levels of certification by the Joint Commission for excellence in stroke care.

LINK TO LEARNING

This fact sheet outlines the four different levels of stroke certification (https://openstax.org/r/77StrokeCertLev) that accredited hospitals can earn from the Joint Commission. A certification guarantees standardized, best practice for care, ensuring patients will have the best outcomes possible.

Signs and Symptoms of CVA

The signs and symptoms of a CVA can vary greatly. This variance exists because an occlusion can occur anywhere within the cerebral vasculature and cause an **infarct**, or area of necrotic tissue, in any part of the brain that the occluded vessel should supply. The most commonly occluded artery is the middle cerebral artery (MCA), which is responsible for blood supply to parts of the cerebrum, including the temporal, frontal, and parietal lobes. Depending on the involvement of one to up to four of the MCA branches, signs and symptoms of an occlusion could include:

- **hemiplegia**, or complete paralysis on the side of the body opposite the CVA
- **hemiparesis**, or weakness on the side of the body opposite the CVA
- sensory changes of the face and arm on the side of the body opposite the CVA
- **aphasia**, or loss of language skills affecting expression, comprehension, or both, depending on the severity of the CVA
- **homonymous hemianopsia**, or a deficit causing a loss of vision in the same halves of the visual field in each eye

The anterior cerebral circulation includes the vessels that originate from the carotid arteries, and occlusions result in lateralizing neurological signs and symptoms. Occlusions in the internal carotid artery (ICA) can result in:

- paralysis of and sensory changes in the face, leg, and arm on the side of the body opposite to the CVA
- aphasia
- **apraxia**, or the inability to perform tasks, movements, or gestures
- homonymous hemianopsia

Anterior cerebral artery (ACA) occlusions can result in:

- paralysis and sensory changes of the foot or leg on the side of the body opposite the CVA
- gait impairments
- cognitive impairment
- urinary incontinence
- flat affect
- increased distractibility
- lack of interest in surroundings

In contrast, the posterior cerebral circulation includes the vessels that originate from the vertebrobasilar arteries and results in diffuse neurological signs and symptoms. Occlusions in the vertebral artery (VA), which supplies the cerebellum and brainstem, can cause dizziness, **nystagmus** (rapid, uncontrolled eye movements), **dysphagia** (trouble swallowing), **dysarthria** (trouble speaking), gait abnormalities, and facial weakness and numbness on the same side of the body as the stroke. Another vessel responsible for posterior supply is the basilar artery (BA). Occlusions there can result in quadriplegia, weakness of the mouth and throat, or even **locked-in syndrome**, a rare condition in which patients retain consciousness but develop paralysis of the entire body except in the muscles of eye movement. A CVA of the posterior inferior cerebellar artery (PICA) causes nausea, vomiting, dysphagia, dysarthria, nystagmus, ataxia, vertigo, and loss of sensation of pain and temperature on the side of the body opposite the stroke. Finally, occlusions in the posterior cerebral artery (PCA) can result in visual and memory deficits, **perseveration** (continuous and repetitive speech, behavior, or thoughts), abnormalities in pupils, and sensory loss. Table 15.2 summarizes these deficits for the major stroke locations.

Stroke Location	Common Deficits
MCA	• hemiplegia • hemiparesis • aphasia • homonymous hemianopsia
ICA	• paralysis of and sensory changes in the face, leg, and arm on the side of the body opposite to the stroke • aphasia • apraxia • homonymous hemianopsia • one-sided neglect
ACA	• paralysis and sensory changes of the foot or leg on the side of the body opposite to the stroke • gait impairments • cognitive impairment • urinary incontinence • flat affect • increased distractibility • lack of interest in surroundings
VA	• dizziness • nystagmus • dysphagia • dysarthria • gait abnormalities • facial weakness and numbness on the same side of the body as the stroke
BA	• quadriplegia • weakness of the mouth and throat • locked-in syndrome
PICA	• nausea • vomiting • dysphagia • dysarthria • nystagmus • ataxia • vertigo • loss of sensation of pain and temperature on the side of the body opposite the stroke
PCA	• visual and memory deficits • perseveration • abnormalities in pupils • sensory loss

TABLE 15.2 Common Stroke Deficits by Vessel Occluded

The signs and symptoms of a hemorrhagic versus an ischemic stroke may not differ much. Whether blood flow is impaired by the presence of a clot (**ischemic stroke**) or a leak or rupture in the vasculature of brain (**hemorrhagic stroke**), function can still be impaired in the same way. An infarct of either kind in the occipital lobe still manifests with visual impairment. An infarct of either kind in the cerebellum may still cause balance and coordination problems. The main differences that may be appreciated involve extra findings in hemorrhagic stroke. Patients with hemorrhagic strokes will more often complain of neck pain, photosensitivity, or nausea and vomiting; patients often present with subjective complaints of the worst headache of their life. These patients are much more likely to have a decreased level of consciousness than patients with ischemic strokes. A hemorrhagic stroke is usually more devastating than an ischemic stroke (Salvadori et al., 2020).

FAST and BE-FAST

A common acronym for recognition of stroke signs and symptoms is FAST: face, arm, speech, time.

- Face: Look for facial drooping, especially on one side. Is the patient's smile uneven?
- Arm: Look for weakness or numbness of the arm. Can the patient lift both arms up and hold them there?
- Speech: Look for slurred speech or problems with communication. Can you understand what the patient is saying? Can they understand you?
- Time: Call 911 immediately when you notice these symptoms. Ask yourself: How can I get help now?

However, a newer acronym, BE-FAST, has been found to identify strokes that would be missed by the FAST algorithm (Chen et al., 2022). BE-FAST adds two letters, B and E, for balance and eyes.

1. Balance: Check if the patient has trouble remaining upright. Does the patient have trouble walking, standing, or sitting up straight?
2. Eyes: Look for any visual changes. Does the patient have trouble seeing out of one or both eyes? Do they have a new onset of double or blurry vision?

Emergency CVA Treatment

Recognizing the signs of a CVA and initiating quick treatment are essential for preserving as much brain tissue, and therefore function, as possible. The phrase "time is brain" is often repeated for emphasis on rapid care, highlighting this fact. Upon arrival to the emergency department (for patients in the community) or after a stroke notification has been sent to the appropriate responding team (for hospitalized patients), a head computed tomography (CT) scan is performed to determine whether the symptoms are being caused by an ischemic or hemorrhagic stroke. To certify a hospital as "Acute Stroke Ready," the Joint Commission expects to see CTs initiated in ≤ 25 minutes of patient arrival and a radiologist reading within 45 minutes (Joint Commission, 2023).

If a hemorrhagic stroke is ruled out by the absence of a bleed, a clot is the assumed cause of the infarction. A **tissue plasminogen activator (tPA)** can then be administered intravenously to dissolve the clot and restore perfusion. To be effective at reversing brain ischemia, tPA must be administered within 3 to 4.5 hours of stroke onset, or the time when the patient was last seen as normal ("last known well").

If bleeding is present, signifying a hemorrhagic stroke, immediate care must be taken to determine the source of the bleeding and control the bleed or pressure within the skull (Caplan, 2023). Just as with a clot in an ischemic stroke, the brain cells are not being properly perfused, which damages brain tissue and impairs function. If the time between stroke onset or "last known well" is past the 3–4.5 hour time frame for intervention, measures to restore perfusion may not be effective in saving the brain. The longer the time to treatment, the more brain cells die, causing irreparable neurological damage that may result in paralysis, permanent disability, or even death.

LINK TO LEARNING

The American Heart Association published a resource that outlines three measures, or sets, of guidelines: stroke achievement, stroke quality, and stroke reporting (https://openstax.org/r/77GetWithGuide) called "Get with the Guidelines." It recommends that hospitals meet these guidelines to provide the best stroke care informed by scientific evidence. Hospitals achieving measurement goals are recognized formally during the International Stroke Conference and given promotional materials to advertise their expertise in their communities.

Diagnostics

A CT of the head is the gold standard for determining whether a stroke is ischemic or hemorrhagic. After the initial head CT without contrast, diagnostic tests related to CVA care can vary in relation to the type of stroke. For instance, a second head CT with contrast dye can be done for an ischemic stroke. This imaging will reveal the location and size of the infarction as well as the **penumbra**, or area immediately around the infarction receiving marginal blood flow. The penumbra is the tissue at greatest risk for injury but still salvageable with the restoration of perfusion. Another possible diagnostic study is a cerebral angiogram, which may identify vascular abnormalities responsible for bleeds in patients with hemorrhagic stroke.

A diagnostic tool that is used regardless of the type of stroke is the National Institutes of Health Stroke Scale (NIHSS). Though other scoring methods exist, the NIHSS is the most widely used. The NIHSS should be performed immediately upon initiation of stroke care. Scores range from 0 to 42, with higher numbers indicating a more severe stroke. The NIHSS is performed by a physician or other trained individual (often a registered nurse) to determine the severity of the stroke. The person administering the scale asks the patient to perform some physical and mental tests to objectively score their alertness and ability to communicate and perform movements. NIHSS is also a prognostication tool; studies have found that higher scores are indicators of poorer outcomes.

LINK TO LEARNING

The National Institutes for Health NIH Stroke Scale (https://openstax.org/r/77NIHStrokScale) quantifies stroke severity. Some important tips on using the scale correctly include scoring only what the patient does and not what you think the patient can do, not coaching the patient, and making sure to record the patient's first effort rather than their best effort.

Continued CVA Treatment

Subsequent emergency care focused on minimizing tissue infarction, support, and monitoring for multiple systems is essential. In the inpatient setting, a patient's blood pressure must be stabilized, nutrition must be optimized, and intracranial pressure changes, vital signs, blood glucose, neurologic status, and cardiac rhythm should be monitored. Causative factors are investigated, measures to prevent secondary stroke are initiated, and the rehabilitation process begins. The rehabilitation process could include an inpatient rehabilitation stay or even a transition to a long-term care facility when disability is severe. Care after a stroke involves not only the physical care and reconditioning of the body but also care to meet the patient's psychosocial and emotional demands. Continued stroke care requires the collaboration of individuals from many disciplines.

INTERDISCIPLINARY PLAN OF CARE

Interdisciplinary Plan of Care for a Patient Who Had a Stroke

An interdisciplinary plan of care includes a variety of health care professionals who work together to coordinate care for a patient who has had a stroke. Their goal is to provide continued care, management, and preventive measures after the initial acute hospitalization. The interdisciplinary team includes emergency response staff who initially respond to and apply interventions for stroke recognition and management. When a stroke occurs in a community setting, the team may include EMS, mobile stroke units, and emergency room staff. Inpatient stroke care may start with recognition by the primary nurse and activation of the hospital's stroke response team, as applicable. Larger hospitals provide stroke care on dedicated units or stroke inpatient care teams.

Other members of the interdisciplinary team may include:

- diagnostic imaging team members
- pharmacists
- nutritionists
- social workers
- therapists, including occupational, physical, recreational, and speech language

- mental, behavioral, or neuropsychological therapists
- primary care providers
- neurologists and specialists in stroke care
- various health educators
- rehabilitation nurses
- home care providers

15.2 Ischemic Stroke

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for ischemic stroke
- Describe assessment and diagnostics in ischemic stroke
- Apply nursing concepts and plan associated nursing care for the patient with an ischemic stroke
- Evaluate the efficacy of nursing care for the patient with an ischemic stroke
- Describe the medical therapies that apply to the care of the patient with an ischemic stroke

An ischemic stroke is when the obstruction of blood flow in the brain is caused by an occlusion in a vessel, most commonly by atherosclerotic fatty deposit build-up. About 87 percent of all strokes are ischemic (American Stroke Association, 2023). An ischemic stroke requires different initial care than a hemorrhagic stroke, mainly because the primary cause is a clot rather than a bleed from a vessel within the brain. Though the initial treatment differs, the roles of the nurse and the rest of the interdisciplinary care team can have many similarities in the later stages of treatment and care.

Pathophysiology

In thrombosis, an obstructive process prevents blood flow to regions of the brain. The most common risk factor is large vessel atherosclerosis. An ischemic stroke is most commonly caused by the fatty deposits, or plaques, found collecting on the lining of the vessel walls, seen in patients with atherosclerosis. These deposits can form a **cerebral thrombus**, which is essentially a clot within a blood vessel that blocks cerebral perfusion. Alternately, the clot preventing perfusion could be a **cerebrovascular embolus**, which forms elsewhere in the body (such as the heart or carotid arteries), breaks off, and travels to the blood vessels of the brain. The embolus then gets lodged in a smaller vessel in the brain and prevents perfusion, causing a **cerebral embolism**. Such embolisms most commonly form in the left atrium of the heart in patients with atrial fibrillation, a heart dysrhythmia discussed in Chapter 12 Cardiovascular System (American Stroke Association, 2023).

Ischemic strokes fall into four categories: large artery thrombosis, small artery thrombosis, cardiogenic embolism, and cryptogenic. A large artery thrombosis is a plaque occlusion of blood flow in a larger vessel. The larger vessels responsible for cerebral perfusion are the basilar artery, the middle cerebral artery (MCA), and the carotids in the neck. A small artery thrombosis, often referred to as a **lacunar stroke**, occurs in the small arteries in the brain that branch off from the larger vessels. These can be caused by high cholesterol, atherosclerosis, diabetes, or high blood pressure.

Cardiogenic strokes are those caused by clots traveling into the brain from the heart. Some common cardiac conditions that cause emboli to form are arrythmias such as atrial fibrillation, valvular heart disease such as endocarditis, prosthetic heart valves, recent myocardial infarction, and some ventricular diseases. Another common cause is the presence of a **patent foramen ovale**, a small hole between the left and right atria to support fetal circulation; the hole usually closes on its own, but it remains open after birth for 25 percent of the population (American Heart Association, 2023). A cardiogenic embolus may occur due to cholesterol accumulation, platelets or other blood clots, calcium, or accumulated bacteria. Such emboli can enter systemic circulation and travel throughout the body. However, more than 80 percent of such clots travel to the brain (Pillai et al., 2022).

The final type of ischemic stroke is a **cryptogenic stroke**. A cause cannot be determined for this type of stroke, regardless of testing done to identify the common causes. Studies have reported an increased incidence of cryptogenic stroke among African Americans and Hispanics (American Stroke Association, 2023).

Though it is not a type of stroke, **transient ischemic attack (TIA)** deserves mention. Often referred to as a “mini-

stroke," a TIA is caused by an occlusion of the blood vessels perfusing parts of the brain, just like a full stroke. The difference is that in a TIA, the clot dislodges or dissolves on its own, restoring perfusion before any permanent damage to the brain can occur. It can cause the same symptoms as a full stroke and symptoms can last from minutes up to twenty-four hours; however, there is no permanent loss of function. A "mini-stroke" is dangerous because it usually indicates that a full stroke will occur: The 90-day stroke risk after a TIA is almost 18 percent (Amin et al., 2023). It is important to determine the cause of a TIA so the condition can be treated, thereby decreasing the risk of a full stroke.

LIFE-STAGE CONTEXT

Older Adults and Risk for Stroke

Age-related changes are associated with increases in systolic blood pressure readings but do not have the same effects on the diastolic blood pressure readings. Isolated systolic hypertension is the most common type of hypertension in adults over the age of fifty. Isolated systolic hypertension is associated with increased risk of stroke. Older adults should begin treatment with lifestyle modifications.

(Tan & Thakur, 2023)

Clinical Manifestations

The clinical manifestations of an ischemic stroke can vary depending on which area of the brain is not being well perfused; another factor is the size of the clot impairing perfusion. In general, the symptoms of large vessel strokes present very suddenly. A patient with a large artery ischemic stroke may have weakness or paralysis on one side of the body, a loss of sensation to one side of the body, visual changes, problems with balance or coordination, issues with word-finding, or aphasia. A small vessel, or lacunar, stroke generally causes one-sided deficits: facial droop, weakness or paralysis in the arm or leg, impaired or complete loss of sensation, and ataxia. It may also manifest with dysarthria. The symptoms of a small vessel stroke often appear more gradually than a large vessel stroke, and deficits are often fewer because the small vessels perfuse a smaller area of the brain. Larger vessels are responsible for delivering blood to a larger region of the brain, so the symptoms can be greater.

A patient with an ischemic stroke may present with other symptoms, too, including vertigo or dizziness, neck stiffness, memory loss, confusion, or even nausea and vomiting. In fact, dizziness and vertigo are the most common symptoms in a missed stroke diagnosis. The presentation of a stroke can vary and be nonspecific. The most important thing to know is that brain cells die within minutes of not receiving adequate oxygen through cerebral perfusion, so early recognition and intervention are essential for reducing poor outcomes.

Assessment and Diagnostics

Stroke assessment is based on subjective data, but it is also important to conduct a complete neurological assessment, which is objectively rated using the National Institutes of Health Stroke Scale (NIHSS). The NIHSS also is a prognosticator: Lower scores generally predict a more devastating stroke. Subjectively, the most important question you can ask is, "When were you last seen acting normal?" This data is imperative since stroke onset is considered to be when the patient was "last known well," or without symptoms; treatments to save brain tissue and function are time-sensitive. Other subjective data include a health history, focusing on diseases (such as diabetes mellitus and hypertension) and lifestyle factors (such as nicotine use and use of certain oral contraceptives) that may increase stroke risk; providers should also ascertain whether the patient had previous strokes or TIAs. The objective neurological assessment involves five areas: cognition, cranial nerves, motor function, sensory function, and gait. A complete neurological exam will reveal deficits used to help localize the area of the brain affected, and then the NIHSS will be used to determine the severity and prognosis of the stroke.

Diagnostics and Laboratory Values

The diagnostic imaging for stroke begins with a STAT head CT without contrast dye. This CT is done to determine whether a bleed in the brain is present, signifying a hemorrhagic stroke rather than an ischemic stroke. The treatment of a hemorrhagic stroke is very different from the treatment of an ischemic stroke, so the results of the CT will allow the provider to decide on a treatment plan.

Diagnostic studies after the initial head CT are focused on determining the location, size, and impact of the infarct, or area of necrosis, formed by the interruption in perfusion. Diagnostic studies can also provide details to find the cause of the stroke. If a cause can be identified, measures can be taken to reduce the risk of a subsequent stroke.

To view the impact of the infarction on the brain, magnetic resonance imaging (MRI) is essential. An MRI with diffusion-weighted imaging (DWI) allows visualization of not only ischemia related to stroke but identifies the penumbra, the brain tissue that has been hypoperfused as a result of the occlusion but is not yet ischemic. The DW-MRI may be done right after the initial head CT to further determine the course of treatment.

Subsequent diagnostic imaging will be conducted to help reveal the cause of the stroke by first looking at the vasculature. This may include a computed tomography angiography (CTA), a magnetic resonance angiography (MRA), angiography, or ultrasonography. MRAs and CTAs are noninvasive scans that provide a view of the vessels within the brain and neck and allow vascular abnormalities, such as occlusions and stenoses, to be visualized. A CTA is a more sensitive test than an MRA, but it is less widely available and requires the patient to receive an intravenous iodinated contrast dye. A cerebral angiography requires a catheter be inserted into the patient, usually through the femoral artery, and considerable amounts of contrast dye, but it provides detailed images of blood flow. Finally, ultrasonography is much less invasive. These tests can be completed at bedside; they allow for visualization of the carotids but not the vessels within the brain.

A stroke "work-up" aimed at identifying the cause of the stroke includes an electrocardiogram or telemetry monitoring, as well as a transthoracic or transesophageal echocardiogram (TEE). To help identify abnormalities in the heart's rhythm (namely atrial fibrillation) or structure anomalies (primarily a patent foramen ovale), laboratory studies include but may not be limited to the following:

- complete blood count (CBC) and basic metabolic panel (BMP) to analyze platelets and electrolyte levels;
- prothrombin time (PT), international normalized ratio (INR), partial thromboplastin time (PTT), and clotting factor Xa to measure clotting times because a patient with prolonged clotting times may not be eligible for tPA due to bleeding risk;
- thyroid-stimulating hormone (TSH) levels because hyperthyroidism increases the risk of developing atrial fibrillation and thus increases stroke risk;
- blood glucose levels because hypoglycemia symptoms can mimic stroke symptoms; diabetes is a risk factor for stroke, so hemoglobin A1C levels will be tested to assess average three-month glucose control;
- lipid blood test or cholesterol panel to check for high cholesterol;
- erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) to look for inflammation; and
- D-dimer test, which can indicate an increased clotting risk.

The assessment, diagnostic tests, and laboratory tests that assist in the identification of an ischemic stroke also detail the extent of the stroke, identify the brain tissue that can potentially be saved, and help determine the cause of the stroke. The reason that the stroke work-up is so labor intensive is that identifying the cause of a stroke assists in the collaborative efforts of the interdisciplinary team to treat the stroke and employ preventive actions to minimize the risk for another stroke.

Nursing Care of the Patient with Ischemic Stroke

A nurse is caring for a hospitalized patient in a medical-surgical unit. The nurse performs their morning assessment of the patient and notices several findings that are not within normal limits. Let's read on to see how the nurse uses clinical judgment in this situation.

Recognizing and Analyzing Cues

On assessment, the nurse first recognizes the following cues: the patient's face is drooping on the left side, the patient's speech is slurred, and the patient does not appear to be moving their left arm as well as their right arm when the nurse is assessing range of motion.

The nurse analyzes the cues, recognizing facial droop is related to cranial nerve VII and that slurred speech is called dysarthria. The patient clearly understands what is being said, but is unable to respond by speaking clearly. Finally, by assessing the patient's strength in both arms, the nurse can rate the strength of the right arm 5/5 but the left arm only 4/5. The nurse recognizes these three cues as neurological changes consistent with stroke warning signs.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

The nurse analyzes the cues to determine the source of neurological changes, hypothesizing different rationales for signs and symptoms. After determining that the patient is having an acute stroke, the nurse prioritizes interventions for immediate action. When generating solutions, the nurse knows patient safety is most important. The nurse calls for the emergency stroke response to be activated at the facility. Larger hospitals may alert the specific stroke or neurology providers who respond immediately to the emergency; the protocol at smaller hospitals may be to call the rapid response team and notify the attending who is covering the patient. To ensure safety, the nurse does the following:

- positions the patient's head, neck, and body in proper alignment to aid in perfusion and prevent airway compromise
- applies supplemental oxygen per facility protocol
- initiates NPO status to reduce the risk of aspiration
- obtains vital signs to check the patient for adequate oxygenation and perfusion
- prepare and educates the patient for what may come next, such as preparing for transport to diagnostic imaging areas, obtaining two large IVs, and getting an accurate weight for weight-based tPA administration.

CLINICAL SAFETY AND PROCEDURES (QSEN)

QSEN Competency: Safety

Disclaimer: Always follow the agency's policy for medication administration.

Definition: Minimizes risk of harm to patients and providers through both system effectiveness and individual performance. The nurse will . . .

Skill: Demonstrate effective strategies to reduce the risk of harm to self or others.

Attitude: Value the contributions of standardization/reliability to safety. Patients suspected of having a stroke should be made NPO right away because one of the major stroke impairments is dysphagia.

- The patient should remain NPO until a trained nurse or speech–language pathologist can perform a swallow screen using an evidence-based tool.
- Swallowing should be evaluated to identify dysphagia and prevent aspiration before any PO food, fluids, or medications are given.

Evaluation of Nursing Care for the Patient with Ischemic Stroke

Evaluation is a critical component of the nursing process. Through evaluation, the nurse can assess the effectiveness of their interventions and modify their actions to help reach the desired outcome or solution that they generated.

Evaluating Outcomes

In the previously described scenario, the nurse focused on patient outcomes related to maintaining safety and optimizing the patient's prognosis status by initiating prompt interventions. The nurse's actions of initiating an emergency stroke response, focusing on patient safety (e.g., NPO status, proper body alignment to facilitate the best possible oxygenation and cerebral perfusion), and preparing the patient for the next steps in the stroke work-up aided in the speedy diagnosis and treatment of an ischemic stroke. Recovery from a CVA, however, is not instantaneous; residual deficits may be identified months after the initiation of rehabilitation. Thus, "recovery" in the acute care phase of stroke treatment cannot be used as an indicator of long-term outcomes.

Medical Therapies and Related Care

Initial or emergency stroke treatment focuses on reversing brain ischemia and initiating successful reperfusion. The subsequent treatment of ischemic stroke focuses on two areas: preventing subsequent strokes and minimizing the effects of long-term disability.

Thrombolytics

Only one kind of drug is used to treat ischemic stroke by dissolving the clot to restore perfusion: tissue plasminogen activator (tPA). Medications in this class are alteplase and tenecteplase. Treatment must be administered within 3–4.5 hours of stroke onset or "last known well" to be effective at reversing brain ischemia. This medication is given intravenously after a hemorrhage has been ruled out by head CT (because a thrombolytic agent could make a hemorrhage worse). The American Heart Association has set a door-to-needle time (meaning the time between when the patient arrives to an emergency department to the time tPA is administered) of 60 minutes or less in at least 85 percent of patients (American Heart Association, 2019).

The major risk associated with tPA is bleeding, particularly intracranial hemorrhage. Because of this bleeding risk, there are conditions that would make the patient ineligible for tPA treatment. The excluding factors include:

- oral anticoagulation therapy (INR > 1.7, PT > 15 seconds, or a PTT > 40 seconds)
- platelet count < 100,000/mm^3
- previous ischemic stroke or head trauma in the past three months
- gastrointestinal bleeding within the last 21 days
- intracranial or spinal surgery within the past three months
- persistent high blood pressure (systolic ≥ 180 mmHg or diastolic ≥ 110 mmHg)
- confirmed active internal bleeding
- infective endocarditis, or abnormal cardiac rhythms
- aortic arch dissection
- pregnancy or recent C-section

Other important considerations prior to tPA administration are ruling out hypoglycemia as the cause for symptoms, ensuring two large-bore (such as eighteen gauge) intravenous lines are in place, and obtaining an accurate weight for the patient since the tPA dose is weight-based (Oliveira-Filho & Samuels, 2023). After receiving tPA, the patient is closely monitored for at least twenty-four hours in an ICU or stroke-dedicated unit. Care is comprised of cardiac monitoring, routine neurological assessment, and frequent vital signs checks. During that time, the patient's blood pressure must be controlled to ≤ 180/105. It is necessary to obtain another CT or MRI twenty-four hours after tPA to rule out intracranial bleeding prior to starting antiplatelet or anticoagulant therapies.

Thrombectomy

Another treatment for ischemic stroke is a mechanical **thrombectomy**. This procedure essentially involves a catheter inserted through a vessel (commonly in the groin) to physically remove the clot from the cerebral artery. A thrombectomy is used only for large artery occlusions and must be done within twenty-four hours of stroke onset or "last known well." Clots occluding small arteries are too difficult to reach. A thrombectomy can be done with or without concurrent tPA treatment.

LINK TO LEARNING

Review the current guidelines for clinical management of patients diagnosed with an ischemic stroke (https://openstax.org/r/77GuideIschStrk) from the American Heart Association/American Stroke Association.

Continued Ischemic Stroke Management

After the initial treatment with tPA or a thrombectomy, or when a patient presents outside of the respective care windows, treatment is aimed at preventing subsequent strokes and minimizing the effects of long-term disability.

Blood pressure management is very important after a stroke. High blood pressure is almost always noted in patients with ischemic strokes. Most times, after the removal of a clot with tPA or thrombectomy, the brain still relies on a higher systemic blood pressure for reperfusion of the ischemic penumbra. To sustain the perfusion, the patient is initially allowed to maintain a higher blood pressure, called **permissive hypertension**. The systolic goal is < 160–180 mmHg for patients who have received tPA, but it may be even higher (up to 220/120) for those who did not receive tPA. Control within these parameters may require intravenous administration of labetalol or nicardipine. Reduction in blood pressure begins twenty-four to forty-eight hours after stroke intervention, at which time antihypertensive medications will be resumed or started.

An aspirin regimen should be started for stroke patients. Aspirin's antiplatelet effects help improve circulation. It is typically given orally but can be administered rectally to patients with impaired swallowing or whose swallowing ability has not yet been evaluated. The initial or loading dose is 325 mg, followed by daily treatment of 81 mg. Dual antiplatelet therapy is often a treatment for patients. Dual therapy adds clopidogrel: a loading dose of 300–600 mg, followed by 75 mg daily. Antiplatelet therapy continues for twenty-one days for smaller strokes and ninety days for larger strokes.

Hyperlipidemia is a major cause of atherosclerosis and thus stroke. Laboratory results commonly show elevated cholesterol and low-density lipoprotein levels in ischemic stroke patients. Pharmacotherapy, such as statin therapy, reduces the risk of subsequent strokes and is most often administered in the form of atorvastatin (80 mg daily).

Managing blood glucose is another way to reduce risk of subsequent stroke. The risk for stroke increases for patients with diabetes mellitus, particularly females. Patients with diabetes are more likely to have carotid atherosclerosis, which can impair cerebral perfusion. Glycemic control can be achieved through any combination of insulin, oral drugs, diet, and exercise to reach a goal of A1C ≤ 7 percent (Oliveira-Filho & Mullen, 2023). Education should also be provided regarding modifiable and nonmodifiable risk factors (Table 15.3).

Type of Risk Factor	Factors
Modifiable	Alcohol consumption Atrial fibrillation Cardiac disease Diabetes mellitus Hyperlipidemia Hypertension Obesity Physical inactivity Sleep apnea Smoking Unhealthy diet
Nonmodifiable	Age (older adults at greater risk) Family history Prior stroke or TIA Race/ethnicity (Black and Hispanic/Latinx populations at greater risk) Sex (females have more strokes than males)

TABLE 15.3 Modifiable and Nonmodifiable Risk Factors for Ischemic Stroke

Complications during acute stroke may include risks for falls, aspiration, pressure injury, and venous thromboembolism. Complications specific to neurologic function are the risks for **hemorrhagic transformation** of the stroke, cerebral edema, and seizure. Hemorrhagic transformation is when a hemorrhagic infarct occurs after ischemic stroke; this risk increases after the administration of tPA. The health-care team needs to monitor closely for changes indicative of these complications, such as increased or new neurological deficits and changes in Glascow Coma Scale (GCS), and implement strategies to prevent them. A hemorrhagic transformation occurs when blood vessels in the brain rupture after reperfusion; this is usually within twenty-four hours for patients who received tPA or had a thrombectomy or within the first few days for untreated patients.

REAL RN STORIES

Nurse: John, RN
Years in Practice: Nineteen
Clinical Setting: Inpatient neurosciences unit
Geographic Location: Large, urban, mid-Atlantic hospital

I have been working as an RN on a busy, acute inpatient unit specializing in neurological and stroke care for nearly two decades. One day, when I first started in the unit, I was caring for a patient who had suffered an ischemic stroke two days prior and been treated with tPA. During my morning assessment, I found the patient to have a slight decrease in his strength of the upper and lower extremities on the right side, but no other apparent neurological deficits. The patient's vital signs were normal, and the telemetry monitor revealed a normal sinus rhythm. The patient had no slurred speech and stated nothing felt wrong.

As I quickly went to notify the charge nurse of my findings, the patient pressed his call bell and told the assistive personal that he had a bad headache. When I got to the room, I found the patient to be lethargic, with an increased respiratory rate. I immediately tried to arouse the patient. I checked the patient's pupillary response, which had been normal just minutes earlier, and found both pupils to be unreactive to light. I immediately called for help from the rapid response team, recognizing these signs of deterioration may point to a hemorrhagic transformation of the patient's previous ischemic stroke.

Other interdisciplinary team members who may be part of a patient's continued ischemic stroke treatment are physical, occupational, speech language, and recreational therapists. These professionals help with regaining muscle movement, strength, and control, as well as increased independence with ADLs and coping, confidence building, and improving socialization skills. They also help with learning to live with the disabilities that may result from stroke. Sometimes a patient may need to relearn or develop alternative strategies for daily activities and actions, such as safe movement and transfers, dressing, bathing, speech, swallowing, and higher-level thinking involved with activities like grocery shopping or playing card games. Therapists help make those adjustments. A neuropsychologist or other therapist may help with the effects on a patient's cognition and mental health. A nutritionist or dietician may teach the patient about foods that interact with new medications or help reduce cholesterol. A pharmacist may help the patient understand new medications. A social worker or case manager may be involved to help with placement in a rehabilitation facility or to orchestrate home nursing and therapy services after discharge. There are many people across a variety of specialties who are involved in continued stroke care and whose job it is to reduce long-term disability and the risk of future stroke in their patients.

Prevention

The primary stroke prevention recommendations by the American Heart Association/American Stroke Association are to stop cigarette smoking, increase physical activity, maintain a healthy weight, and control cholesterol, blood pressure, and diabetes. Risk factors that should be managed are atrial fibrillation, obstructive sleep apnea (OSA), migraine with aura, sickle cell disease, and hypercoagulable states (e.g., COVID-19, cancer). Finally, efforts to end alcohol or drug abuse should be initiated (Tai, 2022).

15.3 Hemorrhagic Stroke

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for hemorrhagic stroke
- Describe assessment and diagnostics in hemorrhagic stroke
- Apply nursing concepts and plan associated nursing care for the patient with a hemorrhagic stroke
- Evaluate the efficacy of nursing care for the patient with a hemorrhagic stroke
- Describe the medical therapies that apply to the care of a patient with a hemorrhagic stroke

A hemorrhagic stroke is less common than an ischemic stroke but often more devastating and debilitating; it is also much more likely to be fatal (Cleveland Clinic, 2022). A hemorrhage is a bleed, which can be from a rupture or leak in a cerebral vessel, either within the brain or around the brain. Bleeding in either location can take up room in the finite space of the skull, causing increased cerebral pressure and cerebral edema. This change in volume puts pressure on the brain and increases the intracranial pressure (ICP); increased pressure inside the cranium can result in neurological damage. Refer to Chapter 17 Nervous System and Chronic Diseases of the Nervous System for more details on ICP. Bleeds tend to expand quickly, so the patient's neurological status could change as well. Once again, the adage "time is brain" rings true: The faster a person can receive treatment, the lesser the damage and the better the outcome.

Pathophysiology

A hemorrhagic stroke is caused by the absence of proper perfusion to the cells of the brain, resulting from a rupture of either a vessel within the cerebral vasculature or around the brain. A hemorrhage, or bleed, in the cranium is called an intracranial hemorrhage. If the intracranial hemorrhage is within the cerebral vasculature, it is an **intracerebral hemorrhage (ICH)**. A bleed that occurs in the subarachnoid space directly surrounding the brain but still under the skull is called a **subarachnoid hemorrhage (SAH)** (Figure 15.8).

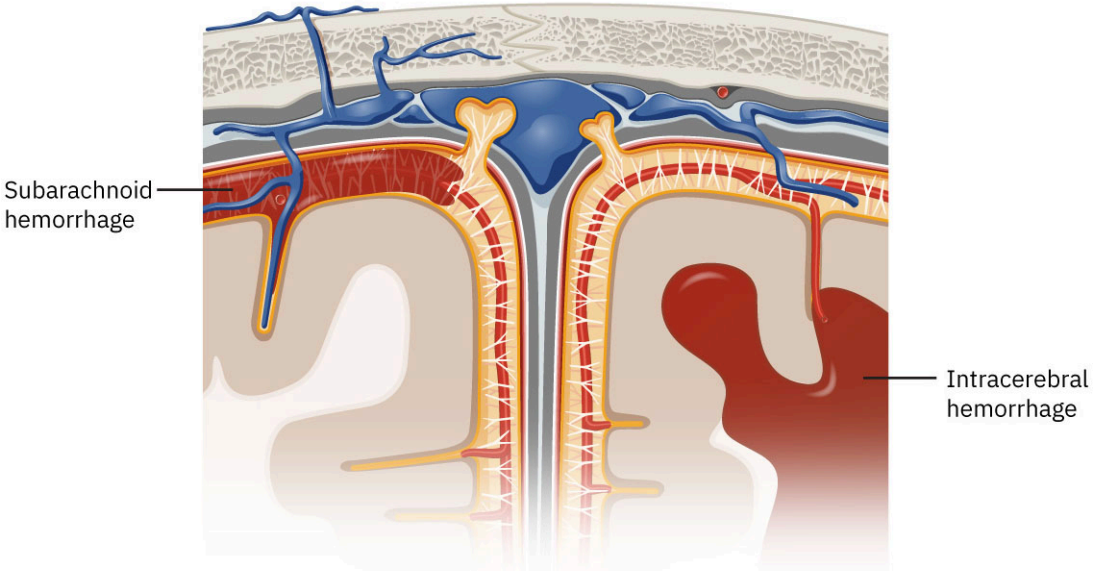

FIGURE 15.8 A hemorrhagic stroke is blood found between the various meninges or within the brain itself. The two different types of hemorrhagic stroke are an intracerebral hemorrhage (ICH), which is a bleed inside the brain, and a subarachnoid hemorrhage (SAH), which is a bleed in the area surrounding the brain. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Intracerebral hemorrhages are most often caused by hypertension. Over time, hypertension can degrade vessels, and the increased pressure within the vessel can cause the weakened vessel to burst. The small vessel disease arteriosclerosis also increases ICH risk by changing the vessel walls into stretched and weakened versions of themselves, increasing the risk of rupture. Finally, ICH may be caused by cerebral amyloid angiopathy (CAA), which is a disease that increases the fragility of the cerebral vessels, making them prone to bleeding. Arteriosclerosis and CAA are generally age related, whereas hypertension can develop at any age.

Patients taking anticoagulants or antiplatelets are at risk for ICH because their blood is "thinner," meaning that clotting times are increased. This makes a bleed from a vessel more likely to occur. Likewise, those who have chronic liver disease are also at greater risk for an ICH because of the associated coagulopathy and thrombocytopenia. Heavy alcohol use and cigarette smoking, as well as substance use (particularly of sympathomimetic drugs like cocaine, heroin, and methamphetamine), increase ICH risk. Cerebral trauma and bleeding from a brain tumor can cause ICH, as well as aneurysm ruptures and arteriovenous malformations. However, the latter two are more likely to cause SAHs (or subarachnoid hemorrhages).

SAH is most often caused by a just-ruptured aneurysm, a thinned or weakened spot in the vasculature that balloons and fills with blood. Another common cause is **arteriovenous malformation (AVM)**, an abnormal formation of blood vessels in which the arteries and veins can become tangled and form connections. AVMs can rupture and cause uncontrolled bleeding. SAH also occurs in cases of vasculitis and cerebral artery dissection. People at increased risk for SAH are those with hypertension or substance use disorders, as well as those who are pregnant or use estrogen-containing oral contraceptives.

Modifiable risk factors for hemorrhagic stroke are:

- hypertension
- smoking
- alcohol consumption

- antiplatelet or anticoagulant therapy
- sympathomimetic drug usage

Nonmodifiable risk factors for hemorrhagic stroke include:

- assigned male at birth
- advanced age
- Asian ethnicity
- chronic kidney disease
- cerebral amyloid angiopathy (CAA)

Clinical Manifestations

The clinical presentation of a hemorrhagic stroke may mimic that of an ischemic stroke because the same areas of the brain may be deprived of proper perfusion, resulting in the same deficits. The nurse is likely to observe aphasia, hemiplegia, dysphagia, and sensory changes. The deficits a patient displays depend on the location and size of the bleed. Because of the nature of a hemorrhage within the brain, a bleed is also likely to cause additional signs and symptoms that reflect the change in volume within the closed space of the skull. These include:

- decreased level of consciousness or coma
- **thunderclap headache**, a severe, sudden headache that peaks in intensity in seconds, lasts at least five minutes, and lingers and fades within a few hours
- vomiting
- seizure activity
- neck stiffness or pain
- photophobia
- increases in blood pressure

REAL RN STORIES

Nurse: Margaret, RN
Years in Practice: Two
Clinical Setting: Adult emergency room
Geographic Location: Urban

I have worked as an emergency room (ER) nurse for two years now. I commonly see patients coming in to be treated for unrelieved severe headaches. Most of time the headaches are diagnosed and treated as migraines. These often coincide with electrolyte imbalances or dehydration. Occasionally some of these patients' headaches include additional symptoms and are the result of meningitis or other infections.

One day, a 62-year-old male was brought in by ambulance. He complained of the worst headache of his life, which had started only a half an hour before and become so severe that his coworkers called 911 for emergency response. The EMTs reported vital signs of BP: 266/120, HR: 98, RR: 22, and SpO_2: 96 percent on room air. The patient was afebrile and had no other deficits.

I used clinical judgment to recognize cues of the headache's immediate onset and severity and to analyze the patient's vital signs. I then hypothesized that the patient could be experiencing a thunderclap headache. I knew thunderclap headaches are a symptom of hemorrhagic stroke. Taking action, I immediately notified the stroke response team and prepared to transport the patient for head CT upon arrival. Whether nurses are novice or experienced, critical thinking is imperative to providing quality patient care.

(Sekhon et al., 2023)

Blood accumulates most rapidly in the first four hours after initial leak or rupture, but expansion continues up to twenty-four hours. Though the initial injury in ICH is vessel damage, further damage can be caused by blood leakage and increased ICP, evolving cerebral edema, and ischemia that may linger for days or weeks (Hickey & Strayer, 2020). Complications can include inflammation, vascular compression, ventricular compression, brain herniation,

brainstem compression causing cardiorespiratory failure, and blood product toxicity.

Assessment and Diagnostics

It may not be possible to differentiate hemorrhagic stroke from ischemic stroke based on clinical manifestations alone. Hemorrhagic stroke presentation is acute and progresses rapidly. A thorough neurological assessment is critical, but diagnostic tests—including imaging and laboratory testing—are necessary to determine the type and cause of the stroke.

Obtaining and monitoring for changes in vital signs are important assessments. Hemorrhagic strokes often result from increased blood pressure and can continue to rise because of factors triggered by the bleed, such as elevated ICP, stress response, and damage to the central autonomic center. The evolving nature of the hemorrhage and cerebral edema can cause continued and rapid deterioration in neurological status. Neurological exams should be conducted regularly to monitor symptoms.

Decreases in level of consciousness associated with hemorrhagic stroke can be assessed using the **Glasgow Coma Scale (GCS)** (Table 15.4), which rates impairment of consciousness by scoring in three areas: eye opening, verbal response, and motor response. A completely unimpaired score is 15, and the lowest possible score is 3. Due to the evolving nature of the bleed and cerebral edema associated with hemorrhagic stroke, GCS may decrease as the stroke progresses—sometimes very rapidly. GCS must be reassessed at regular intervals.

Category	Score
Eye opening	4: Spontaneously 3: To speech 2: To pain 1: No response
Verbal response	5: Oriented to time, person, and place 4: Confused 3: Inappropriate words 2: Incomprehensible sounds 1: No response
Motor response	6: Obeys command 5: Localizes pain 4: Withdraws from pain 3: Abnormal flexion 2: Abnormal extension 1: No response

TABLE 15.4 Glasgow Coma Scale

Several additional scales exist for classifying ICH and SAH. They describe severity, prognosticate, or assess surgical risk. Table 15.5 lists three scales that are commonly used. Which scale is used depends on institutional protocol.

Scale Name	Purpose
Intracerebral hemorrhage (ICH) score (https://openstax.org/r/77ICHScore)	To standardize ICH rating for improved communication
Hunt and Hess classification (https://openstax.org/r/77HuntHess)	To assess SAH severity; to predict mortality
Fisher scale (https://openstax.org/r/77FisherScale) Modified Fisher scale (https://openstax.org/r/77ModFisher)	To index risk for vasospasm and delayed cerebral ischemia related to vasospasm after SAH

TABLE 15.5 Classification Scales for ICH and SAH

Diagnostics and Laboratory Values

Laboratory studies in hemorrhagic stroke mainly serve to find the reason for the bleed. Studies often include:

- complete blood count (CBC) and basic metabolic panel (BMP), blood glucose, and electrolyte levels to determine if underlying medical complications are present;
- prothrombin time (PT), international normalized ratio (INR), partial thromboplastin time (PTT), and clotting factor Xa to measure clotting times;
- liver and renal function tests to look for hepatic or renal cause;
- inflammatory markers produced in patients with CAA;
- urine toxicology screen to test for the presence of drugs in the system;
- pregnancy test for patients capable of becoming pregnant because pregnancy increases the risk of brain bleeds because of changes in circulating blood volume, hormonal changes, water retention, and hemostatic system changes.

Diagnostic imaging for hemorrhagic stroke always begins with a non-contrast head CT. A head CT is the first imaging done in response to the signs and symptoms of a stroke because it determines whether a bleed is present, dictating the course of treatment. When a bleed is present, an MRI can be used to investigate further. An MRI can be useful in measuring the volume of the hematoma; differentiating between primary hemorrhage and hemorrhagic transformation of pre-existing ischemic stroke; and identifying underlying causes of the bleed, such as AVMs, tumors, and vascular disease. Serial imaging monitors for changes in hematoma and edema, as well as the possible **mass effect** (compression of and injury to surrounding brain tissue because of the hematoma), **midline shift** (a displacement of brain tissue across the midline, shown in Figure 15.9), and the development of **hydrocephalus** (an increase in cerebrospinal fluid in the ventricles of the brain). Computerized tomography angiography (CTA) allows for visualization of hematoma expansion and the “spot sign” that shows active contrast extravasation and indicates active hematoma expansion. Ongoing bleeding evidenced in CTA is associated with higher fatality rates (Unnithan et al., 2023).

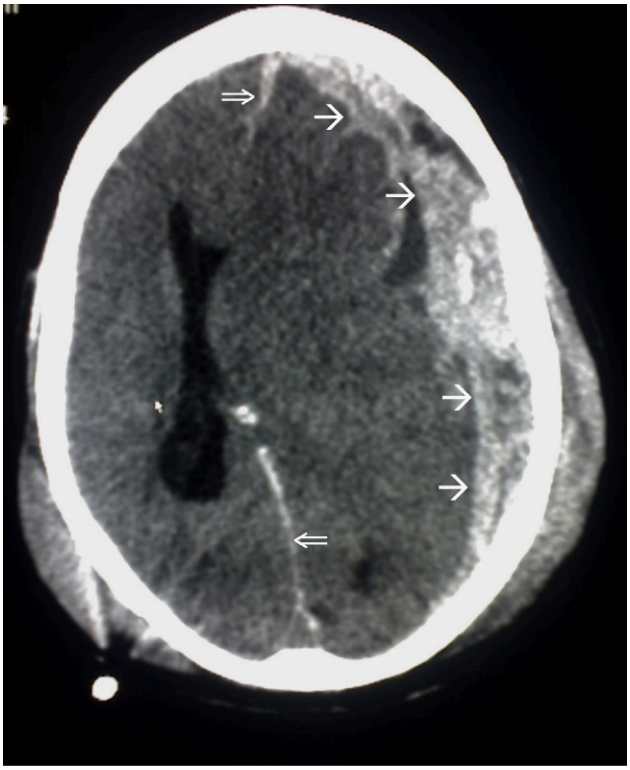

FIGURE 15.9 This CT image shows a midline shift (double arrows) due to a hematoma (single arrows). The brain tissue has been displaced so that the center, or midline, of the brain is no longer in the middle. (credit: Trauma subdural arrows by Glitzy queen00/Wikimedia Commons, Public Domain)

Finally, cerebral angiography may be performed to detect an aneurysm; this is the definitive diagnostic tool used. An AVM, or arteriovenous malformation, diagnosis can be made with cerebral angiography, too. In this procedure, the provider inserts a catheter into the patient's artery at the wrist or groin to explore the vessels of the neck and head. The aneurysms and malformations can be visualized, and the provider may intervene during the procedure. One intervention performed is a coil embolization for a ruptured aneurysm, described later in the chapter.

Nursing Care of the Patient with Hemorrhagic Stroke

A nurse on a neurological unit has an admission from the ICU: a patient who is three days post-hemorrhagic stroke. The next sections describe how the nurse uses clinical judgment in the case.

Recognizing and Analyzing Cues

The nurse performs an initial assessment on the patient and obtains vital signs. Vital signs are all within normal limits. The nurse notes the blood pressure is 128/88; looking at the trend in vital signs, the nurse notes that there has been a steady downward trend since admission, when the blood pressure was 210/102. The patient is sleeping and does not follow commands; however, the patient opens their eyes, groans, and mutters as the nurse stimulates the patient by squeezing their hand. The patient's pupils are equal and responsive to light. All other systems are within normal limits except for the skin. The nurse notes some redness on the patient's sacral area. In the nursing orders, the nurse notes the patient has not been ordered a diet but all the medications that were administered intravenously in the ICU are now ordered orally.

When analyzing the cues, the nurse notes the GCS to be 9 and does not notice any other neurological deficits. The nurse knows the importance of obtaining a baseline right away to note any changes, which can occur rapidly with a hemorrhagic stroke. The fact that the patient has redness on the sacral area alerts the nurse to the potential for skin breakdown. The nurse is also concerned that, even though the patient is not eating or drinking, they have been ordered oral medications that used to be given intravenously, an action that should not be taken until a formal swallow evaluation is given.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

When caring for a patient with a low GCS who cannot speak for themself, the nurse knows they will have to be

diligent about and advocate for the patient's safety. The nurse prioritizes monitoring for changes in neurological status, which would indicate an evolution in the hemorrhagic stroke. The actions the nurse will take include reassessing vital signs and neurological status every four hours as ordered.

As far as safety is concerned, the nurse will clarify the order for oral administration of medications with the provider. Because the nurse is regular staff on this neurological unit, they are aware of the AHA stroke measure that states patients should have a formal swallow evaluation before anything is taken by mouth. By holding all PO medications and contacting the provider for alternate routes of medication administration, the nurse may save the patient from aspiration.

The patient has limited consciousness and mobility and already exhibits redness in the sacral area. The nurse will be sure to reposition the patient every two hours, check if the patient had any episodes of incontinence at these regular intervals, and provide perineal and general skin care. The nurse will also prioritize their own safety by asking a colleague to help reposition the patient rather than try to move them alone, which could risk back injury. Also, because the patient has limited mobility, the nurse will ensure the patient is on appropriate venous thromboembolism (VTE) prophylaxis.

Evaluation of Nursing Care for the Patient with Hemorrhagic Stroke

When evaluating outcomes related to hemorrhagic stroke, the nurse focuses on recognizing changes pointing toward evolution of the stroke and maintaining stability. Evaluation allows the nurse to determine whether their interventions were effective or revised interventions are needed.

Evaluating Outcomes

In this case, the nurse continued performing vital sign and neurological checks every four hours to discover clues of worsening hemorrhage. Nothing was found, and the nurse will continue to monitor. As the nurse was unable to perform a swallow screen, based on the patient's mental status, the provider agreed that the patient should remain NPO. Medications were ordered to be administered IV and per rectum (PR). The fact that the sacral skin redness did not worsen but in fact improved a bit indicates that the nurse's skin integrity–related interventions are helping. Finally, the provider ordered sequential compression devices and subcutaneous heparin administration to prevent VTEs. The patient has no heat, swelling, warmth, or redness in the extremities.

Medical Therapies and Related Care

Medical treatment for hemorrhagic stroke depends on the cause of the bleeding. In general, once the cause of the bleed has been determined, therapies aimed at controlling the bleed, blood pressure, and ICP can be implemented more specifically. Treatments can be both surgical and nonsurgical.

One of the most important nonsurgical interventions is stopping medications that could increase bleeding; alternatively, the patient may be given medications to counteract the effects of the bleeding-increasing medications and promote clotting. For example, patients with an elevated prothrombin time may need to receive intravenous vitamin K to reduce progression of the bleed. Blood pressure management is another area of nonsurgical treatment focus. Hemorrhagic stroke is commonly caused by high blood pressure or pressure rises in response to the bleed. In either case, the American Stroke Association states that acute lowering of blood pressure is safe for patients with initial systolic blood pressures (SBP) ranging from 150 to 20; patients presenting with a SBP above 220 need aggressive reduction with continuous intravenous medications. Another nonsurgical treatment is monitoring for and treating seizure activity. Prophylactic antiepileptic drugs have no known benefits for treating strokes, but as many as 28 percent of patients have a seizure within the first twenty-four hours of a stroke and will require such medications (Greenberg et al., 2022).

Finally, the nonsurgical interventions associated with treating increased ICP are raising the head of the bed and administering osmotic diuretic drugs like mannitol. For continuous ICP monitoring, the best method is an invasive technique called a ventriculostomy (Figure 15.10). During a **ventriculostomy**, a hole is drilled through the skull and a catheter for measuring pressure is placed directly into the ventricle. The result is a display on a monitor that reads the intracranial pressure. This is often coupled with an external ventricular drain (EVD) that provides a way to drain cerebrospinal fluid (CSF) from the ventricles if the ICP becomes too high.

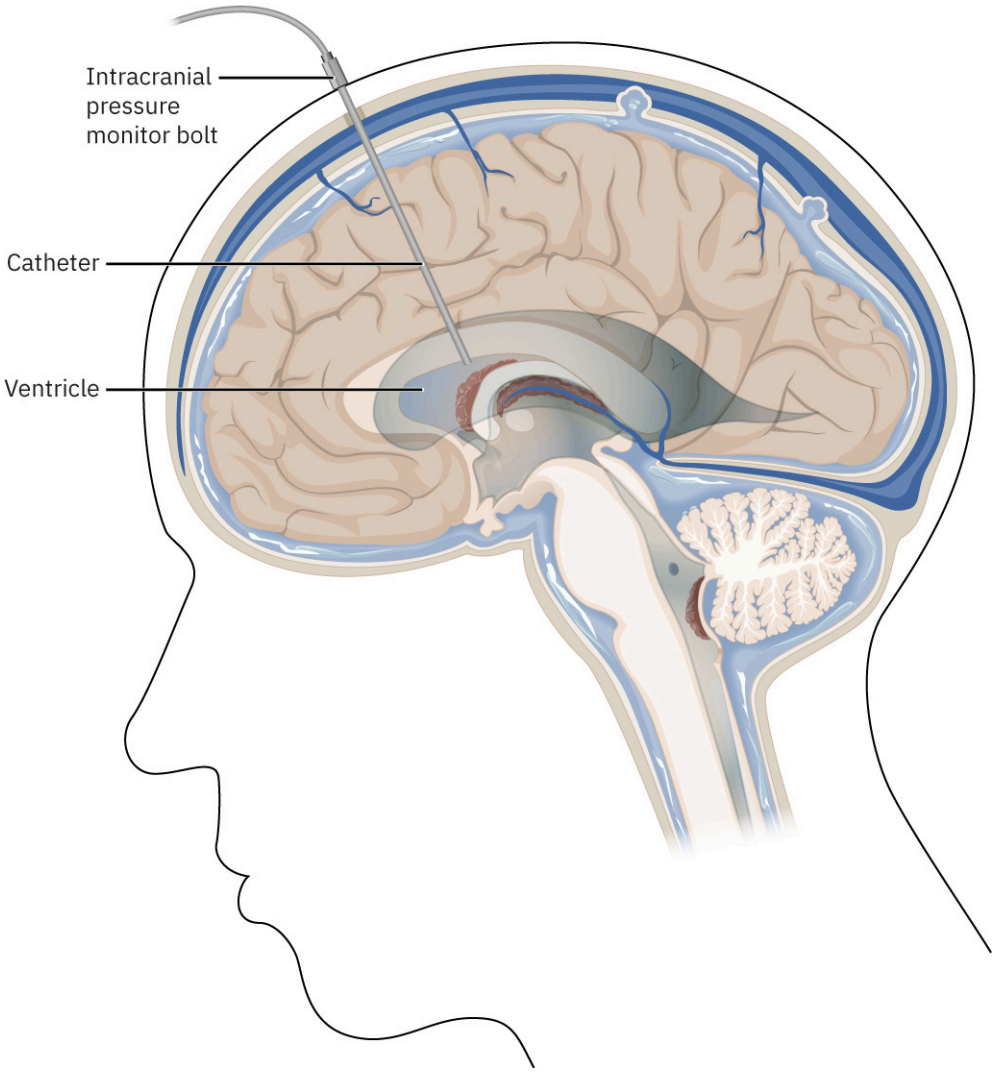

FIGURE 15.10 A ventriculostomy is an invasive technique for monitoring ICP. It can also include a drainage system (EVD) to drain CSF if needed. (credit: modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Surgical interventions for hemorrhagic stroke aim to stop bleeding, aspirate the hematoma, or relieve pressure on the brain. Patients with an aneurysm often require a surgical procedure that exposes the brain aneurysm. The surgeon can then place a clamp or clip at the base of the aneurysm, which prevents it from bleeding or rebleeding. In a less-invasive, alternative procedure, a surgeon uses a catheter to place small coils in the aneurysm, which will eventually develop clots that prevent blood from flowing into the aneurysm.

A decompressive craniectomy is the removal of part of the skull to open the cranial vault and relieve pressure from cerebral edema. The skull piece is usually stored in the patient's abdomen or in a bone bank to be reinserted later. The care team must treat the patient with extra caution, such as using helmets to cover the unprotected brain when ambulating.

Hematoma evacuation via stereotactic aspiration is generally a minimally invasive surgery. Other options are endoscopic aspirations and catheter aspirations. A small opening is made in the skull and instruments are inserted to evacuate the hematoma. AVMs are treated with surgery, radiosurgery, or embolization.

The care for patients with hemorrhagic stroke is multi-faceted and ongoing. Health-care professionals across the interdisciplinary team need to be involved in the care to maintain safety, limit complications, and recognize symptoms of worsening neurologic status due to evolution or a rebleed.

Summary

15.1 The Cerebrovascular System and Cerebral Vascular Accidents

- The brain is a complex collection of vasculature and tissues. The brain itself comprises the cerebrum, the brainstem, and the cerebellum. The brain is protected by the skull and the meninges. The cranial nerves are responsible for the sensory and motor functions of the head and neck.
- Different areas of the brain are perfused by different branches of the circle of Willis (CoW). The functions of brain cells are dependent on perfusion needs.
- A CVA, or stroke, is an interruption of the blood flow to areas of the brain. Treatment of CVA is targeted at rapidly restoring perfusion needs, since the longer the brain is without proper blood flow, the greater the damage.
- A CVA can be ischemic (resulting from a vessel occlusion impairing blood flow) or hemorrhagic (resulting from bleeding within the brain impairing blood flow).

15.2 Ischemic Stroke

- An ischemic stroke results from a thrombus or embolus occluding blood flow in the brain. Ischemic strokes account for 87 percent of strokes.
- A head CT without contrast is the standard for first diagnosing a stroke. Subsequent imaging and laboratory blood testing will help practitioners determine the cause and treatment.
- The presentation and treatment of acute ischemic stroke differ from those of hemorrhagic strokes, but the care provided by the nurses and other intradisciplinary care team members is relatively similar.
- The medical treatments for acute ischemic stroke include administration of IV tPA and thrombectomy.
- The goals of care focus on saving the brain, minimizing the lasting effects or disability caused by the stroke, and preventing future strokes.

15.3 Hemorrhagic Stroke

- A hemorrhagic stroke results from bleeding into the brain caused by the rupture of a blood vessel. Hemorrhagic strokes are classified as intracerebral hemorrhages (ICH) or subarachnoid hemorrhages (SAH).
- A head CT is the standard for first diagnosing a stroke. Subsequent imaging and laboratory blood testing will help practitioners determine the cause and treatment.
- The presentation of and treatment for hemorrhagic strokes may differ from those of ischemic strokes, but the care provided by the nurses and other interdisciplinary care team members is relatively similar. All methods are focused on patient safety and providing the best possible outcome.
- The medical treatments for hemorrhagic stroke include hematoma evacuation and craniectomy.
- The goals of care focus on stopping the bleeding, determining the cause of the bleeding, controlling blood pressure, and monitoring and controlling intracranial pressure.

Key Terms

aphasia loss of language skills affecting expression (Broca's), comprehension (Wernicke's), or both (global), depending on the area of brain damage

apraxia inability to perform tasks, movements, or gestures

arteriovenous malformation (AVM) abnormal formation of blood vessels in which the arteries and veins can become tangled and form connections

central nervous system (CNS) body's processing and functional control center

cerebral embolism obstruction in which a clot forms elsewhere in the body, breaks off, and travels to the blood vessels of the brain

cerebral thrombus clot within a blood vessel that blocks cerebral perfusion

cerebrovascular accident (CVA) interruption in blood flow to cells within the brain; commonly referred to as a stroke

cerebrovascular embolus clot that forms elsewhere in the body, breaks off, and travels to the blood vessels of the brain

circle of Willis (CoW) location in the brain where cerebral arteries meet and divide in a way aimed to maintain perfusion

cryptogenic stroke stroke for which the cause cannot be determined
dysarthria trouble speaking
dysphagia trouble swallowing
Glasgow Coma Scale (GCS) objective measurement scale that rates impairment of consciousness by scoring in three areas: eye opening, verbal response, and movement
hemiparesis weakness on one side of the body
hemiplegia complete paralysis on one side of the body
hemorrhagic stroke bleeding into the brain caused by the rupture of a blood vessel
hemorrhagic transformation occurrence of a hemorrhagic infarct after an ischemic stroke, particularly after the administration of tPA
homonymous hemianopsia deficit causing a loss of vision in the same halves of the visual field in each eye
hydrocephalus increase in cerebrospinal fluid in the ventricles of the brain
infarct area of necrotic tissue in the brain
intracerebral hemorrhage (ICH) hemorrhage, or bleed, within the cerebral vasculature and brain tissue
intracranial hemorrhage hemorrhage, or bleed, in the cranium
ischemic stroke type of stroke in which a clot prevents blood flow to part of the brain
lacunar stroke small artery thrombosis
locked-in syndrome rare condition in which patients retain consciousness but develop paralysis of the entire body except in the muscles of eye movement
mass effect compression of and injury to surrounding brain tissue because of hematoma
midline shift displacement of brain tissue across the midline
nystagmus rapid, uncontrolled eye movements
patent foramen ovale small hole between the left and right atria to support fetal circulation that closes on its own in most cases
penumbra tissue that is immediately around an infarction, is receiving marginal blood flow, and is still salvageable with restoration of perfusion
permissive hypertension post-stroke condition in which the patient is allowed to maintain a higher blood pressure to support perfusion
perseveration continuous and repetitive speech, behavior, or thoughts
proprioception awareness of one's own body position and movement in relation to the space around oneself
subarachnoid hemorrhage (SAH) hemorrhage, or bleed, that occurs in the subarachnoid space surrounding the brain
thrombectomy procedure in which a catheter is inserted through a vessel to physically remove a clot from the cerebral vasculature
thunderclap headache severe, sudden headache that peaks in intensity in seconds, lasts at least five minutes, and lingers and fades within a few hours
tissue plasminogen activator (tPA) medication administered intravenously to break up a blood clot responsible for stopping cerebral blood flow
transient ischemic attack (TIA) temporary occlusion of the blood vessels perfusing parts of the brain, after which the clot dislodges or dissolves on its own, restoring perfusion; sometimes called a "mini-stroke"
ventriculostomy procedure in which a hole is drilled through the skull and a catheter for measuring pressure is placed directly into the ventricle

Assessments

Review Questions

1. In the FAST or BE-FAST algorithm for detecting stroke, what does the A stand for?
   a. arm
   b. aphasia
   c. alertness
   d. ataxia

2. The circle of Willis receives blood supply from which vessels? Select all that apply.

a. internal carotid arteries
b. internal jugular arteries
c. vertebral arteries
d. meninges

3. You receive a report from the emergency department that you are getting an admission who had a middle cerebral artery (MCA) stroke. You think about the common deficits seen with this type of stroke. What interventions might you prepare to implement? Select all that apply.
a. Make sure an antiemetic is prescribed r/t nausea and vomiting.
b. Ensure a bed/chair alarm is present to promote safety r/t hemiplegia.
c. Decrease risk for aspiration by providing thickened fluids r/t dysphagia.
d. Prepare for the patient to be intubated r/t respiratory distress.
e. Get a paper and pen ready for communication r/t aphasia.

4. A family member of a patient who had a stroke reports that the patient suddenly began to act impulsively, could not reason through simple problems, and experienced personality changes. What area of the brain does the nurse assume has been affected based upon the patient's presentation?
a. cerebellum
b. pons
c. frontal lobe
d. parietal lobe

5. What drug classification is used to treat ischemic stroke by dissolving the clot to restore perfusion?
a. thrombolytic
b. antiplatelet aggregators
c. anticoagulant
d. lipid lowering

6. What test(s) can be used for initial stroke diagnosis? Select all that apply.
a. CT/CTA
b. MRI/MRA
c. X-ray
d. ultrasound
e. carotid artery angiogram

7. What is a risk factor for ischemic stroke?
a. atrial fibrillation
b. recent respiratory infection
c. illicit drug use
d. assigned male at birth

8. What nursing intervention ordered by the provider would best help prepare a patient for administration of tPA?
a. providing a 1L fluid bolus
b. administering anticoagulants
c. inserting two large-bore IVs
d. maintaining the patient's NPO status

9. What statements would the nurse identify as measures of evaluation to decrease the risk of complications in the immediate care of the patient suspected of having an ischemic stroke? Select all that apply.
a. Patient remained NPO until swallow could be evaluated.
b. Patient maintained proper body alignment to facilitate cerebral perfusion.
c. Stroke symptoms resolved.

d. Patient was educated on ischemic stroke risk factors.

10. What patients are at increased risk for hemorrhagic stroke? Select all that apply.
a. an 88-year-old male
b. a 30-year-old pregnant person
c. a 35-year-old with testicular cancer
d. a 62-year-old experiencing homelessness
e. a 45-year-old who uses methamphetamines daily

11. What does a CT angiography show that a regular head CT would not?
a. location of the hemorrhage
b. volume of the hemorrhage
c. vascular malformations
d. active hematoma expansion

12. What nursing interventions should the nurse plan to implement for a patient with a hemorrhagic stroke? Select all that apply
a. perform neurological assessments regularly to identify changes
b. administer all medications through an NGT to reduce aspiration risk
c. maintain bedrest to reduce fall risk
d. assess vital signs daily to monitor for hypotension

13. A nurse is assessing a patient who recently had a hemorrhagic stroke. What finding would be the most positive outcome for maintaining patient safety?
a. The patient's blood pressure has remained stable.
b. The patient's GCS score has increased.
c. The patient can verbalize four stroke risk factors.
d. The patient has not experienced a fall.

14. A patient who had what surgery after a hemorrhagic stroke will likely require a helmet to protect the brain?
a. ventriculostomy
b. aneurysm coiling
c. decompressive craniectomy
d. hematoma evacuation via stereotactic aspiration

Check Your Understanding Questions

1. Describe the purpose of the circle of Willis.

2. Describe the functions of the different areas of the brain: the four lobes of the cerebrum, the brainstem, and the cerebellum.

3. Why is it important to perform a head CT prior to the initiation of tissue plasminogen activator (tPA)?

4. Describe a thunderclap headache.

5. How might a craniectomy help a patient who had a hemorrhagic stroke?

Reflection Questions

1. Why do the acronyms for stroke recognition, FAST and BE-FAST, include T for "time?"

2. What is one sign or symptom that might manifest in a stroke affecting the function of each of the twelve cranial nerves?

3. Though it is not possible to diagnose a hemorrhagic stroke versus an ischemic stroke solely on assessment findings, discuss some of the clinical manifestations that are likely to make the nurse suspect a hemorrhagic stroke rather than an ischemic stroke.

Competency-Based Assessments

1. Complete an internet search to locate the National Institutes of Health Stroke Scale. Using the scoring tool, assess a patient at your next clinical rotation who recently suffered a stroke and compare your findings with the documented score in the patients' medical record.
2. Develop an education pamphlet to hand out for a community health fair. The pamphlet should highlight interventions for the FAST protocol.

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CHAPTER 16

Hematopoietic Disorders and Regulation

FIGURE 16.1 Blood collection is a skill needed to provide competent nursing care. Blood samples are used for critical diagnosis of a patient's condition. Components of a blood sample include plasma, erythrocytes, leukocytes, and platelets. (credit: Jessica Condit/Little Rock Air Force Base, Public Domain)

CHAPTER OUTLINE

INTRODUCTION The root *hemato-* comes from Greek and Latin words for blood. So, hematological disorders are diseases involving blood: specifically, the various structures and systems that produce blood, constitute it, and move it through the body. Blood makes up approximately 8 percent of the body by weight and consists of four main components (Mayo Clinic Staff, 2022):

- Red blood cells (RBCs; erythrocytes) transport oxygen.
- White blood cells (WBCs; leukocytes) fight infections.
- Platelets form clots to stop bleeding.
- Plasma carries red and white blood cells, platelets, and everything else—including a wide variety of nutrients, hormones, and waste products—through the circulatory system.

Understanding hematology is important for nursing professionals because blood components affect every body system and play crucial roles in maintaining the body's overall health. Each of the molecules found in a blood

sample—including water; oxygen; proteins, such as albumin, globulin, fibrinogen, and prothrombin; vitamins; sugars; fats; hormones; and waste products—can disrupt the body's homeostasis when their levels are either elevated or deficient. This chapter investigates the pathophysiology of the main disorders caused by blood imbalances, as well as appropriate treatments and approaches to nursing care.

16.1 Anemias

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations associated with the common types of anemia
- Describe the diagnostics and laboratory values for anemias
- Apply nursing concepts and plan associated nursing care for the patient with anemia
- Evaluate the efficacy of nursing care for the patient with anemia
- Describe the medical therapies that apply to the care of the patient with anemia

The **hematopoietic system** consists of the body structures responsible for the formation of blood cells. One of the most common hematopoietic disorders, **anemia**, is defined as deficient production of red blood cells (RBCs) or of **hemoglobin (Hb)**, a protein in RBCs that is key to the transport of oxygen from the lungs to cells and tissues. Table 16.1 identifies Hb levels in grams per deciliter (g/dL) of blood for different groups of people with and without anemia (WHO, 2024).

Group	Hb Level (g/dL)			
	No Anemia	Mild Anemia	Moderate Anemia	Severe Anemia
Children (>5 years)	≥11.0	10.0–10.9	7.0–9.9	<7.0
Children (5–11 years)	≥11.5	11.0–11.4	8.0–10.9	<8.0
Children (12–14 years)	≥12.0	11.0–11.9	8.0–10.9	<8.0
Nonpregnant females	≥12.0	11.0–11.9	8.0–10.9	<8.0
Pregnancy: First trimester Second trimester Third trimester	 ≥11.0 ≥11.0 ≥11.0	 10.0–10.9 9.5–10.4 10.0–10.9	 7.0–9.9 7.0 – 9.4 7.0–9.9	 <7.0 <7.0 <7.0
Males	≥13.0	11.0–12.9	8.0–10.9	<8.0

TABLE 16.1 Hemoglobin Levels and Anemia (WHO, 2024)

There are several types of anemia, each with distinct causes and clinical presentations, which can make management challenging. Some types, like iron-deficiency anemia, result from insufficient intake of essential nutrients, like iron, in food. In contrast, other anemias, such as sickle cell anemia, are hereditary conditions brought on by genetic mutations. Chronic illnesses, such as chronic kidney disease and inflammatory conditions, often contribute to secondary anemia as a side effect. However, all types of anemia deprive tissues and organs of the oxygen necessary to function optimally. Those affected by the disorder often experience debilitating symptoms including fatigue, weakness, pale skin tone, and shortness of breath. This diversity of causes and effects underscores the importance of being knowledgeable about anemia to ensure accurate diagnosis, appropriate treatments, and successful management for those living with it (Mayo Clinic Staff, 2022).

LIFE-STAGE CONTEXT

Anemia in Older People

Older adults are prone to anemia due to declines in their bone marrow production and immunity, as well as increased occurrence of myeloproliferative disorders (Mayo Clinic Staff, 2022). Changes in diet and access to nutrition may also play contributing roles in the prevalence of anemia. Older adults often associate fatigue and cold intolerance as symptoms of aging; however, often it is due to anemia. Nurses must encourage the older patient to get screened for and, if necessary, care for anemia. Supportive interventions centered around the patient's condition can alleviate symptoms if anemia has been identified as the source (Mayo Clinic Staff, 2022).

Pathophysiology of Anemia

Anemia can have several causes, but its general pathophysiology involves several key mechanisms affecting the production of RBCs. RBCs are produced within bone marrow. If bone marrow is damaged, such as from osteoporosis or bone cancer, it may no longer produce enough RBCs to meet the body's needs (WHO, 2024). Kidney damage can also hinder RBC production. In a healthy system, hypoxemia triggers the kidneys to release the hormone **erythropoietin (EPO)**, which, in turn, stimulates the bone marrow to produce RBCs. If the kidneys are damaged, such as in acute or chronic renal failure, the secretion of EPO may decrease or fully stop (WHO, 2024).

Another cause of anemia is blood loss or hemorrhage that exceeds normal RBC production, creating a net negative volume. Anemia can result from acute bleeding, as in trauma or surgery, or from chronic, low-level bleeding, as in gastrointestinal bleeding or heavy menstrual periods. When RBC loss exceeds RBC replacement, the blood loses oxygen-carrying capacity, threatening the ability of cells and tissues to function.

Nutritional deficiencies can also contribute to chronic anemia. Vitamins such as B_{12} and folate, and minerals such as iron, are essential in RBC production. When they are deficient, the resulting RBCs may be ineffective in volume, color, quality, or quantity.

Another route leading to anemia is the rapid destruction of RBCs, or **hemolysis**. In hemolytic anemia, RBCs are destroyed faster than they can be produced. This disorder may result from genetic or extrinsic causes, including autoimmune reactions, infections, and side effects of certain medications.

Pernicious Anemia

Vitamin B_{12} malabsorption anemia, known as **pernicious anemia**, occurs due to inadequate amounts of vitamin B_{12}, a nutrient that plays a key role in producing healthy RBCs. Vitamin B_{12} deficiency often results from either an autoimmune attack against parietal cells in the stomach lining or impairment of the chief cells in the gastric lining of the stomach. Both types of cells are necessary to produce and secrete **intrinsic factor**, an essential protein needed for the absorption of vitamin B_{12} by the small intestine. Patients who undergo weight loss surgery in which parts of the stomach are excised, altering production of intrinsic factor and absorption of vitamin B_{12}, are also at risk of pernicious anemia. Symptoms of pernicious anemia include fatigue, weakness, pale skin, and neurological symptoms such as tingling and numbness in extremities.

LINK TO LEARNING

To prevent pernicious anemia, it is important to eat foods that are high in vitamin B_{12}. This fact sheet about vitamin B_{12} (https://openstax.org/r/77vitaminB12) by the National Institutes of Health includes information about this important nutrient, including daily recommended amounts and foods that are rich in the vitamin.

Folate-Deficiency Anemia

Folate, also called folic acid or vitamin B_9, is essential to the production of DNA, but it also helps RBCs form and develop. Megaloblastic anemia, or **folate-deficiency anemia**, results from inadequate levels of folate, resulting in diminished production of healthy RBCs and Hb. A common cause of this disorder is impaired DNA synthesis within bone marrow, leading to the production of abnormally large and immature RBCs (WHO, 2024). These abnormal cells

cannot transport oxygen effectively, leading to symptoms associated with anemia, including fatigue, weakness, pale skin, and tingling or numbness in the extremities. Treatment options may include changes to diet, though it may be necessary to take lifelong folate supplements.

LINK TO LEARNING

To prevent folate-deficiency anemia, it is important to eat foods that are high in vitamin B_9. This fact sheet about vitamin B_9 (https://openstax.org/r/77vitaminB9) by the Harvard School of Public Health includes information about folate, including daily recommended amounts and foods that are rich in the vitamin.

Iron-Deficiency Anemia

The mineral iron is necessary to form Hb. An **iron-deficiency anemia** arises from insufficient levels of iron in the body leading to inadequate Hb formation. This disorder may develop from inadequate iron intake, impaired iron absorption (e.g., from celiac disease or weight-loss surgery), or increased iron loss (e.g., from menstruation or gastrointestinal bleeding) (Camaschella, 2019). An iron-rich diet is key for supporting Hb production and avoiding iron-deficiency anemia. Furthermore, certain foods, such as those high in vitamin C, can facilitate iron absorption, whereas other foods, particularly those high in calcium, can inhibit it. Thus, when consuming foods with iron, it may be wise to avoid also consuming calcium-rich dairy products. Furthermore, animal sources of iron may provide more efficient absorption compared with vegetable sources.

LINK TO LEARNING

To prevent iron-deficiency anemia, it is important to eat foods that are high in iron. This iron fact sheet (https://openstax.org/r/77iron) by the National Institutes of Health includes information about iron, including daily recommended amounts and foods that are rich in the mineral.

Other Causes of Anemia

Anemia can also be caused by various autoimmune conditions and chronic diseases that affect RBC production. Cancers and cancer treatments can also lead to anemia. For example, the cytotoxic effects (i.e., harmful impacts) of chemotherapy may inhibit hematopoiesis (the process by which the body manufactures RBCs), and cancer cells often invade bone marrow or alter production of EPO in the kidneys (NHLBI, 2021). Other anemias occur as secondary effects from chronic or autoimmune diseases, such as rheumatoid arthritis, as well as those due to advanced age, chronic infection, or kidney disease can create inflammation and disrupt iron metabolism (Weiss et al., 2019).

Clinical Manifestations

Anemia's exact pathophysiology depends on its cause; however, all forms share one characteristic: an inability to provide enough oxygen to meet bodily needs, which has serious ramifications for health and well-being. Regardless of the etiology or cause, symptoms of anemia include fatigue, weakness, pallor, and shortness of breath. In more serious cases, the disorder can cause complications affecting the heart, brain, and other vital organs. People with anemia may also feel lightheaded, which can be exacerbated by position changes, and they may experience impairment of their memory or other cognitive processes.

Diagnostics and Laboratory Values

Blood tests are a foundational method of diagnosing and classifying anemia as well as other hematological conditions. They offer key insight into the RBCs and other components of a blood sample. A **hemogram** is a detailed analysis of a blood sample that examines not only the quantity of RBCs, WBCs, and platelets but also their size, color, and the percentage of iron in them. The following terms are important for understanding and interpreting a hemogram:

- The root *chromic* refers to the color of a cell.
- The root *cytic* refers to a cell.

- The prefix *micro-* signifies a size measurement that is below the normal parameter.
- The prefix *macro-* signifies a size measurement that is above the normal parameter.
- The **mean corpuscular volume (MCV)** describes the average size of an RBC.
- The **mean corpuscular hemoglobin concentration (MCHC)** describes the concentration of Hb in a single RBC.

Table 16.2 connects different types of anemia with results from a hemogram. Remember that regardless of the color and size of the RBCs, anemia is characterized by a lower-than-normal quantity of RBCs resulting in hypoxemia.

Type of Anemia	Reference Range	Laboratory Description
Microcytic anemia	• MCV: less than the reference range (typically <80 fL) • MCHC: typically within the reference range	• RBCs do not have adequate iron to fully form and are smaller than normal, indicating impaired Hb synthesis. • Common causes include iron-deficiency anemia, thalassemia, and certain chronic diseases.
Microchromic anemia	• MCV: typically within the reference range • MCHC: less than the reference range (typically <31 g/dL)	• Characterized by RBCs with reduced Hb content, often appearing pale • Can result from conditions like iron-deficiency anemia, anemia of chronic disease, and thalassemia
Macrocytic anemia	• MCV: greater than the reference range (typically >100 fL) • MCHC: typically within the reference range	• RBCs are larger than normal but have not fully formed. • Can be related to vitamin B_{12}–deficiency anemia or folate-deficiency anemia. Other causes include certain medications and bone marrow disorders.
Macrochromic anemia	• MCV: typically within the reference range • MCHC: greater than the reference range (typically >36 g/dL)	• RBCs contain excessive Hb, making them appear darker than normal. • This type of anemia is rare and can be seen in hereditary conditions like hereditary spherocytosis.
Normochromic anemia	• MCV: within the reference range • MCHC: within the reference range	• The size and Hb content of RBCs are within the normal range. • This category is broad and can encompass various types of anemia, including anemia of chronic disease, chronic kidney disease–related anemia, and early stages of some hemolytic anemias.

TABLE 16.2 Associated Laboratory Values for Different Types of Anemia (Weiss et al., 2019)

Nursing Care of the Patient with Anemia

Nursing care for individuals with anemia must be tailored according to the type and severity of the disorder, as well

as the patient's specific symptoms, needs, and circumstances. Collaboration among health-care team members and patient education are both integral in providing comprehensive care for those affected by anemia (Weiss et al., 2019).

Recognizing and Analyzing Cues

Nurses must recognize and analyze signs of anemia through a holistic assessment that encompasses both subjective and objective information. Subjective symptoms that might signal anemia include fatigue, weakness, dizziness, and shortness of breath. Nurses should actively listen to patient complaints, ask about the onset and progression of symptoms, and consider medical histories and risk factors.

Objective signs may include physical findings such as pale skin and mucus membranes and delayed capillary refill time. Nurses should look for signs of decreased perfusion in vital sign deviations, including hypotension, tachycardia, and a low pulse oximetry. A review of laboratory blood test results, such as a complete blood cell (CBC) count, will show a low Hb level. Nurses should assess for any signs and symptoms of bleeding, which include reports of increased bruising, bloody stools, bloody urine, frequent heavy menstrual cycle patterns, and problems with bloody noses or bleeding guns. A nutritional assessment can identify any dietary deficiencies.

LINK TO LEARNING

To identify anemia (https://openstax.org/r/77anemia) quickly, it is important to understand which vital signs might change and why. Recognizing changes in your patients' vital signs is the first step in critical thinking.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Once anemia has been diagnosed, stabilization of the disorder and treatment of the underlying cause are the priorities. Nursing interventions for patients with anemia depend on the underlying cause, and can include:

- administering medications to reverse interventions that caused excess bleeding, such as vitamin K to induce blood clotting and reverse an elevated international normalized ratio (discussed later in this chapter) due to high warfarin levels
- frequently assessing vital signs to monitor hemodynamic trends and symptoms due to anemia
- instituting fall precautions to reduce patient harm
- monitoring for bleeding by collecting occult stool samples, drawing blood samples for measurement of serial Hb and hematocrit (Hct) levels to monitor trends, and documenting output from any drains
- providing supplemental oxygen, as prescribed, to patients with transient hypoxia
- transfusing prescribed blood products

Patients with stable anemia are often cared for on medical-surgical floors, though they may require surgical consultations or, in worse cases, surgery to identify any bleeding. Patients with severe, symptomatic cases may require close monitoring in the intensive care unit. Once the anemia has been stabilized, the patient is likely to experience weakness. To avoid fatigue, activities of daily living should be performed in clusters, or planned rest periods should be provided between activities.

Patient education should focus on the type of anemia, its causes and effects, and the importance of following prescribed treatments. Instruct the patient on how to prevent complications and manage anemia-related symptoms. Provide education about prescribed therapies, including dietary recommendations, purposes, and medications. Include nutritional recommendations to increase oral iron intake, if necessary.

Finally, schedule follow-up appointments and laboratory tests, as necessary, to assess the patient's response to therapy, adjust interventions, and quickly report any side effects or concerns to the health-care team.

Evaluation of Nursing Care for the Patient with Anemia

Evaluation is a crucial element of nursing practice that enables nurses to assess the efficacy of nursing interventions provided to patients with anemia.

Evaluating Outcomes

To evaluate the effectiveness of nursing interventions, the desired goal must first be identified and then compared

with the outcomes. The following are examples of outcomes the nurse would evaluate for a patient with anemia:

- Blood pressure, respiratory rate, and oxygenation saturation levels have returned to target ranges.
- Neurological findings of syncope and altered consciousness are resolved and improved.
- Nutritional improvements include increasing dietary intake of vitamin B_{12}, iron, and folate.
- The patient reports improvement of symptoms, such as less fatigue and shortness of breath; the patient is able to complete activities of daily living.
- The patient reports reduced levels of pain secondary to alteration in perfusion.

Medical Therapies and Related Care

Treatment of anemia depends upon accurately diagnosing the cause, including any nutritional deficiencies involved (Mayo Clinic Staff, 2022). Appropriate therapies may include nutritional support; pharmacological support, such as RBC-stimulating agents; and, in acute or severe symptomatic presentations, blood transfusion. If anemia is a secondary effect of another health condition, like gastrointestinal bleeding or chronic inflammation disease, it will be necessary to treat that condition.

Iron supplementation is a needed treatment when iron is low, because RBCs require iron for full functioning. Oral iron supplements may be taken up to three times a day with food to boost body stores of iron and promote appropriate production of RBCs. These supplements may come in the form of ferrous sulfate, ferrous gluconate, or other iron preparations. Consuming iron with vitamin C potentiates its effectiveness, whereas taking it with calcium can delay the absorption. Caution patients that iron supplements may cause a darkened stool and some constipation. Adequate water intake is essential. Proper supplementation is also essential for pernicious anemia and folate-deficiency anemia. Folate is dosed with daily supplements or can be administered as a subcutaneous injection.

When severe symptoms or complications develop due to anemia, blood transfusion may become necessary. Donated blood can quickly replace depleted RBC counts. EPO therapy stimulates RBC production from bone marrow. Recombinant human EPO may be prescribed to those experiencing anemia caused by chronic kidney disease or cancer treatments like chemotherapy. Medications, such as darbepoetin alfa and epoetin alfa, may help stimulate bone marrow to produce more RBCs by acting on the bone marrow. Bone marrow stimulants are commonly administered subcutaneously to patients who are dialysis dependent.

16.2 Hereditary Disorders

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations associated with hereditary hematological disorders
- Describe the diagnostics and laboratory values of hereditary hematological disorders
- Apply nursing concepts and plan associated nursing care for the patient with a hereditary hematological disorder
- Evaluate the efficacy of nursing care for the patient with a hereditary hematological disorder
- Describe the medical therapies for hereditary hematological disorders

Hereditary blood disorders include sickle cell anemia and thalassemia. These inherited disorders disrupt the structure, function, or production of Hb, the protein that transports oxygen in RBCs. These disorders have an enormous effect on individuals and their families, often necessitating lifelong medical treatment and management. Understanding the genetic mechanisms, clinical manifestations, and treatments available for hereditary blood disorders is important for health-care professionals because they play an essential part in diagnosing, caring for, and supporting those who have these chronic conditions.

Sickle Cell Anemia

An inherited blood disorder caused by abnormal Hb production that results in RBCs forming into crescent-shaped "sickles" is called **sickle cell disease**. Of the many types of sickle cell diseases, the one that causes severe anemia is called **sickle cell anemia (SCA)**. Like other sickle cell diseases, SCA is characterized by abnormal production of Hb caused by a genetic mutation; in the case of SCA, however, RBCs become rigid and sticky before taking on their

characteristic crescent shape (sickle). As a result, the RBCs block vessels and may eventually prevent blood from reaching organs (Figure 16.2). SCA most often affects individuals of African, Mediterranean, Middle Eastern, or South Asian descent; presents as acute pain crises or long-term organ damage; and affects mortality and morbidity.

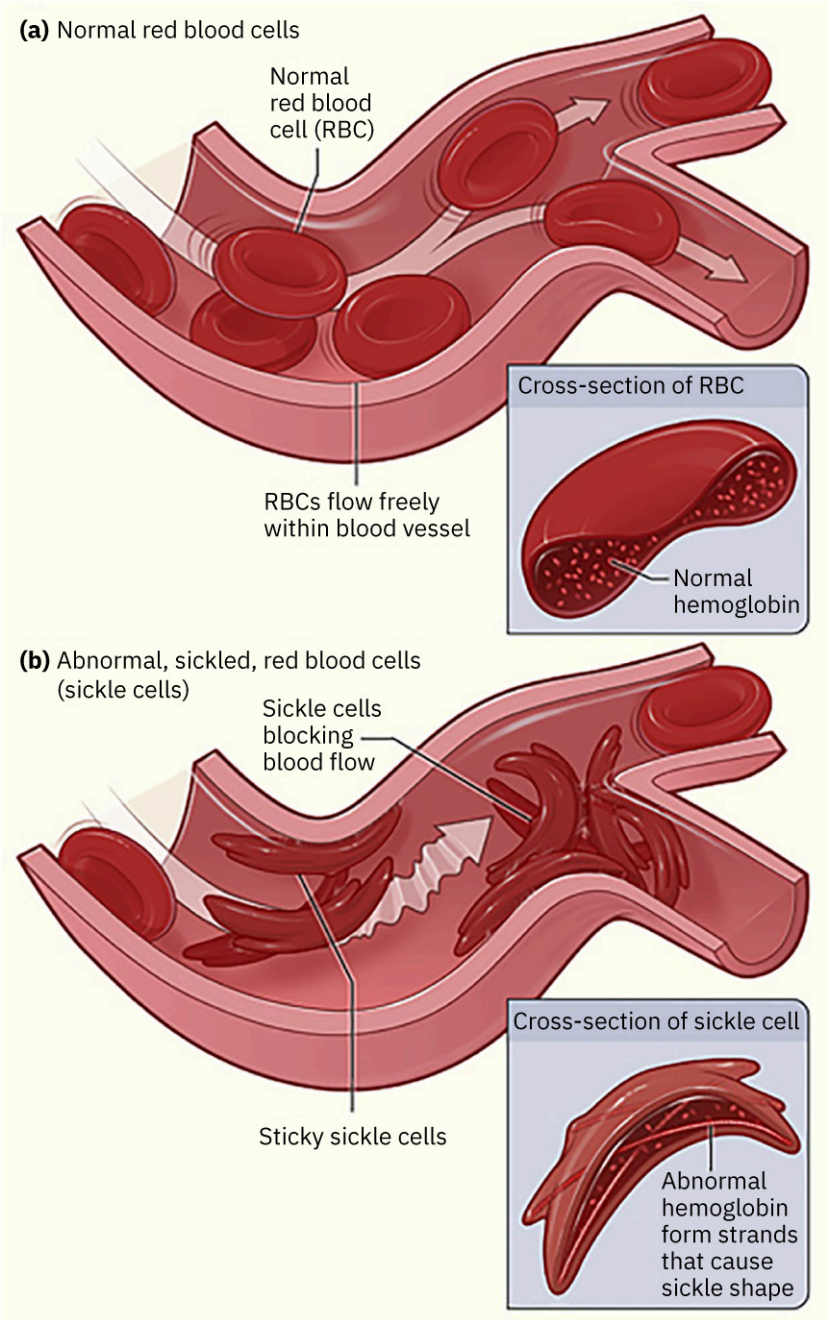

FIGURE 16.2 (a) Normal red blood cells (RBCs) are circular with healthy hemoglobin protein, and freely flow through the blood vessels carrying oxygen. (b) In SCA, RBCs take on a sickle shape from abnormally formed hemoglobin and become sticky, preventing them from freely flowing through the blood vessels and successfully transporting oxygen throughout the body. (credit: The National Heart, Lung, and Blood Institute/Wikimedia Commons, Public Domain)

Clinical Manifestations

SCA clinical manifestations vary significantly from patient to patient. Generally, they are like symptoms for other kinds of anemia, but the resulting pain may be worse, particularly during a **vaso-occlusive crisis**. Also known as a pain crisis or sickle cell crisis, this is when sickle-shaped RBCs block circulation through small vessels, causing tissue ischemia, which can lead to infection and permanent tissue damage. SCA also increases the risk for stroke among children, because of smaller blood vessels. Effective management of SCA generally includes pain management, blood transfusions, medication (e.g., hydroxyurea), and sometimes bone marrow or stem cell

transplantation. People living with SCA require lifelong medical supervision to control symptoms and avoid complications.

It is important to distinguish between having SCA and being in a sickle cell crisis. People with the genetic abnormality for sickle cell disease may be asymptomatic for years until a crisis occurs, which often is due to another issue, such as an infection, trauma, accident, or emotional upset. Crises may also be caused by conditions that create a demand for more RBCs, such as high altitude or strenuous exercise (Mangla et al., 2023). Clinical manifestations of SCA include

- damage to the organs such as the spleen, heart, lungs, and kidneys
- delayed growth and development, seen mostly in children, due to tissue hypoxemia and hypoxia
- fatigue from hypoxemia due to ineffective RBCs
- frequent infections from poor blood flow due to clogged vessels from sickled cells
- leg ulcers from poor blood flow to lower limbs
- pain
- presenting as a yellow hue to the skin, **jaundice** results from the body breaking down RBCs, releasing the heme portion
- swelling of hands and feet, that may be identified in childhood, often called "hand-foot syndrome" or **dactylitis**

Note that severity and frequency of signs and symptoms can differ for every individual with SCA (Mangla et al., 2023).

REAL RN STORIES

Nurse: Ramon
Years in Practice: Ten
Clinical Setting: Step-down progressive care unit
Geographic Location: Hartford, Connecticut

One challenging night shift in the emergency department [ED], I was tending to Jamal, a 25-year-old patient, who was experiencing an intense sickle cell crisis. Jamal had frequently visited the ED due to sickle cell anemia. I entered his room and heard muffled groans of pain from his bedside. Upon reviewing his medical history, I recognized his past struggles with pain crises and quickly started an assessment gathering vital signs and recognized the need for immediate pain relief. Jamal described increasing discomfort in his joints and back. I tried to maintain a calm and caring demeanor by acknowledging his discomfort and administering medication to alleviate his joint pain. Recognizing that repeated crises take an emotional toll, I engaged Jamal in conversation by sharing stories and inviting him to open up about his experiences. I observed nonverbal signals of anxiety and distress in our dialogue. Responding to his needs, I adjusted his positioning, provided warm blankets, and collaborated closely with the health-care team and hematologist on call to ensure he received high-quality treatment and multidimensional support. Together, we discussed Jamal's treatment plan, reviewed his medical history, and considered long-term adjustments in management.

I remained with Jamal throughout the night and monitored his response to interventions, dispensed medications promptly, and offered emotional support as necessary. Over time, Jamal's pain started subsiding. I was profoundly moved by this experience and realized the significance of not only treating physical symptoms of sickle cell disease but also considering psychological and emotional aspects that play such an integral part in the patient's journey. It was an eye-opening experience for me because it demonstrated just how profound and impactful a holistic nursing approach can be when helping someone manage chronic conditions like sickle cell anemia.

Diagnostics and Laboratory Values

The following laboratory and diagnostic tests can be used during the diagnostic process, as well as for continued monitoring of the sickle cell condition:

- A **bone marrow aspiration** is used to verify SCA by measuring the production of RBCs in the bone marrow. It

is often performed alongside a bone marrow biopsy.

- A **complete blood count (CBC)** measures the amount of RBCs, WBCs, and platelets in a blood sample. SCA often presents with low RBC counts.
- A **total bilirubin test** measures how much bilirubin is being released into the bloodstream. SCA causes destruction of RBCs faster than they can be created. This causes strain on the liver and can result in the liver releasing bilirubin into the patient's system, causing jaundice in some instances.
- Genetic testing can verify specific mutations associated with SCA and is often used for prenatal counseling to determine whether individuals are carriers for the disease.
- A **hemoglobin solubility test** quickly screens for sickle Hb detection, offering results in minutes. Blood samples are mixed with a reducing agent to inactivate Hb and form characteristic crystals. In positive results, there would be presence of hemoglobin S (Hb S) and sickling Hb.
- A **hemoglobin electrophoresis** can diagnose SCA by distinguishing different forms of Hb to detect the form and characteristics of sickle-shaped RBCs.
- A **peripheral blood smear** enables analysis of RBC shape and condition for diagnostic purposes. SCA is characterized by RBCs with characteristic sickle-shaped membranes.
- A **reticulocyte count** measures the number of young RBCs in a blood sample. As a compensatory mechanism in SCA, bone marrow produces more young RBCs into circulation than normal to replace short-living RBCs, leading to an elevated reticulocyte count.

Thalassemia

A group of hereditary blood disorders that affect the Hb genes, leading to decreased **erythropoiesis**, or Hb production, is referred to as **thalassemia**. Thalassemia mostly affects people of Mediterranean, Asian, or African descent (Mangla et al., 2023). Thalassemia can be one of the more devastating blood disorders to encounter, with symptoms ranging in severity from mild anemia to life-threatening conditions that necessitate ongoing medical intervention. Therefore, understanding its genetic, clinical, and treatment aspects is of utmost importance for providers (Bajwa & Basit, 2023).

Clinical Manifestations

Normal adult Hb is made up of two alpha and two beta protein chains. Thalassemia results from defects in Hb production. Alpha-thalassemia is a deletion of one or more of the a-globin producing genes, and beta-thalassemia is a deletion of one or more of the b-globin producing genes (Bajwa & Basit, 2023). Affected individuals may experience fatigue, weakness, pale skin tone, and shortness of breath due to insufficient oxygen-carrying capacity in their blood supply. In severe cases, it may manifest through symptoms including splenomegaly, jaundice, and bone deformities. Some individuals can remain asymptomatic carriers, whereas others require regular blood transfusions and medical monitoring.

Diagnostics and Laboratory Values

Thalassemia can be identified through specific patterns that depend upon its type (alpha or beta) and severity, as well as the frequency of transfusions necessitated by the disorder. The difference between the types is that alpha thalassemia necessitates blood transfusions in early childhood and rates of fatality at birth are higher (Barid et al., 2022).

Laboratory and diagnostic tests for thalassemia are very similar to those done for SCA. A few key tests that are used to diagnose the disorder's type (genetic karyotyping) and disease severity are the following:

- A CBC count assesses both the quantity and quality of blood cells. Thalassemia often presents with anemia, with low levels of Hb, RBCs, and Hct.
- Hemoglobin electrophoresis is a test for identifying different types of Hb present in a blood sample and identifying any mutations. Some types of Hb include:
  - hemoglobin A and A2: adult hemoglobin
  - hemoglobin F: fetal hemoglobin; found in fetuses and is replaced by hemoglobin A shortly after birth
  - hemoglobin E, S, C, H, and M: abnormal Hb caused by genetic mutations
- Thalassemia may lead to increases in hemoglobin A2 as well as hemoglobin F. Quantifying these components in a blood sample helps accurately diagnose thalassemia.
- Iron studies may reveal altered iron levels in a patient with thalassemia due to frequent blood transfusions.

Ferritin levels and iron concentration in the blood can be measured to detect iron overload.

- A peripheral blood smear examination provides information regarding the size, shape, and color of RBCs present in a specimen. Thalassemia can be identified by hypochromic and microcytic RBCs.
- Genetic testing can detect specific mutations of globin genes to confirm diagnosis and provide more details on the Hb type.
- If necessary, a bone marrow biopsy specimen can be collected and used to help evaluate RBC production within bone marrow to confirm a diagnosis and establish treatment plans such as blood transfusions or iron chelation therapies. Regular monitoring through this testing process is crucial in managing thalassemia effectively.

Nursing Care of the Patient with a Hereditary Hematological Disorder

Nursing care for patients living with hereditary hematological disorders must incorporate both physical and emotional needs to treat patients holistically. Nurses play a pivotal role in providing necessary treatments such as blood transfusions or iron chelation therapy (discussed in detail in Medical Therapies and Related Care), monitoring dosage accuracy, and tracking potential adverse reactions. Patient education is crucial to helping individuals and their families understand the nature of hereditary disorders, the pros and cons of available treatment modalities, and the importance of taking all prescribed medication per the prescribed schedule. Essentially, the main goals of preventive measures for patients with SCA and thalassemia are to manage symptoms, reduce complications, and improve the overall quality of life.

Recognizing Cues and Analyzing Cues

To recognize and understand SCA and thalassemia, nurses must use their clinical assessment skills, review patient histories, and comprehend each disorder's specific manifestations. Regularly monitoring vital signs and reviewing CBC counts and specific markers relating to each disorder can help nurses identify the status of the condition. Other parameters nurses are responsible for monitoring include hydration status and vaccine compliance, because dehydration and infection can trigger an exacerbation. The nurse should also help the patient identify any potential provoking factors, such as temperature variations. Additionally, collaborative communication between health-care teams as well as ongoing education of both the patient and their caregivers are integral parts of ensuring comprehensive care for individuals living with these conditions. Cues are found in the nursing health history assessment, physical assessment, laboratory results, and even psychosocial assessment. These cues help nurses obtain the relevant objective and subjective data, analyze these data, and create a nursing diagnosis and care plan.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Primary prevention is a main goal for patients with thalassemia and SCA. Nurses can identify a vaso-occlusive crisis in a patient with sickle cell disease by recognizing early dehydration or signs of infection, and then help manage pain with adequate hydration and analgesics. In acute exacerbations of sickle cell crisis, hydration with intravenous (IV) fluid replacement may be required, along with analgesics (predominantly IV opioids) to assist with pain control. In acute exacerbations of thalassemia, interventions differ in that nurses may have to administer a blood transfusion or iron chelation therapy—treatments that assist with binding to excess iron and maximize elimination. If anemia causes tissue hypoxia, the nurse can support oxygenation. For all patients with anemia, patient and family education needs to be given to empower them with better understanding of the causes, risk factors, and treatment plan for their disorder.

After tertiary interventions have been implemented, secondary prevention measures are necessary to avoid future exacerbations. Patients with SCA are encouraged to identify triggers. Promotion of adequate hydration, vaccine compliance, regular medical check-ins, and avoidance of extreme temperature fluctuations are all important elements to consider when educating patients. Patients with thalassemia are recommended to receive surveillance of Hb levels, iron studies, and whole-blood hemograms to ensure an exacerbation is not imminent. Patients with thalassemia or the trait for it may require genetic counseling when interested in pursuing family planning.

To provide holistic nursing, patients with sickle cell disease or thalassemia require further support in addition to the physical burdens. Emotional support should also be offered because these conditions typically require lifelong management. Nurses are part of the health-care teams that develop customized care plans tailored specifically to each hematological disorder, taking into account each person's specific needs and challenges. Furthermore, nurses promote preventive measures while encouraging patients to actively take part in their treatment, instilling control

and well-being amid chronic hereditary conditions.

CLINICAL SAFETY AND PROCEDURES (QSEN)

Patient-Centered Care: Care of the Patient with Sickle Cell Crisis

Patients with sickle cell disease are often at risk for vaso-occlusive crisis. Primary prevention is aimed at staying hydrated and avoiding infection by complying with vaccination recommendations. In an acute crisis, perfusion and pain are the main clinical concerns. Due to the aggregation of sickling RBCs, patients with a vaso-occlusive crisis require hospitalization, telemetry, IV fluids, and pain management. Although this disorder is usually diagnosed in the pediatric population, adults can learn how to manage with transitional programs. Community partnership and outreach with nursing support have shown promising outcomes to assist patients with sickle cell disease.

Evaluation of Nursing Care of the Patient with a Hereditary Hematological Disorder

Evaluating nursing care for patients diagnosed with hereditary hematological disorders involves an ongoing, systematic process designed to measure both intervention effectiveness and overall patient well-being. Some examples include preventing bleeding-related injuries and evaluating the patient understanding of the need to continue this practice in their daily life. Another example is promoting good skin integrity. The integrity of the skin becomes paramount to prevent wounds that may lead to bleeding complications.

Evaluating Outcomes

The nurse can evaluate patient outcomes by comparing them with initial goals set for the patient and assessing for symptom improvement. Regularly monitoring laboratory results can help the nurse compare changes against a baseline condition. For example, in patients with thalassemia, a Hb level greater than 9 g/dL would indicate that treatment was working (Bajwa & Basit, 2023). Pain management for a patient with SCA should be evaluated as early as 15 minutes after administration of pain medication and then hourly. For patients with chronic anemia, nurses should assess patient adherence to the treatment plan, including medications, blood transfusions, iron chelation therapy, or other therapeutic interventions. Collaborating with the health-care team can help the nurse evaluate patient outcomes through communication of progress with the allied health-care team.

Medical Therapies and Related Care

The treatment approach for hereditary hematologic disorders often centers on managing symptoms, avoiding complications, and improving overall quality of life. Treatment methods will depend on both the type and severity of the disorder. In acute phases, pain management with IV analgesics is common. Also, IV fluid therapy may be indicated to alleviate a vaso-occlusive crisis.

In chronic management, other conservative therapies exist. One medication is hydroxyurea, which increases the production of hemoglobin F. This makes RBCs larger, rounder, and more flexible, preventing sickle cells from forming. Bone marrow transplantation may be considered for severe cases of hereditary hematologic diseases like thalassemia; replacing defective bone marrow with healthy donor material may provide curative options. Folate supplements may support RBC production for those diagnosed with anemia (including thalassemia). Other treatments include regular blood transfusions to combat anemia and improve oxygen-carrying capacity of blood.

A treatment called **iron chelation therapy** is an effective method of eliminating excess iron from the body, especially among individuals receiving frequent blood transfusions that have caused the buildup of excess iron. Iron chelators are medications designed to bind to excess iron in the bloodstream, creating a compound that can then be expelled from the body through excretion. This helps avoid iron overload, which, if untreated, can result in organ damage (Kwiatkowski, 2023).

16.3 Polycythemia

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations associated with polycythemia
- Describe the diagnostics and laboratory values in polycythemia
- Apply nursing concepts and plan associated nursing care for the patient with polycythemia
- Evaluate the efficacy of nursing care for the patient with polycythemia
- Describe the medical therapies for the care of polycythemia

A hematologic condition marked by an abnormal increase in the number of RBCs in the body is called **polycythemia**. This condition can be primary (genetic) or secondary (caused by other diseases or conditions, such as chronic lung disease, kidney disease, cardiopulmonary shunts) (Haider & Anwar, 2023). Polycythemia increases the blood's viscosity (thickness), resulting in complications including blood clots, cardiovascular issues, and reduced circulation. When caring for patients with polycythemia, the primary objectives are to identify its underlying causes, take appropriate diagnostic steps, and devise tailored management strategies to minimize potential risks while increasing overall well-being for patients.

Pathophysiology of Polycythemia

The pathophysiology of polycythemia can be divided into two major subcategories: primary and secondary. Primary polycythemia, or **polycythemia vera**, is a myeloproliferative disorder, which means it originates from the bone marrow (Pillai et al., 2023). A genetic mutation causes an abnormal response to the hormone EPO, an important hormone that stimulates RBC production from the kidneys, causing erythropoiesis (RBC production) to increase independently of the body's natural regulatory mechanisms (Pillai et al., 2023). Overproduction of RBCs increases blood viscosity, impairing blood flow and increasing the risk for thrombosis, stroke, or myocardial infarction.

When EPO stimulation occurs as an adaptive reaction to other conditions, **secondary polycythemia** occurs. Recall that EPO (erythropoietin) is normally released by the kidneys as a response to low oxygen levels in blood. The abnormal release triggers the bone marrow to increase RBC production. This can lead to impaired blood flow, with potential complications including stroke or myocardial infarction. Conditions that can trigger secondary polycythemia include chronic hypoxia from respiratory or cardiovascular illnesses, congenital heart disease, and certain tumors such as renal cell carcinoma. Smoking and living at high elevation can also trigger excess RBC production.

Primary and secondary polycythemia both can result in complications arising from increased blood viscosity, making it imperative that its root causes be addressed to reduce any risk for thrombotic events. Treatment strategies may include phlebotomy to lower RBC counts, medication to address symptoms, and management of any secondary conditions underlying polycythemia. An interdisciplinarian team approach is key to optimize management and avoid possible complications related to polycythemia.

Clinical Manifestations

Clinical presentation of polycythemia varies from patient to patient. Symptoms may be nonspecific and may include fatigue, headache, and dizziness (Haider & Anwar, 2023). If large vessel occlusion occurs due to clumping of excess blood cells, symptoms will result in the occluded vessel. For example, if viscous blood clumps and creates a clot in a coronary artery, the patient may report chest pain, shortness of breath, fatigue, or nausea. If a clot develops in a brain artery, the patient may experience weakness (generalized or one sided), visual changes, or difficulty with speech.

Diagnostics and Laboratory Values

Diagnosing polycythemia requires performing various laboratory and diagnostic procedures that assess RBC counts as well as determine their source. Primary polycythemia often results in lower or normal EPO levels, while secondary polycythemia usually causes an increase. The following tests are used to help diagnose either type of polycythemia:

- A CBC count identifies Hb and Hct levels and compares them with the normal ranges. It also measures RBCs.
- Bone marrow aspiration and biopsy may be performed to evaluate the composition of blood cells as well as

rule out other conditions that may exist in the bone marrow. Primary polycythemia affects bone marrow with increased cell volume due to increased RBC precursors.

- For accurate detection of primary polycythemia, genetic tests must look specifically for *JAK2* mutations. An extensive diagnostic approach is key to distinguish primary from secondary polycythemia and provide appropriate management strategies.
- A simple pulse oximeter can measure the presence of hypoxia, which can stimulate RBC production and lead to secondary polycythemia.
- Chest x-rays and computed tomography (CT) scans can help identify lung diseases or tumors, which may be a cause of secondary polycythemia. Ultrasound or magnetic resonance imaging visual tests can also identify organ enlargement, such as of the spleen or liver, resulting from polycythemia.
- An arterial blood gas analysis can give information about blood pH and oxygenation. These data can help identify secondary causes of polycythemia, which may be causing the body to produce more RBCs.
- The cause of a thrombotic event can be identified by testing for clotting factors and blood components.

An extensive diagnostic approach is key to distinguishing primary from secondary polycythemia and providing appropriate management strategies. Patients suspected of polycythemia should undergo extensive evaluation by health-care providers.

Nursing Care of the Patient with Polycythemia

Nurses play an invaluable role in recognizing and interpreting signs in patients experiencing polycythemia. Through diagnostic studies, the nurse can recognize the overproduction of RBCs. Nursing actions include monitoring vital signs and clinical manifestations, completing a physical exam, and administering ordered treatments.

Recognizing and Analyzing Cues

By completing vital signs and a thorough head-to-toe assessment, nurses can recognize cues from each body system suggesting the existence of polycythemia (Table 16.3). A subjective assessment may include the patient stating feelings of fatigue, early satiety (feeling full), abdominal pain, inactivity, problems with concentration, night sweats, pruritus, bone pain, weight loss, and fever. Elevations in Hb, Hct, and EPO levels are particularly important when identifying polycythemia. Additional cues may be obtained from a thorough patient history, which should include questions about the patient's history of smoking and altitude exposure.

System	Symptoms
General	Fatigue
Integumentary	Erythromelalgia (redness and a burning sensation), often of hands and feet Pruritus (itching) due to histamine release
Neurologic	Headache Visual disturbances, sometimes resulting in dizziness or disorientation Cognitive changes due to poor blood flow to the brain
Hematologic	Easy bruising and bleeding Increased occurrence of blood clots
Cardiovascular	Hypertension Peripheral edema caused by increased blood flow congestion
Respiratory	Dyspnea (shortness of breath)
Gastrointestinal	Hepatomegaly or splenomegaly due to increased blood volume

TABLE 16.3 Body Systems Affected by Polycythemia

System	Symptoms
Renal	Increased urine flow due to increased blood volume
Musculoskeletal	Joint pain

TABLE 16.3 **Body Systems Affected by Polycythemia**

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Acute management of polycythemia centers around treating the cause, if possible; preventing thrombotic events due to the overproduction of RBCs; and symptom improvement. Dependent on the degree of symptoms, nursing interventions are tailored to the patient's presentation (Brennan-Cook, 2020).

LINK TO LEARNING

The Oncology Nursing Society endorses the MPN Symptom Assessment Form Total Symptom Score (MPN-SAF TSS) (https://openstax.org/r/77MPNassess) tool. This allows patients to track symptoms to report to the nurse and health-care team, who can then evaluate the severity of symptoms and create an effective plan of care.

Ultimately, nurses assist patients with symptom control and reduction of thrombotic risk (Lu & Chang, 2023). Education is important. For example, the patient might be taught to slowly increase their activity level in alignment with their fatigue. If night sweats are a sign, nurses can educate patients to identify triggers (e.g., alcohol, spicy food, caffeine) and to adjust their intake accordingly. For early satiety, nurses can help patients plan a diet that is heart healthy and high in protein, whole grains, fruits, and vegetables. For severe pruritus, nonpharmacological remedies such as cool showers and skin moisturizers are recommended. Patients with brain fog or difficulty concentrating may require pharmacological therapy, including additional education on the purposes of these medications. Given the propensity for infection, identification of fevers that deviate from target temperature parameters and a comprehensive workup may be indicated (Brennan-Cook, 2020).

Evaluation of Nursing Care for the Patient with Polycythemia

Evaluation of nursing care for polycythemia centers around symptom management and tailoring interventions and care plans specifically to address each patient's unique needs. It is important to perform regular assessments to evaluate how interventions affect symptom improvement.

Evaluating Outcomes

A continuous evaluation process is crucial to improving care delivery, avoiding complications, and supporting overall health and well-being for each patient. Stabilization of an acute exacerbation and/or avoiding a thrombotic event are ideal outcomes, but there are specific outcomes nurses may identify (Pillai et al., 2023), including:

- A reduction of self-reported physical symptoms and objective signs help the nurse assess for changes or improvements, which can dictate next steps.
- The stabilization or normalization of RBCs, Hb, and Hct, and comparing the current results with previous results.
- The patient can articulate importance of compliance with pharmacological therapy, and verbalizing signs and symptoms of a thrombotic event.
- The patient can report reduced anxiety and depression and identify healthy coping mechanisms. Evaluating the patient's social support system can also help identify what resources will be needed.
- The patient maintains target parameters for oxygen saturation, heart rate, and blood pressure.

Medical Therapies and Related Care

The goal of medical management of polycythemia is to lower RBC counts, prevent complications such as thrombosis, and improve overall symptoms. The following are major therapies for patients with polycythemia:

- A **therapeutic phlebotomy** is the removal of excess RBCs by reducing overall blood volume. If the patient has

no genetic concerns or other comorbidities, the removed blood may be donated to a blood bank or service. The frequency and quantity of each reduction is determined by the Hb and Hct levels (Pillai et al., 2023).
- Management of cardiovascular risk factors includes management of hypertension and anticoagulation. Maintaining blood pressure at an ideal level is critical for minimizing cardiovascular events, and cholesterol management helps mitigate cardiovascular risks (Pillai et al., 2023).
- Medications such as ruxolitinib, an immune modulator, specifically target the abnormal JAK2-signaling pathway associated with polycythemia vera. Hydroxyurea is a myelosuppressive medication to decrease RBC production; interferon-α may also be used. Low-dose aspirin therapy helps decrease the risk of thrombosis by inhibiting platelet aggregation (Pillai et al., 2023).
- Regular monitoring and assessment via blood tests, including CBC counts, are used to track Hct levels and adjust treatment accordingly. Imaging studies may also be performed periodically to measure liver and spleen sizes as well as assess for potential complications (Pillai et al., 2023).
- Smoking cessation is another important strategy for patients with polycythemia because nicotine can exacerbate polycythemia's complications significantly. Smoking cessation should be pursued immediately to decrease these effects (Pillai et al., 2023).

Treatment decisions should take into consideration factors such as a patient's age, overall health status, and risk factors, as well as their response to previous interventions. Individualized treatment plans for patients with polycythemia must be created in conjunction with hematologists or health-care providers specializing in blood disorders. Their ongoing monitoring and adjustments are integral to managing this condition effectively and avoiding potential complications.

16.4 Thrombocytopenia

LEARNING OBJECTIVES

By the end of this section, you will be able to:
- Discuss the pathophysiology, risk factors, and clinical manifestations associated with thrombocytopenia
- Describe the diagnostics and laboratory values in thrombocytopenia
- Apply nursing concepts and plan associated nursing care for the patient with thrombocytopenia
- Evaluate the efficacy of nursing care for the patient with thrombocytopenia
- Describe the medical therapies for thrombocytopenia

Low platelet count syndrome, or **thrombocytopenia**, is an uncommon hematologic condition characterized by decreased numbers of platelets (thrombocytes) in the bloodstream, affecting three out of 100,000 people yearly in the United States (NORD, 2022). Platelets play an essential role in **hemostasis**, which is the physiological process that prevents and controls bleeding. Individuals with thrombocytopenia may have increased risk for bleeding as their platelet count decreases, resulting in difficulty creating blood clots and controlling hemostasis. Thrombocytopenia may either present as its own condition or be the result of other medical issues, including autoimmunity disorders, infections, or adverse drug reactions. The disorder may range in severity from mild cases with minimal symptoms to those posing significant risks of spontaneous bleeding. Management and treatment approaches depend upon the cause, level of platelet reduction, and associated symptoms. Consequently, early diagnosis and effective monitoring are key to providing optimal health-care services to patients with thrombocytopenia.

Pathophysiology of Thrombocytopenia

Platelet production is triggered in bone marrow by **thrombopoietin**, a protein released by the liver. Thrombocytopenia can have many causes: from bone marrow disorders that impair production of platelets, such as leukemia and myelodysplastic syndromes, to diseases that disrupt platelet survival over time. Immunological mechanisms may contribute to platelets being destroyed by the immune system and lead to immune thrombocytopenic purpura (ITP). Other causes include various infections, hereditary disorders, and overuse of certain medications, such as aspirin or heparin. Liver damage, from excessive alcohol intake, for example, can also cause a decrease in viable platelets, due to lower levels of thrombopoietin being produced by the liver.

Pathophysiology often includes disruption in the delicate equilibrium among platelet production, circulation, and removal, leading to fewer platelets in the bloodstream. The normal range of platelets for males and females is 150,000–400,000/μL blood) (NORD, 2022). Clinical manifestations can range from petechiae (pinpoint-sized spots

on the skin) and bruising to more serious conditions like gastrointestinal or intracranial bleeding. Prompt recognition, thorough diagnostic evaluation, and targeted interventions are crucial for effectively managing thrombocytopenia and mitigating its risks of bleeding complications in affected individuals (Nicolas et al., 2023).

Heparin-Induced Thrombocytopenia

An immune-mediated side effect caused by exposure to heparin products is known as **heparin-induced thrombocytopenia (HIT)**. HIT is characterized by a drop in platelet count and an increase in blood coagulability, which can manifest anytime from 1 to 14 days after exposure to heparin (Nicolas et al., 2023). An exaggerated immune response occurs due to antibodies produced against complexes composed of heparin and platelet factor 4 (PF4) proteins released by activated platelets. When heparin binds with PF4 proteins, an immune response triggers the production of antibodies, which attach themselves directly onto platelet surfaces, activating platelets to clot. This causes the platelet count to drop because they die off before they can be reproduced in the bone marrow. Because of its late onset in some instances, HIT may go unrecognized if a patient is discharged; therefore, occurrence may be difficult to detect.

LINK TO LEARNING

Learn more about the pathophysiology, diagnosis, and treatment of heparin-induced thrombocytopenia (https://openstax.org/r/77hepthrom) in this video.

Clinical Manifestations

HIT typically manifests as swelling at multiple points on the body surface, as the result of blood clot formation following the activation of PF4. HIT can be identified by an acute drop in platelet count, usually below 150,000 microliters; in severe cases, this can be as low as 50,000 microliters. Although most individuals with HIT do not experience bleeding directly, its adverse effect is an increased risk of arterial and venous thrombosis and subsequent arterial and venous clot formation resulting from hypercoagulability. These conditions may result in deep vein thrombosis (DVT), which is a type of venous thromboembolism; pulmonary embolism (PE); and potentially life-threatening conditions such as stroke or myocardial infarction (Nicolas et al., 2023). Because blood interacts with all tissues of the body, all organs and body systems may be affected, as shown in Table 16.4.

System	Symptom
General	Fatigue
Integumentary	Ischemic limb necrosis and necrotic lesions Swelling and edema Warmth of skin in thrombotic areas
Neurologic	Anxiety, if there is a pulmonary embolism Headache, dizziness, cognitive changes, and disorientation from poor blood flow to the brain
Hematologic	Increased blood clotting vs bleeding
Cardiovascular	Hypotension
Respiratory	Dyspnea (shortness of breath)
Gastrointestinal	Abdominal tenderness

TABLE 16.4 HIT Symptoms by Systems

System	Symptom
Renal	Hematuria
Musculoskeletal	Joint pain

TABLE 16.4 HIT Symptoms by Systems

Diagnostics and Laboratory Values

Blood tests for markers related to hypercoagulability are used to diagnose HIT. A "4-Ts" scoring system is commonly used to estimate risk potential of disease; 4-T scores less than 3 indicate a low probability for developing HIT (Lindholm & Perrotta, 2023). The four "Ts" assess degree of thrombocytopenia, thrombocytopenia timing, thrombosis, and thrombocytopenic cause. Additionally, laboratory tests such as enzyme-linked immunosorbent assays, as well as serotonin release assays can confirm antibodies specific for HIT.

Idiopathic Thrombocytopenic Purpura

More frequently referred to as immune thrombocytopenia, **idiopathic thrombocytopenic purpura (ITP)** is an autoimmune condition marked by an abrupt and significant drop in platelet count, leading to increased risks of bleeding and anemia. With ITP, the immune system erroneously recognizes platelets as foreign and produces antibodies to destroy them in the spleen and liver, which are key organs for filtering blood. Children typically experience acute ITP; in contrast, adult-onset ITP typically manifests chronically and requires ongoing management.

Clinical Manifestations

ITP may be related to other autoimmune disorders; therefore, it is important for providers to conduct a comprehensive evaluation and follow-up for patients exhibiting signs of ITP. Clinical presentation includes uniquely notable petechiae. Large, discolored, purple areas called **purpura** may also be seen on the body, due to internal bleeding. Ecchymosis and spontaneous bleeding from mucous membranes, gums, nosebleeds, and even the intestines may occur, resulting in nausea and vomiting.

Diagnostics and Laboratory Values

Laboratory and diagnostic tests for ITP are similar to those for other types of thrombocytopenia. They include measuring CBC and platelet counts, as well as autoimmune antibodies to rule out other autoimmune conditions (Nicolas et al., 2023). Additional tests such as a bone marrow biopsy can help identify bone causes of thrombocytopenia and distinguish the etiology from the other types.

Alcoholic Thrombocytopenia

A condition in which excessive alcohol consumption results in decreased platelet count in the blood is known as **alcoholic thrombocytopenia**, which leads to decreased clotting mechanisms and increases the risk for bleeding and bruising. Chronic alcohol consumption can impair platelet production from bone marrow and has other consequences, direct and indirect, on platelet production and function. Alcohol abuse is one of the main contributors of liver diseases such as alcoholic liver disease and cirrhosis. Given the importance of liver cells to platelet storage, liver damage from alcohol abuse can contribute to thrombocytopenia by disrupting clotting factor synthesis and thrombopoietin. Moreover, alcoholic thrombocytopenia is compounded by nutritional deficiencies in folate, thiamine, and vitamin B_{12} (Silczuk & Habrat, 2020).

Clinical Manifestations

Alcohol abuse often manifests with signs of thrombocytopenia that include easy bruising and petechiae, along with prolonged bleeding from minor injuries. With advanced liver disease, thrombocytopenia can be enhanced through the development of esophageal varices, which are dilated veins that generate under the mucosa of the lower esophagus and gastrointestinal tract, making the patient at risk for hemorrhage (Meseeha & Attita, 2023). Other symptoms include nose bleeds, bleeding gums, or prolonged bleeding times after minor invasive procedures (Silczuk & Habrat, 2020).

Diagnostics and Laboratory Values

Diagnostic tests are the same as for the other two types of thrombocytopenia; however, a careful social history of

the patient may reveal alcohol use disorder, which can help clarify the cause of thrombocytopenia. Management then includes the same medical treatments, with the addition of patient education and support and resources to decrease alcohol consumption.

Nursing Care of the Patient with Thrombocytopenia

Nursing care for the patient with thrombocytopenia focuses on avoiding bleeding complications, creating a safe environment, and supporting overall patient well-being. Nurses should monitor laboratory tests and vital signs, administer medication, take safety precautions, and educate the patient about their condition. Effective communication and collaboration between the patient and members of the health-care team are crucial in optimizing treatment of this disorder and increasing overall quality of life for everyone affected by it.

REAL RN STORIES

Nurse: Sarita
Years in Practice: 2
Clinical Setting: Oncology
Geographic Location: Dallas-Fort Worth, TX

I was working in a bustling oncology unit and my patient was a middle-aged male who had leukemia with severe thrombocytopenia. He needed platelet transfusions twice daily to address his low count. He had a continuous nosebleed and we worked so hard to supply him with towels. His laboratory results had been declining for several days until his platelet count dropped to 2! I recognized his life-threatening situation and tirelessly advocated on his behalf for comfort and wellness. I worked closely with the health-care team to coordinate timely platelet transfusions and provide meticulous care.

Despite our efforts, the medical team knew the outcome was not going to be good. I recognized the emotional toll the patient's illness was taking on both him and his family. I answered his questions with empathy during difficult conversations. Unfortunately, he succumbed to complications associated with his condition. I was profoundly moved by his death and offered support for his loved ones through their grief process. I focused on providing holistic, patient-centric care despite difficult circumstances. I also learned to value my own platelets like never before. It is amazing to me how powerful simple blood clotting factors are. I started to really learn how to strengthen my own blood by eating more nutritious meals, staying hydrated, and even avoiding alcohol.

Recognizing and Analyzing Cues

Nurses should maintain a level of clinical judgment when treating patients at risk for thrombocytopenia, such as those with an underlying hematologic disorder, liver disease, or recent use of medication associated with platelet depletion. It is vitally important to work closely with all members of the health-care team, but particularly hematologists, to provide timely diagnoses and interventions and ongoing management. A careful physical exam from head to toe may reveal cues that point to decreased platelet count and possibly thrombocytopenia. These cues include bruising, purpura, petechiae, excessive bleeding from minor cuts or injuries, bleeding from gums, hematomas, hematuria, heavy menstrual bleeding, frequent or spontaneous nosebleeds, and blood blisters in the mouth or on the body. Other cues to analyze are downward trends in platelet counts and vital sign deviations such as tachycardia, hypotension, and, in severe cases, hypoxia. A past medical and social history may reveal recent exposure to heparin or heavy alcohol use, which may cause thrombocytopenia.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

When deciding on hypotheses and solutions, nurses should always prioritize a patient's airway, breathing, and circulation. Because thrombocytopenia is a circulation problem, it is important to perform a comprehensive physical exam, paying attention to potential clinical manifestations. The nurse should consider the potential causes of thrombocytopenia, including immune-mediated causes, decreased production of platelets from bone marrow or nutritional disorders, or medications such as heparin or other anticoagulants.

Taking action includes the nursing interventions of administering prescribed medications, coordinating blood transfusions and products as ordered, providing patient education on bleeding and injury prevention, and

collaborating with the health-care team. Actions to reduce further bleeding include avoiding sharp objects and using an electric razor or a soft toothbrush to avoid tissue integrity issues. Safety implications include identifying patients at high risk of falling and educating patients to avoid contact sports. Dietary and nutrition interventions include avoiding alcohol (which decreases platelet production) and avoiding foods that may disrupt the intestinal lining. In the event the patient sustains a fall or trauma, imaging, such as a head CT scan, may be clinically warranted to rule out bleeding in the brain.

Thrombocytopenic conditions that have been acutely stabilized also require thorough education. Patients should be taught the pathophysiology of the disease and the importance of adhering to the treatment plan and identifying signs and symptoms of acute bleeding and hemorrhage. As demonstrated during the COVID-19 pandemic, vaccinations for COVID-19 and influenza can decrease or even eliminate risk for exacerbation of forms of ITP that have been caused by viral illness (ITP Support Association, n.d.).

Evaluation of Nursing Care for the Patient with Thrombocytopenia

Evaluation of interventions for thrombocytopenia requires an ongoing and methodological process to assess their efficacy and assess any changes that implemented measures have on the patient's hemostasis levels. The nurse should keep the following points foremost in mind:

- The primary focus of evaluation is to monitor the patient's platelet counts to detect improvements or declining trends.
- It is also important to evaluate the patient's response to medications. The nurse should be aware of side effects and adverse reactions to prescribed medications, which may include nausea, vomiting, and clot formation.
- Documentation is essential to visualize trends in vital signs, blood components, and clotting times. Indications that the patient is improving include normalization of vital signs and blood tests showing stabilizing or improving platelet levels and decreasing clotting times.

Medical Therapies and Related Care

Medical treatments for thrombocytopenia depend on its cause, severity, symptoms, or complications associated with its presence. Treatment plans are individualized, requiring close collaboration among health-care providers and ongoing monitoring to assess treatment efficacy and make necessary adjustments. Patients should be taught to recognize signs of bleeding and to prioritize follow-up care.

HIT presents serious clinical challenges, so prompt recognition, appropriate management strategies, and collaboration among health-care providers are critical in mitigating its associated complications. HIT can be managed effectively by immediately stopping all forms of heparin therapy and other anticoagulant agents like direct thrombin inhibitors (e.g., argatroban, bivalirudin, fondaparinux) to avoid further thrombosis. Warfarin typically should be avoided during the acute stage of the condition due to the risk of skin necrosis. Other essential components of care for managing HIT effectively include monitoring platelet counts regularly and conducting ongoing assessment for potential complications. The removal, treatment, and return or replacement of blood and blood products, known as **plasmapheresis**, may be performed help remove antibodies when treating HIT.

There are several interventions for ITP, including:

- corticosteroids, such as prednisone or dexamethasone, which are immunosuppressant medicines used to moderate immune system activity and help protect from immune-mediated thrombocytopenia. They are the first-line treatment for ITP.
- immunosuppressive therapy, which is given when the patient's immune system is attacking itself. It carries the risk of depleting the body's ability to fight pathogens naturally, but it can be a helpful treatment for ITP, when the immune system is hypersensitive and destroying its own platelets. Medications such as azathioprine, mycophenolate mofetil, cyclophosphamide, and rituximab can help decrease the autodigestion of valuable platelets.
- **intravenous immunoglobulin infusion therapy (IVIG)**, in which antibodies collected from multiple donors are administered intravenously over several days or weeks. IVIG treatment keeps immunity active but controlled, protecting affected tissues from further injury while the body fights infection by pathogens.
- removing the spleen, which can help decrease platelet destruction and increase platelet counts, increasing

their numbers significantly. This treatment should only be considered when chronic ITP does not respond to other therapies.
- thrombopoietin receptor agonists, which form a class of medications for chronic ITP. They work by stimulating the production of platelets from the bone marrow.

Regardless of the cause, platelet transfusions can be used to directly increase the body's platelets levels. This intervention is often used in cases such as severe bleeding or when platelet numbers have dropped dangerously low. Effective treatment is also contingent on addressing the actual cause of thrombocytopenia. If it is alcohol induced, for example, then, in addition to stabilizing platelets, alcohol cessation is key.

16.5 Neutropenia

LEARNING OBJECTIVES

By the end of this section, you will be able to:
- Discuss the pathophysiology, risk factors, and clinical manifestations associated with neutropenia
- Describe the diagnostics and laboratory values in neutropenia
- Apply nursing concepts and plan associated nursing care for the patient with neutropenia
- Evaluate the efficacy of nursing care for the patient with neutropenia
- Describe the medical therapies for neutropenia

A medical condition marked by abnormally low levels of neutrophils is called **neutropenia**. WBCs play an integral part in our immune system's defenses against pathogens. A **neutrophil** is a type of WBC that helps fight against bacteria and fungi. Neutrophils make up most of the WBC populations in the human body: normally, there are up to 8,000/µL of a whole-blood sample (Yale Medicine, n.d.). Someone with mild neutropenia has WBC levels of 1,000–1,500/µL; moderate neutropenia is characterized by WBC levels of 500–1,000/µL, and severe neutropenia by WBC levels below 500/µL (Yale Medicine, n.d.).

Consider the WBCs as the soldiers in the body's army against common pathogens like bacteria and fungi. When the body recognizes invading pathogens, it releases WBCs into the area to attack, engulf, and destroy them. A WBC count higher than 11,000/mm^3 demonstrates the body is fighting an infection, whereas a WBC below 4,000/mm^3 may mean there are no more WBCs left to fight, leaving the body without protection and at risk for a dangerous infection. Nursing assessment and medical treatments are then needed.

Pathophysiology of Neutropenia

There are many causes of neutropenia, including chemotherapy, which suppresses bone marrow production of neutrophils. Certain antibiotics and antiseizure medications can also decrease the number or effectiveness of neutrophils. Cancer, tumors, and conditions such as aplastic anemia and myelodysplastic syndromes can hinder the bone marrow's ability to produce neutrophils, and certain infections, such as HIV, can decrease neutrophil levels. Autoimmune disorders, such as lupus and rheumatoid arthritis, can mistakenly attack neutrophils, leading to neutropenia. Without adequate amounts of neutrophils, the body is at risk of further infections.

Types of Neutropenia

Classifying neutropenia assists health-care providers in understanding its cause, forecasting its progression, and deciding on appropriate interventions. The following types of neutropenia are defined based on their respective causes:

- Autoimmune neutropenia is when the immune system mistakenly attacks and destroys neutrophils, leading to low neutrophil counts.
- Chronic idiopathic neutropenia is characterized by persistently low neutrophil counts without apparent cause.
- Congenital neutropenia is present at birth and is generally due to a genetic mutation in the bone marrow, where blood cells are created.
- Cyclic neutropenia is a form of neutropenia in which individuals experience regular, cyclic fluctuations in their neutrophil counts; a complete cycle typically happens every 21 days.
- Drug-induced neutropenia is caused by certain chemotherapy drugs and antiseizure medications such as carbamazepine. Other drugs, such as certain antivirals, antibiotics, and antipsychotics also can have an impact.

- Infectious neutropenia is caused by the body's normal response to external pathogens.
- Post-transplant neutropenia is a side effect of immunosuppressive medications taken after organ or stem cell transplant.
- Secondary (acquired) neutropenia is caused by another condition such as a bacterial, fungal, or viral infection. Underlying conditions may be HIV, hepatitis, cancer, aplastic anemia, or autoimmune diseases.

Treatment and management strategies depend on identifying the specific type and addressing underlying causes whenever possible.

LINK TO LEARNING

The Immune Deficiency Foundation provides more information about the diagnosis and treatment of chronic neutropenia (https://openstax.org/r/77neutrop) on this website.

Clinical Manifestations

Symptoms include traditional characteristics of any infection, such as fever, fatigue, sore throat, swollen lymph nodes, ulcers in the mouth or anus, pain, swelling at an infection site, diarrhea, and dysuria if a bladder infection is present.

Diagnostics and Laboratory Values

A common test to identify the body's neutrophil level is a CBC count. Additional tests may include a bone marrow sample to identify cell growth and features. Identifying the cause of infection may require additional blood tests, as well as diagnostic radiography. A comprehensive physical exam and complete history can also help identify causes of infection or exposure that may have caused the neutrophil disorder. If there is high degree of suspicion for neoplastic (tumor related) causes, a bone marrow biopsy may be warranted.

Nursing Care of the Patient with Neutropenia

Patients with neutropenia require close nursing supervision to reduce infection risks and promote overall well-being. Close cooperation between all members of the health-care team and patient education are also integral parts of effective nursing interventions for neutropenia management (Yale Medicine, n.d.).

Recognizing and Analyzing Cues

By completing the normal nursing duties of obtaining a health history and completing a thorough physical exam, the nurse can optimize care for a patient with neutropenia. Subjective data may include fatigue, sore throat, pain, and urinary symptoms such as urgency and frequency. Objective data may reveal signs of infection such as fever, swollen lymph nodes, mouth ulcers, rash, and inflammation. Assessing nutritional status may help the nurse evaluate any nutritional deficiencies that may contribute to neutropenia. Diets that are deficient in folate and vitamin B_{12} may lead to neutropenia (Yale Medicine, n.d.). A CBC count will reveal low WBC levels.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Acute neutropenia requires hospitalization to avoid further risks of infection. To reduce infection transmission, patients are typically given their own room, a positive pressure isolation room if available, and placed on **reverse precautions**, also known as neutropenic precautions, which are measures to avoid introducing additional pathogens to the patient, such as:

- Fresh flowers are avoided to decrease exposure to chemicals or *Aspergillus* fungi infection.
- Fresh fruit and uncooked meats are avoided to avoid foodborne contaminants.
- Meticulous hand hygiene and upholding aseptic techniques all are directed at reducing nosocomial infection.
- Providers, staff, and visitors wear masks to protect the patient from opportunistic infections.
- Routine surveillance of temperature, monitoring absolute neutrophil counts, and thorough skin assessments are performed to help identify the source of an infection or signs of a potentially worsening infection.
- The nurse educates the patient to use good oral and pulmonary hygiene to avoid oral fungal infections and nosocomial pneumonia.

To optimize immune functioning, adequate hydration and protein in nutrition are instrumental. Administration of

antibiotics, antivirals, and corticosteroids may be necessary. Although neutropenia places patients at risk for bacterial infections, perpetual drops in WBC count and other aspects of immunity place patients at risk for **pancytopenia**, which is a reduction in platelets, RBCs, *and* WBCs.

Evaluation of Nursing Care for the Patient with Neutropenia

Evaluation of nursing interventions for neutropenia involves observing how patients react to care, monitoring for any indications of improvement, and making necessary modifications as required. For every nursing intervention, the nurse must evaluate the patient's response to the intervention for effectiveness as part of the nursing process (Yale Medicine, n.d.). Table 16.5 describes how common nursing interventions for neutropenia should be evaluated.

Nursing Intervention	Evaluation
Regularly monitor neutrophil count	Assess for trends and notify provider of progress or decline.
Assess signs and symptoms of infection	Assess for fever, infection, fatigue, and signs of inflammation.
Monitor vital signs	Evaluate stability of blood pressure and temperature. Document findings to recognize trends.
Observe skin and mucous membranes	Evaluate skin integrity and protect skin as needed to prevent breakdown. Assess for petechiae, ecchymosis, and pancytopenia.
Patient education	Instruct patient about the importance of adhering to medication orders and hand hygiene. Instruct patient how to practice hand hygiene. Address any barriers to understanding.
Neutropenic precautions: hand, oral, and respiratory hygiene	Evaluate staff and family adherence to neutropenic precautions and re-educate as needed. Provide needed supplies and signage.
Collaborate with health-care team	Evaluate team's ability to communicate and support the plan of care. Address any barriers to understanding.
Administer prescribed medications	Evaluate the patient's response to medications by monitoring the WBC count. Take precautions to avoid side effects or adverse reactions.

TABLE 16.5 Evaluating Common Interventions for Neutropenia

Medical Therapies and Related Care

Therapies should be focused on stimulating WBC creation to replace and recover healthy neutrophils. Classifying neutropenia helps health-care providers better comprehend its cause, predict its course, and tailor interventions accordingly. Treatment and management strategies entail identifying each specific type while targeting any possible root causes underlying it (Yale Medicine, n.d.). Regular blood count monitoring as well as cooperation among health-care providers are integral for successfully treating neutropenic conditions.

Antibiotic treatment can directly fight many bacterial and fungal pathogens. Corticosteroids can help suppress the body's immune response if the neutropenia is caused by an autoimmune condition that destroys the body's own WBCs. Medications to stimulate neutrophil genesis in bone marrow include filgrastim. Granulocyte colony-stimulating factor medications promote WBC production in the bone marrow. Antithymocyte globulin is an immunosuppressant that may be used to treat neutropenia from aplastic anemia. A bone marrow or stem cell

transplant may be performed if the underlying cause of neutropenia is a condition such as aplastic anemia or leukemia. Additionally, implementing reverse precautions can protect the patient from further infection during treatment.

16.6 Thrombotic Disorder

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss pathophysiology, risk factors, and clinical manifestations associated with thrombotic disorders
- Describe the diagnostics and laboratory values in thrombotic disorders
- Apply nursing concepts and plan associated nursing care for the patient with a thrombotic disorder
- Evaluate the efficacy of nursing care for the patient with a thrombotic disorder
- Describe the medical therapies for thrombotic disorders

A **thrombotic disorder** is a condition that interferes with hemostasis, which is the body's ability to clot or stop the flow of blood. A **thrombus** is a clot that forms inside a blood vessel. To effectively treat thrombotic disorders, nurses must understand the complex mechanisms of **coagulation**, which is the process of a liquid changing into a semi-solid or solid state. For blood, coagulation depends on **platelet aggregation**, which is the clumping together of platelets around RBCs (Figure 16.3). This process is supported by complex cascade of enzymatic reactions and essential proteins that combine to form a stable blood clot.

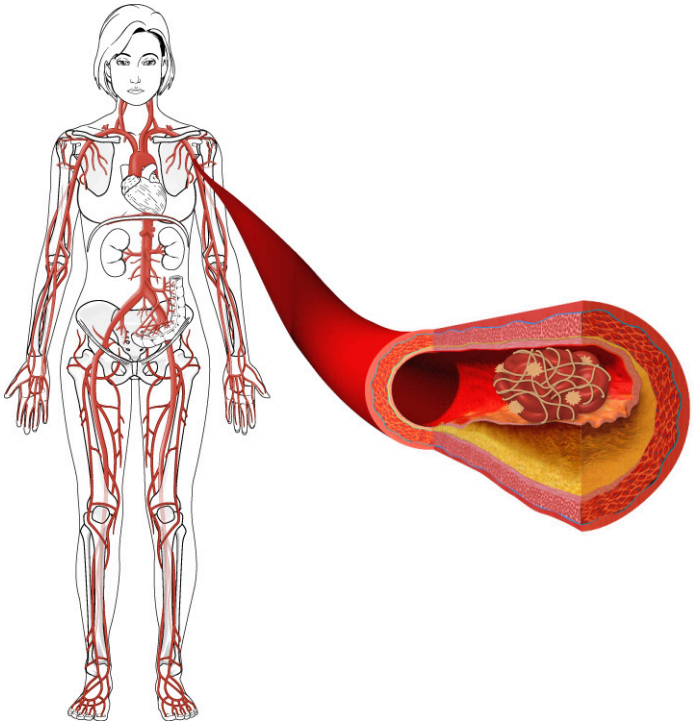

FIGURE 16.3 Platelets aggregate around, or bind to, red blood cells to form a clot within a blood vessel. (credit left: modification of work from Anatomy and Physiology, 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license; credit right: modification of "Blood Clot" by Blausen.com staff (2014) from "Medical Gallery of Blausen Medical 2014"/WikiJournal of Medicine, CC BY 3.0)

Pathophysiology of Thrombotic Disorders

Understanding the pathophysiology of thrombotic disorders is vital to an accurate diagnosis and successful management. There are three main types of clotting disorders: vascular, platelet, and coagulation.

Vascular disorders are conditions that may lead to bleeding. Examples include aneurysms and vasculitis, or inflammation of blood vessels; disruptions in blood flow due to blood vessel structure can also lead to vascular disorders. Constricted blood vessels can restrict the lumen of a vessel, provoking RBC aggregation and creation a blood clot.

Platelet disorders are caused by abnormalities in the quantity or quality of the platelets (Yale Medicine, n.d.).

Internal conditions of the bone, such as bone marrow cancer or tumors, can disrupt the normal production and quality of platelets. As previously discussed in 16.4 Thrombocytopenia, thrombocytopenia, or low quantities of platelets, can result in impaired clot formation. Irregular or abnormal qualities of platelets also disrupt normal coagulation.

Coagulation disorders stem from disruptions to the cascade of reactions that happens during clotting. Vitamin K deficiency is essential for clot formation; if not properly absorbed or deficient, clotting cannot occur. Because vitamin K is processed in the liver, people with liver disease may not be able to metabolize vitamin K and can be at increased risk for impaired clotting. An acquired disorder of coagulation is **disseminated intravascular coagulation (DIC)**, which triggers activation of the clotting cascade using up all the clotting factors, resulting in a mix of clotting and bleeding. Sepsis, trauma, and other diseases can trigger DIC.

Another pathology of coagulation disorders is due to fibrinolytic disorders. The breaking down of blood clots, or **fibrinolysis**, is needed to return the blood to homeostasis. Disorders in the ability to create a clot and then dissolve it are grouped in the pathology of fibrinolytic disorders.

Hereditary Thrombotic Disorders

Hereditary thrombotic disorders can often be detected when there is a family history of repeated venous thromboembolism. Genetic testing can confirm their presence and provide vital data for risk analysis as well as managing appropriate strategies such as anticoagulant treatment. It is crucial that individuals with family histories of blood clots seek appropriate medical care as soon as they experience repeated blood clots, so they can mitigate increased risks efficiently and avoid bleeding events. Two of the most common hereditary thrombotic disorders are factor V Leiden mutation and prothrombin G20210A mutation. Each occurs due to deficiencies in clotting factors from a genetic mutation in a particular gene (Stevens et al., 2018).

A **factor V Leiden mutation** is caused by a mutation in the *F5* gene, which prevents normal production of the factor V needed for clotting. The factor V Leiden mutation is one of the most frequently hereditary thrombotic disorders. The pathophysiology of *F5* gene mutation leads to the production of a factor V Leiden variant that resists inactivation by protein C, which is an anticoagulant protein. It acts as its own barrier against inactivation by anticoagulants such as warfarin. Individuals carrying a factor V Leiden mutation are more at risk of DVT and PE than people without this mutation.

A **prothrombin G20210A mutation** is a mutation that involves changes to the prothrombin (F2) gene, resulting in higher prothrombin levels, an essential clotting factor. High prothrombin levels contribute to blood clot formation by amplifying the coagulation cascade. Individuals carrying the prothrombin G20210A mutation have an increased risk of venous thromboembolism. Prothrombin G20210A carriers may also have an increased chance of DVT and PE, often in response to environmental influences like oral contraceptive use or pregnancy.

Venous Thromboembolism

In **deep vein thrombosis (DVT)**, a type of venous thromboembolism (VTE), a blood clot forms within a deep vein, most commonly in the leg or pelvis. This happens when blood clots form within the vessels of muscles as opposed to superficial veins of the skin. Pooling of the blood within the veins occurs, creating soreness, redness, and pain (Figure 16.4). Risk factors include immobility; surgery or trauma; certain medical conditions such as cancer, obesity, and inflammatory disorders; and other conditions that damage vessels. An unprovoked occurrence of DVT is typically linked to an inherited disorder. Genetic mutations involving factor V Leiden or prothrombin can increase the risk of incorrect clotting (Ginsberg et al., 2019).

FIGURE 16.4 With deep vein thrombosis, blood pools in the peripheral veins due to thrombosis. (credit: "Behçet's Syndrome and Thrombosis" by E. Seyahi & S. Yurdakul/National Library of Medicine, CC BY 2.0)

An untreated DVT may lead to serious health complications, including PE, and become a medical emergency. A clot that migrates from the deep veins and occludes the pulmonary arteries has a mortality risk of 25 percent (CDC, 2023).

A **pulmonary embolism (PE)** is a medical emergency caused when a blood clot from DVT migrates through the circulatory system and lodges itself within a pulmonary artery in a lung, blocking off oxygen and potentially leading to life-threatening consequences (Figure 16.5). Risk factors for PE include a previous history of PE or DVT, as well as immobility, prolonged bedrest after surgery, surgery itself, cancer, and chemotherapy; genetic mutations and medications that can cause blood clots are also risk factors for PE.

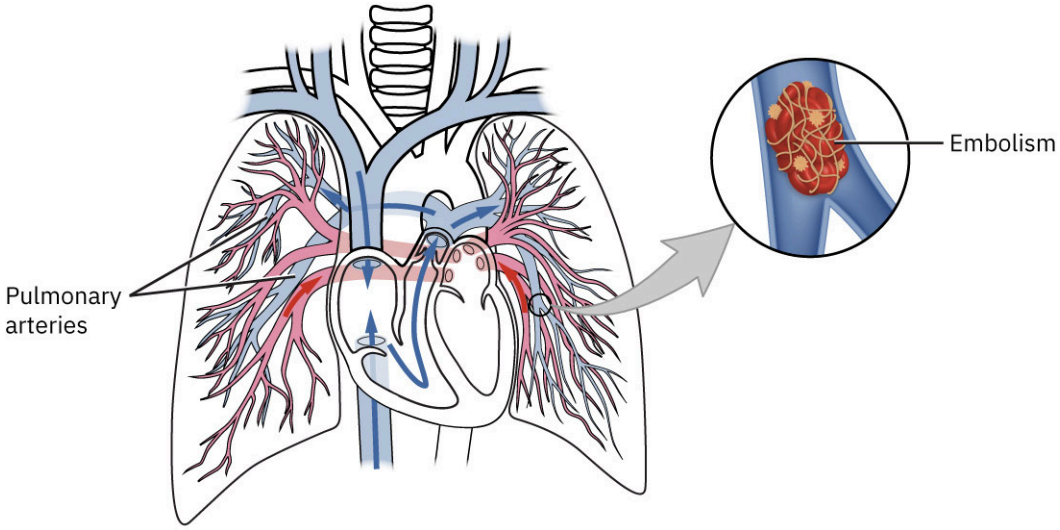

FIGURE 16.5 With a pulmonary embolism, a blood clot breaks free and travels through the circulatory system to the lungs, where it lodges in a pulmonary artery. (attribution: modification of work *from Anatomy and Physiology*, OpenStax, under CC BY 4.0 license)

Clinical Manifestations of VTE

Common symptoms of DVT include pain or tenderness of the leg or calf on the affected side, as well as swelling, edema, warmth, and redness. Complications can happen if the blood clot loosens and travels through the

bloodstream as an **embolism**. This can cause a pulmonary embolism in the lung, stroke if lodged in the brain or carotid arteries, or heart attack if lodged in the coronary artery.

The clinical presentation of a PE needs to be recognized quickly by a nurse because the prognosis is poor if oxygen is blocked within the lung and cannot perfuse into the main circulation. Symptoms include sudden shortness of breath, anxiety, chest pain that is sharper with inhalation, tachycardia, exertional dyspnea, cough with possible bloody sputum, sweating, dizziness, and disorientation (Ouellette, 2020). The complications from PE can be life-threatening because the clot blocks blood flow to the lungs, creating an increase in pulmonary artery pressure, which affects the right heart. Consequently, PE can exacerbate right-sided heart failure, leading to poor cardiac output and death.

Diagnostics and Laboratory Values of VTE

The most common diagnostic imaging tool for identifying DVT is ultrasound, which is noninvasive and allows providers to visualize the blood flow within a patient. A venous duplex is an ultrasound that examines for patency of veins in the legs. Coagulation laboratory studies can also look at the following factors relevant to clotting:

- **partial thromboplastic time (PTT)**: measures the intrinsic clotting cascade and the time it takes blood to clot. It is often used to measure the therapeutic effectiveness of heparin treatment. The normal range is 18–24 seconds.
- **prothrombin time (PT)**: uses extrinsic clotting factors to measure the time it takes for blood to clot. The normal range is generally 9–12 seconds.
- **international normalized ratio (INR)**: a standard measurement of PT that is used across different laboratories, because many laboratory values for PT and PTT may vary. The INR is also used to measure the therapeutic range of coagulation. The normal ratio is 1:2 (Favaloro, 2017).

Diagnosis of a PE should be quick for best patient outcomes. Imaging studies are helpful in visualizing the blood clot within the lungs. Computed tomography pulmonary angiography can visualize the pulmonary arteries within minutes to help expedite a diagnosis. Other laboratory work is slower but can include clotting factors, CBC count, PT, PTT, and INR. A laboratory test that has been done for decades but is now known to be less specific is the **D-dimer test**, which measures a protein in the blood created when a clot dissolves. A normal D-dimer result is considered less than 0.50 (Bounds & Kok, 2023). An elevated D-dimer result may indicate the presence of a blood clot or clotting disorder (Cleveland Clinic, n.d.). Current recommendations endorse using this test simply as a qualitative test when there is a low suspicion of PE (Bounds & Kok, 2023).

Nursing Care of the Patient with VTE

Treatment goals include managing the symptoms of existing clots and preventing further clot formation. Common interventions include administering anticoagulant medicines (blood thinners) to avoid additional clotting (Peck & Brown, 2020). Nursing interventions also include monitoring the patient's vital signs, assisting with airway and breathing, sitting the patient up in bed, and educating the patient about their condition.

Recognizing and Analyzing Cues

Nurses must remain diligent when it comes to monitoring patients for cues of excess blood clotting. To obtain cues, the nurse should complete a medical history, including any family history of clotting disorders, and examining risk factors—especially for those undergoing surgical procedures and for high-risk populations. Timely recognition of signs and symptoms along with collaboration among health-care providers allows prompt diagnosis and intervention in individuals at higher risks of blood clots. Education and preventive measures are also essential components of nursing care for these high-risk groups.

Completing a thorough physical exam can help the nurse identify cues such as warmth or redness in the lower legs or sudden respiratory problems that may be indicative of a DVT or PE. Laboratory work should be reviewed for clotting levels, including PT, PTT, and INR. Nurses should assess for changes in skin color and temperature, sudden chest pain worsened by deep breathing or movement, tachycardia, cough, hemoptysis, and laboratory studies (Anderson et al., 2021). One endorsed mnemonic to consider when assessing for the possible presence of DVT are the 6Ps: pulselessness, pallor, pain, perishingly cold, paresthesia (numbness), and paralysis. Capillary refill may be delayed by longer than 2 seconds. For recognizing PEs, a combination of subjective and objective complaints should be analyzed. The patient may appear pale, work harder to breathe at rest, appear anxious, or have a drop in their

oxygen saturation level during ambulation. Vital signs may demonstrate tachycardia and may or may not show hypoxia.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

The priority of care in patients with VTE is maintenance of hemodynamic stability and oxygenation. Patients with DVT should maintain bed rest and avoid further ambulation; the latter may promote clot migration. The nurse should avoid massage or rubbing the affected extremity, and the patient should be instructed to abstain from this also. The nurse should also perform a neurovascular assessment (using the 6Ps) and monitor capillary refill every shift—more frequently if the patient underwent an interventional procedure to surgically break down the clot.

Patients with acute PE tend to have a higher degree of symptom burden in regard to airway and breathing. Supplemental oxygen and putting the head of the bed up to high Fowler's position (i.e., sitting up with spine straight) can assist with ventilation and oxygenation.

First-line therapies for acute VTE management include the initiation of blood thinners, either through the IV infusion of heparin or the administration of subcutaneous, low-molecular-weight heparins or direct oral anticoagulants (DOACs). Patients with a PE may require step-down or intensive care unit (ICU) level of care, with cardiac telemetry and frequent hemodynamic monitoring if there is a significant clot. Identification and treatment of atrial dysrhythmias put patients at risk for VTE occurrence.

Patients who have potential risks for thrombotic disorders should be educated about the risks of smoking while taking oral contraceptives or undergoing hormone replacement therapy, and should be discouraged from smoking while using oral contraceptive therapy. The vasoconstriction from nicotine in addition to the increased viscosity of blood from hormonal contraceptives may put a woman at risk for a pulmonary embolism or DVT. Patients with a hereditary thrombotic disorder may need to explore other methods of birth control to reduce risk of a thrombotic event. During assessment, nurses must interview patients to determine if there is any family history of thrombotic disorders. Patients with factor V Leiden will require lifelong anticoagulant therapy.

VTE prophylaxis is considered a standard of care in medical-surgical nursing. To decrease the risk of VTE occurrence, nurses may use a **sequential compression device (SCD)**, which uses sleeves that fit over a patient's legs and intermittently inflate and deflate to assist with blood mobilization in the legs (Figure 16.6). SCDs should never be used if the patient already has a DVT, because the pressure could dislodge the clot into circulation and increase the risk for PE, stroke, or heart attack. Prophylaxis also includes applying compression hose that help with venous return and decreasing edema. Early mobilization is also a part of the nursing care plan, along with frequent ambulation or with passive range of motion exercises. Adequate hydration and frequent mobilization also help prevent VTE occurrence. Nurses should also provide education on pharmacological therapies, which may be short term (e.g., 6 months) or longer.

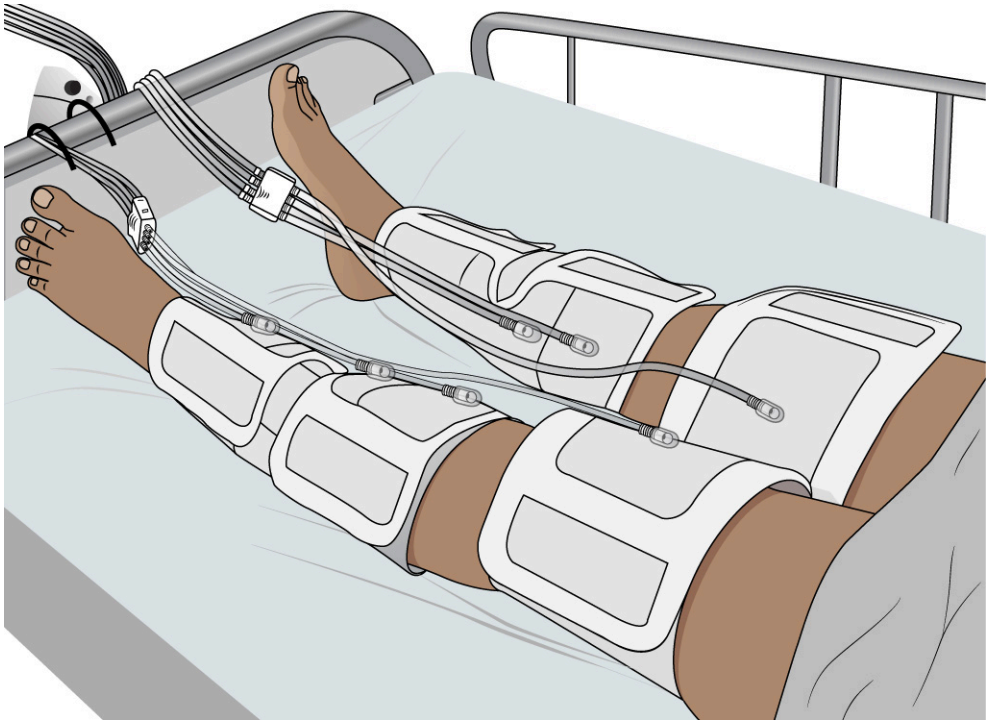

FIGURE 16.6 Sequential compression devices wrap around the patient's legs and intermittently inflate and deflate. This assists with mobilizing blood when the patient is bed-bound. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Evaluation of Nursing Care for the Patient with VTE

As part of the nursing process, reevaluation is an important step to identify how the plan of care should be modified, if needed, based on the patient's response to treatments and interventions. The nurse should evaluate the progress and patient response to nursing interventions for common problems seen in thrombotic disorders. Evaluating trends for impaired gas exchange, pain, impaired mobility, and risks of infection and bleeding can alert the nurse to take action.

Evaluating Outcomes

Evaluation of nursing care may depend on the acuity or chronicity of the VTE. Examples of improvement include

- Patient will report decreased shortness of breath and exhibit normalization of respiratory rate and oxygen saturation levels.
- The patient will identify risk factors that promote VTE occurrence, such as smoking and concurrent use of oral contraceptives or hormone replacement therapy.
- The patient will report decreased pain, swelling, warmth, and redness of the affected extremity.
- The patient will verbalize the importance of adherence to anticoagulation therapy.

Medical Therapies and Related Care

Treatment involves targeting the root cause of the thrombotic disorder, providing replacement clotting factors if applicable, or taking anticoagulant drugs as appropriate based on each disorder's individual presentation. The most frequently used anticoagulants include heparin, warfarin, and apixiban. For chronic management, the choice of medication should be made collaboratively with the patient to ensure compliance and ease of administration, as well as consideration of cost. Historically, warfarin was the common drug of choice; however, it requires frequent blood monitoring. Newer DOACs do not require surveillance with bloodwork, but they may be more expensive.

16.7 Blood Products and Transfusion Principles

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the physiology of the antigen response with blood types
- Identify examples of blood products
- Explain the legal and ethical implications of administering blood products
- Describe the pertinent nursing assessments included in the care of a patient receiving a blood transfusion

A **blood transfusion** is a medical procedure involving the transfer of blood or its components from one individual (donor) to another individual (recipient). Blood transfusions have been performed for centuries (Figure 16.7). The first recorded transfusion was attempted in 1628, shortly after an English physician discovered the process by which blood circulates through the body (AABB, n.d.). Unfortunately, many early blood transfusions failed; practitioners were not aware of the differences of blood types. Once scientists identified the ABO system of blood types, in the early 20th century, transfusions became much safer because providers could ensure that patients receive only compatible blood.

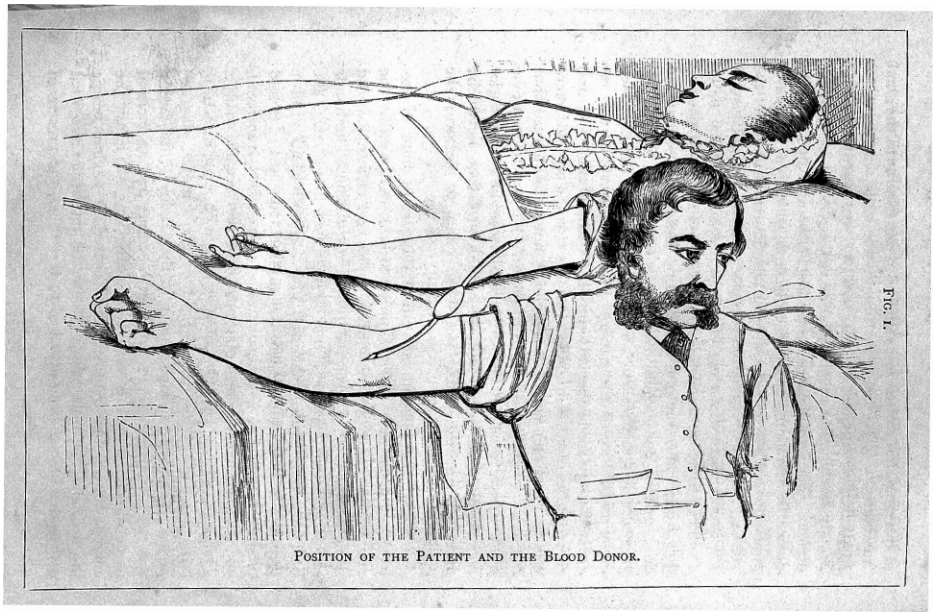

FIGURE 16.7 This illustration from a 19th-century English medical journal shows a man giving blood to a sick woman via a direct transfusion. (credit: "Immediate transfusion in" by J. H. Aveling/Wellcome Images, CC BY 4.0)

Blood transfusion protocols must adhere to stringent specifications to guarantee patient safety, including compatibility testing, proper storage, observance of expiration dates, and close supervision during administration. Transfusions may be administered based on clinical indications as well as tailored to a patient's unique medical conditions. Advances in blood component separation and processing techniques continue to enhance both the safety and efficacy of these processes.

Blood Typing and Antigen Response

ABO blood typing is a laboratory procedure used to ascertain an individual's blood type based on the different antigens (proteins) on the surface of the RBCs. The **ABO system** classifies these antigens into four main blood types: A, B, AB, and O. This test is essential in blood transfusion procedures to ensure compatibility between donor's and recipient's blood types. Blood typing is critical because if incompatible blood is given, the immune system treats the donor cells as if they were foreign invaders and attacks them accordingly. Mismatching of blood products has profound physiological effects if not done so correctly; a catastrophic effect of a severe immune response could have dire consequences, even death.

Table 16.6 lists the types of blood products that are compatible with each blood type (Poh et.al., 2021). Note that recipients with type AB blood can receive blood from any donors, and donors with type O blood can give blood to recipients of any blood type.

Blood Product	Recipient Blood Type	Donor Blood Type	Rh Compatibility
Red blood cells	A B AB O	A, O B, O AB, A, B, O O	Rh-negative patients must receive Rh-negative RBCs. Rh-positive patients must receive Rh-positive RBCs.
Plasma	A B AB O	A, O B, O AB, A, B, O O	Not applicable
Platelets	The same blood type is preferable but not necessary.		Rh compatibility is preferable but not necessary.
Cryoprecipitate (clotting proteins)	The same blood type is preferable but not necessary.		Not applicable

TABLE 16.6 Blood Products by Type

Examples of Blood Products

Recall that blood is composed of fluid (plasma, which contains clotting factors, electrolytes, and nutrients) and the three major formed elements (RBCs, WBCs, and platelets). These components can be separated and given as treatment for specific medical deficiencies. Table 16.7 outlines the major blood products for each component (American Red Cross, 2021).

Blood Product	Component	Indications	Storage
Packed red blood cells	RBCs, some plasma, and platelets as whole blood	For anemia resulting from blood loss, surgery, trauma, or medical conditions such as sickle cell disease	Typically stored refrigerated; have a shelf life of ~42 days
Fresh frozen plasma (FFP)	Plasma that contains clotting factors, proteins, and electrolytes	Corrects coagulation deficiencies, such as those caused by liver disease, massive transfusions, or clotting factor deficiencies	Frozen within 8 hours of collection and typically stored for up to 1 year
Platelets	Concentrated platelets with less plasma	For conditions with low platelet counts, such as leukemia, chemotherapy-induced thrombocytopenia, or platelet function disorders	Stored at room temperature with a shorter shelf life compared with other blood products (up to 5 days)
Cryoprecipitate	Derived from FFP; contains high concentrations of clotting factors, including fibrinogen	To treat bleeding disorders, particularly those related to fibrinogen deficiencies, such as in cases of trauma, surgery, or liver disease	Frozen within 8 hours of collection and typically stored for up to 1 year

TABLE 16.7 Blood Products and Components

Blood Product	Component	Indications	Storage
Albumin	Albumin, which is a protein-rich component of plasma	Used to treat hypovolemia, burns, or conditions for which plasma volume expansion is required	Stored at room temperature; has a longer shelf life compared with other blood products; provided in a glass bottle
Granulocyte transfusions	Granulocytes, which are a type of WBC	For severe infections or neutropenia in which the patient is not responding to antibiotics	Have a short shelf life; typically administered shortly after collection

TABLE 16.7 Blood Products and Components

Nurses need to understand the rationale for administering each blood product and the rationale for type and crossmatch. Transfusion reactions must be avoided, so donated blood must be compatible with the blood of the patient who is receiving the transfusion (Andiç, 2022). More specifically, the donated RBCs must lack the same ABO and Rh D antigens that the patient's RBCs lack (Andiç, 2022). For example, a patient with blood group B can receive blood from a donor with blood group B, because they lack the A antigen, or they can receive from blood group O because donors with blood group O lack all ABO blood group antigens (Andiç, 2022). Proper blood administration protocols must be followed exactly to avoid the devastating aftermath of mismatch transfusions.

If a patient has a low platelet level but is at risk for fluid volume overload, administering a smaller volume of 50 mL of cryoprecipitate is better than administering a full unit of whole blood (which is approximately 240 milliliters). If a patient's blood pressure, Hb, and Hct values are low and the laboratory values of platelets are within the normal range, then the volume of whole blood is the better choice. If the Hb, Hct, and vital signs are stable and a provider orders a unit of blood for transfusion, the nurse may need to call the provider and clarify the order.

READ THE ELECTRONIC HEALTH RECORD

Laboratory Values after PRBCs

The nurse is caring for a patient who reports feeling weak and tired all the time. The patient has a history of right-sided congestive heart failure, atrial fibrillation, and anemia. The nurse notes atrial fibrillation on the telemetry monitor. The provider ordered two units of PRBCs, each unit to be infused over 4 hours. Laboratory values show the following:

Laboratory Values	Normal Range	Result
Hct	37–52	↓ Hct: 22.4%
Hb	12–18	↓ Hgb: 6.9 g/dL
Blood urea nitrogen	4–10	↑ 21 mg/dL
WBCs	5–10	↑ 10,000/μL
Platelets	150–400	300,000/μL
Creatinine	0.6–1.2	↑ 1.8 mg/dL

TABLE 16.8 EHR

Laboratory Values	Normal Range	Result
Potassium	3.5–5.0	3.7 mEq/L
Sodium	135–145	137 mEq/L

TABLE 16.8 EHR

1. What information on the electronic health record concerns you?
2. Are any of these findings expected?
3. Is there any information you should question?

Legal and Ethical Implications

Nurses should be aware of the following legal and ethical considerations regarding blood transfusion. These considerations ensure the standards of care are followed and care takes place safely, responsibly, and with due regard for individuals' rights and well-being.

- Informed consent: Prior to administering blood transfusion services, health-care providers must obtain informed consent from either the patient or the patient's legal representative. Informed consent ensures that patients understand all potential risks, benefits, and alternatives associated with any procedure or health-care service offered to them. Respect for patients' autonomy and right to make informed health-care decisions are vital elements of ethical standards of care. Health-care providers must communicate clearly and transparently, providing accurate information for patients to make educated decisions based on facts (INS, 2024). The role of the nurse is to advocate for the patient and witness the consent, ensuring the information was provided in a manner the patient fully understands before the consent form is signed.
- Testing and screening: Blood donors must undergo stringent screening and testing protocols to guarantee safe blood donation practices. Legal regulations govern testing procedures to safeguard transfusion patients against infectious disease transmission through transfusions. Assuring blood product safety also reflects the ethical obligation to shield patients from potential harm. Rigorous testing is essential to safeguarding the health-care system and limiting disease transmission.
- Blood donation policies: Legal frameworks dictate who can donate blood and under what conditions. These regulations may include age and health requirements as well as restrictions based on recent travel or high-risk behaviors. From an ethical perspective, blood donation policies attempt to strike an appropriate balance between meeting an adequate blood supply while protecting donor and recipient well-being. Fairness in donation policies is vitally important in upholding public trust.
- Privacy and confidentiality: Information related to blood transfusions is protected under privacy legislation, offering legal certainty regarding data handling practices. Health-care providers must abide by stringent confidentiality standards. Respecting patient privacy is an ethical imperative and helps develop trust between health-care providers and patients. Protecting sensitive health information is critical for maintaining individuals' dignity and confidentiality. Legal frameworks may recognize religious or cultural exemptions to certain medical procedures, including transfusions. Health-care providers must navigate these exemptions while upholding patient safety.
- Reporting adverse events or complications: This may be legally mandated, but there are ethical considerations as well. Transparent reporting of adverse events creates an atmosphere of accountability and learning that makes possible continuous improvement of blood transfusion practices to protect patient safety and mitigate risks.
- Resource allocation: A network of local, state, and national guidelines regulates the dispersal of blood products. Ethical considerations begin with the limited supply of blood products. How should providers determine who receives a product if the demand exceeds the supply? How much should products cost, and what role, if any, should cost play in determining whose needs are met?

CULTURAL CONTEXT

Cultural and Religious Beliefs Regarding Transfusions

Ethical nurses consider the cultural diversity and religious beliefs of their patients when providing health care. Some religious groups do not accept blood transfusions. For example, Jehovah's Witnesses believe the Bible prohibits consumption of blood (Pavlikova & van Dijk, 2022). From their perspective, most believe receiving a blood transfusion, even in life-threatening cases, would violate this prohibition (Pavlikova & van Dijk, 2022). Providers must be prepared to offer alternative interventions that do not use blood products. For example, a bolus normal saline fluid may be used to maintain blood pressure, and the hormone epoetin may help stimulate natural bone marrow production of RBCs.

Nursing Care of the Patient Receiving Blood Products

Though an everyday nursing procedure, administering blood transfusions requires close monitoring to ensure patient safety and well-being. The following are key nursing interventions for blood transfusions:

- Patient assessment: Assess the patient's baseline vital signs such as temperature, heart rate, blood pressure, and respiratory rate before starting the transfusion process. This information will enable you to quickly notice any deviations that indicate a potential reaction to the transfusion. Document any signs or symptoms of anemia or other conditions necessitating transfusion. The nurse ensures all appropriate informed consent forms are comprehensively completed by the patient or their legal representative prior to the transfusion procedure. The nurse should also educate the patient and their caregivers about the blood transfusion processes, including the purpose, risks, and benefits, to ensure an optimal experience during the blood transfusion.
- Blood product verification: Institutional policies require two registered nurses to implement the verification. The nurses should confirm the patient demographics, medical record number, signed consent form, the blood product type, the registered number that is applied to the product, and the product expiration time and date.
- IV access: Establish IV access and ensure patency before retrieving the blood product. The specialized filtered tubing made for blood products is called Y tubing. It allows a unit of the blood product to be hung on one side of the tubing and normal saline to be on the second side of the Y. Typical IV gauges used for routine or nonurgent transfusions are 20–22 gauge for adults, whereas 16–18 gauge or central venous catheters are preferred for rapid administration (Lotterman & Sharma, 2023). Access assessment is critical because blood products must be administered within a certain time once arriving on the patient's floor.
- Patient monitoring: Before, during, and after the transfusion, the patient should be monitored carefully. Assessments typically occur within the first 15 minutes after the transfusion, then hourly and at the completion of the transfusion (Lotterman & Sharma, 2023). Delivery of the blood differs between patients, depending on the perfusion requirements and how well the patient can handle volumes. Patients with a history of heart failure may require a slower transfusion due to an impaired heart ventricle that cannot tolerate fast infusions. In contrast, patients with active hemorrhage may receive blood products more rapidly, as prescribed.

REAL RN STORIES

Nurse: Nancy, BSN
Years in Practice: Forty-five
Clinical Setting: Surgical step-down unit
Geographic Location: Washington, DC

I have been a nurse for a long time! I remember giving blood in the 1980s before HIV was identified. Before the blood-transmitted virus was identified, our blood transfusion delivery was much less strict. The testing and safety measures for any unit of donated blood were less stringent. It has been interesting to watch the evolution of a much more detailed process for blood donations and administration. Although it takes the nurse much longer to prepare

and administer a single unit of PRBCs, it is satisfying to know the blood we are giving a recipient has been strictly screened for a myriad of potential problems. Blood is life, but giving the wrong blood can be death!

Recognizing and Analyzing Cues

The most critical cues for a nurse to be aware of during a transfusion is for a transfusion reaction within the first 15 minutes of transfusion (Bates & Owusu-Ofori, 2020). Table 16.9 lists important cues by body systems.

System	Cues
Neurologic	Dizziness, anxiety, localized pain Disorientation if the reaction develops into shock
Integumentary	Flushing, itching, hives, chills Edema if the reaction is due to fluid volume overload
Respiratory	Wheezing, shortness of breath, dyspnea
Cardiac	Tachycardia, hypotension, shock
Gastrointestinal	Nausea, abdominal pain
Genitourinary	Dark or blood-tinged urine, hematuria, lower back pain
Renal	Hematuria, hemoglobinuria

TABLE 16.9 Most Common Transfusion Reaction Cues by Body System

There are different types of reactions to a blood transfusion. Treatment varies depending on the cause (Cleveland Clinic, n.d.).

- A **febrile nonhemolytic reaction**: This is the most prevalent reaction type. It usually manifests through an increase of 1° in temperature over baseline. When this happens, patients typically receive acetaminophen for treatment before returning for further transfusion if deemed safe by their medical provider.
- An **allergic reaction**: This happens when there is an allergy to one or more proteins present in donor blood. Symptoms may range from mild irritation to serious anaphylaxis (which is rare). Most often, this reaction will not require disrupting transfusion, because diphenhydramine may provide sufficient relief.
- An **acute hemolytic reaction**: This reaction, typically due to an administrative mistake, is caused by an ABO mismatch between donor and recipient. The patient may complain of low back pain, itching, or increased body temperature. It can lead to serious symptoms, including low blood pressure and shock, hemoglobinuria, nausea, vomiting, pain, chills, and fever. The patient can show extreme distress, including hypotension from shock as well as nausea, vomiting, chills, fever, and **hemoglobinuria** (the breakdown of Hb in the urine).
- A **delayed hemolytic reaction**: Most transfusion reactions happen within 15 minutes of transfusion. If the reaction happens after 15 minutes, it is considered delayed. Delayed hemolytic reactions manifest with similar clinical symptoms as other transfusions.
- A **septic reaction**: Septic reactions arise when blood products, particularly platelets, are improperly stored and become contaminated. Shortly after the transfusion, patients may exhibit signs of severe infection, including high fever, chills, hypotension, and tachycardia, as well as nausea, vomiting, dyspnea, and even cardiovascular collapse. Septic transactions usually happen within hours or soon after blood transfusion has taken place.
- A **transfusion-related acute lung injury (TRALI)**: Transfusion reactions can often result in acute respiratory distress syndrome due to an immune response between donor antibodies and antigens in a recipient, which triggers mediator release, resulting in pulmonary edema and causing rapid tissue swelling. Signs and symptoms manifest during or shortly after transfusion; they include respiratory distress symptoms such as shortness of breath. On physical assessment, the patient may have rales in the lung fields.

- A **transfusion-associated circulatory overload (TACO)**: This reaction happens when fluid volumes exceed expectations. Symptoms include shortness of breath and coarse lung sounds. This condition could also include possible widespread edema. Patients with background heart failure may receive a dose of diuretics, such as furosemide, to mitigate this reaction.

LINK TO LEARNING

A further explanation of the differences between TACO and TRALI (https://openstax.org/r/77TACOTRALI) is given in this video.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

When administering a blood transfusion, nurses use clinical judgment and critical thinking to identify a transfusion reaction. Prioritizing actions is critical to avoid serious complications. For example, knowing the patient's baseline vital signs and clinical status are key to be able to compare baseline values with any changes throughout the transfusion. Immediately stopping the blood transfusion when a reaction is occurring is important. Knowing the steps to take to stop a transfusion reaction helps the nurse generate solutions and act quickly:

- Stop the transfusion.
- Disconnect the blood tubing and flush the patient's IV with normal saline.
- Prime new IV tubing with normal saline and infuse at a lowered rate to keep the vein open (typically 20 mL/h).
- Notify the provider.
- Monitor the patient's vital signs and remain with the patient.
- Prepare to obtain blood and urine specimens from the patient to send to the laboratory.
- Send the used blood bag and IV tubing to the blood bank for further testing.

Evaluation of Nursing Care for the Patient Receiving Blood Products

Evaluating nursing care for patients receiving blood products is essential to ensure both safety and effectiveness during a transfusion. Evaluation involves gauging a patient's response to the transfusion, observing for any possible complications, and quickly responding to any issues as soon as they arise. The following are key questions to ask during evaluation:

- Did the patient's vital signs remain stable during administration of blood products? Did they normalize after the transfusion?
- Did the patient's blood Hb, Hct, platelets, and RBC levels return to target norms?
- Does the patient report improvement in fatigue?
- Did the patient tolerate the blood transfusion without any incidence of transfusion reaction?

By conducting systematic nursing care evaluations before, during, and after blood transfusions, nurses can identify any problems, respond quickly to complications that arise, and promote patient safety and well-being. Continuous quality improvement efforts further optimize this process and the patient outcome.

Summary

16.1 Anemias

- Anemia is a deficiency of red blood cells (RBCs) or hemoglobin (Hb). It impairs the blood's oxygen-carrying capacity. Clinical signs and symptoms of anemia include fatigue, weakness, pale skin, and shortness of breath. Pathophysiology of anemia includes nutritional deficiencies, chronic diseases, genetic factors, and chronic bleeding.
- Diagnostics and laboratory values include a variety of blood tests and a physical examination to identify manifestations of the disorder and diagnose the cause. The main diagnostic is a hemogram, a detailed analysis of a blood sample that examines not only the quantity of RBCs, WBCs, and platelets but also their size and color and the percentage of iron in them.
- Nursing care for patients with anemia involves regular monitoring of vital signs and review of hematology laboratory tests. Management of symptoms includes helping the patient conserve energy effectively. Medication administration includes nutritional supplements and erythropoietin as ordered. Blood products may also be administered when necessary. Patient education is provided on diet, lifestyle modifications, and adherence to medications. Nurses also provide emotional support by providing resources and acknowledging the patient's fatigue.
- To evaluate the effectiveness of nursing interventions, the desired goal must first be identified and then compared with the outcomes. The following are a few examples of outcomes the nurse would evaluate for a patient with anemia: assessing vital signs to determine if ranges are met, assessing the patient for continued syncope or altered consciousness, and identifying if there has been an improvement in overall symptoms.
- The medical therapies that apply to the care of the patient with anemia include medication administration, such as iron supplements. In severe cases, blood transfusions may be necessary.

16.2 Hereditary Disorders

- Pathology of hematological disorders includes genetics, and hereditary disorders such as sickle cell anemia (SCA) and thalassemia are common in ethnic and racial groups, such as the those of African, Mediterranean, Middle Eastern, or South Asian descent (sickle cell anemia) or Mediterranean, Asian, or African descent (thalassemia).
- Identification of these disorders includes specific diagnostic testing, such as bone marrow aspiration, complete blood cell (CBC) count, total bilirubin test, genetic testing, hemoglobin solubility test, hemoglobin electrophoresis, peripheral blood smear, and reticulocyte count.
- Nursing care is directed if the patient is experiencing an acute exacerbation or through prevention. Acute interventions include hydration, pain control, or, if required, transfusion. Chronic management may be medications, iron chelation therapy, or bone marrow transplantation.
- The efficacy of nursing care is measured by symptom control during an exacerbation, normalization of laboratory test results toward target goals (clinically driven), and prevention of complications.
- Medical treatments for patients with hereditary hematological disorders include medication administration, blood transfusions, and iron chelation therapy.
- Emphasize infection prevention measures like vaccinations and proper hygiene, given the greater susceptibility to infection associated with some hematologic disorders.

16.3 Polycythemia

- Polycythemia is an abnormal increase in the number of red blood cells in the bloodstream.
- The two types of polycythemias are primary polycythemia (polycythemia vera), which is caused by a gene mutation, and secondary polycythemia, which is caused by an external factor triggering an increase in EPO production.
- Clinical manifestations include headache, dizziness, fatigue, pruritus, and jaundice.
- Diagnosis is based on CBC count, genetic testing, and, in some cases, bone marrow biopsy.
- Treatment includes therapeutic phlebotomy, myelosuppressive medications, aspirin, anticoagulants, and JAK2 inhibitors.
- Lifestyle measures include smoking cessation, adequate hydration, and regular exercise and nutrition to support normal RBC production.

- Nursing actions include medication administration, patient education, identification of complications, collaborative care, and monitoring of laboratory tests.

16.4 Thrombocytopenia

- Thrombocytopenia is a hematologic disorder with the hallmark feature of decreased platelet count, which increases the risk of bleeding.
- The causes of thrombocytopenia include immune-mediated destruction, decreased platelet production, and increased consumption of platelets.
- Nursing actions for patients with thrombocytopenia include frequent monitoring of vital signs and assessing any signs of bleeding. Monitoring laboratory results of platelet counts is crucial to awareness of trends of improvement or decline.
- Patient education must include bleeding precautions, such as using a soft toothbrush, and injury prevention. Patients must be taught to notify their provider of any increase in bleeding.
- Medical treatments include corticosteroids and immunosuppressive drugs for immune-related thrombocytopenia. Intravenous immunoglobulin (IVIG) and thrombopoietin receptor agonists stimulate platelet production. Splenectomy is a last resort for chronic ITP resistant to other treatments. Platelet transfusions can be given to immediately increase platelet counts in the acute care setting. Plasmapheresis may be used to remove antibodies in HIT.

16.5 Neutropenia

- Neutropenia refers to abnormally low levels of neutrophils, a type of white blood cell that is critical to fighting bacterial and fungal infections.
- Neutropenia can be caused by chemotherapy, radiation, certain medications, bone marrow disorders, infections, autoimmune diseases, and congenital genetic mutations.
- Nursing interventions include infection prevention, assessment, and monitoring; patient education; and management of neutropenic precautions.
- Medical treatments for neutropenia include antibiotics targeting the offending pathogen, adjustment of medications that may be causing neutropenia, bone marrow stimulants, granulocyte colony-stimulating factor, bone marrow or stem cell transplantation, monitoring of laboratory test results, and overall infection control.

16.6 Thrombotic Disorder

- Two common thrombotic disorders are deep vein thrombosis (DVT) and pulmonary embolism (PE).
- A thrombotic disorder creates a blockage in a blood vessel, threatening adequate oxygen delivery to tissues.
- The pathology of thrombotic disorders includes hypoxemia and tissue hypoxia.
- Classic symptoms of DVT include redness and warmth of the affected limb, as well as pain or tenderness.
- Classic key symptoms of a PE include tachypnea, redness of sputum, difficulty breathing, especially on exertion, disorientation, and anxiety due to lack of oxygen to the brain.
- Nursing actions include completing a thorough medical history and physical exam, stabilizing breathing, notifying the provider of changes, monitoring vital signs, preparing the patient for diagnostic studies, and administering anticoagulant medications as ordered.
- Medical treatment is focused on identification of the thrombus and use of anticoagulants.

16.7 Blood Products and Transfusion Principles

- Blood typing is a necessary safety procedure because the antigen response differs among blood types.
- Examples of blood products include PRBCs, plasma, FFP, cryoprecipitate, and proteins, such as albumin, which can each be given separately depending on the patient's specific need.
- A type and crossmatch of blood ensures the recipient of a blood donation receives the correct ABO match and as well as the least possible risk of adverse reactions.
- There could be cultural considerations that spill into the ethical and legal protections when administering blood products. Informed processes are in place to respect these.
- Nursing assessments of the patient's tolerance of administered blood products are required before, during, and after administration and are critical to ensure the safe administration of blood.
- Blood transfusion reactions can be caused by improper handling and storage of blood products,

incompatibility, contamination, and fluid overload.
- Safe transfusion is a priority in patient care.

Key Terms

ABO system categorization of blood into four main types—A, B, AB, and O—based on the different antigens on the surface of red blood cells

acute hemolytic reaction transfusion reaction due to an ABO mismatch, which can lead to serious signs and symptoms, including low blood pressure and shock, hemoglobinuria, nausea, vomiting, pain, chills, and fever

alcoholic thrombocytopenia condition in which excessive alcohol consumption results in decreased platelet count in the blood, leading to decreased clotting mechanisms and increasing the risk for bleeding and bruising

allergic reaction transfusion reaction due to an allergy to one or more proteins present in donor blood; symptoms may range from mild irritation to serious anaphylaxis

anemia medical condition characterized by deficient production of red blood cells or of hemoglobin

blood transfusion medical procedure involving the transfer of blood or its components from one individual (donor) to another individual (recipient)

bone marrow aspiration test to verify the presence of sickle cell anemia by measuring the production of red blood cells in the bone marrow

coagulation process of a liquid (e.g., blood) changing into a semi-solid or solid condition

complete blood count (CBC) measurement of the number of red blood cells, white blood cells, and platelets in a sample of blood

D-dimer test test that measures a protein in the blood produced after the breakdown of blood clots

dactylitis hand-foot syndrome manifesting as swelling (edema) and pain of the hands and feet during a sickle cell crisis

deep vein thrombosis (DVT) medical condition marked by the formation of blood clots within deep veins in the legs

delayed hemolytic reaction transfusion reaction that happens more than 15 minutes after transfusion, with similar symptoms to other types of reactions

disseminated intravascular coagulation (DIC) acquired disorder that activates the clotting cascade, using up all the clotting factors and resulting in a mix of clotting and bleeding

embolism blood clot that has come loose and can travel through the body

erythropoiesis hemoglobin production

erythropoietin (EPO) hormone made in the kidneys that stimulates bone marrow to produce red blood cells

factor V Leiden mutation disorder caused by a mutation to the *F5* gene, which prevents normal production of the factor V needed for clotting

febrile nonhemolytic reaction most prevalent type of transfusion reaction, usually manifesting as an increase of 1° in temperature over baseline

fibrinolysis breaking down of blood clots after they form

folate-deficiency anemia type of anemia in which inadequate levels of the vitamin folate within the body cause low levels of red blood cells and hemoglobin; also called megaloblastic anemia

hematopoietic system body structures responsible for the formation of blood cells

hemoglobin (Hb) protein in red blood cells that is key to the transport of oxygen from the lungs to cells and tissues

hemoglobin electrophoresis test to diagnose sickle cell anemia by distinguishing different forms of hemoglobin to detect the form and characteristics of sickle-shaped red blood cells

hemoglobin solubility test quick screening method to detect sickle hemoglobin by mixing blood with a reducing agent to inactivate hemoglobin and form characteristic crystals

hemoglobinuria breakdown of hemoglobin in the urine

hemogram detailed analysis of a blood sample that examines not only the quantity of red blood cells, white blood cells, and platelets but also their size, color, and percentage of iron

hemolysis destruction of red blood cells

hemostasis physiological process that prevents and controls bleeding

heparin-induced thrombocytopenia (HIT) immune-mediated side effect caused by prolonged use of anticoagulants like heparin

idiopathic thrombocytopenic purpura (ITP) autoimmune condition marked by an abrupt and significant drop in

platelet count, leading to increased risks of bleeding and anemia; more frequently referred to as immune thrombocytopenia

international normalized ratio (INR) standard measurement of prothrombin time that is used across different laboratories

intravenous immunoglobulin infusion therapy (IVIG) intravenous administration of antibodies collected from multiple donors to maintain a controlled immune response that fights infection without further injuring tissues damaged by idiopathic thrombocytopenic purpura

intrinsic factor essential protein needed for the absorption of vitamin B_{12} by the small intestine

iron chelation therapy therapy in which medications bind to excess iron in the bloodstream, creating a compound that can then be expelled from the body through excretion

iron-deficiency anemia anemia due to inadequate levels of iron

jaundice yellowing of the skin and sclera

mean corpuscular hemoglobin concentration (MCHC) concentration of hemoglobin in a red blood cell

mean corpuscular volume (MCV) average size of red blood cells in a sample

neutropenia medical condition marked by abnormally low levels of neutrophils

neutrophil type of white blood cell that helps fight against bacteria and fungi

pancytopenia reduction in platelets, red blood cells, and white blood cells

partial thromboplastic time (PTT) measurement of the time it takes blood to clot, based on the intrinsic clotting cascade

peripheral blood smear test enabling analysis of red blood cell shape and condition for diagnostic purposes

pernicious anemia anemia due to inadequate levels of vitamin B_{12}; also referred to as vitamin B_{12} malabsorption anemia

plasmapheresis removal, treatment, and return or exchange of blood and blood products

platelet aggregation clumping together of platelets in the blood

polycythemia hematologic condition marked by an abnormal increase in the number of red blood cells

polycythemia vera type of polycythemia that originates from the bone marrow and is caused by a genetic mutation; also called primary polycythemia

prothrombin G20210A mutation disorder caused by a mutation to the prothrombin (*F2*) gene, which results in higher levels of the clotting factor prothrombin

prothrombin time (PT) measurement of the time it takes for blood to clot, based on extrinsic clotting factors

pulmonary embolism (PE) blood clot from deep vein thrombosis that migrates through the circulatory system and lodges within a pulmonary artery in a lung, blocking off oxygen

purpura large, discolored, purple areas that may be seen throughout the body, due to internal bleeding

reticulocyte count measures the number of young RBCs in a blood sample

reverse precautions measures to avoid introducing additional pathogens to the patient

secondary polycythemia type of polycythemia caused when erythropoietin stimulation occurs as an adaptive reaction to other conditions

septic reaction transfusion reaction resulting from blood products that have been incorrectly stored and thus become contaminated

sequential compression device (SCD) external sleeves that wrap around a patient's legs and inflate and deflate to promote blood flow

sickle cell anemia (SCA) one of the many types of sickle cell diseases that causes severe anemia

sickle cell disease inherited blood disorder caused by abnormal hemoglobin production that forms red blood cells into crescent-shaped "sickles"

thalassemia group of hereditary blood disorders that affect the hemoglobin genes, leading to decreased erythropoiesis

therapeutic phlebotomy removal of excess red blood cells by reducing overall blood volume

thrombocytopenia hematologic condition characterized by decreased platelets in the bloodstream, significantly impairing the blood's ability to clot effectively; also called low platelet count syndrome

thrombopoietin protein released by the liver

thrombotic disorder condition that interferes with hemostasis, or blood clotting

thrombus clot that forms inside a blood vessel

total bilirubin test blood test that measures the amount of bilirubin in a patient's system, indicating liver strain

from the accelerated turnover of RBC cells caused by sickle cell anemia

transfusion-associated circulatory overload (TACO) transfusion reaction that happens when fluid volumes have exceeded expectations; symptoms include shortness of breath, coarse lung sounds, and possible edema formation

transfusion-related acute lung injury (TRALI) transfusion reaction manifesting as acute respiratory distress syndrome due to an immune response between donor antibodies and antigens in a recipient

vaso-occlusive crisis result of sickle cell anemia caused by constricted blood vessels and hypoxemia; also known as a pain crisis and sickle cell crisis

Assessments

Review Questions

1. What is the primary function of RBCs in humans?
   a. to carry oxygen directly to tissues
   b. to fight off infections
   c. to form clots
   d. to regulate blood pressure

2. As a nurse caring for a patient with a past surgical history of a gastric bypass, which type of anemia would the nurse anticipate the patient to be most at risk for?
   a. pernicious anemia
   b. iron-deficiency anemia
   c. hemolytic anemia
   d. folate-deficiency anemia

3. A 45-year-old female presents to the emergency room and is diagnosed with moderate anemia. What would you expect the patient's Hb level to be?
   a. 12.5 g/dL
   b. 11.7 g/dL
   c. 13.2 g/dL
   d. 9.1 g/dL

4. What clinical finding in your patient with anemia would lead you to believe that the treatment plan was working?
   a. The patient's blood pressure dropped from 116/76 mm Hg to 96/62 mm Hg during the shift.
   b. The patient's Hb increased from 8.6 g/dL to 9.9 g/dL over 8 hours.
   c. The patient is maintaining an oxygen saturation of 90% with oxygen supplementation through a 2-L nasal cannula.
   d. The patient has a delayed capillary refill.

5. What is a characteristic feature of sickle cell disease?
   a. microcytic RBCs
   b. macrocytic RBCs
   c. crescent-shaped RBCs
   d. normocytic RBCs

6. What is the primary cause of pain crises in individuals with sickle cell disease?
   a. bacterial pneumonia infection
   b. RBCs blocking blood flow to tissues
   c. increased bleeding
   d. increased bilirubin levels in the body

7. In sickle cell disease, what complication can arise due to the destruction of RBCs and release of excess bilirubin?

a. hematuria
b. splenomegaly
c. jaundice
d. thrombocytopenia

8. The nurse is caring for a patient with thalassemia who receives frequent blood transfusions. What potential complications of these transfusions should the nurse watch for? (Select all that apply.)
a. iron overload
b. hypoxia
c. hemolysis
d. thrombocytopenia
e. neutropenia

9. What is the primary feature of polycythemia?
a. elevated WBC count
b. increased platelet count
c. elevated Hb and Hct levels
d. decreased RBC count

10. In secondary polycythemia, what is a pathophysiology that causes increased RBC production?
a. decreased EPO levels
b. chronic hypoxia
c. genetic mutation
d. excess energy

11. What are appropriate nursing interventions for managing polycythemia? (Select all that apply.)
a. administering anticoagulants
b. initiating therapeutic phlebotomy
c. encouraging smoking cessation
d. administering antibiotics

12. What laboratory result would indicate thrombocytopenia?
a. increased RBC count
b. decreased platelet count
c. decreased RBC count
d. decreased plasma level

13. How do corticosteroids help to treat thrombocytopenia?
a. They directly increase platelet production in the bone marrow.
b. They inhibit immune-mediated platelet destruction.
c. They decrease clotting factors III, IV, and VIII.
d. They decrease destruction of platelets in the spleen.

14. What organ can cause platelet destruction that results in ITP?
a. liver
b. kidneys
c. spleen
d. bone marrow

15. What type of medication should the nurse expect to administer to a patient with neutropenia?
a. anticoagulant medications
b. nonsteroidal anti-inflammatory drugs
c. bone marrow stimulant

d. antacids

16. What nursing intervention is appropriate for a neutropenic patient?
a. encouraging a diet high in fresh fruits
b. administering antivirals
c. advising the patient to take very large doses of vitamin C
d. educating the patient on hand, oral, and respiratory hygiene practices

17. A patient was admitted to the emergency room with a fever and swollen lymph nodes. What additional cue would lead you to suspect that the patient has neutropenia?
a. The patient was recently diagnosed with and is being treated for candidiasis.
b. The patient recently fractured their toe.
c. The patient is a smoker.
d. The patient ran a marathon 48 hours ago.

18. What condition is a contributory risk factor for the development of DVT?
a. hypernatremia
b. prolonged immobility
c. vitamin C deficiency
d. hypothyroidism

19. What laboratory test is commonly used to assess for PE?
a. venous duplex
b. computed tomography pulmonary angiography
c. PT
d. CBC count

20. What medication(s) would the nurse anticipate for treatment of a DVT? (Select all that apply.)
a. warfarin
b. aspirin
c. low molecular-weight heparin
d. clopidogrel
e. apixiban

21. If a patient has type A blood, what type(s) of blood can the patient receive? (Select all that apply.)
a. A
b. B
c. AB
d. O

22. The nurse finds that a patient has developed a rash and lower back pain 15 minutes after receiving a blood transfusion of cryoprecipitate. What is the nurse's priority action?
a. Stop the infusion.
b. Hang 1,000 milliliters of normal saline at 100 mL/h.
c. Call the provider.
d. Send the blood bag and tubing to the laboratory.

23. The nurse started the transfusion of one unit of PRBCs. What clinical finding(s) indicate a transfusion reaction? (Select all that apply.)
a. lower back pain
b. same blood pressure as before the transfusion
c. urticaria
d. pruritus

e. wheezing

24. A trauma patient comes into the emergency room with signs of hemorrhage. Vital signs are as follows: heart rate, 130; blood pressure, 84/62 mm Hg; respiratory rate, 24 per minute; oxygen saturation, 92%. Given this clinical assessment, what IV access device should the nurse start?
   a. 18 gauge
   b. 22 gauge
   c. 20 gauge
   d. central line

25. What blood type can be donated to anyone?
   a. O
   b. AB
   c. A
   d. B

Check Your Understanding Questions

1. Identify a condition that may be complicated due to anemia, and explain why.

2. You are the nurse working with a dietitian to create a high-iron diet for your patient with iron-deficiency anemia. Describe a meal that would be a good source of iron for the patient. Explain your reasoning.

3. What nursing intervention could you suggest for someone experiencing pernicious anemia? Explain your answer.

4. What dietary supplements may be needed for patients with thalassemia?

5. Explain the difference between primary and secondary polycythemia.

6. Identify causes of secondary polycythemia.

7. A patient follows up at their annual hematology visit for polycythemia. How would the nurse evaluate that the patient is not having any complications?

8. What medical therapies would the nurse anticipate for polycythemia?

9. Identify several appropriate nursing interventions for a patient with thrombocytopenia.

10. A nurse is caring for a patient who drinks alcohol daily and has been receiving heparin. Explain how these behaviors put the patient at risk of thrombocytopenia.

11. Describe the approach used when deciding which treatment to use for patients with neutropenia.

12. Describe how you would evaluate that nursing care is effective for a patient with neutropenia.

13. Identify several assessment findings that are indicative of a PE.

14. Identify several appropriate nursing interventions for people at risk for thrombotic disorders.

15. Explain why a patient who smokes and also takes oral contraceptives is at a higher risk for VTE.

Reflection Questions

1. As a nurse, what are some key challenges associated with caring for patients with anemia? What nursing actions can help to overcome these challenges?

2. You are caring for a patient with thalassemia who has high iron levels due to frequent blood transfusions. The patient is confused about the recommended iron chelation therapy. Explain in your own words what it is and how it helps.

What Should the Nurse Do?

1. Your 16-year-old patient was recently diagnosed with SCA after experiencing a vaso-occlusive crisis. What are some ways you can evaluate how well the patient understands signs and symptoms to report to their provider?
2. You are a nurse on a medical-surgical unit caring for a patient diagnosed with polycythemia vera. You have recently witnessed sudden pain, swelling, and discoloration to their left lower leg. After conducting an assessment, you suspect there might be a deep vein thrombosis present, causing the leg symptoms. What should you do?
3. An off-duty nurse at a family function observes a loved one, known to have thrombocytopenia, sustain a fall with head trauma and a forehead laceration. What should the nurse do?
4. Describe three ways a nurse would assess the efficacy of nursing care for a patient with alcohol-induced thrombocytopenia.
5. You are the nurse caring for a patient on neutropenic precautions. You have heard from other staff nurses that a family member named Mark, who visits daily, does not follow the neutropenic precautions, and you are concerned. Today, you notice Mark is bringing several other friends into the patient's room. What should you do?
6. The nurse is caring for J.T., a 34-year-old male, trauma patient who was in a motor vehicle accident two days ago. He is now stabilized in the ICU. He has already received 4 units of PRBCs over the past 3 days. His Hb value today is 14.2 g/dL, Hct is 48%, and blood pressure is 122/80 mm Hg. The doctor has ordered another unit of PRBCs. What should the nurse do?

Competency-Based Assessments

1. Develop a teaching aid to give your patient as a supplement to VTE prevention education.

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CHAPTER 17

Nervous System and Chronic Diseases of the Nervous System

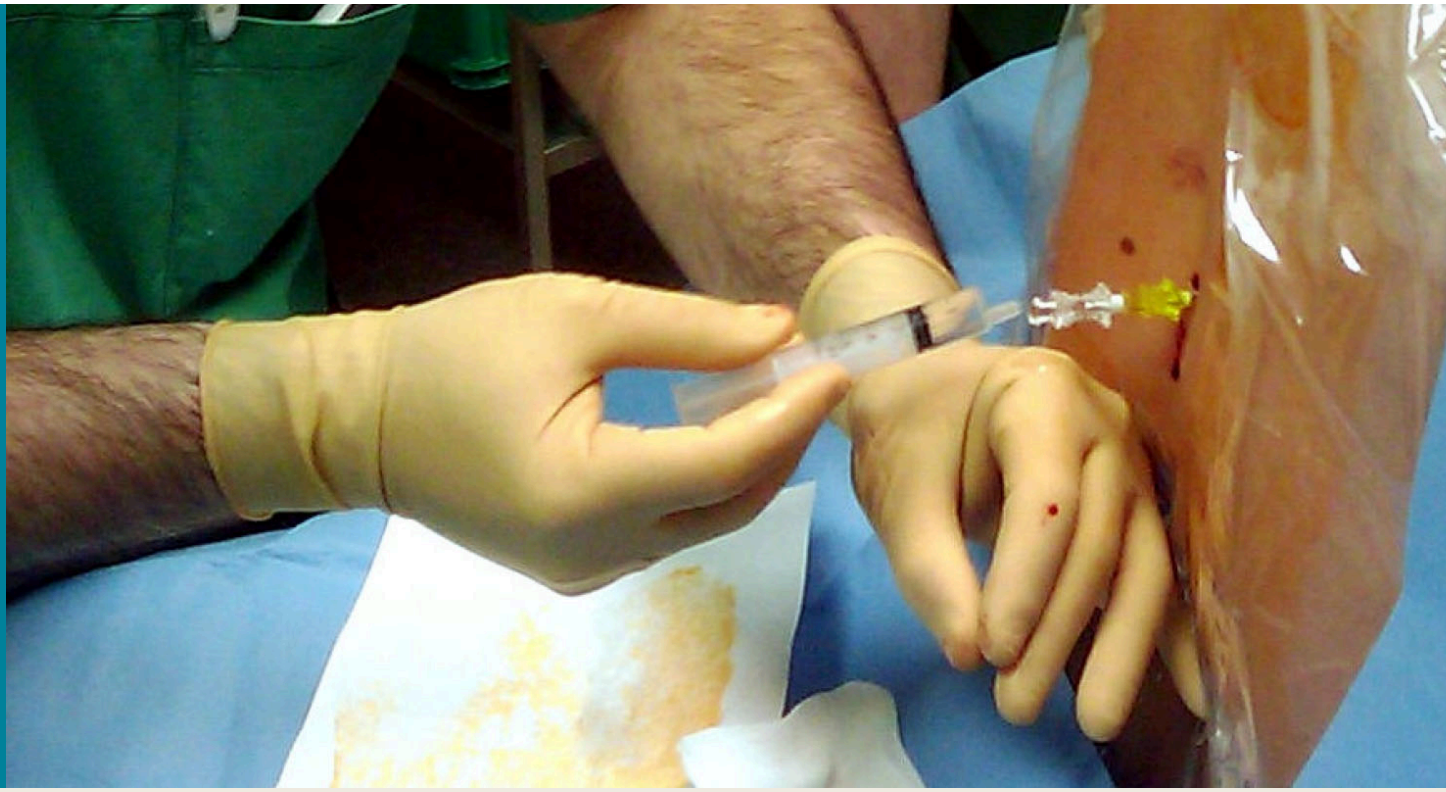

FIGURE 17.1 The structure and function of the human nervous system begins in the brain and spinal cord. The image shows a lumbar puncture, a procedure used to identify infections in the cerebral spinal fluid. (credit: modification of work from *Anatomy and Physiology 2e.* attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

CHAPTER OUTLINE

INTRODUCTION The body's communication and response systems are comprised of trillions of neurons, and billions of these are within the brain. When these neurons function properly, they route signals to the brain, enabling the brain and nervous system to support the body's performance, including activities such as breathing, walking, and reading this textbook.

Sometimes, neurons are injured, which may negatively affect the brain's ability to function. This chapter discusses disorders and diseases that injure neurons and explores how this affects the brain and the body. For patients who experience any of these conditions, nurses provide essential services as caregivers and advocates. If patients must

learn to live with their disease or condition, nurses provide them with information and support to help them make this adjustment. Regardless of the patient's disease or condition, nurses should keep in mind that they must always collaborate and communicate effectively with the patient's health-care team. This may include physicians, neurologists, surgeons, therapists, dieticians, pharmacists, and other health-care professionals. As appropriate, nurses should work with these team members and use interdisciplinary approaches to develop a comprehensive health-care treatment plan. Working with the health-care team, nurses should monitor each patient and address changes in the patient's care plan as needed.

17.1 Intracranial Pressure Changes

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Explain the Monro-Kellie doctrine
- Discuss the pathophysiology, risk factors, and clinical manifestations for intracranial pressure changes
- Describe the diagnostics and laboratory values in the disease of intracranial pressure changes
- Apply nursing concepts and plan associated nursing care for the patient with intracranial pressure changes
- Evaluate the efficacy of nursing care for the patient with intracranial pressure changes
- Describe the medical therapies that apply to the care of intracranial pressure changes

To stay healthy and function optimally, the brain must have stable **intracranial pressure (ICP)**, which refers to the pressure within the rigid confines of a skull. In the skull, brain tissue, blood, and **cerebral spinal fluid (CSF)**—a colorless fluid found within the subarachnoid space of the meninges of the brain, which surrounds both brain and spinal cord, acting to maintain health and functioning of the brain—exist together. Proper regulation of ICP is vital to achieve an ideal **cerebral perfusion pressure (CPP)**, which is the net pressure gradient required to ensure sufficient oxygen delivery to the brain and allow optimal pressure levels for proper brain health.

This first part of this section covers the Monro-Kellie doctrine, which helps explain why maintaining ICP is so critical. The section discusses the pathophysiology, risk factors, and clinical manifestations for intracranial pressure changes and describes the expected diagnostics and laboratory values for the disease of intracranial pressure changes. The remainder of the section describes nursing concepts and explains the role of nurses in caring for patients who experience intracranial pressure changes as well as techniques and therapies that enable nurses to provide the best possible care to these patients.

Monro-Kellie Doctrine

The **Monro-Kellie doctrine** is an important concept in neurology and neurosurgery that establishes relationships among brain, blood, and CSF volumes within the rigid confinement of a skull (Figure 17.2). Scottish doctors Alexander Monro, George Kellie, and John Hughlings Jackson independently contributed to the doctrine's development between 1795 and 1810. The doctrine's basic principle recognizes that craniums are closed and nonexpandable structures that house the brain, blood, and CSF. Because skulls have rigid constraints, intracranial volume remains constant. As such, if the volume of the brain, blood, or CSF increases or decreases, this change in volume must be counterbalanced by a corresponding change in the volume of one or both of the other components inside the skull. Nurses must apply the concepts of this doctrine to understand and treat conditions that affect ICP, such as traumatic brain injuries, tumors, cerebral edema, and hemorrhages.

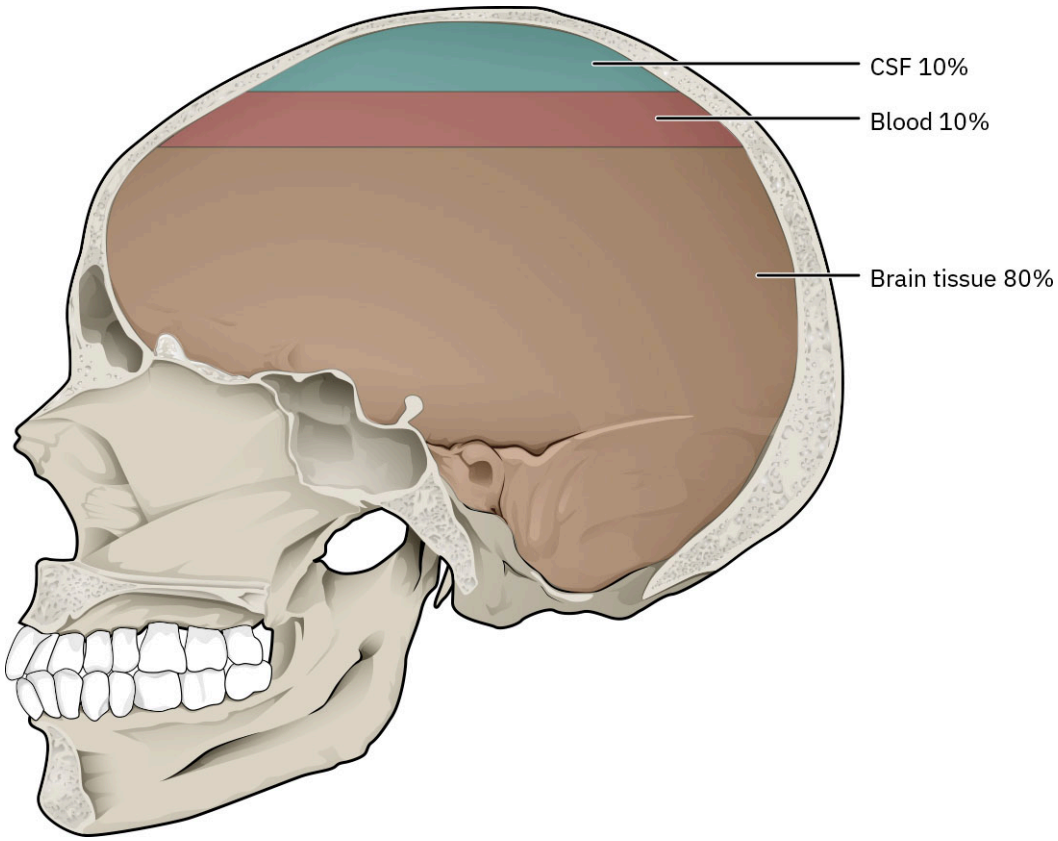

FIGURE 17.2 The Monro-Kellie doctrine states that the skull is a fixed space and any change within the brain tissue, blood, or cerebral spinal fluid (CSF) will force the others to compensate. (modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Increased ICP

ICP is determined by measuring the pressure exerted by fluids in the brain, such as CSF. Typically, ICP levels are measured in millimeters of mercury (mm Hg). While a patient is in a prone position, normal ICP should be between 7 and 15 mm Hg. When a patient is upright, this measurement should not be more than 15 mm Hg (Munakomi & Das, 2024).

ICP can be affected by many factors, including changes to blood volume, changes in the rates of CSF production and absorption, fluctuations in brain tissue volume, and obstruction of CSF flow. When **increased intracranial pressure (IICP)** occurs, it can cause compression of brain tissues and blood vessels, making it a serious condition with the potential to damage the brain.

Pathophysiology of Increased ICP

Common causes for IICP include head trauma, brain tumors, bleeding within the brain (intracerebral hemorrhage), vascular disorders such as aneurysms, and conditions such as infections that cause brain swelling. When any of these occur in the brain, they cause displacements of brain tissue, blood, and/or CSF, and may lead to IICP.

Clinical Manifestations of IICP

The clinical manifestations of IICP may include headaches, nausea, vomiting, altered mental status and level of consciousness (LOC), seizures with sensory and motor function impairments, and changes to speech patterns. Patients may also have visual disturbances, such as impaired eye movement, pupillary changes, and swelling in the optic disks known as **papilledema**.

Some patients with IICP may experience abnormal body posturing, including the following: **decerebrate posturing**, which is a neurological reflex movement of muscles causing the limbs to extend and hold rigidly at the sides of the body; **decorticate posturing**, which is a neurological reflex movement of muscles causing the limbs to flex and hold rigidly across the chest; and **flaccid posturing**, which occurs when muscles lack tension and go limp. IICP may also cause changes in a patient's vital signs that result in **Cushing's triad**, which is a combination of widened pulse

pressure (or larger distance between diastolic and systolic measurements) in the blood pressure, bradycardia (low pulse rate), and irregular breathing patterns. In infants, IICP may cause issues such as bulging fontanels, cranial suture separation, increased head circumference, and a high-pitched cry.

Assessment and Diagnosis of IICP

To assess IICP, health-care professionals, including nurses, should obtain the patient's medical history and do a physical examination that assesses the patient's mental alertness, orientation, reflexes, bodily movements and functions, pupils and eyes, and overall behavior. This process may include using the Glasgow Coma Scale (GCS) to assess a patient's consciousness level, evaluating the patient's motor response, eye openings, and verbal responses. Patients with a GCS score lower than 8 should be monitored for IICP (Munakomi & Das, 2024).

LINK TO LEARNING

The Glasgow Coma Scale (GCS) (https://openstax.org/r/77GlasgowComa) can be a vital tool to assess a patient's level of consciousness. The GCS has been used by health-care professionals since 1974 and is recognized as an accurate, reliable resource.

Diagnostics and Laboratory Values

The diagnostic tools generally used for IICP include computed tomography (CT) scans, magnetic resonance imaging (MRI), and lumbar punctures. CT scans or MRIs may show structural abnormalities, tumors, hemorrhages, or other conditions that change the volumes of a patient's brain, blood, or CSF, causing IICP. Also useful is **cerebral angiography**, a type of x-ray that creates digital images of the anatomy of the brain with a focus on the blood vessels within and around the brain. Cerebral angiography identifies blockages and other abnormalities in the blood vessels of a patient's head and neck that may be causing IICP. CSF analysis, which examines the actual contents of CSF, including pathogens, may help determine the cause of IICP.

LINK TO LEARNING

CSF can help determine the cause of IICP testing (https://openstax.org/r/77CSFTesting) by evaluating the concentrations and levels of cells and various substances in CSF.

ICP monitoring with vital signs is also necessary. Monitoring devices include intraventricular catheters and parenchymal monitors. Intraventricular catheters are inserted through a hole in the skull and put in place to measure the skull's internal pressure as well as drain excess CSF (Figure 17.3). Parenchymal monitors are placed inside brain tissue to monitor pressure. In other words, intraventricular catheters and parenchymal monitors may reveal abnormal pressure readings. Pressures greater than 20 mm Hg require treatment (Munakomi & Das, 2024).

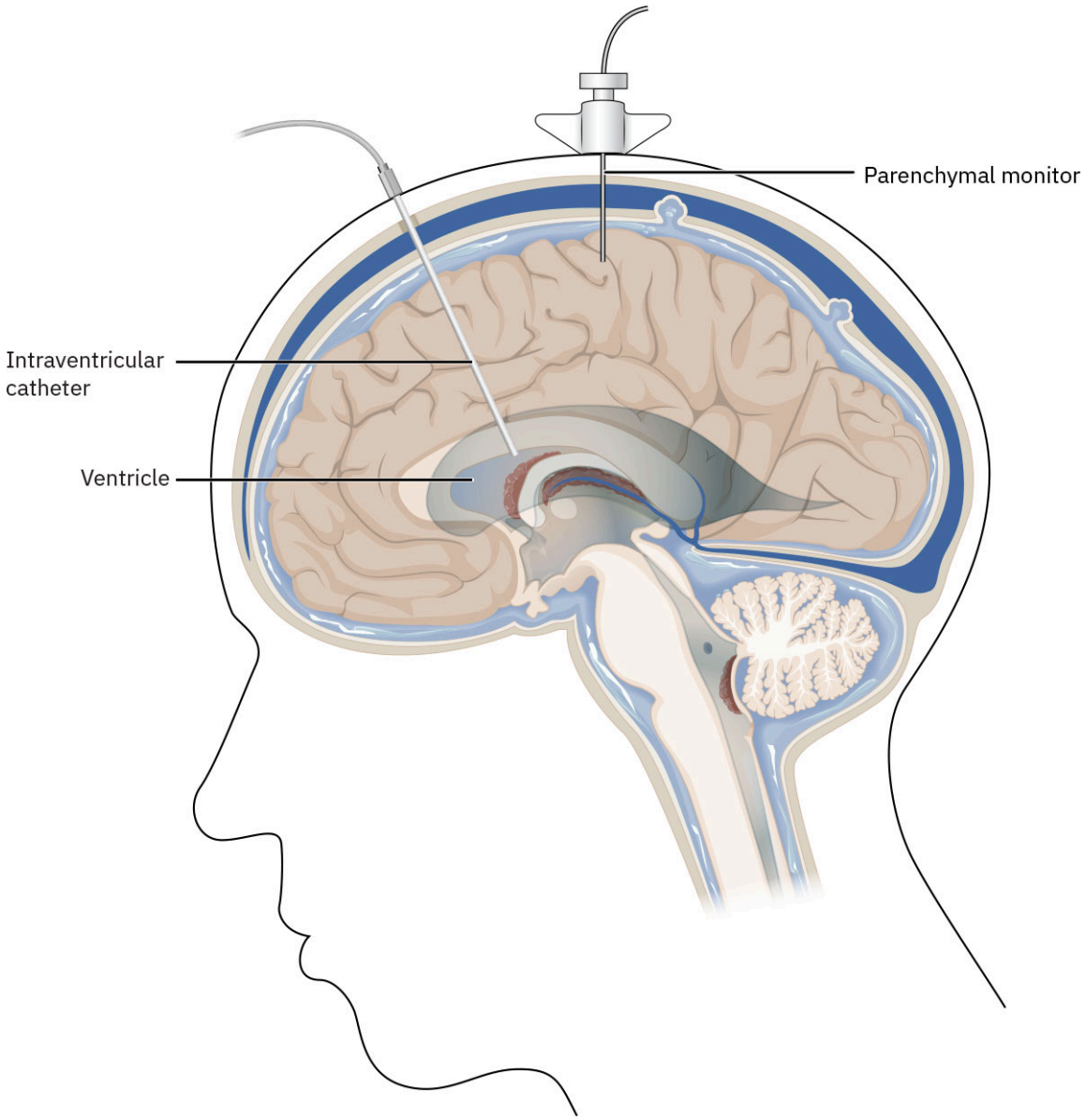

FIGURE 17.3 Intraventricular catheters can be useful tools for ICP monitoring. The catheter should be inserted into the skull via a small hole. Once the catheter is in place, it can be used to measure the skull's internal pressure. (credit: modification of work from *Anatomy and Physiology 2e*. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

LIFE-STAGE CONTEXT

Age-Related Changes in Intracranial Pressure

Consider age-related changes in ICP from the very young to older adults when assessing neurological status. For example, in pediatric patients, an important consideration is fontanelle assessment. In infants, the fontanelles are soft and can even be visually bulging when the infant is experiencing IICP or sunken with decreased ICP. Bulging fontanelles may be a sign of IICP from inflammation and infection caused by hydrocephalus or meningitis.

In older adults, as well as younger patients with decreased mental functioning, mental status may be more challenging to assess for changes in the patient with major neurocognitive disorder (MND) or Alzheimer disease. Sudden confusion or disorientation, however, is never a good sign and is cause for further investigation.

Communication of symptoms is difficult in both the very young, older adults, or those who have trouble communicating. Motor functions may be difficult to assess in an infant who does not yet walk, or in an immobile

older person. Verbalizing headache symptoms can be difficult in a nonverbal infant or a confused adult.

Nursing Care of the Patient with IICP

IICP is generally an acute clinical concern that needs immediate medical attention. To provide care for patients with IICP, nurses use a physical examination and patient's subjective statements to gather data from a patient's vital signs, neurological status, and response to interventions.

Recognizing Cues and Analyzing Cues

The cues that indicate IICP include confusion, high blood pressure, headache, slurred speech, muscle weakness, difficulty breathing, blurred vision, and vomiting. Using patient statements, as well as test results, nurses should analyze these cues to identify causes of or contributors to IICP. Test results may reveal an underlying condition such as an infection, head injuries, high blood pressure, tumors, aneurysm, and swelling in the brain. If the patient has an ICP monitoring device, the nurse should include data from this device as part of the process to determine if the patient's ICP is above normal.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Prioritize according to severity for patients with IICP, including urgency of intervention and potential impact of ICP levels. For instance, sudden neurological changes or signs of **herniation**, which is a protrusion of tissue displacing the brain, may necessitate immediate medical intervention. As noted precedingly, the cues and signs may include changes to a patient's mental alertness, blood pressure, ability to breathe, vision, bodily functions, muscle weakness, and general behavior. Solutions generated should be aimed at decreasing ICP as well as decreasing the risk of further harm caused by the IICP.

As with all diseases and conditions, the process to generate solutions should include collaborating with the patient's health-care team members, including neurologists and neurosurgeons. Use interdisciplinary approaches and include health-care professionals such as physical therapists, respiratory therapists, and pharmacists to develop a comprehensive care plan that also anticipates potential complications related to IICP, such as seizures or declining neurological status. Act by implementing the nursing interventions described in Table 17.1.

Nursing Care	Rationale
Complete focused neurological assessments	Changes in LOC, pupillary response and shape, motor function, speech, and vital signs indicate health issues.
Monitor vital signs.	VS are controlled in the medulla oblongata/brain stem, and worsening changes can signal herniation in the brain from IICP.
Elevate head of bed (HOB) 30 degrees.	Elevation of HOB can help with venous drainage to decrease ICP. Keep the body in alignment to protect spinal cord.
Avoid Valsalva maneuvers; use stool softeners/laxatives to avoid bowel straining.	Avoiding or minimizing bowel straining, coughing, or bearing down will reduce the risk of increases in ICP.
Monitor and maintain fluid and electrolyte balance.	Disruptions in hydration could affect ICP.
Implement measures to prevent fever.	Fever can increase ICP and exacerbate IICP.
Administer analgesics and complementary pain relief measures.	Pain and stress can cause IICP.

TABLE 17.1 Nursing Interventions for Patients with IICP

Nursing Care	Rationale
Support oxygenation and ventilation.	Adequate oxygenation and ventilation helps maintain appropriate ICP.
Monitor intracranial pressure.	Changes in ICP readings may indicate improvement, as well as declining health that needs attention.
Implement seizure precautions.	IICP can cause seizures.

TABLE 17.1 Nursing Interventions for Patients with IICP

Evaluation of Nursing Care for the Patient with IICP

The desired outcome for patients with IICP is a lower level of ICP. To determine if the patient's ICP is lower, nurses should evaluate the ICP pressure levels and GCS results, as well as the results of the patient's lab tests, including data for glucose and white blood cell (WBC) levels.

Medical Therapies and Related Care for IICP

Once IICP is diagnosed, treatment for these patients should focus on the cause of IICP. For example, patients with brain swelling may need medications, such as diuretics and corticosteroids, which help reduce swelling. Patients with tumors or hematomas may need surgical interventions to remove lesions. If the patient's IICP is caused by CSF drainage problems, the patient may need a ventriculoperitoneal shunt, external ventricular drainage system, or lumbar drain to control CSF drainage. A ventriculoperitoneal shunt is a thin tube that is inserted into the brain's ventricles to drain excess CSF. With an external ventricular drainage system, the patient's head is positioned to allow intracerebral pressure and gravity to work together to drain CSF. A lumbar drain is a small tube that is placed in the lumbar spine, rather than the brain's ventricles, to drain excess CSF.

Patients who have IICP due to infection or metabolic disturbances may need medications, such as antibiotics or aspirin. To determine the appropriate therapy to meet the needs of each patient, nurses should have a thorough understanding of the patient's condition, including the cues that indicate IICP, and should collaborate with other members of the patient's health-care team.

Decreased Intracranial Pressure

Although not as common as IICP, some patients experience decreased ICP, or intracranial hypotension. As noted previously, normal ICP should be between 7 and 15 mm Hg when a patient is lying down (Munakomi & Das, 2024).

Pathophysiology

When pressure within the skull and brain drops below normal, decreased intracranial pressure presents. Generally, this results from CSF leakage, which may occur as a result of trauma, surgery, or conditions such as dehydration. Decreased ICP may also occur because of **brain atrophy**, which is a loss of neurons and synapses sometimes caused by disorders such as MND, infections, and cerebral palsy. Keep in mind the principle of the Monro-Kellie doctrine that any change in the volumes of a patient's brain, blood, or CSF causes intracranial pressure changes.

Clinical Manifestations

The clinical manifestations of decreased ICP typically include headaches, which may vary from mild to severe and may be dull or throbbing. Often, patients can relieve their headaches by lying flat. Other clinical manifestations of decreased ICP may include poor reflexes, dizziness, lightheadedness, lack of orientation, and blurred vision as changes occur in cerebral blood flow. Patients may also experience ringing in the ears, along with a sense of imbalance, and their neck may feel stiff and/or painful. Some patients with ICP also have gastrointestinal symptoms, such as nausea and vomiting.

Assessment and Diagnostics

As with IICP, to assess decreased ICP, nurses and other members of the patient's health-care team should review the patient's medical history and conduct a physical examination. The assessment should consider the patient's overall behavior, visual acuity, reflexes, orientation, and coordination and functioning.

Diagnostics and Laboratory Values

Diagnostic tests to identify decreased ICP may include MRIs, CSF pressure measurements, and a neurological examination. MRIs may show problems such as sinus engorgement, pituitary enlargement, and subdural hematomas that are causing decreased ICP. CSF pressure measurement may yield a low pressure reading. Imaging may show a problem such as **brain sagging**, which is a disorder that causes cognitive dysfunction and other issues typically associated with MND. Brain sagging causes decreased ICP and is diagnosed when imaging shows the brain in a sagging position (Liaquat & Jain, 2023).

Nursing Care of the Patient with Decreased ICP

Low intracranial pressure is generally not considered an acute clinical concern like IICP, which is life-threatening and requires emergency treatment. However, because normal range ICP is necessary to ensure proper cerebral perfusion and neurological function, patients should receive treatment to restore their ICP to an appropriate level.

Recognizing Cues and Analyzing Cues

To recognize the cues of decreased ICP, nurses should conduct a physical examination of the patient and note issues in their level of consciousness, pupillary response, motor function, speech, and vital signs. Issues that provide cues of decreased ICP include positive or negative changes in a patient's blood pressure, mental alertness, ability to speak, reflexes, visual acuity, and other vital signs and behaviors, including nausea and gastrointestinal issues. If applicable, nurses may also find cues in the readings of the patient's ICP monitoring device, such as a parenchymal monitor. To analyze these cues, nurses should consider whether they deviate from normal for the patient.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

The analysis of the data gained through the nursing assessment can enable the nurse to prioritize hypotheses. The findings may include cues, such as a lack of mental alertness, blurred vision, and low blood pressure, as well as test results such as sagging brain or low CSF pressures. When such cues are part of the findings, the nurse may conclude that the patient has decreased ICP. The nurse should generate solutions to decrease or maintain ICP and take actions to help the patient, which may include those portrayed in Table 17.2.

Nursing Care	Rationale
Complete focused neurological assessments.	Changes in LOC, pupillary response and shape, motor function, speech, and vital signs indicate health issues.
Monitor vital signs.	VS are controlled in the medulla oblongata/brain stem, and worsening changes can signal dehydration of brain tissue.
Place patient in flat HOB position.	Flat HOB positioning can increase ICP because ICP tends to be higher when patients are in a flat position.
Monitor and maintain fluid and electrolyte balance.	Disruptions in hydration could affect ICP.
Monitor ICP levels.	Compare ICP levels to baseline.
Support oxygenation and ventilation.	Maintain patient's airway and assist with respiratory care to ensure adequate oxygenation and ventilation. Patients with head trauma may be in an induced coma and on ventilator support.
Monitor intracranial pressure.	Follow hospital protocols to obtain ICP readings and alert the provider of any worsening trends.

TABLE 17.2 **Nursing Interventions for Patients with Decreased ICP**

Evaluation of Nursing Care for the Patient with Decreased ICP

The desired outcome for patients with a decreased ICP is a higher level of ICP. To determine if the patient's ICP is higher, nurses should use pressure measurements as well as evaluate the results of the patient's lab tests, such as MRIs and neurology examination.

Medical Therapies and Related Care

As with IICP, once patients are diagnosed with decreased ICP, treatment and medical therapies should focus on the cause of the condition. Because the most common cause of decreased ICP is a CSF leak in the brain or lumbar spine, treatment options may include an **epidural blood patch**, which is the process of injecting a small amount of autologous blood into a patient's epidural space to plug the leak. If the patient's decreased ICP is caused by other issues, such as dehydration, treatment should focus on therapies, such as rehydration, to restore equilibrium to the brain's water balance. Therapies such as potassium supplements and salt tablets, as prescribed by the patient's provider, may be helpful.

17.2 Acute Disorders of the Nervous System

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for brain tumors, Guillain-Barré syndrome, and meningitis
- Describe the diagnostics and laboratory values in the disease of brain tumors, Guillain-Barré syndrome, and meningitis
- Apply nursing concepts and plan associated nursing care for the patient with brain tumors, Guillain-Barré syndrome, and meningitis
- Evaluate the efficacy of nursing care for the patient with brain tumors, Guillain-Barré syndrome, and meningitis
- Describe the medical therapies that apply to the care of brain tumors, Guillain-Barré syndrome, and meningitis

Acute disorders of the nervous system include injuries and conditions caused by trauma as well as sudden-onset diseases that can compromise neurological functioning. This section will explore brain tumors, Guillain-Barré syndrome, and meningitis.

Approximately one million Americans have a primary brain tumor, and in 2023, brain cancer was the tenth leading cause of death among patients with cancer (National Brain Tumor Society [NBTS], 2024). The median age for diagnosis of a brain tumor is 61 years. Although most brain tumors occur among adults, almost 4 percent of cases occur in children aged 14 or younger. The majority of brain tumors are benign, and patients learn to live with them. But about 28 percent of brain tumors are malignant. During 2023, almost 19,000 people died from a brain tumor (NBTS, 2024).

Guillain-Barré syndrome (GBS) is a less common neuropathy causing central nervous system weakness that can lead to paralysis. GBS occurs when the immune system fails, possibly as a result of infection, and attacks the body's peripheral nerves. The estimated annual incidence rate for GBS is one to two cases per 100,000 individuals (Nguyen & Taylor, 2023).

Meningitis is an infection that causes inflammation in the brain and spinal cord. Meningitis has five types—bacterial, viral, fungal, parasitic, and amoebic. Bacterial meningitis is the most serious and may even cause death. Viral is the most common type and also the least serious, with some patients recovering without medical treatment. Regardless of the type of meningitis, patients should be monitored and seek medical treatment as needed.

To successfully manage acute neurological disorders—including tumors, GBS, and meningitis—nurses must understand the fundamental principles of nervous system anatomy and physiology (Figure 17.4). The nervous system is divided into the central nervous system, which includes the brain and spinal cord; and the peripheral nervous system, composed of all of the spinal nerves that innervate the body's muscles.

The peripheral nervous system is further divided into the following systems:

- autonomic system, which regulates internal organs and glands

- somatic, or muscular response, system, which helps control voluntary movements and processes, such as the senses of sound, touch, smell, and taste

The autonomic system is further divided into two systems:

- sympathetic system, which controls the fight, flight, or freeze arousal response
- parasympathetic system, which controls the feed and breed, or rest and digest, calming response

The somatic system is further divided into two divisions that serve as a balancing force within the body to maintain homeostasis:

- sensory input division
- motor output division

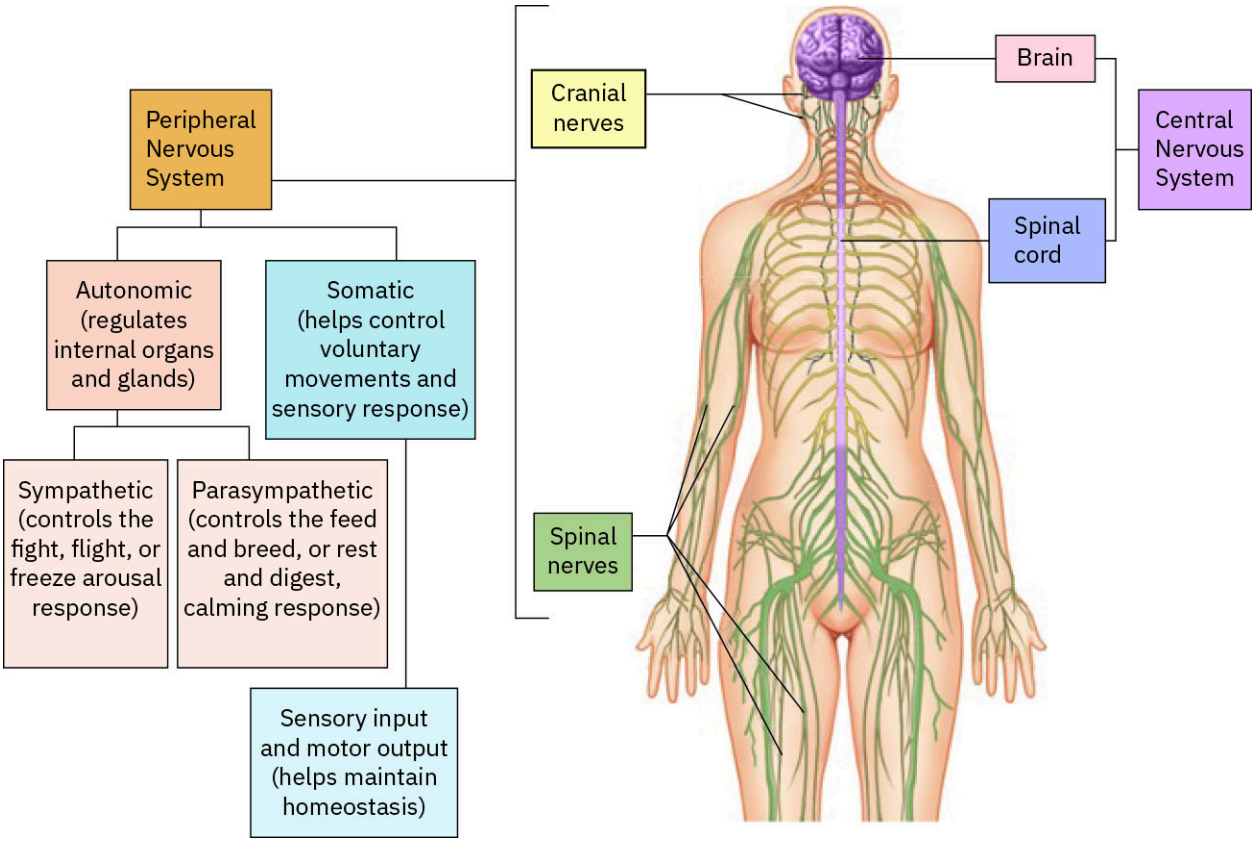

FIGURE 17.4 The divisions of the nervous system include the autonomic, somatic, and sympathetic systems. (credit: modification of work from Cenveo on AnatomyTool.org, attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license, original creator should also be credited)

Brain Tumors

A **brain tumor** is any abnormal growth of cells found within the brain or near it. Typically, a brain tumor, which can be **benign** (noncancerous) or **malignant** (cancerous), results from unchecked cell division and abnormal tissue growth. Benign brain tumors generally grow slowly and rarely spread to remote parts of the body. Although benign tumors are not cancerous, they can be dangerous if they constrict or damage areas of the brain. Malignant brain tumors usually grow fast and spread, moving aggressively through the brain's tissue layers and possibly into the spinal column.

Given the brain's complex functions and delicate anatomy, diagnosis of brain tumors can be challenging. Brain tumors are classified based on their location, behavior, and cell type. Whereas **primary brain tumor**s originate within or near the brain itself, **metastatic brain tumor**s, also referred to as secondary tumors, originate elsewhere in the body—such as the lung, breast, or colon—and then spread into brain tissue.

LINK TO LEARNING

The American Brain Tumor Association (https://openstax.org/r/77BrTumorAssoc) provides information for patients and health-care professionals about brain tumors, research, and resources.

Pathophysiology

Brain tumors involve genetic, molecular, and cellular changes, which contribute to abnormal cell proliferation in the central nervous system or brain. When cells do not experience **apoptosis**, which is the normal, controlled process of cell death, cancer may occur. Cancer cells have uncontrolled division and produce additional abnormal cells when they duplicate. These cells are undifferentiated and may compress blood vessels and vasculature. They also outgrow their own vasculature and sometimes develop new vasculature, while releasing toxins to surrounding tissues.

Cancers, including brain tumors, are varied and have different causes. Medical professionals are not certain what causes brain tumors, but typically, brain tumors result in genetic and molecular alterations, abnormal cell proliferation, **angiogenesis** (the formation of new blood vessels), infiltration and compression of normal body tissues, obstruction of CSF flow, and abnormal immune response.

Genetic and molecular alterations in oncogenes and tumor suppressor genes play an integral part in brain tumor onset. Typically, **proto-oncogene**s enable cells to stay alive by growing and dividing properly. Their work is complemented by that of tumor suppressor genes, which control cell divisions, while also repairing DNA errors and forcing cells to die when they reach the end of their lifespan. If patients experience DNA alterations that affect the functioning of proto-oncogenes and tumor suppressor genes, brain tumors may result. When a proto-oncogene becomes mutated, it is known as an **oncogene**.

One goal of cancer research is to determine the triggers that turn on oncogenic genes and turn off tumor suppressor genes. Research has identified contributing factors, including obesity, poor diet, stress, and smoking.

Types of Brain Tumors

Brain tumors include several types of benign and malignant growths. The benign tumors include the following (American Association of Neurological Surgeons [AANS], n.d.):

- **meningioma—**the most common type of benign intracranial tumor. As their name suggests, meningiomas begin growing in the meninges around the brain and spinal cord.
- **schwannoma—**common type of benign brain tumor found in adults. Schwannomas are found near nerves and may displace a nerve rather than invading it. Although schwannomas are benign, they can be serious health threats, even causing death, if they exert too much pressure on nerves and/or the brain.
- **pituitary adenoma—**also common, this type of benign tumor begins in the pituitary gland. Typically, pituitary adenomas affect individuals in their 30s and 40s, although children may have them.
- **craniopharyngioma—**typically arises from the pituitary gland and becomes embedded deep in the brain near critical structures. Patients with craniopharyngiomas usually need hormone replacement therapy, even though these tumors are benign.
- **chordoma—**rare, slow-growing tumor that generally occurs in individuals between the ages of 50 and 60. Typically, chordomas are found at the base of the skull or in the lower spine.
- **gangliocytoma—**rare tumor that involves the neoplastic nerve cells, which are nervous system cells that have become cancerous, and typically occurs in young adults.
- **glomus tumor—**rare tumor that occurs in the head and neck, often near the jugular vein.

The more serious brain tumors are malignant. The most common type of malignant brain tumor is a **glioma**, produced from the brain's glial cells. A **glial cell** is a supporting cell that provides nourishment to neurons. The different types of malignant brain tumors include the following (AANS, n.d.):

- **astrocytoma—**common type of glioma that grows from astrocytes. An **astrocyte** is a star-shaped glial cell that forms part of the brain's supportive tissue. Typically, astrocytomas form in the brain's cerebrum and can occur in individuals of all ages.

- **glioblastoma multiforme (GBM)—**the most invasive of the glial tumors. GBMs tend to be comprised of multiple types of cells, including astrocytes and oligodendrocytes, and they tend to grow quickly, spreading to other tissues. GBMs typically affect individuals between ages 50 to 70 and tend to occur in men more than women. For individuals who have a GBM, the prognosis is usually poor.
- **medulloblastoma—**typically occurs in children, affecting the cerebellum, and tends to be high-grade. Medulloblastomas usually respond to chemotherapy and radiation, making them more treatable than some brain tumors.
- **ependymoma—**less common brain tumor that occurs when the ependymal cells that line the ventricular system experience a **neoplastic transformation**, which occurs when oncogenes are activated while tumor suppressor genes are inactivated.
- **oligodendroglioma—**occurs in the cells that produce the brain's myelin, which insulates the brain's wiring.

Clinical Manifestations

Brain tumor symptoms vary according to the tumor's location, size, and growth rate. Generally, all brain tumors cause headaches. Other common symptoms include vertigo, nausea, fatigue, and changes in appetite. Additional manifestations, depending on the part of the brain affected by the tumor, include the following (Mayo Clinic, 2023a):

- Frontal lobe tumors tend to cause personality changes, disinterest in normal activities, forgetfulness, balance issues, and difficulty walking.
- Parietal lobe tumors, in the upper middle section of the brain, typically cause issues with the senses, including hearing and vision problems.
- Occipital lobe tumors, in the back of the brain, may cause vision problems, including blindness.
- Temporal lobe tumors, on the lower sides of the brain, may cause memory loss as well as issues with the senses, such as tasting or smelling something that does not exist.

Assessment and Diagnostics

As with other medical issues, to assess a brain tumor, nurses and other health-care professionals should first obtain the patient's medical history. This history should identify whether patients could be at risk for a brain tumor because of factors such as obesity, age, family history, and certain radiation exposure. It should also determine whether patients are exhibiting symptoms of a brain tumor, such as frequent headaches and nausea. Patients should receive a physical examination to check their vision, hearing, speech patterns, coordination, and other physical behavior, including the patient's ability to walk. The examination should also include an assessment of the patient's deep tendon reflexes.

Diagnostics and Laboratory Values

Diagnostic procedures for brain tumors typically include imaging studies such as MRI or CT scans, tissue biopsies, and magnetic resonance spectroscopy (MRS) testing. MRI and/or CT scans will show whether a tumor exists. A tissue biopsy can determine the type and grade of the brain tumor. MRS testing can provide further analysis of the tumor by examining its chemical profile and providing more details about lesions found on MRIs.

To gauge their severity, tumors are graded on a four-point scale, with one being the least aggressive tumors and four being the most aggressive. The characteristics associated with each grade of tumor include the following (AANS, n.d.; Johns Hopkins Medicine, n.d.):

- Grade I—slow-growing, benign tumors that may appear as normal cells, are noninfiltrating, and typically pose no life threats
- Grade II—reasonably slow-growing tumors that are usually benign, appear as slightly abnormal cells, may be infiltrative, and may recur if removed
- Grade III—malignant tumors that grow reasonably fast, appear as abnormal cells, infiltrate into neighboring tissues, and tend to recur as a grade 4 tumor
- Grade IV—malignant, aggressive tumors that grow rapidly, appear as very abnormal cells, infiltrate easily into other parts of the brain, and rapidly recur if removed

Nursing Care of the Patient with Brain Tumors

Brain tumors, whether benign or malignant, are critical conditions requiring nursing care tailored to address the patient's needs based on the grade of their tumor. By recognizing the cues of brain tumors, nurses can help to

identify patients with a brain tumor. Nurses also need to understand how to provide effective nursing care to patients with a brain tumor.

Recognizing Cues and Analyzing Cues

To recognize when patients may have a brain tumor, nurses use data about patients' vital signs and neurological status to identify and analyze cues (Table 17.3).

Cues Found in Nursing Assessment	Analysis of Cue
Environmental triggers, such as exposure to radiation, head traumas, and medical history, such as a family member with neurofibromatosis or another genetic condition that puts some patients at greater risk of developing a brain tumor. Also, patients with another type of cancer, such as lung or breast, are at greater risk for developing a brain tumor as a secondary site to their primary cancer diagnosis.	May indicate risk of brain tumor
Headaches, vertigo, confusion, memory loss, fatigue, poor reflexes, numbness or paralysis, seizures, nausea, changes in appetite, behavioral changes	General symptoms that may indicate a brain tumor
Personality changes, disinterest in normal activities, forgetfulness, balance issues, and difficulty walking	May indicate a frontal lobe tumor
Difficulty with the senses, particularly hearing and vision problems	May indicate a tumor in the parietal or occipital lobe
Memory loss, tasting or smelling something that doesn't exist	May indicate a tumor in the temporal lobe

TABLE 17.3 Brain Tumor Assessment Cues

REAL RN STORIES

Nurse: Aarti
Years in Practice: Fourteen
Clinical Setting: Oncology
Geographic Location: Ohio

In my role as a registered nurse, I had the honor and pleasure of providing care for Mr. Anderson, an inspiring 55-year-old German male facing an insurmountable brain tumor diagnosis. From day one, I knew that providing clinical care wasn't enough; providing emotional support was also critical. As my patient underwent surgery to remove his brain tumor, I stood with him every step of the way, explaining each procedure with kindness and making him as comfortable as possible despite uncertainty. Postoperatively, I closely monitored his neurological status so as to act immediately if any signs of complications arose. Crafting an individualized pain management plan required working closely with Mr. Anderson's health-care team. I listened carefully and responded accordingly with empathy and professionalism to his fears, providing education on his treatment plan and offering guidance for at-home care. My holistic care commitment extended further by supporting his family as they planned to be present during his treatment and by offering advice about at-home care arrangements. As we transitioned into his recovery journey, I collaborated closely with therapists in devising an individualized rehabilitation plan and celebrating each small victory along the way. Facilitating open dialogue with Mr. Anderson, his family members, and members of his health-care team enabled me to foster a trusting and healing environment. As challenging as brain tumors may have been, my dedication was motivated by the desire not just to provide nursing care but to have an impactful role in those lives served. Through expertise and genuine concern, I worked hard to be an integral member of Mr. Anderson and

his family's support network through every phase of his condition with grace and determination. It doesn't always happen, but he did well, and it was wonderful to see him smile again."

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Nurses should prioritize brain tumor symptoms based on severity experienced by patients, such as frequency and intensity of headaches, vertigo, and seizures. Brain tumor symptoms should also be prioritized based on whether the symptoms result from tumors that are benign or malignant, as well as whether the tumors are grade 1, 2, 3, or 4. When taking action to care for patients with brain tumors, as appropriate, nurses should implement the nursing interventions in Table 17.4.

Nursing Care	Rationale
Complete focused neurological assessments.	Changes in LOC, pupillary response and shape, motor function, speech, and vital signs indicate health issues.
Provide after-surgery care.	Patients may need assistance as the effects of anesthesia wear off, which may include suturing incisions, emptying drains, changing dressings and bandages, and applying heat/cold packs to assist with any swelling.
Provide care associated with radiation therapy.	Patients may need help to understand what to expect with radiation, and they may experience side effects such as nausea.
Administer chemotherapy as ordered.	The patient may need help to understand the treatment and chemotherapy drugs that may need to be administered. Patients should be monitored because they may experience side effects, such as nausea and fatigue.
Manage pain.	Patients may experience pain, including headaches. They may need pain medications, such as analgesics.
Avoid Valsalva maneuvers.	Avoiding or minimizing bowel straining, coughing, or bearing down will reduce the risk of increases in ICP.
Implement seizure precautions.	Because brain tumors can cause seizures, keep the bed in a low position with the side rails up and provide bedside padding if needed. Ensure basic suction equipment is set up and ready for use.

TABLE 17.4 Nursing Interventions for Patients with Brain Tumors

Evaluation of Nursing Care for Patients with Brain Tumors

The desired outcomes for patients with brain tumors include the successful removal of brain tumors if possible. For patients who must learn to live with their brain tumors, the desired outcome is to relieve symptoms and restore as much quality of life as possible. For patients whose brain tumors are terminal, the desired outcome is to help patients navigate end-of-life challenges. Examples of successful outcomes for patients with brain tumors include pain that is satisfactorily controlled, physical therapy that results in a decreased risk for falls, and range of motion exercises that restore or sustain the patient's mobility.

Medical Therapies and Related Care

Treatment strategies for brain tumors depend on whether the tumor is benign or malignant, the grade of the tumor, its location and size, and the patient's health. Common treatments for tumors may include the following:

- Surgical procedures
  - craniotomy—involves removing a bone flap from the skull to access a tumor

    - neuroendoscopy—uses an endoscopy to enter the skull through small holes and access a tumor
    - laser ablation—uses heat to destroy tumor cells
    - laser interstitial thermal therapy—uses a laser inserted through a tiny incision in the skull to kill tumor cells
- Radiation therapy
- Chemotherapy drugs to kill existing cancer cells and inhibit the growth of new cancer cells
- Immunotherapy to strengthen immunity by recognizing and destroying cancerous cells as soon as they appear

LIFE-STAGE CONTEXT

Brain Tumors in Children versus Adults

Brain tumors in both children and adults may differ in many aspects, from their types, symptoms, and treatment approaches to how quickly the cancers may grow back over time. In pediatric cases, medulloblastomas, ependymomas, and low-grade gliomas, such as an astrocytoma are more prevalent. In comparison, adults more commonly have gliomas, meningiomas, and metastatic tumors. Whereas tumors in children have a large genetic component, brain tumors in adults develop more commonly due to environmental triggers over time. Treatment approaches also differ as pediatric oncologists may be less inclined to do surgery and rely more on chemotherapy for younger patients, compared to the surgical option more commonly seen with adults. Long-term effects of brain tumors and their treatment are seen more dramatically with pediatric patients compared to adults.

Guillain-Barré Syndrome

Guillain-Barré syndrome (GBS) is a rare autoimmune disease in which the immune system attacks the peripheral nervous system, affecting motor functions. Patients usually recover fully from GBS, but the syndrome duration tends to cause severe symptoms, which can include temporary paralysis. Occasionally, GBS is fatal, and some recovered patients may have lingering symptoms, such as fatigue, numbness, or weakness.

Pathophysiology

The exact cause of GBS remains unknown, but people who develop GBS often experience respiratory illness or diarrhea in the days, or even weeks, before they develop GBS. GBS may follow infection with *Campylobacter jejuni* or influenza viruses such as H1N1, and on rare occasions, vaccinations for the flu may lead to the development of GBS (Centers for Disease Control and Prevention, 2023). Surgeries can also trigger GBS, which occurs when an immune response damages myelin sheaths or nerve axons of peripheral nerves, causing muscle weakness, especially in the arms and legs. This muscle weakness may affect other bodily functions, such as swallowing and breathing (muscles in the throat and diaphragm are affected), and some patients with GBS may have difficulty walking. Some patients with GBS experience near complete paralysis.

GBS comes in different forms. The four primary types of GBS include the following:

- acute inflammatory demyelinating polyradiculoneuropathy (AIDP)—most common form of GBS characterized by muscle weakness that begins in the lower parts of the body and spreads upward
- Miller Fisher syndrome (MFS)—begins with paralysis in the eyes
- acute motor axonal neuropathy (AMAN)—characterized by paralysis and the loss of reflexes but the senses remain intact
- acute motor-sensory axonal neuropathy (AMSAN)—characterized by sensory deficiencies as well as a loss of reflexes and motor weakness

Clinical Manifestations

The symptoms typical of GBS include the following:

- muscle weakness progressing upward from feet to the hands and head
- tingling and weakness from lower body to upper body
- loss of deep tendon reflexes
- progressive paralysis from legs to respiratory muscles
- pain and aching of limbs

- difficulty speaking and swallowing
- autonomic dysfunction of heart rate, temperature, and bowels
- cranial nerve disorders causing blurred and double vision
- **paresthesia**, which is abnormal sensations such as burning, prickling, and tingling

In addition, because GBS affects patients' nerves and bodily functioning, patients with GBS may experience breathing difficulties, blood pressure and heart issues, blood clots, bladder and bowel dysfunction including incontinence, and pressure injury as the condition progresses.

Assessment and Diagnostics

To assess and diagnose GBS, nurses and other health-care professionals should review a patient's medical history and conduct a physical examination that focuses on GBS symptoms, such as vision problems, muscle weakness, paralysis, and loss of reflexes. If GBS is suspected based on the physical examination findings, medical tests to confirm the diagnosis may include a lumbar puncture, nerve conduction study, and/or electromyography (EMG).

Diagnostics and Laboratory Values

The analysis of CSF obtained by a lumbar puncture for a patient with GBS may show an infection and/or high protein in the spinal fluid. Nerve conduction studies may show slower speeds in nerve signals. EMG measures nerve activity and may reveal GBS symptoms such as slower nerve conduction and reflex abnormalities. EMG may also find abnormal changes in nerve patterns and absent or prolonged F-wave motor responses.

Nursing Care of the Patient with Guillain-Barré Syndrome

GBS is a serious condition that requires emergency medical treatment and hospitalization. Without immediate care, patients with GBS are more likely to experience long-term effects, such as muscle weakness, pain in the limbs, and difficulty with balance and coordination. Some patients with GBS may even die without medical treatment.

Recognizing Cues and Analyzing Cues

To recognize the cues of GBS, nurses should gather the patient's medical history to learn about indicators, such as recent surgery or exposure to infections or viruses that can trigger GBS. As noted previously, symptoms that may be cues of GBS include muscle weakness, loss of reflexes, pain and aching in limbs, paralysis, difficulty speaking and swallowing, and sensations of burning and tingling. Nurses should also review the results of tests performed on the patient with GBS, which may include a lumbar puncture, nerve conduction study, and/or EMG. To analyze these cues, nurses should determine if the examination and test results deviate from normal for the patient.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Because GBS is a serious condition that requires immediate care, prioritize GBS as critical and provide emergency interventions. Once the patient is stable, collaborate with the patient's health-care team members to address GBS symptoms, which may include loss of reflexes, muscle weakness, and difficulty speaking and swallowing. The actions that nurses should take to treat patients with GBS may include the interventions in Table 17.5.

Nursing Care	Rationale
Complete focused neurological assessments.	Changes in motor functions, reflexes, speech, and nerve functioning may be cues of GBS.
Monitor vital signs, muscles, and skin.	Blood pressure, heart rate, muscle strength, and skin issues such as bedsores indicate health issues.
Monitor for blood clots.	Symptoms such as pain, redness, and swelling may indicate blood clots, which may occur with GBS.
Monitor for bladder and bowel dysfunction.	Irregular urine outputs and bowel movements indicate health issues.

TABLE 17.5 Nursing Interventions for Patients with GBS

Nursing Care	Rationale
Prevent and monitor for aspiration and position the patient upright during meals.	Patients may experience swallowing and aspiration difficulties.
Manage pain.	Patients may require analgesics and complementary pain relief measures.
Support oxygenation and ventilation.	Patients may require respiratory care, including deep breathing exercises, to ensure adequate oxygenation and ventilation.
Assist with mobility exercises.	Physical therapy may assist patients with mobility exercises and positioning changes to minimize risk for impaired physical mobility.
Assist with plasma exchange.	Patients with GBS may need a plasma exchange to purify their blood.
Assist with immunoglobulin therapy.	Patients with GBS may need immunoglobulin therapy to strengthen their immune system.

TABLE 17.5 Nursing Interventions for Patients with GBS

Evaluation of Nursing Care for the Patient with Guillain-Barré Syndrome

The desired outcome for patients with GBS is recovery that results in a fully functioning peripheral nervous system. Ideally, patients with GBS should also not have lingering symptoms, such as fatigue, numbness, or weakness. Table 17.6 provides more specific details about evaluating outcomes for patients with GBS.

Nursing Diagnosis	Nursing Evaluation
Impaired gas exchange	• Evaluate improved oxygen saturation levels.
Risk for aspiration	• Observe for successful swallowing without aspiration. Evaluate the patient's ability to tolerate oral intake.
Impaired physical mobility	• Assess improvements in range of motion. • Monitor the patient's ability to ambulate independently or with assistance.
Risk for impaired physical mobility	• Assess improvements in mobility and range of motion. Evaluate the patient's ability to perform activities of daily living.
Ineffective airway clearance	• Assess the patient's ability to clear secretions effectively. Monitor for improvements in breath sounds and respiratory effort.
Sleep disturbance	• Assess improvements in sleep duration and quality. Monitor for signs of daytime alertness and energy levels.

TABLE 17.6 Evaluating Outcomes for Patients with GBS

Nursing Diagnosis	Nursing Evaluation
Swallowing impairment	• Observe for successful swallowing without signs of aspiration. • Assess the patient's tolerance of oral intake.
Verbal communication impairment	• Assess improvements in the patient's ability to articulate and communicate. • Evaluate the use of alternative communication methods.
Malnutrition risk	• Evaluate weight gain or stabilization. • Monitor for improvements in nutritional markers.
Acute pain	• Assess for a reduction in pain intensity or frequency. Evaluate the patient's comfort level during activities.
Impaired skin integrity risk	• Assess the skin for the absence of pressure ulcers or improvement in existing ones.

TABLE 17.6 Evaluating Outcomes for Patients with GBS

Medical Therapies and Related Care

Many patients with GBS are treated with intravenous immunoglobulin therapy (IVIG). This process provides patients with healthy antibodies intravenously. IVIG modulates immune response and decreases inflammation by blocking damaged antibodies in the patient's body. Plasma exchange (plasmapheresis) is another treatment regimen often used for patients with GBS. This procedure removes harmful antibodies by replacing old plasma with fresh plasma taken from another source, such as a donor.

Meningitis

Meningoencephalitis, also referred to as **meningitis**, is an inflammation of the meninges, which are the membranes covering the brain and spinal cord. Typically, meningitis is caused by bacteria, viruses, fungi, amoebae, or parasites. Less frequently, meningitis may be caused by noninfectious factors such as certain medications, such as antimicrobials or anti-inflammatory drugs, or by autoimmune conditions, such as rheumatoid arthritis or lupus. Meningitis varies in its incidence and prevalence depending on its cause. Viral meningitis is more common than bacterial meningitis but tends to be less severe; patients with bacterial meningitis are more likely to require medical treatment.

Pathophysiology

Meningitis can affect anyone, including children, but people with weakened immune systems are at greater risk. People who live in crowded conditions, such as dormitories, military barracks, or immigration camps have a higher risk of contracting meningitis. Also, those who have not been fully immunized are more likely to contract meningitis. Children are eligible to receive their initial meningococcal vaccination at age 10, with a booster at age 15. When there is an outbreak of infected individuals, exposure can elevate the risk for those who are not fully immune. Head injuries, such as skull fractures, and surgical procedures that break the protective barriers of the meninges increase the risk of introducing a pathogen into the meninges. In addition, people who travel to areas with a higher prevalence of meningitis risk contracting it (National Institute of Neurological Disorders and Stroke [NINDS], 2024).

Clinical Manifestations

The symptoms of meningitis are varied and range in intensity depending on severity of the case. Common clinical manifestations include sudden onset fever, severe headache, neck stiffness, **photophobia**, which is an increased sensitivity to light, and **phonophobia**, which is an aversion to loud noises.

If the infection progresses, patients may experience neurological symptoms, such as altered mental status, confusion, difficulty focusing, irritability, and seizures. Individuals who have bacterial meningitis may exhibit

additional symptoms such as hearing loss and a skin rash associated with *Neisseria meningitidis* pathogens. They may also experience **petechiae**, which are round spots on the skin caused by bleeding in the skin; they may be red, brown, or purple. Typically, symptoms in patients with viral meningitis are less severe than in patients with bacterial meningitis (Figure 17.5).

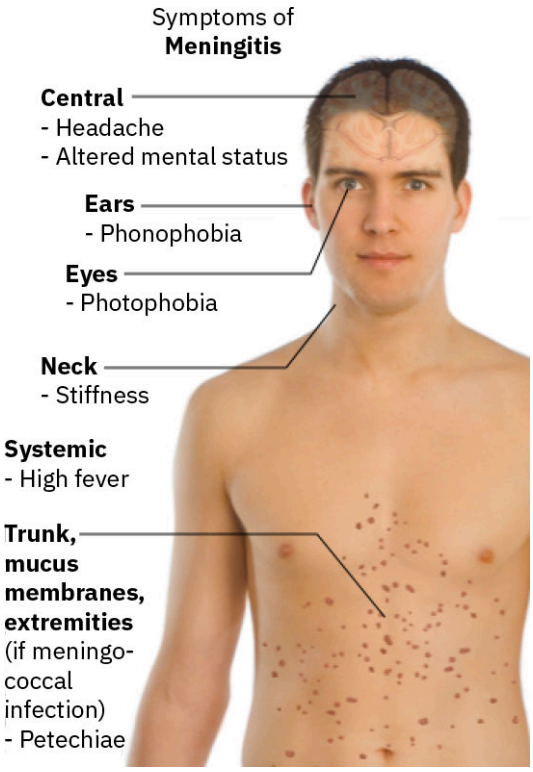

FIGURE 17.5 Clinical manifestations of meningitis include sensory symptoms, skin, and musculoskeletal changes. (credit: modification of "Symptoms of Meningitis" by Mikael Häggström/Wikimedia Commons, Public Domain)

Assessment and Diagnostics

Meningitis can be diagnosed through blood tests, lumbar punctures of CSF, and imaging with CT scans or MRIs. When assessments of patient's medical history and symptoms indicate that the patient may have meningitis, nurses or other health-care professionals should draw samples of blood and/or cerebrospinal fluid for laboratory testing. They may also order CT scans of the sinuses or chest or MRI scans of the head.

Diagnostics and Laboratory Values

Blood tests for patients with meningitis will show bacteria known to cause meningitis. Lumbar punctures may reveal bacteria that cause meningitis, as well as increased protein, elevated WBC count, and a low glucose level. Imaging may show inflammation and infection, including bacterial and viral.

Nursing Care of the Patient with Meningitis

Meningitis is a serious disease that can be deadly for some patients. Thus, patients with meningitis need immediate medical attention. Nursing care should focus on treating the bacterial and/or viral infection that has caused meningitis and should strive to relieve patients' symptoms, such as fever and pain.

Recognizing Cues and Analyzing Cues

To recognize the cues of meningitis, nurses should obtain the patient's medical history and determine if the patient is at risk for meningitis and has symptoms of meningitis. Nurses should check patients for skin rashes and petechiae. In addition, a physical examination may reveal a positive Brudzinski's sign or a positive Kernig's sign. A positive **Brudzinski's sign** occurs when pressure applied to the pubic symphysis elicits a reflex hip and knee flexion and abduction of the leg (Stribos & Jones, 2023). To elicit **Kernig's sign**, the patient is kept in a supine position, the hip and knee is flexed to a right angle, and then the knee is slowly extended by the examiner. The appearance of resistance or pain during extension of the patient's knee beyond 135 degrees constitutes a positive Kernig's (Karl et.al., 2022) (Figure 17.6). If the physical examination indicates the patient may have meningitis, patients should

receive testing, such as blood tests and lumbar punctures, to confirm the diagnosis. Meningitis is contagious. Thus, when drawing blood from patients with meningitis, nurses should take necessary precautions, such as wearing appropriate PPE equipment such as gloves and face masks.

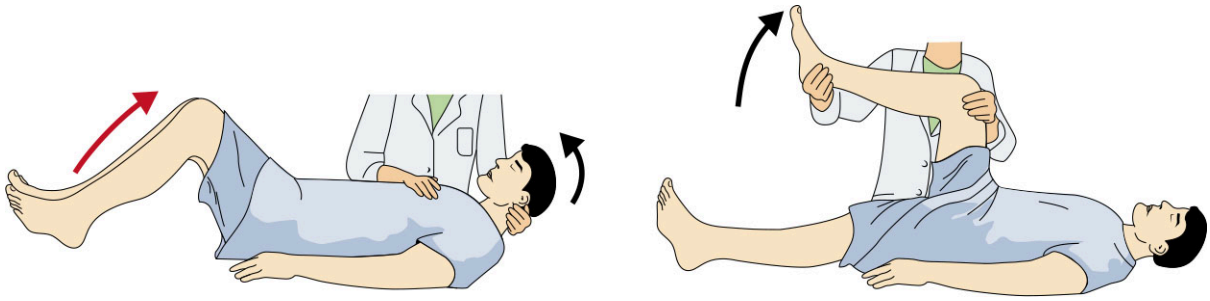

FIGURE 17.6 The (left) Brudzinski's and (right) Kernig's signs can be indicative of meningitis. (credit: attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Meningitis has the potential for rapid disease progression and can cause serious complications, such as brain damage, hearing and/or vision loss, seizures, and even death. Given the seriousness of meningitis and the threats it poses, meningitis should be prioritized as a critical disease that requires immediate, emergency intervention. Work with the patient's health-care team to develop solutions to address each patient's meningitis case. The appropriate nursing interventions may include the actions listed in Table 17.7.

Nursing Care	Rationale
Complete focused neurological assessments.	Changes in the patient's neurological symptoms, including cognitive issues and confusion, as well as problems such as headaches and fever are cues of meningitis.
Administer medication.	Antibiotics and possibly corticosteroids can help patients with bacterial meningitis. For patients with both bacterial and viral meningitis, pain medication can help relieve body aches and reduce fever.
Monitor vital signs.	Changes in blood pressure, heart rate, temperature, and other vital signs indicate how the patient is doing.
Drain fluids.	Patients with bacterial meningitis should have infected mastoids or sinuses drained. Nurses may assist with these procedures.
Monitor and maintain fluid and electrolyte balance.	Interventions such as intravenous fluids and potassium supplements may be needed to ensure patients stay hydrated and have the appropriate electrolyte balance.
Implement skin care.	Lotions, antibiotic creams, and other skin care treatments may be needed to care for rashes, wounds, and damaged skin.
Support oxygenation and ventilation.	Patients may have breathing difficulties and need assistance to maintain adequate oxygenation and ventilation.

TABLE 17.7 Nursing Interventions for Patients with Meningitis

Nursing Care	Rationale
Implement seizure precautions.	In some patients, meningitis can cause seizures. These patients need a quiet room, including limited visitors and dim lights. They also need airway supplies at the bedside, and the bed should be in a low position with the side rails up, as well as bedside padding if needed. Basic suction equipment should be set up and ready for use.
Maintain patient isolation.	Until diagnosis confirms the type of meningitis, patients may need to be isolated. If diagnosis confirms that the patient is contagious, the patient should continue to be isolated and patients must use the appropriate PPE equipment when treating the patient.

TABLE 17.7 Nursing Interventions for Patients with Meningitis

Evaluation of Nursing Care for the Patient with Meningitis

The successful treatment of meningitis should result in the removal of infection and alleviation of symptoms such as fever, headache, and neck stiffness. Patients should no longer experience issues such as seizures, photophobia, or phonophobia. If the treatment is not prompt, the patient is at risk for long-term issues, such as permanent nerve damage or hearing loss.

Medical Therapies and Related Care

Immunizations are essential in protecting against various forms of meningitis. Although vaccination schedules differ by country, they most often target specific pathogens associated with meningitis, such as *Hemophilus influenzae*, *Neisseria meningitidis* or *Streptococcus pneumoniae*. Patients with bacterial meningitis are more likely to require hospitalization, whereas those with viral meningitis may be treated as outpatients and provided supportive care while they remain at home. Patients who experience permanent damage from meningitis, such as nerve damage, may need long-term care such as anti-inflammatory medications and physical therapy.

LINK TO LEARNING

Meningitis can affect anyone, and although the infection can be serious, most people recover. But even with medical treatment, meningitis (https://openstax.org/r/77Meningitis) can be serious and even deadly.

17.3 Chronic Disorders of the Nervous System

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for multiple sclerosis and myasthenia gravis
- Describe the diagnostics and laboratory values in the diseases of multiple sclerosis and myasthenia gravis
- Apply nursing concepts and plan associated nursing care for the patient with multiple sclerosis and myasthenia gravis
- Evaluate the efficacy of nursing care for the patient with multiple sclerosis and myasthenia gravis
- Describe the medical therapies that apply to the care of multiple sclerosis and myasthenia gravis

Multiple sclerosis (MS) and myasthenia gravis (MG) are chronic neurological diseases and complex disorders that profoundly affect lives. Multiple sclerosis is more common and typically initially affects people between the ages of 20 and 40 years old (NINDS, 2019). Myasthenia gravis (MG) is an uncommon disorder that usually affects females under 40 and males older than 60 years of age (NINDS, 2024b).

The autoimmune condition of the central nervous system characterized by inflammation, demyelination, and

neurodegeneration that manifests with diverse neurological symptoms, such as difficulties with coordination, slurred speech, and cognitive problems is called **multiple sclerosis (MS)**. MS is an incurable illness.

The autoimmune neuromuscular condition that manifests due to the body's production of hyperreactive antibodies that block acetylcholine receptors on muscle fibers, prohibiting communication to the nerves is called **myasthenia gravis (MG)**. MG primarily affects the **neuromuscular junction**, which is the point where nerve impulses meet muscles to create movement. Fewer nerve signals make it to the muscles, resulting in muscles that do not contract and move. Once a patient develops MG, it is a chronic condition.

Multiple Sclerosis

MS has the potential to be disabling. Although the exact cause of MS is still unknown, various genetic and environmental elements are believed to play a part, including family history, certain infections, vitamin D deficiency, and smoking (NINDS, 2019). Females tend to be affected more frequently than males, with symptoms typically appearing in early adulthood (NINDS, 2019).

Pathophysiology

MS is a neurodegenerative disease that has no cure. It is caused by antibodies attacking and damaging the protective layer of myelin sheath covering nerve fibers in the brain and spinal cord. This process creates scar tissue called "sclerosis." MS disrupts nerve signal transmissions, creating communication issues between the brain and other parts of the body.

Clinical Manifestations

MS manifests through a variety of symptoms, including the following:

- muscle weakness
- fatigue
- tingling and numbness
- lack of coordination
- a sensation that causes patients to feel dizzy, sometimes as if they are spinning or in motion while still, known as **vertigo**
- balance issues, which may include the inability to walk
- cardiovascular disease
- suppressed immune system
- eyesight issues, including blurred and/or double vision
- hearing loss
- difficulty breathing
- bladder, bowel, and sexual dysfunction, including infertility
- speech disorders as well as difficulty with swallowing
- cognitive issues, including confusion, memory problems, and difficulty concentrating
- personality and mood changes

The severity of MS symptoms varies among patients (Figure 17.7). Some patients go through periods of **remission**, when symptoms are minimized or even disappear, before facing **exacerbation**, a period when symptoms manifest again. Some patients do not have periods of remission and are continuously affected by MS symptoms. This may include symptoms so severe that patients are immobile, without the ability to walk independently.

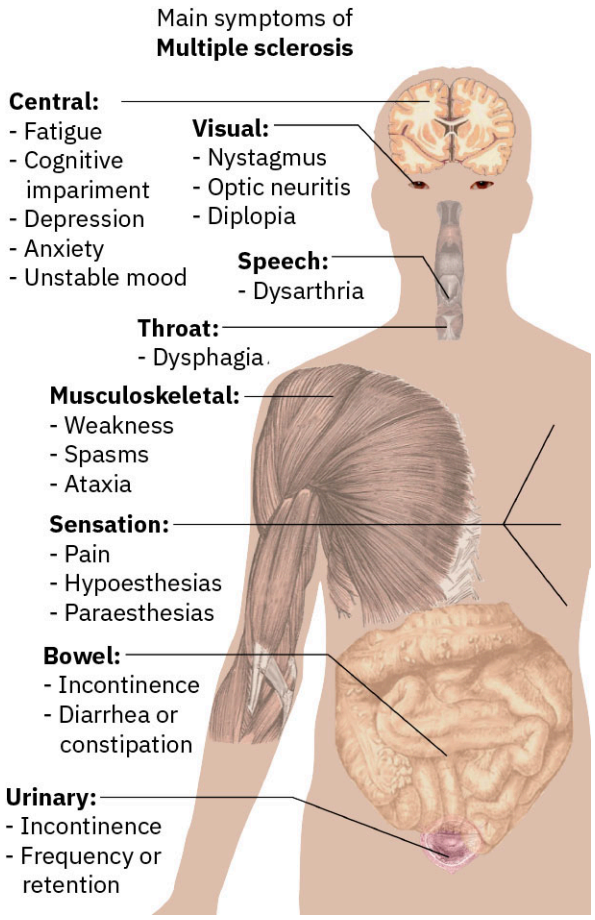

FIGURE 17.7 MS can affect various parts of the body. (credit: modification of "Symptoms of multiple sclerosis" by Mikael Häggström/ Wikimedia Commons, Public Domain)

Assessment and Diagnostics

MS is diagnosed by gathering a patient's medical history to determine if they have risk factors for MS. Such factors include a family history of MS; autoimmune diseases, such as type 1 diabetes or thyroid disease; vitamin D deficiencies; infections, such as Epstein-Barr (the virus that causes mononucleosis); obesity; and smoking. The medical history should also determine if patients have symptoms of MS, such as lack of coordination, cognitive issues, and hearing loss.

Diagnostics and Laboratory Values

If patients have symptoms of MS along with risk factors, additional assessment can be done through diagnostic testing. Blood tests, lumbar punctures, evoked potential tests, and MRIs may be useful to confirm an MS diagnosis.

Blood test results cannot show if a patient has MS, but they may show if a patient has another condition, with symptoms that are similar to MS, such as Lyme disease. If blood tests determine that a patient has a condition other than MS, health-care professionals can rule out MS as a diagnosis for the patient. Blood tests can also show the patient has a problem that is a risk factor for MS, such as a vitamin D deficiency.

A lumbar puncture can rule out infections that may be causing symptoms that mimic MS, as well as show if a patient has antibody abnormalities typical in MS. Evoked potential tests show how quickly nerve signals travel through the body, and in patients with MS these signals are defective. An MRI may show lesions that indicate MS.

Nursing Care of the Patient with Multiple Sclerosis

MS is incurable, but treatment can help patients manage the disease. Nursing care for patients with MS focuses on empowering them to participate in their care while supporting them to maintain the maximum independence and functioning levels possible.

Recognizing Cues and Analyzing Cues

To recognize the cues for MS, nurses should assess the patient's neurological status, with attention to motor functioning, coordination, and sensory perceptions. Nurses should be alert for muscle weakness, tremors, and gait issues, as well as problems with fine or gross motor skills. Other cues include sensory disturbances such as tingling or numbness, as well as problems such as fatigue, memory lapses, difficulty with concentration, and mood shifts. As part of this process, nurses should be aware that some patients with MS go through periods of remission and exacerbation, so some cues may be visible only part of the time. Nurses should also consider the results of blood tests, lumbar punctures, evoked potential tests, and/or MRIs performed on the patient. To analyze the cues of both symptoms and test results, nurses must evaluate how the findings deviate from normal ranges for both body functioning and test results.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

For patients with MS, prioritize health problems according to severity of symptoms, recognizing that some symptoms may be mild and require no treatment. Although there is no cure for MS, patients still need treatment to help them manage symptoms, recover from attacks, and slow the disease's progression. Coordinate with each patient's health-care team to generate solutions and develop the best plan of care to address the patient's case. The appropriate nursing interventions may include the actions in Table 17.8.

Nursing Care	Rationale
Complete focused neurological assessments.	Changes in the patient's neurological symptoms, including cognitive issues such as memory and confusion, personality and mood changes, vertigo, muscle weakness, tingling, numbness, and lack of coordination may indicate MS.
Monitor vital signs.	Changes in the patient's vital signs such as heart rate and blood pressure may indicate health issues.
If patient has an MS exacerbation, provide medications and monitor for side effects.	Patients may need corticosteroids to reduce nerve inflammation. Patients may experience side effects, such as elevated blood pressure, insomnia, and mood swings.
Monitor if patients receive a plasma exchange.	During the healing process after a plasma exchange, the plasmapheresis machine must be monitored and patients need care to prevent infections. This may include administering intravenous methylprednisolone.
Medication for ongoing MS management	Patients may need medication to manage ongoing MS symptoms, including injectable, infusion, or oral treatments of drugs such as monoclonal antibodies, interferons, and teriflunomide.
Administer other medications.	Patients may need additional medications to address problems such as fatigue and pain. Some patients may need muscle relaxants.

TABLE 17.8 **Nursing Interventions for Patients with MS**

Nursing Care	Rationale
Assist with mental health support.	Patients may need consultation with a mental health professional to help them cope with the challenges of living with MS. Some patients may need prescription medications to help with issues such as anxiety and depression.
Collaborate with physical therapist.	Patients may need assistance with mobility, including exercises to strengthen muscles and help with coordination and balance problems. Coordinate with the physical therapist as needed.

TABLE 17.8 Nursing Interventions for Patients with MS

REAL RN STORIES

Nurse: Layne
Years in Practice: Seven
Clinical Setting: Outpatient facility
Geographic Location: Reno, Nevada

At one point in my career as a registered nurse, I encountered an exceptional patient whose journey toward accurate MS diagnosis was challenging. Mrs. Gardner was in her 40s when she visited our health-care facility for answers about symptoms she'd been dealing with for over a year. Fatigue, muscle weakness, and intermittent sensory disturbances had become part of her everyday existence, making even routine activities an arduous struggle. She stated she had begun dropping glasses and cookware and tripping on flat surfaces. However, her previous efforts at communicating her symptoms had been met with dismissive comments from health-care providers who failed to recognize its complexity. Frustrated and distressed, Mrs. Gardner found herself caught up in a negative cycle of self-doubt as her genuine concerns were overshadowed by an overwhelming sense that they might just be an invention of her mind. In other words, she was made to feel that she was just making up the symptoms for attention. Months of proper treatment were delayed because of the delayed correct diagnosis. Our team persevered despite initial setbacks to solve Mrs. Gardner's mystery. At first, our assessment process started by listening carefully to her experiences and documenting any subtle cues we detected. Over time it became apparent that dismissals she had experienced had both dismayed her as well as prevented timely interventions. Advocating on her behalf, we coordinated comprehensive diagnostic evaluations, such as MRI scans and lumbar punctures. As advocates on Mrs. Gardner's behalf, we successfully coordinated the results that confirmed her MS diagnosis. Witnessing Mrs. Gardner's journey from uncertainty to clarity highlighted the essential importance of empathy listening, persistent advocacy, and an unshaken trust in patient experience.

Evaluation of Nursing Care for the Patient with Multiple Sclerosis

Because MS is incurable, the desired outcome for patients with MS is symptom management that enables the patient to have a better quality of life. This should include improvement, and even abatement, of symptoms as much as possible. If symptoms cannot be abated, the goal should be to modify the disease and increase the amount of time that elapses between periods when symptoms occur. Patients should also have the support system needed to help them overcome any psychological challenges, such as anxiety and depression, that they may experience as they manage MS.

Medical Therapies and Related Care

See the medical therapies used for patients with MS in Table 17.9.

Medical Therapy	Explanation of Care
MS exacerbations should first be treated with corticosteroids.	May include drugs, such as intravenous methylprednisolone and oral prednisone
If corticosteroids do not work, MS exacerbations may be treated with plasmapheresis.	The plasma exchange process should include removing the patient's plasma, mixing it with a protein solution, and putting it back into the patient's body. For some patients with MS, the protein solution can help treat MS symptoms.
Disease-modifying therapies may include injectable treatments.	Examples include monoclonal antibodies, interferons, and glatiramer acetate.
Disease-modifying therapies may include infusion treatments.	Examples include monoclonal antibodies such as natalizumab and alemtuzumab.
Disease-modifying therapies may include oral treatments	Examples include teriflunomide, monomethyl fumarate, siponimod, cladribine, ponesimod, and dimethyl fumarate.
Physical therapy	Should include exercises to help patients stretch and strengthen their muscles
Additional medications	Patients may need muscle relaxants and pain relievers to help with pain issues. Patients may also need medications, such as modafinil and methylphenidate, to help with fatigue. Other medications may be needed to help with problems such as constipation, sexual dysfunction, and insomnia.
Mental health support	Support may include counseling as well as medication to treat issues such as anxiety and depression

TABLE 17.9 Therapies for Patients with MS

Myasthenia Gravis

Myasthenia gravis (MG) is a chronic autoimmune disorder that occurs when the nerves and muscles fail to communicate. MG causes the skeletal muscles to become weak, affecting muscles that patients control voluntarily to do things such as swallow, make facial expressions, blink eyes, and move the arms and legs. MG generally affects females under age 40 and males over the age of 50 (Johns Hopkins Medicine, 2024c).

Pathophysiology

MG occurs when the immune system produces antibodies that target and block **acetylcholine** receptors at the neuromuscular junction. Acetylcholine is a key neurotransmitter essential in muscle contraction. When acetylcholine is blocked, it inhibits communication between nerves and muscles, hindering normal nerve-muscle connection, and leading to muscle fatigue and weakness.

Individuals with an autoimmune condition, such as lupus or rheumatoid arthritis, may be at risk for MG. Also, in some cases, MG may result when patients have a tumor in their **thymus gland**. The thymus gland produces and trains T cells, which are white blood cells that assist the immune system to fight infections and disease. The thymus gland can produce antibodies that block acetylcholine, so if the gland has a tumor and malfunctions, it may contribute to MG.

Clinical Manifestations

Typically, the symptoms of MG may include difficulty breathing, chewing, swallowing, and/or speaking; facial movement difficulties, including the inability to smile; vision problems, including double vision and drooping eyelids

known as **ptosis**; neck, limb, and/or muscle weakness; and fatigue. Nurses should be aware that the symptoms of MG are likely to worsen when patients are tired. In particular, a repetitive activity such as working the jaw muscles and chewing a plate of coarse foods, such as a steak or crackers, can be wearisome for patients with MG if the disease affects their **bulbar nerve**s, which hold the jaw in place and control swallowing, chewing, and speaking processes. The symptoms of MG are likely to lessen after periods of resting the affected muscles.

Assessment and Diagnostics

MG is assessed and diagnosed by conducting a physical examination focused on patients' coordination, balance, reflexes, senses of sight and touch, and muscle strength. Neurological assessments may show that patients have symptoms, such as breathing difficulties, muscle weakness, balance and coordination problems, poor reflexes, and vision problems.

Diagnostics and Laboratory Values

Tests that can be used to identify MG include blood analysis, ice pack tests, single-fiber EMG, repetitive nerve stimulation, imaging, and pulmonary function tests. Blood tests may show the presence of antibodies that block acetylcholine receptors. Ice pack tests may show that droopy eyelids do not respond to cold therapy. EMGs may reveal limited electrical activity occurring between the patient's brain and muscles. Repetitive nerve stimulation measurements may show that nerves have a limited ability to send signals to muscles. Imaging may illustrate a tumor in the patient's thymus gland. Pulmonary functioning tests—which measure a patient's lung capacity, volume, gas exchange, and flow rates—can determine whether MG affects a patient's breathing.

LINK TO LEARNING

For patients with MG symptoms, the ice pack test (https://openstax.org/r/77IcePackTest) is a useful bedside tool to help confirm a MG diagnosis.

Nursing Care of the Patient with Myasthenia Gravis

For patients with MG who are struggling to breathe, nurses should alert patients' providers that they need medications and other inventions, such as mechanical assistance to restore breathing. Nursing care should focus on following providers' orders to provide immediate medications and other assistance needed to restore breathing. Because MG is incurable, other nursing care for patients with MG should focus on alleviating symptoms as much as possible and helping patients manage the disease. For example, nurses can help patients conserve energy by modifying the way they eat meals and perform other tasks, such as learning to walk with a cane. Nurses should help patients identify which medications alleviate their symptoms and should provide education and support to ensure that patients understand the disease and the challenges that it poses for them.

Recognizing Cues and Analyzing Cues

To recognize the cues for MG, nurses should assess the patient's neurological status, with focus on the patient's coordination, balance, reflexes, senses of sight and touch, and muscle strength. Nurses should be alert for the symptoms of MG, such as shortness of breath, speaking difficulties, drooping eyelids, trouble swallowing, attempts to smile that appear as a scowl, fatigue, and muscle weakness, particularly in muscles that are used repetitively.

Nurses should consider whether patients have risk factors for MG, such as a thymus gland tumor or an autoimmune condition, such as lupus. To analyze the cues of the patient's symptoms and test results, nurses must evaluate how the findings deviate from normal ranges for both body functioning and test results. For example, a patient's blood test may reveal nontypical antibodies that disrupt communication between the patient's nerves and muscles.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

MG can be life-threatening. Specifically, if MG affects the muscles that enable patients to breathe, patients may need immediate intervention to restore breathing. For other symptoms, because there is no cure for MG, treatment should focus on helping patients manage symptoms, and, as much as possible, slow the disease's progression. Nursing interventions include those in Table 17.10.

Nursing Care	Rationale
Complete focused neurological assessments.	Changes in the neurological symptoms of a patient with MG including muscle weakness, vision issues, difficulties with swallowing and speaking, facial movements, and particularly shortness of breath indicate health issues.
Monitor vital signs.	Changes in the vital signs of a patient with MG, such as heart rate and blood pressure, may indicate health issues.
Maintain breathing.	Patients with MG with breathing difficulties may need medications, such as inhaled bronchodilators and/or inhaled steroids, to restore breathing. They may also need a ventilator, using either endotracheal intubation or a BiPAP.
Assist with bed positioning.	Patients with MG with breathing difficulties should be placed in Fowler's position while they are in bed. This is a semi-sitting position with the head of the bed elevated 45 to 60 degrees.
Administer medications for ongoing MG management.	For ongoing MG symptoms, patients may need medications such as corticosteroids, immunosuppressants, and cholinesterase inhibitors.
Administer intravenous therapy.	If patients with MG have symptoms that suddenly worsen, intravenous therapy may be useful. This includes therapies such as plasmapheresis, intravenous immunoglobulin (IVIG), and monoclonal antibodies that nurses administer by vein.
Assist with mental health support.	Patients with MG may need consultation with a mental health professional to help them cope with the challenges of living with MG. Some patients may need prescription medications to help with issues such as anxiety and depression.
Prepare for surgery and provide aftercare.	For patients with MG who have a thymus gland tumor, surgery may be warranted to remove the tumor. Nurses should help prepare patients for surgery and provide care after surgery. This may include wound care, as well as pain management.
Coordinate with occupational therapist.	Some patients with MG may benefit by learning how to use appliances, such as electrical toothbrushes and electric can openers, to conserve their body's energy by reducing the use of voluntary muscles. Coordinate with the occupational therapist as needed.

TABLE 17.10 Nursing Interventions for Patients with MG

Evaluation of Nursing Care for the Patient with Myasthenia Gravis

For patients with MG who struggle to breathe, the desired outcome is maintaining the optimal quality of breathing, and abatement of the medical emergency caused by the patient's breathing difficulties. Because MG is incurable, the desired outcome for all patients with MG is symptom management that helps patients manage the disease and have a better quality of life. An example includes, after consultation with a mental health professional does the patient appear they can cope with MG prognosis. Another evaluation includes if the bed is positioned to help the patient breathe easier, do they appear in respiratory distress after repositioning.

Medical Therapies and Related Care

The medical therapies used for patients with MG may include those in Table 17.11.

Medical Therapy	Explanation of Care
MG exacerbations that cause breathing difficulties should be treated with medications and possibly ventilation	Medications may include inhaled bronchodilators and/or inhaled steroids. Ventilators may use either endotracheal intubation or a BiPAP.
Medication for ongoing symptoms	Medications to manage ongoing MG symptoms may include corticosteroids, immunosuppressants, and cholinesterase inhibitors.
Intravenous therapy	For some patients with MG, intravenous therapies such as plasmapheresis, intravenous immunoglobulin (IVIG), and monoclonal antibodies given by vein may be useful.
Surgery	For patients with MG who have a thymus gland tumor, surgery may be an option to remove the tumor.
Occupational therapy	Patients with MG may need to be taught to use appliances, such as electrical toothbrushes and electric can openers, to use their voluntary muscles less and conserve energy.
Mental health support	Support may include counseling, as well as medication, to treat issues such as anxiety and depression for patients who need mental health support to manage MG.

TABLE 17.11 Medical Therapies for Patients with MG

INTERDISCIPLINARY PLAN OF CARE

Interdisciplinary Care for Patients with MG

Patients with MG require an interdisciplinary approach to provide care that addresses all of their needs. For example, in addition to treatment from a primary provider, patients with MG typically need occupational therapy to learn how to use tools, such as electric toothbrushes, that can help patients with MG expend less energy to perform everyday tasks. Physical therapists can teach patients with MG about stretching and other exercises that can help them build and conserve physical energy. Mental health professionals can counsel patients with MG about mental health issues they may experience, such as anxiety and depression, and help them learn coping techniques. If needed, mental health professionals can prescribe medication to help patients with MG control issues such as anxiety. Nurses can help patients with MG by acting as the liaison among their care team and helping patients with MG coordinate with each member of their team to get the best possible treatment.

17.4 Major Neurocognitive Disorder and Neurodegenerative Diseases

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for MNDs, Alzheimer disease, amyotrophic lateral sclerosis (ALS), and Parkinson disease
- Describe the diagnostics and laboratory values in MNDs, Alzheimer disease, ALS, and Parkinson disease
- Apply nursing concepts and plan associated nursing care for the patient with MND, Alzheimer disease, ALS, and Parkinson disease
- Evaluate the efficacy of nursing care for the patient with MND, Alzheimer disease, ALS, and Parkinson disease
- Describe the medical therapies that apply to the care of MND, ALS, Alzheimer disease, and Parkinson disease

The decline in cognitive abilities, such as memory and reasoning, in a manner that disrupts patients' daily lives is known as **major neurocognitive disorder (MND)**. MND refers to a group of disorders characterized by neurological changes that make it more challenging for patients to continue routine activities.

LINK TO LEARNING

It is important to note that in *DSM-5* criteria, the definition of dementia (https://openstax.org/r/77DementiaDef) has been updated. The term *major neurocognitive disorder* is now the correct terminology for *dementia*.

MND varies in severity and may worsen over time. For some patients, MND is mild enough that they can still function reasonably well, whereas other patients experience MND so severely that they are unable to care for themselves. MND is a general term that refers to several neurological disorders. The most common form of MND is Alzheimer disease, which is also a **neurodegenerative disease**, a chronic condition that damages the brain and central nervous system, causing problems with cognitive abilities as well as physical movement. In addition to Alzheimer disease, amyotrophic lateral sclerosis (ALS) and Parkinson disease are other neurodegenerative diseases. Neurodegenerative diseases are incurable, but they can be treated and managed. This section will provide an overview of MND, Alzheimer disease, ALS, and Parkinson disease, including symptoms and how nurses can assess, plan, and care for patients with these diseases.

MND Pathophysiology

MND occurs when the brain's neurons, or nerve cells, die after they become inactive and lose their connections to other brain cells. This is a normal process that every person experiences, particularly as individuals age. But for patients who develop MND, this process is more active, and they lose a larger number of neurons. Although MND is associated with aging, not everyone develops MND as they get older. The National Institute on Aging estimates that about one-third of people over age 85 may have some type of MND (Figure 17.8). In addition to Alzheimer disease, other common forms of MND include the following (National Institute on Aging [NIA], 2022b):

- Abnormal deposits of protein in the brain lead to **Lewy body dementia**. The condition progresses slowly and changes patients' ability to think and concentrate.
- Damage to the brain's frontal and temporal lobe neurons leads to a **frontotemporal disorder**. The condition progressively gets worse and causes personality and behavior changes.
- Insufficient blood and oxygen to the brain leading to damage to the brain's blood vessels causes **vascular dementia**. The condition may affect all aspects of a patient's cognitive abilities, including behavior, memory, and reasoning.

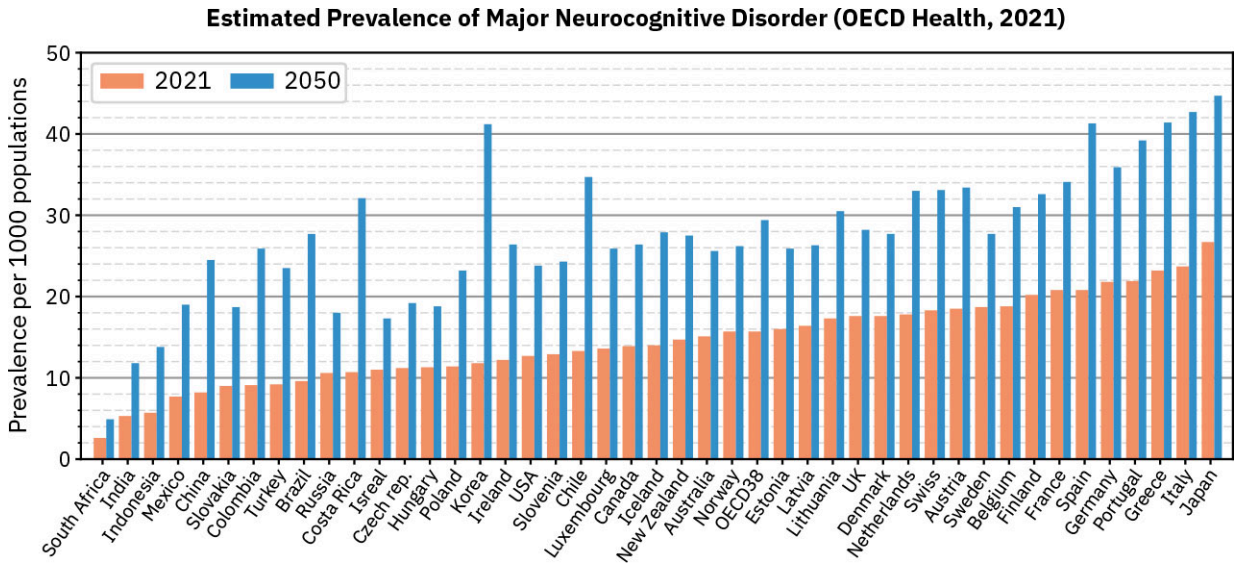

FIGURE 17.8 This graph compares the global prevalence of MND in 2021 to the estimated prevalence in 2050. (credit: modification of "Dementia Prevalence in OECD" by "Yuasan"/Wikimedia Commons, CC0 1.0)

Clinical Manifestations

The symptoms of MND include cognitive problems such as memory loss, disorientation, and confusion; difficulty reasoning and using abstract thinking, logic, and judgment to think and solve problems; decreased ability to organize and plan; communication difficulties, including forgetting simple words; spatial awareness issues, which may include getting lost; and needing more time than usual to complete routine tasks. Patients may lose things or put them in the wrong place for safekeeping. MND symptoms may also include psychological issues, such as changes in personality, which may include losing interest in favorite activities and/or no longer caring about others; feelings of paranoia; being irrational and/or impulsive; hallucinations; anxiety; and depression.

Assessment and Diagnostics

Health-care professionals assess and diagnose MND with a physical examination that includes a review of the patient's symptoms, as well as diagnostic tests. Patients should be asked about their medical background and history, including whether their family has a history of MND and whether they are taking any medications, such as anticholinergic drugs and opioids, which can cause symptoms of MND. The patient's general health needs to be assessed, because patients with MND may have other health problems, such as traumatic brain injury, cardiovascular disease, Parkinson disease, and immune disorders. Patients with MND may also lead unhealthy lifestyles, which may include poor nutrition and lack of exercise, particularly if they are forgetful and don't remember to eat or get exercise.

Diagnostics and Laboratory Values

The diagnostic tests that can help diagnose MND include brain scans, such as a CT or MRI, lumbar puncture, positron emission tomography (PET) scans, and cognitive and neurological tests. Brain scans may show tumors and stroke, and lumbar punctures may show a high level of protein in CSF. PET scans may show abnormal brain activity and may also reveal deposits of protein in the brain. Cognitive and neurological tests will show decline and problems in the patient's mental abilities. Each of these problems can contribute to MND.

LINK TO LEARNING

The Alzheimer's Association (AA) provides a guide to help patients understand the medical tests available (https://openstax.org/r/77AlzheimerTests) to determine if someone has Alzheimer disease or another form of MND. AA's website also includes a link to an interactive tour that helps patients understand what to expect when they are evaluated for cognitive issues.

Nursing Care of the Patient with MND

MND cannot be cured. Patients who have mild MND may be able to continue functioning reasonably well with minimal assistance, but as MND progresses, patients may need more in-depth and routine care. Patients with MND should be in a safe, secure environment that provides the resources they need to function as well as possible, such as health-care facilities that provide memory care or assistance with ADLs.

Recognizing Cues and Analyzing Cues

To recognize and analyze the cues of MND, nurses should review the findings of the patient's physical examination. This includes noting whether the patient seems confused, struggles to communicate, or has paranoid tendencies. Patients with MND may do things such as repeat questions, have trouble writing, or lack interest in a conversation. To gather additional cues, nurses can talk with the patient's family members and ask them about problems they have noticed in the patient. Other cues will come from diagnostic test results. If the results of brain scans, lumbar punctures, PET scans, and/or cognitive and neurological tests show abnormal results, these may be cues that indicate the patient has MND.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

The symptoms of patients with MND should be prioritized based on their severity. For example, if a patient's symptoms are so severe that they do not remember others and do things such as wander from home and get lost, this is more urgent than symptoms that cause a patient to do things such as misplace their keys. Keeping patients safe is paramount, and symptoms that put patients in danger must be prioritized. Solutions should focus on ensuring patients' safety while helping them live as independently as possible. The nursing interventions appropriate for patients with MND may include those in Table 17.12.

Nursing Care	Rationale
Complete focused neurological assessments.	The patient's cognitive status, including confusion, memory issues, communication difficulties, and problem-solving skills may indicate MND. This includes whether the patient acts impulsively, wanders away and gets lost, seems disinterested in others, and repeats questions.
Monitor vital signs.	Changes in the patient's vital signs, such as heart rate and blood pressure, as well as balance issues may indicate health problems.
Administer medications.	Patients with MND may need medications, such as cholinesterase inhibitors and memantine, to help with MND symptoms.
Coordinate with occupational therapist.	Some patients with MND may benefit from occupational therapy, which can teach coping behaviors, particularly how to keep patients with MND safe from threats such as losing their balance and falling. Nurses may refer patients to occupational therapy.

TABLE 17.12 Nursing Interventions for Patients with MND

Nursing Care	Rationale
Help with exercise.	Patients with MND may benefit from exercise and should be encouraged to develop an exercise regimen. Although results are not definitive, research suggests that exercise such as walking and swimming may improve brain functioning. Nurses can help patients identify exercise opportunities and formulate a plan to make exercise part of their daily routine.
Coordinate mental health support.	Patients with MND and their families may need consultation with a mental health professional to help them cope with the challenges of living with MND. Some patients may need prescription medications to help with issues such as anxiety and depression.

TABLE 17.12 Nursing Interventions for Patients with MND

LINK TO LEARNING

Read this article to learn more about how exercise can decrease the risk for cognitive decline (https://openstax.org/r/77BrainExercise) from the Alzheimer's Association.

Evaluation of Nursing Care for the Patient with MND

The desired outcome for patients with MND is alleviation of symptoms if possible. If a patient's symptoms of MND cannot be alleviated, or at least improved, the desired outcome is to help patients and their families learn how to cope with MND. Patients with MND should be kept safe and provided the support needed to enhance their quality of life as much as possible. Goals for patients with MND include helping them live at home if possible, maintaining a routine of physical activity, engaging in activities that provide mental stimulation, and avoiding hospitalization.

REAL RN STORIES

Nurse: Jen
Years in Practice: Five
Clinical Setting: Memory care/Alzheimer unit
Geographic Location: Las Vegas, Nevada

As part of my nursing shift, I struggled with both anger and empathy when caring for Mrs. Sutherland, an older patient experiencing advanced Alzheimer disease. My challenge lay not in an absence of commitment or medical interventions but in Alzheimer disease itself being incurable. Mrs. Sutherland's memory loss and confusion were emotionally taxing, which highlighted medical limitations, as it left Mrs. Sutherland emotionally distraught and confused. It was profoundly humbling. Normally, people with Alzheimer disease can become mean, but she was so sweet and childlike. She seemed to have reverted to the mental capacity of a 3-year-old who was sweet and trusting. As I carefully attended to her needs by providing comfort, reassurance, and steady presence, I struggled with the inherent frustration associated with treating a condition that demands not just clinical competence but an inexhaustible reservoir of compassion. My focus remained on compassionate care rather than finding solace in small victories such as fleeting smiles or moments of clarity. I saw pictures her family brought in when she used to be a fancy nightclub singer, and now she was a wheelchair-bound older woman who took no care for her physical appearance anymore. It was such a contrast and humbling to see what life can reduce a person to. Gentle redirection was essential, creating an environment that minimized confusion and anxiety for Mrs. Sutherland. I met her where she was instead of where she was previously. I acknowledged the fragmented elements of her reality while managing the fluctuations of her emotional landscape. Disgust turned to profound admiration of human

resilience, leading me to pledge my advocacy on behalf of those dealing with Alzheimer disease. By providing care that transcended medical interventions alone, I witnessed firsthand the profoundly powerful effect that compassionate nursing care could have in dealing with an incurable condition. Her family was deeply grateful for the compassionate care I showed to her, which was also rewarding.

Medical Therapies and Related Care

The medical therapies used for patients with MND may include medications, such as cholinesterase inhibitors, which can decrease acetylcholine breakdown, enabling nerve cells to communicate; and memantine, which can decrease neurotoxicity (damage to nerve cells) and protect nerve cells from damage. Other treatments include occupational therapy and regular exercise. Some patients may also need mental health support.

Amyotrophic Lateral Sclerosis (ALS)

A disease of the central nervous system, **amyotrophic lateral sclerosis (ALS)** affects the motor neurons of the brain and spinal cord, causing patients to lose control of their muscles. The disease, which is incurable and ultimately fatal, is sometimes called Lou Gehrig disease for the baseball player who had the disease. The cause of ALS is unknown, but a small percentage of cases, perhaps 5 to 10 percent, are inherited. In all cases of ALS, as motor neurons die and the disease progresses, patients may lose the ability to walk, eat, speak, and breathe (ALS Association, n.d.).

Pathophysiology

ALS occurs when motor neurons degenerate and die, causing the muscles they control to also weaken and degenerate. Except for the small percentage of ALS cases caused by an inherited gene, medical experts do not know why patients contract ALS. A few environmental factors, such as smoking and exposure to toxins, have been linked with an increased risk for ALS. Age is also a factor, because the disease usually affects patients over age 60 (Mayo Clinic, 2023c).

Clinical Manifestations

ALS typically begins with stiffness and weakness in the muscles that control the limbs, including the legs and arms. As the disease progresses, it typically spreads to muscles in the trunk and eventually to muscles that control vital functions, such as breathing. As the muscles get weaker, patients lose the ability to do things, such as walk, chew, swallow, speak, and breathe. The muscle weakness may be accompanied by muscle cramps, as well as twitching in the shoulders and arms. In some patients, the tongue may also twitch. The disease also affects cognitive abilities, changing a patient's behavior and affecting their ability to think. Some patients with ALS also develop frontotemporal MND.

The progression of the disease varies by patient, and some patients even have periods when the disease stops progressing for a few months or longer. On average, patients who develop ALS live about three years once the disease is diagnosed. Some patients do live longer, with about 20 percent surviving at least five years, about 10 percent living for ten years, and 5 percent surviving for more than twenty years after they are diagnosed (ALS Association, n.d.).

Assessment and Diagnostics

Typically, ALS is diagnosed by ruling out other conditions and diseases with similar symptoms, such as multiple sclerosis and myasthenia gravis. The tests that can be useful to help identify whether the patient has a disease or condition other than ALS include blood and urine tests, lumbar punctures, nerve conduction studies, electromyogram (EMG), imaging such as MRI, nerve biopsy, and muscle biopsy. A physical examination can also determine if a patient has symptoms typical of ALS.

Diagnostics and Laboratory Values

The diagnostics and laboratory values that may help diagnose ALS may include the following:

- Blood and urine tests may show higher-than-normal levels of serum **neurofilament light chain (NfL)**, a protein that increases when neurons are damaged.
- Nerve conduction studies may show that the patient has nerve damage, which is an indicator of ALS.
- EMGs document the muscles' electrical activity at rest as well as when contracting. In patients with ALS, this

test, which should be performed in tandem with a nerve conduction study, will show muscle and/or nerve damage.
- MRI imaging with high resolution will show changes in nerves and muscles, such as cortex iron deposition, which indicates ALS. MRIs may also show problems such as herniated disks and spinal cord tumors, which can be used to rule out ALS.
- A nerve biopsy will not show if a patient has ALS but may be used to rule out ALS by diagnosing another condition or disease. For example, a nerve biopsy may show inflammation of the nerves or a **demyelinating disease**, which is a condition that damages the protective covering of the brain's nerve fibers.
- A muscle biopsy will not show if a patient has ALS but may be used to rule out ALS by diagnosing another condition or disease. For example, a muscle biopsy may show infections in the muscles or a disorder such as muscular dystrophy.

Nursing Care of the Patient with Amyotrophic Lateral Sclerosis (ALS)

Nursing care for patients with ALS should focus on controlling symptoms and helping patients and their families learn to manage the disease. Because ALS is a fatal disease, nursing care should include mental health support. As patients with ALS near the end of life, they may need palliative care.

Recognizing Cues and Analyzing Cues

The cues of ALS will be found in the patient's physical examination and test results and may include muscle weakness that affects the patient's ability to speak, swallow, and walk. Some patients may struggle to concentrate and may exhibit unusual behavior, such as untimely laughing or crying. A discussion with the patient may reveal that the patient is struggling to carry out routine activities because of muscle weakness. Nerve conduction studies may show that the patient's lumbar punctures will not reveal findings that indicate ALS, but they may indicate that the patient has a condition with similar symptoms, such as MS.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

ALS symptoms should be prioritized based on severity, with symptoms that affect patients' ability to do life-sustaining activities, such as breathing and eating, given priority over symptoms that do not create life-threatening situations. Solutions should focus on sustaining lives of patients with ALS and enabling them to live as independently as possible. The nursing interventions appropriate for patients with ALS may include those in Table 17.13.

Nursing Care	Rationale
Complete focused neurological assessments.	Patients with ALS may have a limited ability to do things, such as speak, eat, and use their hands. They may also have twitching and/or exhibit unusual behavior, such as untimely laughing.
Monitor vital signs.	Changes in the vital signs of patients with ALS, such as heart rate, blood pressure, and ability to breathe, may indicate severity of ALS symptoms. This is particularly true for patients in more advanced stages of ALS.
Administer medications specifically for ALS.	ALS can be treated with riluzole, edaravone, and/or sodium phenylbutyrate-taurursodiol. Patients with ALS should receive prescribed drugs as appropriate and side effects should be monitored. For example, riluzole may cause gastrointestinal problems and dizziness, whereas edaravone may cause headaches and bruising.

TABLE 17.13 Nursing Interventions for Patients with ALS

Nursing Care	Rationale
Administer other medications.	Patients with ALS may need medications to control other problems that may occur as a result of ALS. For example, patients who experience constipation may need a laxative, patients who have trouble sleeping may benefit by taking a sedative, and patients in pain may get relief with acetaminophen.
Give breathing support.	Patients with ALS who struggle to breathe may need mechanical ventilation assistance.
Coordinate with speech therapist.	Patients with ALS who struggle to speak may benefit by working with a speech therapist to learn how to speak with weakened muscles.
Coordinate with physical therapist.	Physical therapy can help patients with ALS learn exercises and techniques to strengthen their muscles, maintain a greater range of motion, and improve their cardiovascular fitness.
Coordinate with occupational therapist.	Occupational therapy can help patients with ALS learn how to use assistive devices, such as an electric toothbrush, to overcome muscle weakness and continue doing routine activities, such as brushing their teeth.
Coordinate mental health support.	Patients with ALS and their families may need consultation with a mental health professional to help them cope with the challenges of living with ALS. Some patients may need prescription medications to help with issues such as anxiety and depression.

TABLE 17.13 **Nursing Interventions for Patients with ALS**

Evaluation of Nursing Care for the Patient with Amyotrophic Lateral Sclerosis (ALS)

The desired outcome for patients with ALS is control and management of their symptoms to improve their quality of life and help them live longer. This may include enabling them to maintain their independence with activities such as feeding themselves.

Medical Therapies and Related Care

The medical therapies used for patients with ALS may include medications, such as riluzole, which blocks glutamatergic neurotransmission in a patient's central nervous system; edaravone, which captures molecules that can damage cells and thereby protects neurons; and/or sodium phenylbutyrate-taurursodiol, which can help prevent nerve cells from breaking down and dying. Other medications needed to treat problems caused by ALS may include laxatives for constipation and sedatives for insomnia. In the early stages of ALS, some patients may benefit from speech, physical, and/or occupational therapy. Therapy may enable patients with ALS to retain mobility for a longer period. Therapy may also help patients with ALS avoid, or at least postpone, issues such as **contracture**s, which can cause deformity and rigidity in joints if muscles, tendons, and tissues are shortened and/or hardened. As ALS progresses, some patients may need mechanical ventilators for breathing support. Mental health support should be provided as needed. As conditions deteriorate for a patient with ALS, nurses should also strive to help them and their families make end-of-life preparations.

Alzheimer Disease

Alzheimer disease is a disorder in the brain that gradually destroys patients' memory and thinking abilities, eventually making it challenging for patients to handle basic tasks and live independently. As noted previously,

Alzheimer disease is the most common form of MND, accounting for at least 60 percent of MND cases. Generally, Alzheimer disease affects people over age 65 and gradually worsens as patients age. The disease, which has no cure, affects memory and causes patients to be disoriented and confused. Patients with Alzheimer disease struggle to remain independent and continue their daily routines (Alzheimer's Association, 2024).

LIFE-STAGE CONTEXT

Early-Onset Alzheimer Disease

Whereas Alzheimer disease may be regarded as a disease that primarily affects individuals over age 65, early-onset Alzheimer disease affects people in their 40s and 50s. Cases for this age group may be overlooked because providers generally do not expect younger patients to have Alzheimer disease. But occasionally, younger patients with memory problems are experiencing Alzheimer disease, particularly if they have a family history of the disease.

Pathophysiology

Medical experts have not identified the specific cause(s) of Alzheimer disease, but it appears to be linked to factors such as a family history of Alzheimer disease; poor lifestyle, such as lack of exercise and excessive alcohol consumption; head trauma; and environmental factors, such as excessive exposure to air pollution. Alzheimer disease may result when the brain's neurons become damaged, losing their connections and eventually dying.

In addition, patients with Alzheimer disease tend to have issues with beta-amyloid and tau proteins, which provide support to the brain's neurons. When the beta-amyloid proteins malfunction, they may clump together in **amyloid plaque** deposits, which disrupt cell functioning, and the tau proteins may transform into structures called **neurofibrillary tangle**s, which occur when proteins inside neurons accumulate abnormally. These conditions contribute to Alzheimer disease by disrupting brain functioning.

Clinical Manifestations

Typically, Alzheimer disease affects memory first before spreading to affect other brain functioning. Initially, patients with Alzheimer disease may do things such as forget appointments, misplace items, and have trouble remembering the right words to describe things. As problems with memory progress, patients with Alzheimer disease may repeat themselves, sometimes over and over, and do other things such as get lost in familiar surroundings and even forget people they know well.

As the disease progresses, it affects other brain functioning, making it challenging for patients with Alzheimer disease to do things such as reason, make decisions, organize, and make plans. Patients with Alzheimer disease also typically experience personality changes, which may include disinterest in activities they once enjoyed, social withdrawal, moodiness, and aggressive behavior that may include anger. They may also have delusions, change their sleeping habits, and become depressed. As the disease progresses into late-stage Alzheimer disease, patients experience additional symptoms, including the inability to participate in a conversation and difficulty responding to their environment. Eventually, they tend to lose the ability to control their movements, and additional personality changes may occur. At this stage, patients typically need round-the-clock care, and they may become more susceptible to infections, such as pneumonia.

Assessment and Diagnostics

Alzheimer disease is diagnosed by conducting a physical examination that reviews the patient's overall health to gather details about any recent changes in memory, personality, and daily habits. This examination should include a family member who can provide additional details about any recent changes in the patient's behavior and thinking abilities. One goal of the physical examination is to rule out other conditions and diseases that may be causing symptoms similar to Alzheimer disease, such as brain tumors, stroke, and Parkinson disease. As part of this process, the physical examination should review the patient's overall physical health, including eye movements, coordination, speaking patterns, and reflexes.

Diagnostics and Laboratory Values

Diagnostic tests of the patient's memory and skills, such as cognitive/thinking, language, and mathematical abilities, can provide additional evidence of Alzheimer disease. Other tests that may provide helpful data include blood tests, lumbar puncture, and imaging with brain scans. For patients with Alzheimer disease, the diagnostics and laboratory

values that indicate the patient has Alzheimer disease include the following:

- Blood tests cannot confirm an Alzheimer disease diagnosis but can be used to rule out other causes of memory loss, such as vitamin deficiencies and thyroid disorders.
- Lumbar punctures will show increased levels of beta-amyloid and tau proteins, which are indicative of Alzheimer disease and other forms of MND.
- MRI imaging may show shrinkage of areas of the brain that are associated with Alzheimer disease. In addition, MRIs provide evidence to rule out other conditions and diseases that have symptoms similar to Alzheimer disease, such as brain tumors and strokes.
- PET scans can show areas of the brain that have poor metabolism, which is an indicator of Alzheimer disease.
- CT scans will not help diagnose Alzheimer disease, but their findings can help rule out other conditions and diseases, such as head injuries, strokes, and brain tumors.

Nursing Care of the Patient with Alzheimer Disease

Nursing care for patients with Alzheimer disease should focus on controlling symptoms, as well as helping patients and their families learn to manage and live with the disease. This includes helping patients recognize when they are no longer able to care for themselves. Nurses should educate patients and their families about Alzheimer disease and help them establish routines that can help patients live more independently. For example, caregivers should be educated to gently remind patients with Alzheimer disease when it is time for meals and other tasks, such as taking medications. Nurses should also help patients and their caregivers create a safe environment that protects patients from risks, such as wandering away from home and forgetting where they are.

LINK TO LEARNING

Visit the Alzheimer's Association (https://openstax.org/r/77AlzheimAssoc) for more information and resources about MND.

Recognizing Cues and Analyzing Cues

The cues of Alzheimer disease may include memory loss, struggles to think clearly, language difficulties, personality changes, despondency, and aggression. The cues from the diagnostic tests may include increased levels of beta-amyloid and tau proteins and shrinkage of the areas of the brain that control memory and related functioning.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Care for patients with Alzheimer disease should be prioritized based on the severity of their symptoms. Symptoms that threaten patient safety should be prioritized over less severe symptoms, such as mild forgetfulness. Solutions should be generated based on recommendations from the patient's care team to address each patient's needs. The nursing interventions appropriate for patients with Alzheimer disease may include assisting with daily routines and providing healthy meals.

Evaluation of Nursing Care for the Patient with Alzheimer Disease

The desired outcome for patients with Alzheimer disease is control and management of their symptoms to improve their quality of life and help them live as independently as possible. This includes enabling them to cope with the challenges of Alzheimer disease and maintaining a safe environment. For example, helping them develop a daily schedule that includes healthy meals and an exercise regimen can help them establish a routine that promotes independence and safety, while also helping them learn to live with Alzheimer disease.

Medical Therapies and Related Care

The medical therapies used to treat Alzheimer disease may include medications such as antiamyloid treatments, which remove beta-amyloid proteins from the brain, preventing the formation of plaques and promoting healthy brain cells. Some patients with Alzheimer disease may benefit from taking cholinesterase inhibitors, which increase the amount of acetylcholine in the nervous system, promoting healthy nerve cells that can sustain memory and learning processes. Some patients with Alzheimer disease may need other medications, such as sedatives and pain relievers to treat additional health problems such as insomnia and pain. If necessary, patients and their families struggling to cope with the challenges of Alzheimer disease should receive mental health support.

Parkinson Disease

Parkinson disease is an incurable brain disorder that affects the nervous system, causing body parts, such as the hands, to have movements that are unintended and uncontrollable. This includes stiffness and shakiness, as well as balance and coordination issues. Parkinson disease affects multiple parts of the body, including the face, arms, and legs.

Pathophysiology

Parkinson disease occurs when neurons in the brain's basal ganglia are damaged and/or die. The **basal ganglia** are the areas of the brain where movement is controlled. The basal ganglia's neurons produce **dopamine**, a chemical neurotransmitter involved in movement, as well as disposition and memory. When the basal ganglia's neurons are damaged or die, the body does not have sufficient dopamine to control movement. In patients with Parkinson disease, the nerve endings that generate norepinephrine are also damaged and die. The primary chemical messenger for the sympathetic nervous system, **norepinephrine**, controls bodily functions such as blood pressure and heart rate.

Parkinson disease appears to be caused by genetics in a few cases and may be hereditary for some patients. But in most cases, Parkinson disease is not inherited and may be caused by other factors, such as exposure to toxic substances. The brains of patients with Parkinson disease also tend to have clumps of Lewy bodies, which are abnormal protein clumps, and these contain clumps of alpha-synuclein protein that cells cannot break down. This creates chemical changes in the brain, affecting patients' moods and their abilities to think and remember (NIA, 2022a).

Clinical Manifestations

The symptoms of Parkinson disease typically begin subtly and progress gradually. The primary symptoms include the following:

- tremors in head, jaw, arms, hands, and legs
- stiffness and contractions in muscles
- slowed movement, called **bradykinesia**, as patients attempt to do things such as walk or write
- loss of balance and coordination
- difficulty speaking, chewing, and swallowing
- loss of automatic movements, such as blinking or swinging the arms while walking
- constipation and urination issues
- blood pressure irregularities, including **orthostatic hypotension**, a sudden drop in blood pressure when standing up or sitting down
- sleep disorders
- fatigue
- pain
- cognitive issues, such as thinking difficulties, dementia, and MND
- depression and other mental health issues

Assessment and Diagnostics

Parkinson disease is assessed and diagnosed through a physical examination and by conducting tests to rule out other conditions and diseases, such as a brain tumor, which may be causing symptoms similar to those experienced by patients with Parkinson disease. A physical examination may show symptoms of Parkinson disease such as tremors, stiff muscles, coordination and balance difficulties, loss of automatic movements, constipation and urination issues, and cognitive issues.

Diagnostics and Laboratory Values

Tests that can be helpful to confirm a Parkinson disease diagnosis include a dopamine transporter (DAT) scan and imaging tests, such as MRI and PET scans. A DAT scan may reveal that the patient has an unhealthy dopamine system. This does not provide a definitive diagnosis of Parkinson disease, but it is an indicator of Parkinson disease. MRI and PET scans will not diagnose Parkinson disease but may help rule out other disorders, such as a brain tumor, which may be causing the patient to have symptoms similar to those of patients with Parkinson disease.

Nursing Care of the Patient with Parkinson Disease

Because Parkinson disease is incurable, nursing care for patients with Parkinson disease should focus on controlling symptoms, which can be done with medication as well as techniques such as exercise. Nursing care should also strive to teach patients and their families how to live with the disease.

Recognizing Cues and Analyzing Cues

The cues of Parkinson disease will primarily be found in the physical examination. Nurses should analyze these cues, which may include tremors, stiff muscles, coordination and balance difficulties, loss of automatic movements, constipation and urination issues, and cognitive issues. In addition, if the DAT scan finds that the patient has an unhealthy dopamine system, this is a cue that the patient has Parkinson disease.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Parkinson disease should be prioritized based on the severity of symptoms, with more severe symptoms a higher priority than less severe symptoms. Symptoms that affect a patient's ability to function and live independently, such as severe tremors and pain, are more urgent than milder symptoms, such as muscle tension. Solutions should be generated with input from the patient's care team. The nursing interventions appropriate for patients with Parkinson disease may be those in Table 17.14.

Nursing Care	Rationale
Complete focused neurological assessments.	Patients may struggle to do things such as speak, eat, and use their hands.
Monitor vital signs.	The vital signs of the patient with Parkinson disease, particularly blood pressure, can be adversely affected by Parkinson disease.
Administer medications as ordered specifically for Parkinson disease.	The medications that may be ordered for Parkinson disease include the following, which should be administered as prescribed: • Carbidopa-levodopa converts to dopamine inside the brain. • Dopamine agonists mimic dopamine. • Monoamine oxidase B inhibitors prevent the breakdown of dopamine. • Catechol-O-methyltransferase inhibitors block enzymes that break down dopamine. • Anticholinergics control tremors. • Amantadine controls involuntary movements in early stages of Parkinson disease. • Adenosine receptor antagonists allow the release of more dopamine. • Nuplazid treats hallucinations and delusions.
Prepare for surgery and provide aftercare.	Some patients with Parkinson disease may benefit from deep brain stimulation, which is the process of implanting electrodes into the brain that are connected to a generator implanted in the patient's chest. Electrical pulses from the generator to the brain may help with symptoms. For surgery patients, nurses should help them prepare for surgery and then provide surgery aftercare, such as dressing their surgical wounds.

TABLE 17.14 Nursing Interventions for Patients with Parkinson disease

Nursing Care	Rationale
Coordinate with speech therapist.	Speech therapy can help patients with Parkinson disease learn how to control their voices and speak despite muscle difficulties.
Coordinate with physical therapist.	Physical therapy can help patients with Parkinson disease learn exercises and techniques to strengthen their muscles, improve balance and coordination, and gain greater flexibility.
Coordinate with massage therapist.	Massage therapy can help patients with Parkinson disease reduce tension in their muscles.
Coordinate with occupational therapist.	Occupational therapy can help patients with Parkinson disease learn how to use assistive devices, such as electric toothbrushes, which can help them maintain more independence.
Assist with mental health support.	Patients with Parkinson disease and their families may need consultation with a mental health professional to help them cope with the challenges of living with Parkinson disease. Some patients may need prescription medications to help with issues such as anxiety and depression.

TABLE 17.14 Nursing Interventions for Patients with Parkinson disease

Evaluation of Nursing Care for the Patient with Parkinson Disease

The desired outcome for patients with Parkinson disease is control and management of their symptoms to improve their quality of life. This includes educating patients and their families about Parkinson disease and helping them cope with their symptoms to function as normally as possible. If a patient's Parkinson disease is well-managed, they should be reasonably independent, with the ability to feed and dress themselves. They should also have the ability to manage their medications. Their home and other environments where they spend a lot of time should promote safety and provide surroundings that help them avoid falls and other hazards.

Medical Therapies and Related Care

The medical therapies used to treat Parkinson disease may include medications such as dopamine agonists, which activate dopamine receptors to make the brain think that it is receiving dopamine, the neurotransmitter needed for learning and motivation. Some patients with Parkinson disease benefit by taking anticholinergics, which treat tremors by blocking dopamine uptake. In addition to medications, some patients may benefit from speech, physical, massage, and/or occupational therapy.

Surgery may be an option for some patients. The surgical procedures that benefit some patients with Parkinson disease include **deep brain stimulation**, which implants a device in the brain to produce electrical impulses and disrupt the brain signals causing Parkinson disease. Another surgical procedure, **ablative surgery** destroys the brain tissues that produce abnormal chemical or electrical impulses responsible for a Parkinson disease patient's tremors. With transplantation, the brains of patients with Parkinson disease are implanted with cells that produce dopamine.

LINK TO LEARNING

To learn more about Parkinson disease, visit the Parkinson's Foundation (https://openstax.org/r/77ParkinsonFdtn) for information on research and resources to help patients.

17.5 Seizures

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for seizures
- Describe the diagnostics and laboratory values in seizures
- Apply nursing concepts and plan associated nursing care for the patient with seizures
- Evaluate the efficacy of nursing care for the patient with seizures
- Describe the medical therapies that apply to the care of seizures

A **seizure** occurs when some of the brain's neurons experience sudden and uncontrolled electrical activity, sending incorrect messages between brain cells. Electrical bursts may cause changes in consciousness or may cause the body to react with involuntary movements and behavior.

Seizures come in several types and have various causes. Some patients experience seizures because they have **epilepsy**, an incurable neurological disease that causes recurring seizures. This section provides an overview of seizures, including epilepsy, and explains the nursing care that is needed to help patients with seizures.

Pathophysiology

When the brain's neurons function normally, they produce chemical and electrical signals that interact with other neurons, as well as the body's muscles and organs, to create each person's feelings, thoughts, and behaviors. During a seizure, the neurons send signals at a much greater speed, and multiple neurons may send signals at the same time, creating overlapping neuron communication that is too rapid. The body responds with seizures.

Seizures can be triggered by a variety of factors, including high fever, brain tumors, strokes, head trauma, heart attacks, and infections such as encephalitis and meningitis. Patients who have diabetic hypoglycemia may experience a seizure if their glucose level drops too low. Diseases, such as Alzheimer disease, can cause seizures, and seizures have been linked to alcoholism. Any condition or disease that deprives the brain of oxygen or causes the brain to become inflamed has the potential to cause a seizure. In addition, seizures can be triggered by physical problems such as stress, sleep deprivation, hormonal changes, and dehydration. Certain medications, such as atypical antipsychotic drugs and opioids, may lower a patient's **seizure threshold**, which is the likelihood that a patient will have a seizure.

Some patients have seizures because of epilepsy, which is a neurological disorder that causes surges of electrical activity in the brain, resulting in recurring seizures. Epileptic seizures are unprovoked, and doctors typically diagnose epilepsy in patients with seizures when they have two unprovoked seizures.

Types of Seizures

Seizures are categorized as either focal or generalized, and each category includes several different subtypes of seizures:

- **focal seizure**—As the name implies, a focal seizure begins in one area of the brain. Focal seizures include the following types:
  - **onset awareness**—The patient is awake and aware throughout the seizure, which may begin with twitching or stiffness in a specific part of the body, such as the hand; as the twitching and/or stiffness spreads, the patient may experience a range of emotions including happiness, fear, or depression, and they may have déjà vu accompanied by nausea; they may also have hallucinations and see flashing lights.
  - **onset impaired awareness**—The patient is confused and not fully aware during the seizure; they may lose consciousness and have uncontrolled movements such as lip smacking and bicycling legs.
- **generalized seizure**—A generalized seizure affects both sides of the brain at the same time. Generalized seizures include the following types:
  - **absence generalized seizure**—The patient stares into space and may have slight twitching.
  - **atonic generalized seizure** —The patient loses normal muscle tone, which may cause them to involuntary drop their head or fall down.
  - **clonic generalized seizure** —The patient has repetitious jerking movements on both sides of their body
  - **myoclonic generalized seizure** —The patient has twitches and/or jerks in the arms, upper body, or legs.

- **tonic generalized seizure** —The patient's muscles stiffen, typically in the arms, legs, and/or back.
- **tonic-clonic generalized seizure** —The patient has a combination of reactions that may include repetitious jerking, stiffening, and/or a loss of consciousness.

Each type of seizure may have three phases. The **prodrome** phase occurs before the seizure actually begins and includes warning signals—such as a headache, dizziness, racing thoughts, or disorientation—that indicate a seizure is going to happen. Prodrome may occur hours, or even days, before a seizure ensues. The **ictal** phase begins with the first symptom of the seizure and lasts until the seizure ends. The **postictal** phase is the recovery period after a seizure ends. During the postictal phase, which may last minutes or hours, patients may be confused, scared, frustrated, and anxious. They may have memory lapses and may struggle to do things such as walk or write. They may also experience physical symptoms, such as a headache, muscle weakness, and loss of bladder control.

Clinical Manifestations

The symptoms of seizures vary and can be mild or severe. Common symptoms include confusion, staring, uncontrollable twitching or jerking of the arms and legs, sudden falls, body spasms, tense and/or stiffened muscles, weakened muscles, loss of awareness or consciousness, anxiety and fear, and a feeling of déjà vu. Patients may also experience strange sensations and emotions and feel that they have an aura when a seizure begins. An **aura** may include a sense of déjà vu and/or a sudden feeling of intense emotion such as fear or happiness.

If seizures are caused by factors such as hypoglycemia, infection, or head trauma that can be treated and resolved, treating the cause should also stop the patient's seizures. If seizures are caused by factors that cannot be cured, including epilepsy, the patient will need health care focused on minimizing and managing the seizures.

Assessment and Diagnostics

Seizures are assessed and diagnosed with a physical examination and tests. The physical examination should assess the patient's cognitive functioning, behavior, and motor abilities, as well as gather the patient's medical history. This should include information about illnesses and medications that could be a factor in the patient's seizures, and details about a family history of seizures.

Diagnostics and Laboratory Values

Tests for patients with seizures may include blood tests, lumbar puncture electroencephalogram (EEG), stereoelectroencephalography (SEEG), MRI, CT, PET, and single-photon emission computed tomography (SPECT).

Blood tests will show if the patient has genetic conditions or infections that can cause seizures. Lumbar punctures also show infections that can cause seizures. An EEG shows the brain's electrical activity and can reveal abnormal patterns that cause seizures. A SEEG involves surgically implanting electrodes in the brain to track brain activity and determine where seizures originate. MRIs and CTs show abnormal changes in the brain, such as brain tumors and cysts, which may be the cause of seizures. PET scans track abnormal chemical changes in the brain that may cause seizures. PET scans also show areas of the brain that have abnormal metabolism, which indicates the area of the brain that is the focus of a seizure after it is over. SPECT tracks the brain's blood flow during a seizure. SPECT blood flow tracers should be injected during periods of seizure and compared to periods when the patient is not having a seizure. During a seizure, the seizure onset area will show a higher blood flow, identifying where the seizure originates.

Nursing Care of the Patient with Seizures

Nursing care for patients with seizures should focus on keeping patients safe while controlling symptoms. Hazards, such as footstools and other things that could cause patients to fall if they have a seizure, should be removed. If patients are in bed, they should have guard rails, and during a seizure, their head should be supported with a pillow. Tight clothing should be removed, and some patients may need oxygen to support breathing. Nurses should provide education to help patients and their families learn to live with and manage seizures. This may include eating a healthier diet and avoiding triggers for seizures, such as bright lights and sleep deprivation.

LINK TO LEARNING

Every seizure causes neurological dysfunction, making the treatment of seizures critical for patient well-being. Patients with seizures need early therapy and preventative measures (https://openstax.org/r/77SeizureTrtmt) to minimize the possibility of recurring seizures.

Recognizing Cues and Analyzing Cues

The cues of seizures will be found in the patient's physical examination and test results. Patients and their family members should be able to tell the nurse if the patient has had seizures. Even if the patient does not have a seizure during the examination, the physical examination may still yield cues of seizures if the patient exhibits symptoms such as confusion, weakened muscles, and anxiety. If the patient is under observation and has a seizure, the cues may include uncontrollable twitching or jerking of the arms and legs, body spasms, tense muscles, and loss of awareness or consciousness. Other cues, which the provider will use for diagnosis, will come from the patient's test results. Blood tests and lumbar punctures may show infections that are causing the seizures. Imaging may show cues such as brain tumors and cysts that can cause seizures. Results of EEGs, SEEGs, PETs, and SPECTs will show additional cues by providing information about the brain's blood flow, electrical activity, and chemical activity.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Seizures should be prioritized based on the severity of symptoms. Severe symptoms, particularly for frequent seizures, should be a higher priority than infrequent seizures and/or seizures with mild symptoms. In particular, severe seizures that jeopardize patients' safety, and possibly even put them at risk of death, must be prioritized over mild seizures that cause more minor issues, such as mild twitching and muscle weakness. Nurses should work with patients' health-care team members to generate solutions. The nursing interventions appropriate for patients with seizures may include those in Table 17.15.

Nursing Care	Rationale
Complete focused neurological assessments.	Twitching, muscle weakness, staring, confusion, anxiety, and other related symptoms are cues of seizures.
Care during seizures.	During a seizure, remove hazards, particularly sharp objects, and allow the patient's body to move freely. Place a pillow under their head and turn the patient on their side to keep their tongue from blocking the airway. If the patient is wearing eyeglasses and/or necklaces or other items around their neck, remove these if possible. Never attempt to place your fingers into a mouth of a patient who is seizing, and do not attempt to put a barrier between the teeth of a patient having a seizure. After the seizure, provide emotional support and check the patient's vital signs, including awareness levels. Apply supplemental oxygen and provide suction to prevent the patient from aspirating. Ask the patient questions, such as, What is your name? Where are you? Documentation of a seizure includes time of onset, duration of the active seizure, and the length of the postal state. It also includes assessing if the patient experienced an aura before the seizure onset. If the seizure lasts more than five minutes, it is an emergency, and the provider should be called.
Monitor vital signs.	Changes in the patient's vital signs such as heart rate and blood pressure may indicate health problems.

TABLE 17.15 Nursing Interventions for Patients with Seizures

Nursing Care	Rationale
Administer medications specifically for seizures.	The appropriate medicine for each patient depends on the type of seizure and frequency, patient's lifestyle and age, and other factors such as other medications the patient is taking and whether the patient is pregnant. Medications that may be considered include brivaracetam, cannabidiol oral solution, cenobamate, clonazepam, and divalproex sodium.
Administer other medications.	Patients with seizures may need medications to control other problems that may occur as a result of their seizures. For example, patients who develop a headache following a seizure may need pain medication, and patients who have trouble sleeping may benefit by taking a sedative.
Prepare for surgery and aftercare.	Some patients may need surgery to stop seizures. Nurses should help prepare patients for surgery and should provide surgery aftercare, such as dressing the patient's surgical wound(s). Options for surgical procedures that can help patients with seizures include the following: • Corpus callosotomy cuts the connections between the neurons in the brain's right and left halves to stop seizures that begin on one side and travel to the brain's other side. • Hemispherotomy disconnects the side of the brain that has seizures from the rest of the brain and body. • Lobectomy removes the area of the brain where seizures originate. • Multiple subpial transection makes several cuts in the brain that are designed to prevent seizures. • Thermal ablation uses highly concentrated energy to destroy brain cells causing seizures.
Assist with electrical stimulation.	Nurses may assist providers as they conduct electrical stimulation, which includes the options of vagus nerve stimulation, responsive neurostimulation, and deep brain stimulation to implant devices that send signals to the brain to stop seizures.
Consult with a dietician for nutrition issues.	Some patients with seizures, particularly those with epilepsy, may need to change their diet to eat foods that are high in protein and fat, while low in carbohydrates.
Assist with mental health support.	Patients with seizures, particularly those with epilepsy, and their families may need consultation with a mental health professional to help them cope with the challenges of living with seizures. Some patients may need prescription medications to help with issues such as anxiety and depression.

TABLE 17.15 Nursing Interventions for Patients with Seizures

Evaluation of Nursing Care for Patients with Seizures

The desired outcome for patients with seizures is a cure if their seizures are caused by a factor that can be cured, such as infection. If patients with seizures cannot be cured, their condition should be controlled, and they should

experience few or no seizures even if they still have an incurable condition, such as epilepsy, that triggers seizures. Patients with seizures should also understand the risks associated with seizures, and they should exercise safety protocols to minimize the dangers posed by seizures. They should also understand the importance of medications in treating seizures and should be committed to taking the appropriate medications as needed.

Medical Therapies and Related Care

The medical therapies used to treat patients with seizures typically include antiepileptic drugs (AEDs), which are categorized as either broad-spectrum or narrow-spectrum. Broad-spectrum AEDs treat various seizure types and are often used initially, particularly if the patient's diagnosis has not determined seizure type. Broad-spectrum AEDs include clobazam, clonazepam, lamotrigine, levetiracetam, perampanel, rufinamide, topiramate, valproic acid, and zonisamide. Narrow-spectrum AEDs generally are used to treat focal seizures and include carbamazepine, ezogabine, gabapentin, lacosamide, oxcarbazepine, phenytoin, pregabalin, and vigabatrin.

Some patients with seizures may benefit from surgery, such as corpus callosotomy, a procedure that involves cutting the connection between the right and left sides of the brain to slow electrical activity between the hemispheres. Laser interstitial thermal therapy uses computer navigation to find and destroy lesions in a patient's brain that cause seizures. Stereotactic radiosurgery relies on 3D imaging to locate and destroy misfiring nerve cells.

Electrical stimulation benefits some patients with seizures. In this procedure, a neurostimulator is placed inside the patient's skull and connected to electrodes that continuously monitor the patient's brain activity. When a seizure is detected, the electrodes emit an electrical signal that attempts to stop the seizure.

Nutrition can also be a vital part of helping patients with seizures. Patients with seizures need a balanced diet that includes proteins, fats, and carbohydrates along with sufficient fluid intake to prevent dehydration.

17.6 Polyneuropathy

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for polyneuropathy
- Describe the diagnostics and laboratory values of polyneuropathy
- Apply nursing concepts and plan associated nursing care for the patient with polyneuropathy
- Evaluate the efficacy of nursing care for the patient with polyneuropathy
- Describe the medical therapies that apply to the care of polyneuropathy

A peripheral nerve disorder called **polyneuropathy** occurs when multiple peripheral nerves all over the body are damaged and malfunction simultaneously. As noted previously, the **peripheral nervous system** is the division of the nervous system containing the nerves that travel from the brain and spinal cord to carry signals to the rest of the body. The peripheral nervous system enables somatic functions and autonomic functions. A **somatic function** is a conscious movement that an individual controls, such as moving the arms and legs. An **autonomic function** is an automatic movement, such as heart beating, that individuals do not control.

Polyneuropathy can disrupt nerve communication in several ways. For example, lost nerve signals should occur but do not, whereas other nerve signals occur at inappropriate times. And, still other signals occur when they should but deliver an error message. Although the symptoms of polyneuropathy can be severe, even disabling some patients, the condition is rarely life-threatening.

Pathophysiology

Polyneuropathy may be caused by health conditions, such as infections, tumors, bone marrow disorders, kidney failure, cancer, autoimmune diseases such as lupus or rheumatoid arthritis, and other diseases such as hypothyroidism or liver disease. Other causes include alcoholism, vitamin deficiencies, exposure to toxins, and injuries that damage the peripheral nerves. Some medications, particularly those used in chemotherapy, may cause polyneuropathy. Finally, the most common cause is diabetes, with more than 50 percent of people who have diabetes also developing a type of neuropathy, including polyneuropathy (Mayo Clinic, 2023g).

Clinical Manifestations

Polyneuropathy develops slowly in some patients, becoming a chronic case, whereas other patients have an acute case, with a sudden appearance of polyneuropathy. The symptoms vary depending on which type of nerves are damaged. Polyneuropathy can affect the following nerves:

- A **motor nerve** controls muscles that require voluntary control, such as those used to talk and walk. Symptoms include muscle weakness and/or shrinking, cramps, inability to move body parts under voluntary control such as the hands and feet, and **fasciculation**, which is an uncontrolled twitching in the muscles.
- A **sensory nerve** transmits messages about pain, temperature, feelings, and other information gathered by the senses. Symptoms include loss of reflexes; lack of coordination and/or balance; numbness, particularly in the hands and feet; feelings of sensitivity and pain from things that should not hurt, such as clothing; feeling like pins and needles are sticking in the skin; and burning sensations.
- An **autonomic nerve** controls muscles and organs regulating bodily functions that patients cannot control consciously, such as the heart, lungs, and digestive system. Symptoms include heat intolerance, gastrointestinal issues, loss of bowel and/or bladder control, sweating excessively, lack of expansion and contraction in the small blood vessels, dizziness from drops in blood pressure, and breathing difficulties if the muscles that control the lungs are affected.

Assessment and Diagnostics

To assess a patient for polyneuropathy, nurses should conduct a physical examination focused on patients' movements, sense of touch, and pain. Patients may exhibit difficulty moving their hands, arms, legs, and/or feet. This may affect their ability to stand and walk, as well as the ability to do routine tasks such as writing or buttoning a shirt. Patients with polyneuropathy may also experience a loss of their sense of touch and no longer be able to feel cold or heat. They may also have numbness or a sensation that feels like they have pins and needles in their skin. Nurses should also be alert for pain, which patients with polyneuropathy may describe as throbbing and/or sharp, and the pain may occur in any part of the body.

Other ways to assess and diagnose polyneuropathy include blood and urine tests, lumbar puncture, imaging tests, spirometry, EMG, and nerve conduction studies. In some cases, skin and/or nerve biopsies may be useful. Often, polyneuropathy can be diagnosed based on the symptoms noted previously that can affect a patient's motor, sensory, and/or autonomic nerves. Testing confirms the diagnosis and helps to identify the cause.

Diagnostics and Laboratory Values

An examination of patients with polyneuropathy may reveal the following diagnostics and laboratory results:

- Blood and urine tests may identify problems such as diabetes, kidney dysfunction, liver issues, vitamin deficiencies, and infections that can cause polyneuropathy.
- Lumbar punctures may find high protein levels in CSF and/or a low white blood cell count. These findings indicate that the patient may have a condition or disease, such as an autoimmune disorder, that can cause polyneuropathy.
- Imaging such as an MRI or CT scan may find that the patient has pinched nerves, a herniated disk, growths, or other problems that affect the nerves, causing polyneuropathy.
- EMG records the muscles' electrical activity when contracted as well as during rest. This identifies abnormal muscular activity and helps determine if the patient's problem is a muscle or nerve disorder. For patients with polyneuropathy, the EMG will find a nerve disorder.
- Nerve conduction studies measure the speed and strength of signals in the motor and sensory nerves and whether the myelin sheath or axons have been damaged. This information helps determine the severity of nerve damage experienced by patients with polyneuropathy.
- Spirometry can determine if the muscles involved in breathing have been affected. Spirometry is a pulmonary function test that measures the amount of air a patient can inhale and exhale, including how quickly the patient can exhale. During the test, the patient's nostrils are closed with a clip, and their mouth is covered with a breathing mask. The patient is asked to breathe in deeply and hold the breath for a few seconds. Then they exhale, pushing the breath into the mask with as much force as possible.
- Nerve biopsies provide details about the nerve cells that are damaged and causing polyneuropathy. Nerve biopsies have the risk of further damaging nerve cells, however, so they typically are used in more severe

cases when additional information is needed to understand the patient's polyneuropathy.

- Skin biopsies provide information about the number of nerve endings patients have in their skin. For some patients with polyneuropathy, their condition is caused by damage to the nerve endings in the skin rather than damage in the nerves. A skin biopsy can determine this.

Nursing Care of the Patient with Polyneuropathy

When a patient's polyneuropathy is caused by a health issue that can be treated and cured, nursing care should focus on helping the patient overcome the condition. For example, if a curable infection is the cause of a patient's polyneuropathy, nurses should provide patients with the medications needed to eradicate the infection. If the patient's polyneuropathy is caused by a vitamin deficiency, nursing care should focus on helping the patient develop a healthy diet, which may include appropriate dietary supplements, to overcome the vitamin deficiency.

If the patient's polyneuropathy is caused by a condition or disease that cannot be cured, such as type I diabetes, nursing care should focus on education. Nurses should help patients with incurable polyneuropathy understand the disease and learn how to manage the symptoms. This may include medications, as well as teaching patients with polyneuropathy about lifestyle changes that can help them deal with the symptoms. For example, patients may need guidance to help them develop an exercise regimen and understand the need to make changes such as wearing loose-fitting clothes.

Recognizing Cues and Analyzing Cues

The cues of polyneuropathy will be found in the patient's physical examination and test results. The cues from the physical examination may include a family history of neurological issues, as well as problems experienced by the patient, such as diabetes and alcoholism. The patient will also exhibit symptoms of polyneuropathy, which may include muscle weakness, loss of reflexes, coordination and balance issues, numbness, and low blood pressure.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Polyneuropathy should be prioritized based on the severity of symptoms, with priority given to more severe symptoms. For example, symptoms such as pain and the loss of bladder control should be prioritized over mild numbness. Nurses should work with other members of the patient's health-care team to generate solutions. For example, a physical therapist can help a patient with polyneuropathy develop an exercise regimen to address problems such as muscle control. The nursing interventions appropriate for patients with polyneuropathy may include those in Table 17.16.

Nursing Care	Rationale
Complete focused neurological assessments.	The patient's ability to move different body parts, and issues such as muscle weakness, twitching, loss of reflexes, loss of bowel or bladder control, excessive sweating, heat intolerance, balance or coordination issues, numbness, burning sensations, and feelings of pins and needles may indicate polyneuropathy.
Monitor vital signs.	Changes in the patient's vital signs, particularly blood pressure and breathing, may indicate health issues.

TABLE 17.16 Care for Patients with Polyneuropathy

Nursing Care	Rationale
Administer medications.	Patients who have a condition that is causing polyneuropathy, such as an infection, should be treated with medications that can cure the condition and thereby relieve the polyneuropathy. For other patients, such as patients with diabetes, medications that can provide better control of diabetes or other conditions causing polyneuropathy can also improve the polyneuropathy. Patients with chronic polyneuropathy can be given medications that relieve the symptoms, such as pain relievers and topical treatments such as lidocaine cream. Some patients may benefit by taking antiseizure medicines, such as gabapentin and pregabalin, which can also relieve pain. Drugs used to treat depression, such as nortriptyline and duloxetine hydrochloride, can also treat pain by making the brain more capable of inhibiting pain signals. Particularly for patients with polyneuropathy who have a chronic condition and also experience depression, these drugs may be an effective treatment.
Provide breathing support.	Provide mechanical ventilation assistance to patients with polyneuropathy who struggle to breathe.
Coordinate with physical therapist.	Physical therapy can help patients with polyneuropathy learn exercises and techniques to strengthen their muscles and maintain a greater range of motion. For patients who have a disability as a result of polyneuropathy, physical therapy can help them learn to use assistive devices, such as a brace for their hand and/or foot, as well as a walker, cane, or wheelchair if needed.

TABLE 17.16 Care for Patients with Polyneuropathy

Evaluation of Nursing Care for the Patient with Polyneuropathy

The desired outcome for patients with polyneuropathy is relief from their symptoms. Nurses can evaluate whether symptoms of a patient with polyneuropathy have improved by checking their reflexes, lightly touching them and gauging their reaction, and monitoring their level of sensation to a pinprick. The steadiness of a patient's gait can also indicate if they still have symptoms. If patients with polyneuropathy cannot be cured, their symptoms should be managed to improve quality of life.

Medical Therapies and Related Care

In some cases, polyneuropathy can be cured, and even if it isn't curable, medical treatment can usually help patients with polyneuropathy. The medical therapies used to treat patients with polyneuropathy may include those in Table 17.17.

Medical Therapy	Explanation of Care
Medications	May include medications that • treat underlying conditions, such as an infection, that cause polyneuropathy and can be cured.; • treat underlying conditions, such as type 1 diabetes, that cannot be cured but may be better managed with changes in medication; and • treat polyneuropathy symptoms, particularly pain.
Provide breathing support	May include mechanical ventilation assistance.
Physical therapy	May include exercises and techniques to accomplish goals such as strengthen patients' muscles and maintain a greater range of motion. For patients with polyneuropathy who have a disability, physical therapy can help them learn to use assistive devices, such as braces, walkers, canes, or wheelchairs.
Surgery	May include surgical procedures to remove tumors and treat other conditions that can be relieved with surgery. For patients who have surgery, help them prepare for surgery. After surgery, provide wound care, suture incisions, empty drains, change dressings and bandages, and apply heat/cold packs to assist with any swelling.
Scrambler therapy	This procedure uses electrodes to administer electrical stimulation through the patient's skin to block the nerve endings from sending pain signals to the brain.
Spinal cord stimulation	This procedure implants neurostimulators into the patient's body to emit low levels of electricity into the patient's spinal cord, blocking pain signals to the brain.
Plasma exchange	This procedure purifies blood to help with conditions such as inflammation or an autoimmune condition.
Intravenous immune globulin	This therapy can strengthen the immune system.
Mental health support	Support can help patients who have a chronic, ongoing condition cope with the challenges of living with polyneuropathy. It may include medications to help with issues such as anxiety and depression.

TABLE 17.17 Medical Therapies for Polyneuropathy

17.7 Chronic Pain Disorders

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for migraines and fibromyalgia
- Describe the diagnostics and laboratory values for migraines and fibromyalgia
- Apply nursing concepts and plan associated nursing care for the patient with migraines and fibromyalgia
- Evaluate the efficacy of nursing care for the patient with migraines and fibromyalgia
- Describe the medical therapies that apply to the care of migraines and fibromyalgia

Any type of pain, such as a headache or lower back pain, that is ongoing and continues for longer than three months

is known as chronic pain. This section reviews migraines, which include severe headaches, and fibromyalgia, which causes musculoskeletal pain that is widespread throughout the body.

Migraines

Migraines are typically thought of as severe headaches. But a **migraine** is actually a serious neurological disease characterized by a severe, throbbing pain or pulsing sensation that may affect one or both sides of the head. The pain from a migraine is so severe that it disrupts routine activities. If untreated, a migraine attack can last for several days. According to the American Migraine Foundation (2021), migraines affect at least 39 million Americans.

Pathophysiology

The causes of migraines are not fully determined, but genetics may be a factor for some patients because migraines sometimes run in families. Migraines also tend to be triggered by factors such as stress, anxiety, tobacco, alcohol, certain foods such as cheese, food additives such as monosodium glutamate (MSG), low blood sugar, weather changes, bright flashing lights, loud sounds, and irregular sleep patterns. Concussions, hormonal changes, and chemical imbalances in the brain also cause migraines in some patients.

Clinical Manifestations

For some patients, migraines progress through four stages—prodrome, aura, attack, and postdrome. Other patients may only experience some of the stages (Mayo Clinic, 2023e; NIH, 2023). Generally, the symptoms of the four stages include the following:

- prodrome—This stage occurs twenty-four to forty-eight hours before a migraine. During this stage, premonitory symptoms occur, which may include the following:
  - mood changes with euphoria or depression
  - cravings for certain foods
  - uncontrollable yawning
  - increased need to urinate
  - fluid retention
  - constipation
  - stiff neck
- aura—This stage occurs in the minutes immediately before the migraine begins. Symptoms during this stage include the following:
  - muscle weakness and/or numbness
  - visions with flashing lights
  - loss of eyesight
  - speaking difficulties
  - sensations of pins and needles in the arm or leg
- **attack**—In this stage, the headache begins and gradually worsens. Symptoms during this stage include the following:
  - throbbing or pulsating pain on one or both sides of the head
  - sensitivity to sound, light, touch, and/or smell
  - nausea, which may lead to vomiting
- **postdrome**—This stage, which may last up to twenty-four hours, occurs after the headache is over. The symptoms during this stage include the following:
  - exhaustion
  - confusion
  - elation

Generally, migraines are incurable unless caused by an underlying condition, such as head trauma that can be cured. But migraines can be treated, and nursing care can help patients learn to live with migraines.

Assessment and Diagnostics

To assess and diagnose migraines, patients must undergo a physical examination that includes a review of their family background, medical history, and symptoms.

For patients with migraines, a physical examination may reveal a family history of migraines. It may also reveal

factors, such as tobacco and alcohol use, irregular sleep patterns, and stress that are risk factors for migraines. The physical examination should provide details about patients' headaches, including frequency, duration, and severity, that can help identify if the headaches are migraines. Other details, such as going through prodrome, aura, and/or postdrome in addition to having a headache, can help determine if a patient has migraines.

Diagnostics and Laboratory Values

Tests, such as blood tests, cannot confirm a migraine diagnosis. However, blood tests and imaging, such as MRI and CT scans, can help rule out conditions, such as low blood sugar, infections, brain tumors, and strokes, which may be causing migraines. MRI and CT scans may find problems such as brain tumors and strokes that can cause migraines.

If test results do not reveal health problems that cause migraines, providers may diagnose migraines based on patients' symptoms, including the frequency, location, and duration of headaches. A family history of migraines as well as known triggers, such as certain foods and bright lights, can help confirm a migraine diagnosis.

Nursing Care of the Patient with Migraines

If a patient's migraines cannot be relieved by addressing an underlying cause, the patient should receive nursing care that helps them learn techniques to prevent migraines and manage them when they do occur. This includes identifying migraine triggers, such as sleep deprivation and loud noises, and teaching patients to avoid those triggers. This also includes teaching patients how to deal with the symptoms of migraines, such as pain and nausea.

Nursing care for patients with migraines should focus on treating underlying causes to eliminate migraines if possible. For example, if a patient has an infection or a brain tumor that is causing migraines, nursing care should focus on resolving this problem. If other factors, such as smoking or irregular sleep patterns, are causing migraines, patients should receive help to overcome these problems.

Recognizing Cues and Analyzing Cues

The cues for migraines will be found in the patient's physical examination. Nurses should be alert for cues such as a family history of migraines and risk factors such as stress, tobacco and alcohol use, and irregular sleep patterns. Primary cues will come from information patients provide verbally about their experiences with migraines, including the frequency, duration, and intensity of headaches, as well as whether patients experience the symptoms found in prodrome, aura, and/or postdrome stages of migraines. Additional cues may be found in test results. Although these tests cannot diagnose migraines, they can reveal if patients have problems such as infections and brain tumors that can cause migraines.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Migraine symptoms should be prioritized on the basis of their severity. Severe migraine pain that disables patients and leaves them unable to function should be prioritized over milder migraine pain. Although migraines generally are not life-threatening, they can severely disrupt patients' lives, making it challenging for them to handle their daily routines. Solutions should include eradicating underlying causes of migraines if possible. If migraines cannot be relieved, solutions should focus on helping patients learn to manage and cope with migraines. The nursing interventions appropriate for patients with migraines may include those in Table 17.18.

Nursing Care	Rationale
Complete focused neurological assessments.	Patients may have headaches and other issues such as mood changes, food cravings, muscle weakness, speaking difficulties, and other symptoms that might indicate a migraine is forthcoming.
Monitor vital signs.	Changes in the patient's vital signs such as heart rate and blood pressure may indicate health issues.
Provide a peaceful environment.	Patients with migraines need a quiet room with dim lights. They may also need a cool cloth or ice pack to help with pain.

TABLE 17.18 **Nursing Interventions for Patients with Migraines**

Nursing Care	Rationale
Administer medications for immediate relief.	Patients with migraines may need medications such as the following during a headache: • pain relievers such as aspirin or acetaminophen • opioids • lasmiditan • dihydroergotamine • triptans such as sumatriptan or rizatriptan • zavegepant nasal spray • gepants
Administer medications to prevent migraines, as ordered.	Patients with migraines may need medications such as the following to prevent a migraine: • antiseizure drugs • antidepressants • beta blockers to lower blood pressure • monoclonal antibodies • gepants Some patients also benefit from routine Botox injections.
Assist with mental health support.	Patients with migraines who are unable to get relief may need consultation with a mental health professional to help them cope with the challenges of living with migraines. Some patients may need prescription medications to help with issues such as anxiety and depression.

TABLE 17.18 Nursing Interventions for Patients with Migraines

Evaluation of Nursing Care for the Patient with Migraines

The desired outcome for patients with migraines is to stop migraine headaches and their symptoms, as well as prevent attacks in the future. For patients whose migraines cannot be stopped, nursing care should help them learn to manage the factors that trigger migraines, limiting the frequency and severity of migraines. To evaluate patients with migraines, nurses should consider vital signs, such as the patient's temperature and heart rate. They should also examine the patient's neck and head, noting if the patient has areas of tenderness or swelling. The patient's behavior should also be evaluated, focused on whether the patient appears to be restless, grimaces in pain, or moves into certain positions in an effort to alleviate pain.

Medical Therapies and Related Care

The medical therapies for patients with migraines may include medications to prevent migraines, as well as medications to provide relief after a migraine occurs. For example, some patients may benefit by taking triptans, which change the way the brain circulates blood and processes pain signals. Other patients with migraines, especially those who experience nausea, may get relief by taking antiemetics, which interfere with the neurotransmitter receptors that trigger nausea and vomiting. For many patients with migraines, the most effective medications are simply anti-inflammatories, such as aspirin and ibuprofen. Some patients with migraines also find alternative medical treatments helpful, such as yoga and massage therapy.

Fibromyalgia

A chronic condition that affects soft tissues and muscles throughout the body, causing musculoskeletal pain and tenderness, is called **fibromyalgia**. The condition has no cure and affects at least one in twenty-five people in the United States. Most patients with fibromyalgia are middle-aged females, although anyone can experience it, including children. The condition often runs in families, although it also occurs in patients without a family history of the condition (Johns Hopkins Medicine, 2024b; NIAMSD, 2021).

Pathophysiology

The cause of fibromyalgia is unknown, although medical experts suspect the condition is linked to stress and sleep disorders. Other causes may include endocrine, biochemical, and immune disorders. Patients who have conditions and diseases such as migraines, lupus, rheumatoid arthritis, osteoarthritis, chronic back pain, irritable bowel syndrome, anxiety, and/or depression also tend to be more likely to develop fibromyalgia. In some cases, the condition appears to be triggered by an infection, such as HIV, Lyme disease, and both hepatitis B and C (National Institute of Arthritis and Musculoskeletal and Skin Diseases, 2021). Although fibromyalgia is a chronic condition without a cure and the pain can be severe enough to disrupt patients' daily routines, it does not damage the body's muscles or bones.

Clinical Manifestations

Fibromyalgia affects patients in varied ways, and pain can affect any part of the body. Often, the pain is worse in tendons and ligaments, where the muscles attach to the body's bones. For some patients with fibromyalgia, the pain is mild, whereas others experience more severe pain. The pain may present as stiffness, soreness, aching, or a burning sensation. Other common symptoms of fibromyalgia include the following:

- fatigue
- headaches, including migraines
- restless legs
- stiff joints
- numbness and/or tingling in the legs and arms
- sensitivity to touch
- sensitivity to noise, light, and temperature
- lack of exercise endurance
- cognitive difficulties referred to as **fibro fog**. Fibro fog may include the following issues (Arthritis Foundation, n.d.):
  - difficulty concentrating
  - lack of alertness
  - forgetfulness
  - reduction in thinking skills, including inefficient and slow thinking abilities
  - difficulty retrieving information stored in the brain
- sleep disorders
- anxiety and depression
- constipation and/or bladder disorders, such as interstitial cystitis
- excessive pain during menstrual periods

Assessment and Diagnostics

Typically, fibromyalgia is diagnosed by ruling out other conditions and diseases that cause similar pain, such as rheumatoid arthritis. Patients undergo a physical examination and generally must experience ongoing pain for at least three months in at least four body areas before their condition is considered to be fibromyalgia. The body areas include the jaw, neck, shoulders, arms, legs, back, chest, and buttocks. To rule out other conditions that cause similar pain, doctors usually order blood tests. Other symptoms experienced by patients may include sleep disorders, fatigue, restless legs, headaches, stiff joints, cognitive difficulties, and issues such as constipation or bladder dysfunctions. Patients may also have anxiety and/or depression.

Diagnostics and Laboratory Values

If blood tests show results such as rheumatoid factor, thyroid dysfunction, vitamin D deficiency, a high erythrocyte sedimentation rate, or antinuclear antibodies, doctors may determine that the patient has another condition, such as lupus or rheumatoid arthritis, rather than fibromyalgia. If blood tests have normal results and offer no explanation for the patient's pain, fibromyalgia is a likely diagnosis.

Nursing Care of the Patient with Fibromyalgia

Nursing care for patients with fibromyalgia should focus on controlling symptoms and helping patients learn how to manage their condition. For some patients, this may require lifestyle changes as well as treatment for conditions such as anxiety and depression that contribute to fibromyalgia.

Recognizing Cues and Analyzing Cues

The cues of fibromyalgia will be found in the patient's physical examination, particularly the locations and duration of the pain. Nurses will find other cues in patient symptoms such as fatigue, stiff joints, restless legs, and sensitivity to touch. By talking to the patient, nurses can learn about other cues, such as sleep disorders, anxiety, and depression. Finally, cues will be found in the patient's blood test results. If tests do not identify another cause for the patient's pain, such as rheumatoid arthritis, it is reasonable to make a fibromyalgia diagnosis.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Fibromyalgia should be prioritized based on the severity of symptoms. For example, symptoms that cause severe, widespread pain and sleep deprivation should be prioritized over milder symptoms that cause fewer disruptions to a patient's daily routine. Solutions should be generated that help patients learn to manage the pain and discomfort caused by fibromyalgia, while also learning to cope and function. The nursing interventions appropriate for patients with fibromyalgia may include those in Table 17.19.

Nursing Care	Rationale
Complete focused physical examination.	Patients with fibromyalgia will experience pain and likely other symptoms, such as headaches, restless legs, stiff joints, anxiety, and depression. They may also have difficulty sleeping and may experience fibro fog or other problems, such as constipation and/or bladder issues.
Monitor vital signs.	Changes in the patient's vital signs such as heart rate and blood pressure may indicate health issues.
Administer medications for pain.	Although fibromyalgia cannot be cured, patients can be helped with medications. Pain relievers such as acetaminophen and ibuprofen may be beneficial, and patients who need stronger medications may find pain relief by taking antiseizure drugs, such as pregabalin and gabapentin. Some patients may be helped with antidepressants, such as milnacipran and duloxetine, which can treat patients' pain, as well as anxiety and depression.
Administer medications for other symptoms.	Other medication may include laxatives, sedatives, and other drugs appropriate to treat issues such as constipation and sleep disorders.
Coordinate with physical therapist.	Physical therapy can help patients with fibromyalgia learn exercises and techniques to strengthen their muscles, improving their flexibility and strength.
Coordinate with occupational therapist.	Occupational therapy can help patients with fibromyalgia learn how to organize their home and work areas to make it easier to accomplish tasks without stressing the body.
Assist with mental health support.	Patients with fibromyalgia and their families may need consultation with a mental health professional to help them cope with the challenges of living with fibromyalgia. Some patients may need prescription medications to help with issues such as anxiety and depression, which may also help with pain.

TABLE 17.19 Nursing Interventions for Patients with Fibromyalgia

Evaluation of Nursing Care for the Patient with Fibromyalgia

The desired outcome for patients with fibromyalgia is symptom relief, including relief from pain as well as other problems such as restless legs, stiff joints, and anxiety. If patients' symptoms cannot be completely relieved, nursing care should help them learn to control and manage their symptoms, improving their quality of life. This goal is met if patients are able to function despite their pain and do so without experiencing problems such as anxiety and depression. This can be evaluated with tools such as serial assessments of patients' pain levels, screening for depression, and assessment of patients' ability to perform activities of daily living (ADLs) and instrumental activities of daily living (IADLs).

Medical Therapies and Related Care

The medical therapies used to treat fibromyalgia may include medications for pain, as well as medications for other symptoms such as constipation and insomnia. For example, as noted previously, some patients may benefit by taking triptans or antiemetics, whereas others may do well with anti-inflammatories such as aspirin and ibuprofen. Some patients may find relief from antiseizure drugs, such as pregabalin and gabapentin, which can also be used to fight pain. For constipation and insomnia, medications such as laxatives and sedatives may be beneficial. Physical and/or occupational therapy may also be helpful.

17.8 Spinal Disorders

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for low back pain and spinal tumors
- Describe the diagnostics and laboratory values for low back pain and spinal tumors
- Apply nursing concepts and plan associated nursing care for the patient with low back pain and spinal tumors
- Evaluate the efficacy of nursing care for the patient with low back pain and spinal tumors
- Describe the medical therapies that apply to the care of low back pain and spinal tumors

Diseases or injuries that affect the spinal cord and back are known as **spinal disorder**s. Spinal disorders include a variety of conditions that cause problems for patients, including pain. This section will cover two spinal disorders, low back pain and spinal tumors. One reason spinal issues are so serious is that every part of the body except the face is innervated by spinal nerves that travel through the spinal cord. The area innervated by a single spinal nerve is called a **dermatome**. So, when the spinal cord experiences disorder, it can affect almost all of the body (Figure 17.9).

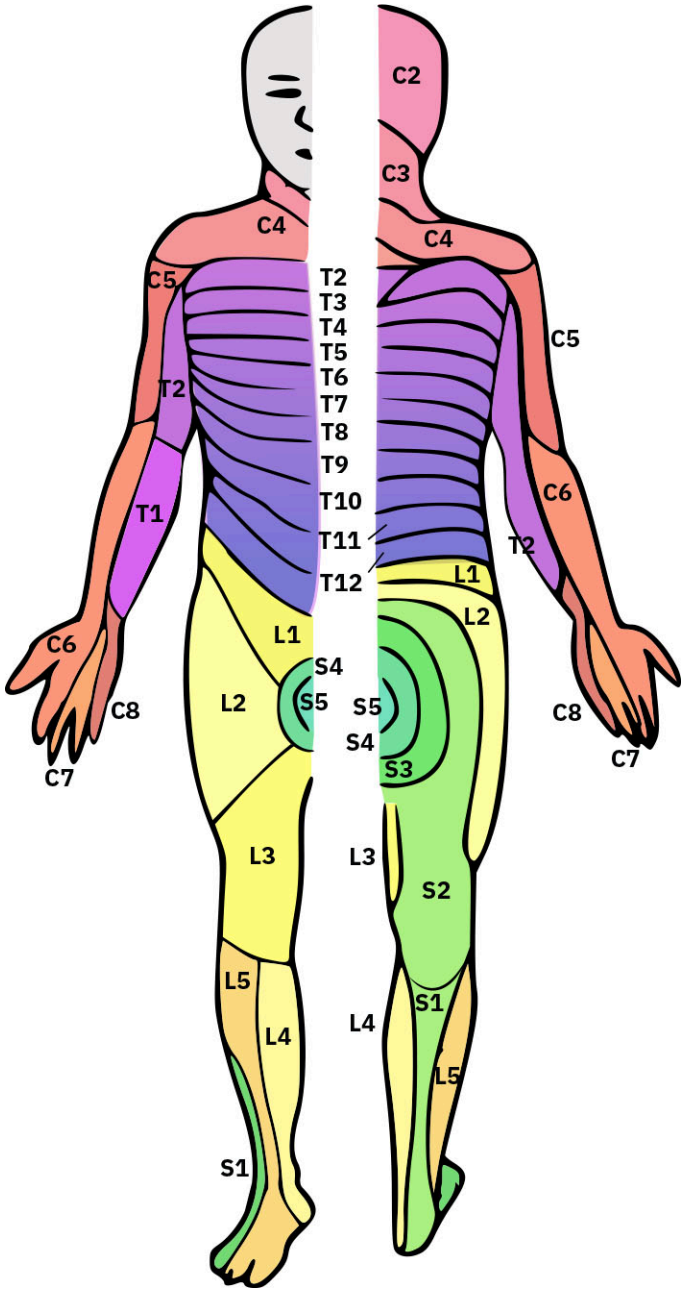

FIGURE 17.9 Dermatomes are connected to each section of the spine, including the cervical, thoracic, lumbar, sacral, and coccyx spine. They affect every part of the body except the face. (credit: "Dermatoms alt" by Ralf Stephan/Wikimedia Commons, Public Domain)

Low Back Pain

Any feeling of aching, burning, or stabbing in the muscles of the lower back is referred to as **low back pain**. It may include sensations of shooting pains, and the pain may travel down the leg. Low back pain affects the **lumbar spine**, the five vertebrae that comprise the lower section of the spine found between the body's ribs and pelvis (Figure 17.10).

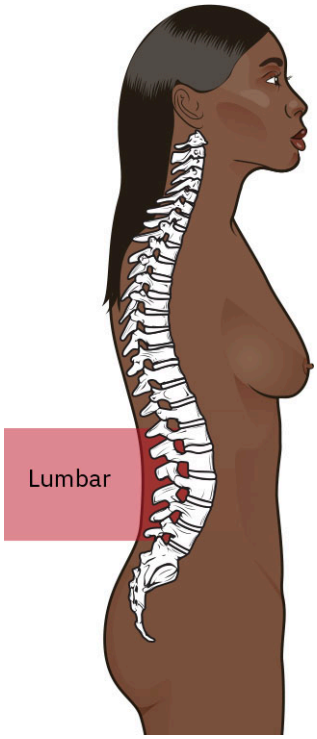

FIGURE 17.10 The lumbar spine represents the portion of the spine located between the ribs and pelvis, between the thoracic and sacral spine. (modification of work from Maternal Newborn Nursing. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Low back pain is a common disorder experienced by an estimated 75 to 80 percent of Americans at least once during their lifetimes. In about 90 percent of cases, low back pain is a temporary problem that can be treated without surgery (AANS, 2024). But for about 50 percent of these patients, low back pain recurs. When low back pain lasts longer than twelve weeks, it is considered a chronic condition (AANS, 2024).

Pathophysiology

Low back pain is caused by a variety of factors that vary among patients. Common causes include injuries, strains, and sprains. Other causes include the following:

- **herniated disk**—A disk in the spine is compressed, irritating nearby nerves.
- **lumbar spinal stenosis**—The spinal cord narrows in the lower back, putting pressure on the nerves.
- **osteoarthritis**—Inflammation in the joints that can occur in the spine.
- **osteoporosis**—Skeletal disorder that causes bones to lose mass and become at greater risk for fracture.
- **axial spondyloarthritis**—Inflammatory disease that affects the spine.
- **sciatica**—The sciatic nerve in the lower back is compressed by a bone spur or herniated disk.
- **scoliosis**—Condition that causes the spine to curve sideways.
- **spondylolisthesis**—A vertebra slips out of place in the spine.

Low back pain has three classifications: **acute back pain**, which occurs suddenly and typically lasts for a few days to a few weeks; **subacute back pain**, which may occur suddenly, but can also appear gradually, and usually lasts for at least four but no longer than twelve weeks; and **chronic back pain**, which can appear suddenly or gradually, occurs daily, and lasts more than twelve weeks (National Institute of Arthritis and Musculoskeletal and Skin Diseases, 2023).

Some patients are at greater risk for low back pain. Risk factors include obesity, lack of exercise, and using improper techniques for lifting. Age can be a factor, with older people generally experiencing more low back pain compared to younger people. Smoking and psychological conditions, such as anxiety and depression, have been linked to low back pain. Some diseases, such as arthritis, may cause low back pain (Mayo Clinic, 2023d).

LINK TO LEARNING

Nurses are at risk of developing low back pain due to lifting patients as part of nursing care. To avoid developing lower back problems, nurses must learn proper lifting techniques (https://openstax.org/r/77SafeLifting) of their patients.

Clinical Manifestations

Low back pain symptoms can vary by patient. Some patients experience localized pain in a certain area, whereas other patients have a more generalized pain that spreads across the back. The pain may also radiate to other parts of the body, including the legs or abdomen. Some patients experience mild low back pain whereas for others, the pain can be intense. Symptoms typical of low back pain include the following:

- pain that comes and goes, becoming worse with activities such as sitting too long, bending, and lifting
- decreased range of motion and/or flexibility, which may include difficulty with standing straight
- weakness, numbness, and/or tingling in legs and/or feet
- bowel and/or bladder issues
- fever
- unexplained weight loss

Assessment and Diagnostics

To assess and diagnose low back pain, patients should undergo a physical examination that includes a review of their medical history and gathers information about the nature of their pain. This includes details about when the pain started, the nature of the pain, and the area(s) of the body affected with pain. The physical examination should check the patient's muscle strength and reflexes, and the spine should be examined to check for issues such as bone structure changes.

Diagnostics and Laboratory Values

Testing options include x-rays, imaging such as MRIs and CTs, electrophysiological tests, bone scans, discography, nerve conduction studies, and blood tests.

- X-rays may show fractures or breaks in the spine or spinal alignment issues.
- Imaging, such as MRIs and CTs, may show issues such as herniated disks or issues in the spine, nerves, muscles, tendons, tissues, ligaments, and blood vessels that can cause low back pain.
- Electrophysiological tests may show poor electrical activity in the muscles and nerves.
- Bone scans may show fractures and/or infections that have affected the spine.
- Discography may identify disks that are the source of the low back pain.
- Nerve conduction studies measure the nerves' electrical impulses and show muscle responses. If the nerves are not functioning appropriately, this may indicate the nerves are affected by a problem such as a herniated disk.
- Blood tests identify issues, such as infections, that may contribute to low back pain.

Nursing Care of the Patient with Low Back Pain

Nursing care for patients with low back pain should focus on finding the cause of the pain and treating that cause with the goal of relieving the back pain. For patients who have chronic back pain that cannot be relieved by treating the cause, nursing care should focus on helping patients control and manage the pain.

Recognizing Cues and Analyzing Cues

The cues of low back pain will be found in the patient's physical examination and test results. Information provided by patients with details about the nature and duration of the pain, as well as findings during the physical examination, such as muscle weakness and reflex issues, will provide additional cues.

Test results should provide cues to confirm the diagnosis. If applicable, cues such as herniated disks, fractures, poor nerve functioning, and infections should be revealed in x-rays and other test results.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Low back pain should be prioritized based on the severity of symptoms. The nursing interventions appropriate for

patients with low back pain may be those in Table 17.20.

Nursing Care	Rationale
Complete focused neurological assessments.	Patients may experience varying levels of pain, decreased range of motion, numbness and/or tingling in their hands and/or feet, and bowel and/or bladder issues.
Monitor vital signs.	Changes in the patient's vital signs, such as heart rate and blood pressure, and fever may indicate health issues.
Administer medications.	Low back pain may be treated with medications including pain relievers such as naproxen sodium and anti-inflammatory drugs, topical pain relievers, muscle relaxants, and antidepressants such as amitriptyline and duloxetine. For patients with more severe pain, narcotics such as opioids may be helpful if their use is limited.
Provide care before and after surgery.	Some patients may require surgery to relieve their low back pain. Surgical options may include procedures to repair herniated disks and create more space in the spine. Some patients may benefit by having nerve stimulators implanted under the skin to deliver electrical impulses to nerves, blocking pain signals. Nurses help patients prepare for surgery and provide surgical aftercare, such as dressing a patient's wound(s).
Assist with other procedures.	In addition to medication and surgery, some patients may benefit from cortisone injections, which can relieve inflammation and provide pain relief for a few weeks. Other patients may benefit from radiofrequency ablation, which involves using a needle to damage the nerves that are sending pain signals and stop these signals from reaching the brain. Nurses can assist with these procedures by providing care such as giving injections and ensuring that patients are positioned properly for treatment.
Coordinate with physical therapist.	Physical therapy can help patients with low back pain learn exercises and techniques to strengthen their muscles, maintain a greater range of motion, and improve their posture, which can help with low back pain. Physical therapists can also teach patients with low back pain how to modify their movements to put less strain and motion on the lower back.
Coordinate to arrange mental health support.	Patients who have chronic low back pain may need help coordinating a consultation with a mental health professional to help them cope with the challenges of living with pain. Some patients may need prescription medications to help with issues such as anxiety and depression.

TABLE 17.20 Nursing Interventions for Patients with Low Back Pain

Evaluation of Nursing Care for the Patient with Low Back Pain

The desired outcome for patients with low back pain is to identify the cause of their symptoms and relieve their pain. If their low back pain is chronic, the desired outcome is to help them control and manage their symptoms.

Medical Therapies and Related Care

The medical therapies used to treat low back pain may be those in Table 17.21.

Medical Therapy	Explanation of Care
Medications	May include pain relievers such as naproxen sodium and anti-inflammatory drugs, topical pain relievers, muscle relaxants, and antidepressants such as amitriptyline and duloxetine. In some cases, narcotics such as opioids may be helpful if use is limited.
Surgery	Surgical options may include procedures to • repair herniated disks, • create more space in the spine, and • implant nerve stimulators under the skin to deliver electrical impulses and block pain signals
Other procedures	May include cortisone injections and radiofrequency ablation.
Physical therapy	May focus on exercises and techniques to strengthen muscles, maintain a greater range of motion, improve posture, and modify movements to put less strain and motion on the lower back. Coordinate with the physical therapist as needed.
Mental health support	May focus on helping patients cope with the challenges of living with pain. May include prescription medications to help issues such as anxiety and depression.

TABLE 17.21 Medical Therapies for Low Back Pain

LINK TO LEARNING

Some patients with low back pain caused by growths may benefit from radiofrequency ablation (RFA). A minimally invasive procedure called RFA (https://openstax.org/r/77RFA) relies on radiofrequency waves to shrink growths, such as tumors or nodules, that cause chronic pain.

Spinal Tumors

A growth of abnormal tissue inside or encompassing the spinal column or the spinal cord is called a **spinal tumor**. Like other tumors, spinal tumors can be benign (noncancerous) as well as malignant (cancerous). When a spinal tumor originates in the spine or spinal cord, it is considered a **primary spinal tumor**. When it originates elsewhere in the body and spreads to the spine, it is considered a secondary spinal tumor, or a **metastatic spinal tumor**.

Pathophysiology

The cause of spinal tumors is unknown. Some of the factors that may create a risk for spinal tumors include defective genes, exposure to toxins, and a compromised immune system. Spinal tumors are also linked to Von Hippel-Lindau disease and neurofibromatosis 2, genetic disorders that can cause tumors throughout the body, including the spine.

Spinal tumors are classified according to the area of the spine where they are located—cervical, thoracic, lumbar, and sacrum—as well as their position within the spinal column (Figure 17.11). These positions include the following:

- **intradural-extramedullary—**Tumors are located on the inside of the **dura**, which is the spinal cord's thin covering, but remain outside the actual spinal cord.
- **intramedullary—**Tumors are located on the inside of the spinal cord.

- **extradural—**Tumors are located outside both the dura and the spinal cord.

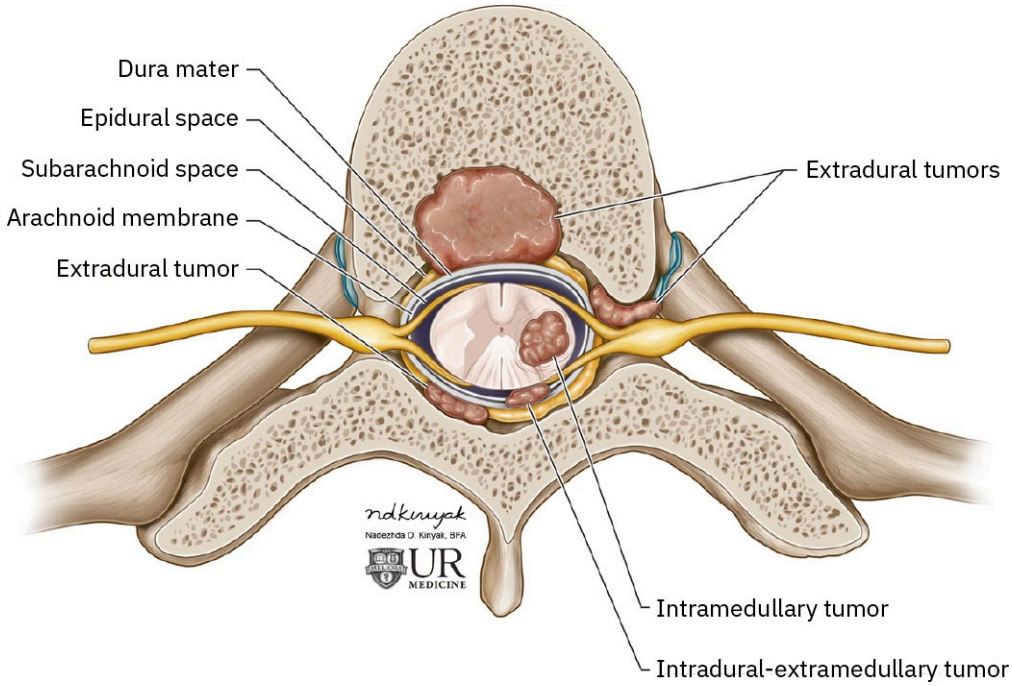

FIGURE 17.11 Spinal tumors are classified according to the area of the spine where they are located. This includes intradural-extramedullary, intramedullary, and extradural tumors. (credit: "Classification of spinal tumors by location" by Nadezdha D. Kiriyak/ Wikimedia Commons, CC BY 4.0)

Clinical Manifestations

The symptoms of spinal tumors vary by patient and by the tumor's progression. Typical symptoms include the following:

- localized pain at the site of the tumor
- low back pain that may radiate to other areas of the body
- muscle weakness that may spread throughout the body
- stiff back or neck
- difficulty walking
- paralysis in any part of the body as a result of compressed nerves
- loss of sensitivity to pain, cold, and heat
- loss of bladder and/or bowel functioning

Assessment and Diagnostics

Spinal tumors are uncommon, comprising about 15 to 20 percent of central nervous system tumors. Of 100,000 people, 0.5 to 2.5 are predicted to develop a spinal tumor, which makes the lifetime risk less than one percent for developing a malignant spinal tumor (Yale Medicine, n.d.). The symptoms of spinal tumors may resemble symptoms of other diseases and conditions, such as low back pain. To assess and diagnose a spinal tumor, patients should undergo a physical examination that gathers information such as the nature and location of the pain, as well as details of other symptoms, such as difficulty walking and loss of sensitivity to pain, cold, and heat.

Diagnostics and Laboratory Values

X-rays, CT scans, and MRIs may show images of the tumor. If a tumor is found, a biopsy will test a sample of the tissue where the tumor is located and determine if the tumor is cancerous.

Nursing Care of the Patient with Spinal Tumors

Health care for patients with spinal tumors should focus on nursing care before and after the provider removes the tumor and curing the patient if possible. Postoperative nursing care for patients should focus on prevention of infections, as well as ensuring the patient stays immobile without bending, lifting, or twisting the spine. To examine patients and move them as necessary, nurses should rely on the log roll maneuver, rolling the patient in 90-degree

steps. Nurses should also note any changes in the patient's sensations.

If the tumor cannot be removed but it is benign, nursing care should focus on helping the patient learn to cope with the condition. If the tumor cannot be removed and it is malignant, nursing care should focus on treating the cancer as well as possible and, if necessary, helping the patient prepare for the end of life.

Recognizing Cues and Analyzing Cues

The cues of spinal tumors will be observed in the patient's physical examination, which will show symptoms such as low back pain, mobility difficulty, and bowel and bladder issues. Other objective cues will be found in the patient's test results, which will show if the patient has a tumor and if so, whether that tumor is benign or malignant.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Spinal tumor interventions should be prioritized based on the severity of symptoms and whether the tumor is benign or malignant. The nursing interventions appropriate for patients with spinal tumors may include those in Table 17.22.

Nursing Care	Rationale
Complete focused neurological assessments.	The patient's pain levels, range of motion, symptoms such as difficulty walking, and loss of sensitivity may indicate a spinal tumor.
Monitor vital signs.	Changes in the patient's vital signs such as heart rate and blood pressure may indicate health issues.
Provide care before and after surgery.	Some patients with a spinal tumor can be helped with surgery. Nurses should prepare patients for surgery and provide care after surgery, such as dressing patients' wound(s).
Assist with radiation therapy.	Patients may need radiation therapy, which may include side effects such as nausea. Nurses should help patients prepare for radiation therapy and provide care afterward, such as administering medications to deal with side effects such as nausea.
Assist with chemotherapy.	Patients may need chemotherapy, which may include side effects, such as nausea and fatigue.
Administer medications.	Patients may need medication to help with pain relief, as well as other problems, such as inflammation.

TABLE 17.22 **Nursing Interventions for Patients with Spinal Tumors**

Evaluation of Nursing Care for the Patient with Spinal Tumors

The desired outcome for patients with a spinal tumor is removal of the tumor. If their tumor cannot be removed, the desired outcome and goal of nursing is to help patients learn to live with the tumor, controlling the symptoms and problems caused by the tumor as much as possible. This includes helping patients learn to control the pain and improve their quality of life with interventions such as better nutrition and exercise. To evaluate the effectiveness of these interventions, nurses can assess patients' functioning with ADLs. For patients whose tumor causes a terminal condition, end-of-life preparation and care may be needed.

Medical Therapies and Related Care

The medical therapies used to treat patients with spinal tumors may include surgery, radiation therapy, chemotherapy, and medications, such as corticosteroids, which can help reduce inflammation.

17.9 Neurological Injuries

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for traumatic brain injuries and spinal cord injuries
- Describe the diagnostics and laboratory values in traumatic brain injuries and spinal cord injuries
- Describe the medical therapies that apply to the care of traumatic brain injuries and spinal cord injuries
- Apply nursing concepts and plan associated nursing care for the patient with traumatic brain injuries and spinal cord injuries
- Evaluate the efficacy of nursing care for the patient with traumatic brain injuries and spinal cord injuries

Traumatic brain and spinal cord injuries occur when the brain and/or spinal cord are damaged by trauma. Such trauma may include a forceful blow to the head and/or body that happens when an individual falls, or trauma may result when an object slams into the head and/or body. Although some patients may be able to recover from brain or spinal cord injuries, in some cases, these injuries cause permanent disability and even death.

Traumatic Brain Injury

Damage that results when the brain experiences a sudden assault from an external source is called **traumatic brain injury (TBI)**. The external source can be a variety of things, including a powerful blow to the head from falling, as well as something like a bullet that shatters the skull and pierces the brain. Incidents that may lead to traumatic brain injuries include automobile accidents, blunt force trauma, and being struck by a flying object.

Pathophysiology

TBI may cause temporary or long-term problems, depending on the nature and severity of the injury. TBIs may be **penetrating**, which occurs when the skull is pieced by a sharp object that enters brain tissue. Other TBIs are **nonpenetrating**, which occurs when the assault is strong enough to move the brain around inside the skull, but the skull is not broken.

The problems caused by TBIs may include cognitive difficulties, such as the inability to think, communication issues, and/or struggling to move body parts. A **primary injury** occurs immediately, whereas a **secondary injury** occurs gradually in response to reactive processes in the brain that are caused by the trauma. Secondary injuries may take days, or even weeks, to appear.

LINK TO LEARNING

Read this article for more information about TBI (https://openstax.org/r/77TBIinfo) from Mayfield Brain & Spine.

Clinical Manifestations

TBIs have symptoms in three areas: physical, cognitive and behavioral, and perception and sensation. Physical symptoms may include headaches, double or blurred vision, seizures, convulsions, tremors, nausea and vomiting, slurred speech and/or difficulty swallowing, muscle weakness, paralysis, balance and coordination issues, drainage in the ears or nose, and bowel and/or bladder control issues. Cognitive and behavioral symptoms may include lack of consciousness, coma, disorientation and confusion, concentration issues, loss of memory, difficulty thinking, short attention span, mood changes, irritability, frustration, loss of inhibitions, and sleep disorders. Perception and sensation symptoms may include ringing in the ears, sensitivity to sound and/or light, vertigo and dizziness, fatigue and lack of energy, anxiety, depression, foul tastes in the mouth, and decreased understanding of time and/or space. Typically, symptoms, such as headache and confusion, tend to occur immediately following a TBI, whereas symptoms that involve moods and emotions may take longer to develop.

Assessment and Diagnostics

To assess and diagnose a TBI, patients should undergo a physical examination that gathers information about the type of injury the patient has, including whether the injury is penetrating or nonpenetrating. The examination should also review the patient's symptoms, which may include physical, cognitive and behavioral, and/or perception and sensation symptoms. If a TBI diagnosis cannot be confirmed through a physical examination, patients should

undergo MRIs, CTs, and/or other neuropsychological tests.

Diagnostics and Laboratory Values

To confirm a TBI diagnosis, patients may need to be tested. Options for testing include MRIs, CTs, and neuropsychological tests. The Glasgow Coma Scale (GCS) can be used to assess the patient's consciousness level. MRIs and CTs will show evidence of injury, such as skull fractures and swelling, bruising, and/or bleeding on the brain. Neuropsychological tests will reveal problems the patient may be having with concentration, memory, problem-solving, and other cognitive skills. As noted previously, a GCS score lower than eight indicates problems with a patient's consciousness level. The highest possible score on the GCS is 15. Patients with higher scores have less severe injuries.

Nursing Care of the Patient with Traumatic Brain Injury

Nursing care for a patient with TBI should focus on helping the patient recover if possible. If the patient has permanent health issues as a result of the injury, nursing care should focus on helping the patient adjust and learn to manage the new health issues, which may include problems such as nerve damage and seizures. Patients may also experience issues such as memory loss, a decline in cognitive thinking abilities, double vision, and headaches. If needed, the patient and their family should be provided with mental health support.

Recognizing Cues and Analyzing Cues

The cues of TBI will be found in the patient's physical examination and test results. The findings should reveal whether the patient has TBI, and if so, the nature and severity of the injury.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

TBI treatment should be prioritized based on the severity of the symptoms. The nursing interventions appropriate for patients with TBI may include those in Table 17.23.

Nursing Care	Rationale
Complete focused neurological assessments.	The patient's pain levels, cognitive abilities, and other symptoms may indicate TBI.
Monitor vital signs.	Changes in the patient's vital signs such as heart rate and blood pressure may indicate health issues. Patient may also show signs of infection.
Provide care before and after surgery.	Some patients with TBI may need surgery. Nurses should help patients prepare for surgery and provide care after surgery, such as dressing patients' wound(s), maintaining oxygenation, positioning the patient, monitoring ICP, and assessing with GCS.
Administer medications.	Patients may need medication to help with pain relief. Other medications that can help limit additional damage to the brain following an injury include antiseizure and coma-inducing drugs. Some patients may need diuretics to help with fluid retention.
Help prevent seizures and provide seizure care.	In some patients, traumatic brain injuries can cause seizures. Nurses should take actions to help prevent seizures, such as low lighting, and provide care to help patients during a seizure, such as safe bedding and pillows.
Coordinate with therapists.	As they recover, some patients need therapy to regain skills and overcome problems incurred by traumatic brain injury. This may include speech, physical, and/or occupational therapists.

TABLE 17.23 Nursing Interventions for Patients with TBI

Evaluation of Nursing Care for the Patient with Traumatic Brain Injury

The desired outcome for patients with TBI is recovery from the injury and relief of their symptoms. If their symptoms cannot be relieved, the desired outcome is to help them control and manage their symptoms, overcoming any losses in skills and functioning.

Medical Therapies and Related Care

The medical therapies used to help patients with TBI may include surgery, medications, and therapy. Depending on the severity of their injury and symptoms, some patients may need rehabilitation and long-term care to recover.

Spinal Cord Injuries

A **spinal cord injury** is damage to any area of the spinal cord, including the nerves and nerve fibers that transmit signals from the brain. Spinal cord injuries may involve the spinal cord and/or the bones and tissues that surround the spinal cord. As with TBIs, spinal cord injuries can be caused by various events, including automobile accidents, falls, sports injuries, and violence. Infections that cause abscesses on the spinal cord can also result in spinal cord injuries.

Pathophysiology

Like TBIs, spinal cord injuries may cause temporary or permanent damage to the body. Depending on the nature of a spinal cord injury, the patient may experience issues with strength, movement, feeling, and functioning in areas of the body below the injured area.

Spinal cord injuries fall into two categories—incomplete and complete. With incomplete injuries, the spinal cord retains some capability to communicate with the brain, enabling patients to maintain some functioning, muscle control, and feeling below the injured area. In complete injuries, patients lose all nerve communication below the injured area, leading to a total loss of functioning, muscle control, and feeling below the injured area.

Spinal cord injuries may also lead to paralysis. A form of paralysis from a spinal cord injury known as **paraplegia** affects some or all of the truck, pelvic organs, and legs. But with paraplegia, patients can still move their arms. A form of paralysis from a spinal cord injury that is known as **tetraplegia**, or **quadriplegia**, affects patients' arms and hands, as well as their trunk, pelvic organs, and legs.

Clinical Manifestations

Typically, the symptoms of a spinal cord injury include the inability to move, pain and/or stinging sensations, muscle weakness, numbness and tingling, balance and coordination difficulties, spasms and/or exaggerated reflexes, loss of bladder and/or bowel control, decreased or lost sensations, and sexual dysfunction. Some patients also experience difficulty breathing.

Assessment and Diagnostics

To assess and diagnose a spinal cord injury, patients should undergo a physical examination that gathers information about the incident that led to the injury and the symptoms the patient is experiencing. This includes impairments, such as the patient's range of motion, muscle weakness, and level of sensations. This also includes the patient's sensory functions as determined by pinpricks and touching. Patients may also need tests such as x-rays, MRIs, and CTs to reveal fractures and other damage to the spine.

Nursing Care of the Patient with Spinal Cord Injury

As with patients who have TBIs, nursing care for the patient with a spinal cord injury should focus on helping the patient recover if possible. If the patient has permanent health issues as a result of the injury, nursing care should focus on helping the patient adjust and learn to manage the new health issues. If needed, the patient and their family should be provided with mental health support.

Recognizing Cues and Analyzing Cues

The cues of a spinal cord injury will be found in the patient's physical examination and test results. In addition to the patient's symptoms, such as pain and inability to move, the findings may include results such as bone fractures and swelling that reveal whether the patient has a spinal cord injury, and if so, the nature and severity of the injury.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Spinal cord injuries should be prioritized based on the severity of the symptoms. The nursing interventions

appropriate for patients may include those in Table 17.24.

Nursing Care	Rationale
Complete focused neurological assessments.	The patient's pain levels and other symptoms, such as ability to move, indicate if a spinal cord injury is present and its severity.
Monitor vital signs.	Changes in the patient's vital signs such as heart rate and blood pressure may indicate health issues. In particular, patients may exhibit signs of shock.
Provide care before and after surgery.	Some patients with spinal cord injury may need surgery. Nurses should help patients prepare for surgery and provide care after surgery, such as dressing patients' wound(s).
Administer medications.	Patients may need medication to help with pain relief.
Assist with traction.	Some patients may need to be placed in traction to keep them immobile and help realign their spine.
Coordinate with therapists.	As they recover, some patients need therapy to regain skills and overcome problems incurred by spinal cord injury. This may include physical and/or occupational therapists.

TABLE 17.24 Nursing Interventions for Patients with a Spinal Cord Injury

Evaluation of Nursing Care for the Patient with Spinal Cord Injuries

The desired outcome for patients with spinal cord injuries is relief of their symptoms. If their symptoms cannot be relieved, the desired outcome is to help them control and manage their symptoms.

Medical Therapies and Related Care

The medical therapies used to help patients with spinal cord injuries may include surgery, medications, and therapy. The medications that may be useful include steroid injections to reduce swelling, as well as nonsteroidal anti-inflammatory drugs, which can also relieve pain and swelling. Some patients may benefit by taking corticosteroids for swelling, and for short-term pain relief, opioids may benefit some patients. For muscle pains and spasms, patients may benefit from drugs such as tizanidine and diazepam. To deal with pain, as well as depression, some patients may find serotonin-norepinephrine reuptake inhibitors helpful. Depending on the severity of their injury and symptoms, some patients may need rehabilitation and long-term care to recover.

Summary

17.1 Intracranial Pressure Changes

- In neurology and neurosurgery, the Monro-Kellie doctrine establishes relationships among brain, blood, and cerebrospinal fluid (CSF) volumes within a skull's rigid confines. Any increase or decrease in one of these components must be counterbalanced with an increase or decrease in one or both other components to maintain a stable intracranial pressure (ICP) in the brain.
- Increased intracranial pressure (IICP) is a serious clinical issue that requires rapid assessment and intervention.
- IICP may be caused by cerebral edema, displacement of brain tissue, impaired blood flow, trauma, or tumors.
- Decreased ICP, a less serious clinical issue (but still in need of treatment), may be due to dehydration, CSF leak, hemorrhage, or brain atrophy.
- Nursing interventions for both increased and decreased ICP include monitoring neurological status and vital sign changes, providing a quiet and calm environment, monitoring and maintaining fluid and electrolyte balance, managing headache pain, oxygenation and ventilation support, recognizing and notifying the provider of any worsening trends, and providing education and support to the patient and their family.
- Nursing care for patients with either increased or decreased ICP must be evaluated to determine efficacy. This is accomplished by using clinical judgment and reviewing nursing interventions to determine if they addressed the patient's concerns.
- Medical therapies to address increased ICP focus on treating the underlying cause of ICP and may include medications, surgical interventions, and shunt systems.
- Medical therapies to address decreased ICP may include interventions, such as epidural blood patches, to stop fluid leaks in the brain as well as therapies, such as salt tablets, to address dehydration.

17.2 Acute Disorders of the Nervous System

- Brain tumors, Guillain-Barré syndrome (GBS), and meningitis are serious threats to neurological well-being that require prompt medical attention.
- Brain tumors, which are the uncontrolled proliferation of abnormal cells within the brain, may produce symptoms such as headaches, seizures, and neurological deficits.
- Brain tumors are typically diagnosed through imaging studies and tissue biopsies and can be benign or malignant. Treatments for brain tumors include surgery, radiation, and chemotherapy.
- Guillain-Barré syndrome is an autoimmune disorder that causes peripheral nerve inflammation and muscle weakness. Commonly caused by infections, GBS may present with ascending paralysis that can progress rapidly.
- GBS can be diagnosed with lumbar punctures, nerve conduction studies, and EMG. Treatment for GBS may include plasma exchange and immunoglobulin therapy. Nursing care goals are to alleviate symptoms, such as fatigue, numbness, or weakness, and help the patient return to normal peripheral nervous system function.
- Meningitis, which is inflammation of the meninges surrounding the brain and spinal cord, may produce symptoms, such as sudden-onset fever, severe headaches, neck stiffness, skin rashes, and petechiae.
- Meningitis can be diagnosed with blood tests, cerebrospinal fluid lumbar punctures, and CT or MRI imaging. Treatments for meningitis may include antibiotics, skin care, and anti-inflammatory medications. Adequate nursing care can alleviate symptoms and prevent long-term effects.

17.3 Chronic Disorders of the Nervous System

- Multiple sclerosis and myasthenia gravis are both chronic autoimmune neurological disorders.
- MS is caused by inflammation, demyelination, and neurodegeneration of the nerve cells.
- MG is caused by the body's production of hyperreactive antibodies that block acetylcholine receptors on muscle fibers, prohibiting communication to the nerves.
- MS manifestations include muscle weakness, lack of coordination, vertigo, eyesight and hearing issues, balance issues, bladder and bowel dysfunction, and cognitive issues.
- MG manifestations include difficulty breathing, vision problems, difficulties with swallowing and speaking, facial movement difficulties, and weakness in voluntary muscles.
- MS treatments may include corticosteroids, plasmapheresis, injections, infusions, and oral treatments. Muscle

relaxants, pain relievers, and physical therapy may also be useful.
- MG treatments may include corticosteroids and intravenous therapy. Surgery may be needed for patients with MG who have a thymus gland tumor.
- Patients with MG may face a life-threatening situation if their disease causes breathing difficulties. In these circumstances, patients will need immediate medical attention, which may include treatments such as inhaled bronchodilators and/or inhaled steroids, as well as a ventilator.
- Neither MS nor MG is curable, and patients must learn to cope with the disease. Some patients may need mental health support to do this.

17.4 Major Neurocognitive Disorder and Neurodegenerative Diseases

- MND is the decline in cognitive abilities, such as memory and reasoning, in a manner that disrupts patients' daily lives.
- MND refers to a group of disorders characterized by neurological changes that make it more challenging for patients to continue routine activities.
- MND occurs when the brain's neurons, or nerve cells, die after they become inactive and lose their connections to other brain cells.
- The symptoms of MND include cognitive problems, such as memory loss and confusion, as well as psychological issues, such as personality changes and feelings of paranoia.
- MND is diagnosed with a physical examination and diagnostic tests, such as lumbar punctures and PET scans. Cognitive and neurological tests that evaluate problem-solving skills, sensory responses, reflexes, and other cognitive abilities provide further evidence of MND.
- MND cannot be cured. But the condition can be managed with medications, such as cholinesterase inhibitors and memantine, as well as treatments, such as occupational therapy and mental health support.
- A neurodegenerative disease is an incurable chronic condition that damages the brain and central nervous system, causing problems with cognitive abilities as well as physical movement. Alzheimer disease, ALS, and Parkinson disease are some of the more common neurodegenerative diseases.
- Amyotrophic lateral sclerosis (ALS) is a disease of the central nervous system that affects the brain and spinal cord's motor neurons, causing patients to lose control of their muscles.
- ALS typically begins with stiffness and weakness in the muscles that control the limbs, including the legs and arms, before spreading to muscles that control vital functions, such as breathing. The disease also affects cognitive abilities, changing a patient's behavior and their ability to think.
- Alzheimer disease is a disorder in the brain that gradually destroys patients' memory and thinking abilities. In addition to being a neurodegenerative disease, Alzheimer disease is the most common form of MND, accounting for at least 60 percent of MND cases.
- Typically, Alzheimer disease affects memory first before spreading to affect other brain functioning. The symptoms often experienced by patients with Alzheimer disease include personality changes, social withdrawal, moodiness, aggressive behavior, delusions, and depression.
- Parkinson disease is an incurable brain disorder that affects the nervous system, causing body parts controlled by nerves to have movements that are unintended and uncontrollable.
- Symptoms of Parkinson may include tremors, stiffness and contractions in muscles, bradykinesia, loss of balance and coordination, difficulty speaking and swallowing, loss of automatic movements such as blinking, constipation and urination issues, blood pressure irregularities, sleep disorders, fatigue, MND, and depression.
- For all patients who have Alzheimer disease, ALS, and Parkinson disease, the overall goal of nursing care is to help the patients manage the disease and improve their quality of life as much as possible.

17.5 Seizures

- A seizure occurs when some of the brain's neurons experience sudden and uncontrolled electrical activity, sending incorrect messages between brain cells, causing the body to react with involuntary movements and behavior, as well as changes in consciousness and feelings.
- Seizures come in several types and have various causes. Some patients experience seizures because they have epilepsy, an incurable neurological disease that causes recurring seizures.
- Seizures can be triggered by a variety of factors, including high fever, brain tumors, strokes, head trauma, heart attacks, infections, diseases, alcoholism, stress, sleep deprivation, hormonal changes, dehydration, and

certain medications.

- Seizures are categorized as either focal, which begin in one area of the brain, or generalized, which affect both sides of the brain at the same time.
- Focal seizures include onset awareness and onset impaired awareness.
- Generalized seizures include absence, atonic, clonic, myoclonic, tonic, and tonic-clonic.
- Seizures may have three phases, including prodrome, which occurs before the seizure actually begins and includes warning signals; ictal, which is the actual seizure; and postictal, which is the recovery period after a seizure ends.
- The symptoms of seizures vary and can be mild or severe. Common symptoms include confusion, staring, uncontrollable twitching or jerking of the arms and legs, body spasms, stiffened and/or weakened muscles, loss of awareness or consciousness, anxiety and fear, and a feeling of déjà vu.
- Nursing care for patients with seizures should focus on identifying the cause of the seizures and curing that cause, if possible, to stop the seizures. If the cause is a condition or disease that cannot be cured, such as epilepsy, nursing care should focus on controlling symptoms and helping patients and their families learn to live with and manage seizures.

17.6 Polyneuropathy

- Polyneuropathy is a peripheral nerve disorder that occurs when multiple peripheral nerves all over the body are damaged and malfunction simultaneously.
- Polyneuropathy can disrupt nerve communication in several ways. For example, lost nerve signals should occur but do not, whereas other nerve signals occur at inappropriate times, and still other signals occur when they should but deliver an error message.
- Polyneuropathy is a serious condition that can disrupt life and cause unpleasant symptoms, such as pain. But generally, polyneuropathy is not life-threatening.
- Polyneuropathy may be caused by health conditions such as infections or tumors, or by alcoholism, vitamin deficiencies, exposure to toxins, and peripheral nerve injuries. The most common cause is diabetes.
- Symptoms vary depending on whether polyneuropathy affects the motor, sensory, or autonomic nerves. Common symptoms include muscle weakness, uncontrolled twitching, loss of reflexes, numbness, feeling of pins and needles, burning sensations, heat intolerance, and gastrointestinal issues. Some patients also experience dizziness from drops in blood pressure and breathing difficulties if the muscles that control the lungs are affected.
- Polyneuropathy is assessed and diagnosed with a physical examination as well as tests, such as blood and urine tests, lumbar puncture, imaging tests, spirometry, EMG, and nerve conduction studies.
- Nursing care for patients with polyneuropathy focuses on identifying the cause of the patient's condition. If patients cannot be cured of polyneuropathy, nursing care should focus on helping the patient understand polyneuropathy and learn how to control and manage the symptoms.

17.7 Chronic Pain Disorders

- Chronic pain refers to any type of pain, such as a headache or lower back pain, that is ongoing and continues for longer than three months.
- Migraines are a serious neurological disease with headache pain so severe that it disrupts routine activities.
- Migraines may be caused by factors including family genetics, stress, anxiety, tobacco, alcohol, foods such as cheese, low blood sugar, irregular sleep patterns, concussions, hormonal changes, and chemical imbalances in the brain.
- Migraines may progress through four stages—prodrome, aura, attack, and postdrome.
- Prodrome symptoms may include mood changes, food cravings, and uncontrollable yawning. Aura symptoms may include muscle weakness, loss of eyesight, and speaking difficulties. During the attack, the migraine headache may be accompanied by sensitivity to sound, light, touch, and/or smell, as well as nausea. In the postdrome stage, patients may experience exhaustion, confusion, and/or elation.
- Generally, migraines are incurable, but migraines can be treated, and nursing care can help patients learn techniques to prevent migraines and manage them when they do occur.
- Fibromyalgia is a chronic, incurable condition that affects soft tissues and muscles throughout the body, causing musculoskeletal pain and tenderness. It does not damage the body's muscles or bones, but the pain

can disrupt daily routines.

- The cause of fibromyalgia is unknown, but it has been linked to factors such as stress, sleep disorders, migraines, lupus, rheumatoid arthritis, osteoarthritis, chronic back pain, irritable bowel syndrome, anxiety, and depression, as well as endocrine, biochemical, and immune disorders.
- In addition to pain throughout the body, common symptoms of fibromyalgia include fatigue, headaches, restless legs, stiff joints, numbness, tingling, sensitivity to things such as touch and light, fibro fog, constipation, bladder disorders, and painful menstrual periods.
- Fibromyalgia generally is diagnosed with a physical examination and blood tests focused on ruling out other conditions and diseases that cause similar pain, such as rheumatoid arthritis.
- To have a fibromyalgia diagnosis, patients must experience ongoing pain for at least three months in at least four body areas, such as the jaw, neck, shoulders, arms, legs, back, chest, and buttocks.
- Nursing care for patients with fibromyalgia should focus on controlling symptoms and helping patients learn how to manage their condition.

17.8 Spinal Disorders

- Spinal disorders refer to diseases or injuries that affect the spinal cord and back.
- Low back pain refers to any feeling of aching, burning, or stabbing in the muscles of the lower back. When low back pain lasts longer than twelve weeks, it is considered a chronic condition.
- Common causes of low back pain include injuries, strains, and sprains, herniated disks, lumbar spinal stenosis, osteoarthritis, osteoporosis, axial spondyloarthritis, sciatica, scoliosis, and spondylolisthesis.
- Low back pain can be classified as acute, subacute, or chronic.
- Risk factors for low back pain include obesity, lack of exercise, using improper techniques for lifting, age, smoking, anxiety, depression, and arthritis.
- Symptoms of low back pain may include pain that comes and goes, decreased range of motion, difficulty standing straight, weakness in legs and/or feet, bowel and/or bladder issues, fever, and unexplained weight loss.
- Nursing care for patients with low back pain should focus on finding the cause of the pain and treating that cause with the goal of relieving the back pain. For patients with chronic back pain, nursing care should focus on helping patients control and manage the pain.
- Spinal tumors are growths of abnormal tissue inside or encompassing the spinal column or the spinal cord. Spinal tumors can be benign (noncancerous) as well as malignant (cancerous).
- When spinal tumors originate in the spine or the spinal cord, they are considered primary tumors. If they originate elsewhere in the body and spread to the spine, they are considered secondary, or metastatic, tumors.
- Factors that may create a risk for spinal tumors include defective genes, exposure to toxins, a compromised immune system, Von Hippel-Lindau disease, and neurofibromatosis 2.
- Symptoms of spinal tumors may include localized pain at the tumor site, low back pain, muscle weakness, stiff back or neck, difficulty walking, paralysis, loss of sensitivity, and loss of bladder and/or bowel functioning.
- Nursing care for patients with spinal tumors should focus on support when removing the tumor and curing the patient if possible. For benign tumors that cannot be removed, nursing care should focus on helping the patient learn to cope with the condition. For malignant tumors, nursing care should focus on treating the cancer and, if necessary, help the patient prepare for the end of life.

17.9 Neurological Injuries

- Traumatic brain and spinal cord injuries occur when the brain and/or spinal cord are damaged by trauma, typically in an accident.
- Traumatic brain and spinal cord injuries may cause temporary or long-term problems, depending on the nature and severity of the injury.
- Traumatic brain injuries may be penetrating, when the skull is pieced by a sharp object that enters brain tissue, or nonpenetrating, when the skull is not broken.
- The problems caused by traumatic brain injuries may include the inability to think, communicate, and/or struggle to move body parts.
- Primary traumatic brain injuries occur immediately, whereas secondary injuries occur gradually in response to

reactive processes in the brain caused by the trauma. Secondary injuries may take days, or even weeks, to appear.
- Traumatic brain injuries can have physical, cognitive and behavioral, and/or perception and sensation symptoms. Typically, symptoms such as headache and confusion tend to occur immediately following a traumatic brain injury, whereas symptoms that involve moods and emotions may take longer to develop.
- Spinal cord injuries may be incomplete, with the spinal cord retaining some capability to communicate with the brain, or complete, with patients losing all functioning, muscle control, and feeling below the injured area.
- Symptoms of a spinal cord injury include the inability to move, pain and/or stinging sensations, muscle weakness, numbness and tingling, balance and coordination difficulties, spasms and/or exaggerated reflexes, loss of bladder and/or bowel control, decreased or lost sensations, and sexual dysfunction.
- Nursing care for traumatic brain and spinal cord injuries should focus on helping the patient recover, if possible. For patients with permanent health issues, nursing care should focus on helping the patient adjust and learn to manage the condition.

Key Terms

ablative surgery procedure that destroys the brain tissues that produce abnormal chemical or electrical impulses responsible for the tremors in a patient with Parkinson disease
absence generalized seizure seizure during which the patient stares into space and may have slight twitching
acetylcholine key neurotransmitter essential in muscle contraction
acute back pain sudden pain in the back that typically lasts for a few days to a few weeks
Alzheimer disease disorder in the brain that destroys memory and thinking abilities
amyloid plaque deposits that occur when the brain's beta-amyloid proteins malfunction
amyotrophic lateral sclerosis (ALS) disease of the central nervous system that affects the brain and spinal cord's motor neurons, causing patients to lose control of their muscles
angiogenesis formation of new blood vessels
apoptosis normal, controlled process of cell death
astrocyte star-shaped glial cell that forms part of the brain's supportive tissue
astrocytoma malignant tumor originating in astrocytes
atonic generalized seizure seizure during which the patient loses normal muscle tone, which may cause them to involuntarily drop their head or fall down
attack migraine stage when the headache begins; symptoms during this stage include throbbing or pulsating pain, nausea, and sensitivity to sound, light, touch, and/or smell
aura occurrence that may take place at the beginning of a seizure and may include a sense of déjà vu and/or a sudden feeling of intense emotion such as fear or happiness
autonomic function automatic movements, such as the heart beating, that individuals do not control
autonomic nerve nerve that controls muscles and organs regulating bodily functions that patients cannot control consciously, such as the heart, lungs, and digestive system
axial spondyloarthritis inflammatory disease that affects the spine
basal ganglia areas of the brain where movement is controlled
benign noncancerous
bradykinesia slowed movement as patients attempt to do things such as walk or write
brain atrophy loss of neurons and synapses sometimes caused by disorders such as MND, infections, and cerebral palsy
brain sagging disorder that causes cognitive dysfunction and other issues typically associated with MND. Imaging shows the brain in a sagging position
brain tumor abnormal growth of cells found within the brain or near it
Brudzinski's sign condition characterized by rigidity and passive flexion of the neck with flexion of both legs and thighs
bulbar nerve nerve that holds the jaw in place and controls swallowing, chewing, and speaking processes
cerebral angiography type of x-ray that creates digital images of the anatomy of the brain with a focus on the blood vessels within and around the brain
cerebral perfusion pressure (CPP) net pressure gradient required to ensure sufficient oxygen delivery to the brain and allow optimal pressure levels for proper brain health

cerebral spinal fluid (CSF) colorless fluid found within the subarachnoid space of the meninges of the brain, which surrounds both brain and spinal cord, acting to maintain health and functioning of the brain
chordoma rare, slow-growing benign tumor found at the base of the skull or in the lower spine
chronic back pain back pain that appears suddenly or gradually, occurs daily, and lasts more than twelve weeks
clonic generalized seizure seizure during which the patient has repetitious jerking movements on both sides of their body
contracture shortening and/or hardening of muscles, tendons, and tissues that causes deformity and rigidity in joints
craniopharyngioma benign tumor that typically arises from the pituitary gland and becomes embedded deep in the brain near critical structures
Cushing's triad changes in a patient's vital signs, including widened pulse pressure in systolic blood pressure, bradycardia (low pulse rate), and irregular breathing patterns
decerebrate posturing neurological reflex movement of muscles causing the limbs to extend and hold rigidly at the sides of the body
decorticate posturing neurological reflex movement of muscles causing the limbs to flex and hold rigidly across the chest
deep brain stimulation surgical procedure that implants a device in the brain to produce electrical impulses and disrupt the brain signals causing Parkinson disease
demyelinating disease condition that damages the protective covering of the brain's nerve fibers
dermatome section of the body's skin that depends on nerves connected to the spinal cord
dopamine chemical neurotransmitter in the brain's basal ganglia that is involved in movement, as well as disposition and memory
dura spinal cord's thin covering
ependymoma less common malignant brain tumor that occurs when the ependymal cells that line the ventricular system experience a neoplastic transformation
epidural blood patch process of injecting a small amount of autologous blood into a patient's epidural space to plug the leak
epilepsy neurological disease that causes recurring seizures
exacerbation time period when symptoms are manifested and/or worsened in patients with MS
extradural relating to spinal tumors located outside both the dura and the spinal cord
fasciculation uncontrolled twitching in the muscles
fibro fog cognitive difficulties caused by fibromyalgia that may include difficulty concentrating, lack of alertness, forgetfulness, reduction in thinking skills, and difficulty retrieving information stored in the brain
fibromyalgia chronic condition that affects soft tissues and muscles throughout the body, causing musculoskeletal pain and tenderness
flaccid posturing abnormal body posturing that occurs when muscles lack tension and go limp
focal seizure seizure that begins in one area of the brain
frontotemporal disorder condition that occurs when the brain's frontal and temporal lobe neurons are damaged; condition progressively gets worse and causes personality and behavior changes
gangliocytoma rare benign tumor that involves the neoplastic nerve cells and typically occurs in young adults
generalized seizure seizure that affects both sides of the brain at the same time
glial cell brain's supporting cell that provides nourishment to neurons
glioblastoma multiforme (GBM) most invasive of the malignant glial tumors
glioma malignant brain tumor produced from the brain's glial cells
glomus tumor rare benign tumor that occurs in the head and neck, often near the jugular vein
Guillain-Barré syndrome (GBS) rare autoimmune disease in which the immune system attacks the peripheral nervous system, affecting motor function
herniated disk compression in the disk in the spine, irritating nearby nerves
herniation protrusion of tissue that can displace the brain
ictal relating to the phase of a seizure that begins with the first symptom and lasts until the seizure ends
increased intracranial pressure (IICP) increase in intracranial pressure that occurs as a result of factors such as changes to blood volume, changes in the rates of CSF production and absorption, fluctuations in brain tissue volume, and obstruction of CSF flow

intracranial pressure (ICP) pressure within the rigid confines of a skull in which brain tissue, blood, and CSF exist together
intradural-extramedullary relating to spinal tumors located on the inside of the dura but outside the actual spinal cord
intramedullary relating to spinal tumors located on the inside of the spinal cord
Kernig's sign condition characterized by the inability to fully extend the knee when the hip is flexed at a 90-degree angle while the patient is supine
Lewy body dementia condition that occurs when the brain has abnormal deposits of protein; condition progresses slowly and changes a patient's ability to think and concentrate
low back pain feeling of aching, burning, stabbing, or shooting pains in the muscles of the lower back
lumbar spinal stenosis narrowing of the spinal cord in the lower back, putting pressure on the nerves
lumbar spine five vertebrae that comprise the lower section of the spine found between the body's ribs and pelvis
major neurocognitive disorder (MND) group of disorders characterized by neurological changes that make it more challenging for patients to continue routine activities
malignant describing a cancerous growth that harms normal tissue by invading and spreading
medulloblastoma malignant, high-grade brain tumor that typically occurs in children, affecting the cerebellum
meningioma the most common type of benign intracranial tumor that begins growing in the meninges around the brain and spinal cord
meningitis (also: *meningoencephalitis*) an inflammation of the meninges, which are the membranes covering both brain and spinal cord
metastatic brain tumor secondary tumor that originates outside the brain, such as in the lung or breast tissue, and spreads into brain tissue
metastatic spinal tumor tumor that originates elsewhere in the body and spreads to the spine
migraine serious neurological disease characterized by a severe, throbbing pain or pulsing sensation that affects one side of the head
Monro-Kellie doctrine principle that intracranial volume remains constant while within rigid skull constraints
motor nerve nerve that controls muscles that patients voluntarily control, such as those used to talk and walk
multiple sclerosis (MS) autoimmune condition of the central nervous system characterized by inflammation, demyelination, and neurodegeneration
myasthenia gravis (MG) autoimmune neuromuscular condition caused by the body's production of hyperreactive antibodies that block acetylcholine receptors on muscle fibers, prohibiting communication to the nerves and affecting voluntary muscles
myoclonic generalized seizure seizure during which the patient has twitches and/or jerks in the arms, upper body, or legs
neoplastic transformation when oncogenes are activated while tumor suppressor genes are inactivated
neurodegenerative disease chronic condition that damages the brain and central nervous system, causing problems with cognitive abilities and physical movement
neurofibrillary tangle disorganized structure that results when the brain's tau proteins malfunction
neurofilament light chain (NfL) protein that increases when neurons are damaged; patients with ALS typically have a high serum level of NfL
neuromuscular junction point where nerve impulses meet muscles to create movement
nonpenetrating relating to brain injuries that occur when the assault is strong enough to move the brain around inside the skull, but the skull is not broken
norepinephrine primary chemical messenger for the sympathetic nervous system, which controls bodily functions such as blood pressure and heart rate
oligodendroglioma malignant brain tumor occurring in the cells that produce the brain's myelin, which insulates the brain's wiring
oncogene mutated proto-oncogene that can cause cancer
onset awareness focal seizure in which the patient is awake and aware
onset impaired awareness focal seizure in which the patient is confused and not fully aware
orthostatic hypotension sudden drop in blood pressure when standing up or sitting down
osteoarthritis inflammation in the joints that can occur in the spine
osteoporosis skeletal disorder that causes bones to lose mass and possibly fracture; when this occurs in the

spine, the fractures cause low back pain

papilledema swelling in the eye's optic disks

paraplegia form of paralysis from a spinal cord injury that affects some or all of the trunk, pelvic organs, and legs, but patients can still move their arms

paresthesia abnormal sensations of burning, prickling, and tingling

Parkinson disease brain disorder that affects the nervous system, causing body parts controlled by nerves to have movements that are unintended and uncontrollable

penetrating relating to brain injuries that occur when the skull is pieced by a sharp object that enters brain tissue

peripheral nervous system division of the nervous system that contains the nerves that travel from the brain and spinal cord to carry signals to the rest of the body

petechiae round spots on the skin caused by bleeding in the skin

phonophobia aversion to loud noises

photophobia increased sensitivity to light

pituitary adenoma common type of benign tumor that begins in the pituitary gland

polyneuropathy peripheral nerve disorder that occurs when multiple peripheral nerves all over the body are damaged and malfunction simultaneously

postdrome migraine stage that may last up to twenty-four hours after the headache is over; postdrome symptoms include exhaustion, confusion, and elation

postictal relating to the recovery period after a seizure ends when patients may experience issues such as confusion, anxiety, memory lapses, headache, muscle weakness, and loss of bladder control

primary brain tumor tumor that originates within the brain or the area surrounding the brain; may be benign or malignant

primary injury injury that occurs immediately after a traumatic brain injury happens

primary spinal tumor tumor that originates in the spine or the spinal cord

prodrome phase before a seizure actually begins; includes warning signals that indicate a seizure is going to happen

proto-oncogene gene that enables cells to stay alive by growing and dividing properly

ptosis vision problem that includes double vision and drooping eyelids

quadriplegia (also: **tetraplegia**) paralysis from a spinal cord injury that affects patients' arms and hands, as well as their trunk, pelvic organs, and legs

remission time period when symptoms disappear or minimize for patients with MS

schwannoma common type of benign brain tumor found in adults near nerves

sciatica compression of the sciatic nerve in the lower back by a bone spur or herniated disk

scoliosis condition that causes the spine to curve sideways

secondary injury injury that occurs gradually in response to reactive processes in the brain that are caused by the trauma

seizure sudden and uncontrolled electrical activity in of the brain's neurons, sending incorrect messages between brain cells

seizure threshold likelihood that a patient will have a seizure

sensory nerve nerve that transmits messages about pain, temperature, feelings, and other information gathered by the senses

somatic function conscious movement that individuals control

spinal cord injury damage to any area of the spinal cord, including the nerves and nerve fibers that transmit signals from the brain

spinal disorder disease or injury that affects the spinal cord and back

spinal tumor growth of abnormal tissue inside or encompassing the spinal column or the spinal cord

spondylolisthesis condition in which a vertebra slips out of place in the spine

subacute back pain back pain that may occur suddenly or gradually and usually lasts four to twelve weeks

tetraplegia (also: **quadriplegia**) paralysis from a spinal cord injury that affects patients' arms and hands, as well as their trunk, pelvic organs, and legs

thymus gland gland that can produce antibodies that block acetylcholine; if the gland has a tumor and malfunctions, it may contribute to MG

tonic generalized seizure seizure during which the patient's muscles stiffen, typically in the arms, legs, and/or

back

tonic-clonic generalized seizure seizure during which the patient has a combination of reactions that may include repetitious jerking, stiffening, and/or a loss of consciousness

traumatic brain injury (TBI) damage that results when the brain experiences a sudden assault from an external source

vascular dementia condition that occurs when the brain does not have sufficient blood and oxygen, resulting in damage to the brain's blood vessels; condition may affect all aspects of a patient's cognitive abilities, including behavior, memory, and reasoning

vertigo sensation that causes patients to feel dizzy, sometimes as if they are spinning or in motion while still

Assessments

Review Questions

1. What is Cushing's triad?
   a. changes in body posture that occur when muscles lack tension and go limp
   b. changes in vital signs including widened pulse pressure, bradycardia, and irregular breathing.
   c. changes in body posture that occur when patients hold their arms and legs out straight
   d. changes in vital signs including decreased pulse pressure, bradycardia, and vertigo

2. When a patient is upright, what is considered normal ICP?
   a. no more than 7 mm Hg
   b. between 7 and 15 mm Hg
   c. no more than 15 mm Hg
   d. no less than 15 mm Hg

3. Why should patients with decreased ICP be placed in flat HOB position?
   a. to control headaches and dizzy spells
   b. to increase ICP
   c. to provide more accurate ICP readings for comparison to baseline levels
   d. to maintain the patient's airway and support oxygenation

4. What are metastatic brain tumors?
   a. tumors that originate elsewhere in the body and spread into brain tissue
   b. tumors that originate in brain tissue
   c. tumors that are cancerous and spread aggressively through the brain's tissue layers
   d. tumors that are noncancerous and rarely spread

5. Why should some patients avoid Valsalva maneuvers?
   a. to decrease the likelihood of causing temporary paralysis
   b. to decrease blood pressure and heart rate
   c. to decrease pressure in the skull caused by coughing, bowel straining, etc.
   d. to decrease experiences of photophobia and phonophobia

6. Why does blocking acetylcholine receptors cause myasthenia gravis?
   a. Communication between nerves and muscle is inhibited, leading to damage in the myelin sheath's protective covering.
   b. Communication with antibodies is inhibited, leading to weakness in the thymus gland.
   c. Communication between nerves and muscle is inhibited, leading to muscle fatigue and weakness.
   d. Communication with antibodies is inhibited, leading to the creation of sclerosis scar tissue.

7. What is plasmapheresis?
   a. process of removing a patient's plasma and replacing it with antibodies
   b. process of removing a patient's plasma, mixing it with saline, and putting it back in the patient's body

c. process of removing a patient's plasma and replacing it with white blood cells
d. process of removing a patient's plasma, mixing it with a protein solution, and putting it back in the patient's body

8. What causes vascular dementia?
a. damage to the brain's blood vessels caused by insufficient blood and oxygen
b. damage to the brain's blood vessels caused by abnormal deposits of protein
c. damage to the brain's blood vessels caused by growths in the frontal and temporal lobe neurons
d. damage to the brain's blood vessels caused by an increase in antibodies

9. When treating patients with ALS, what unusual behavior should nurses watch for?
a. delusions
b. untimely laughing or crying
c. forgetting people they know well
d. getting lost in familiar surroundings

10. How can antiamyloid treatments help patients with Alzheimer disease?
a. by removing beta-amyloid, antibodies that block nerve communication
b. by stopping the inhibition of beta-amyloid, a protein that is vital for nerve communication
c. by removing beta-amyloid, a protein that can develop into plaques
d. by stopping the inhibition of beta-amyloid, antibodies necessary to develop plaques

11. When a patient has a tonic seizure, what happens?
a. The patient's body has repetitious jerking movements.
b. The patient's muscles have twitches and/or jerks.
c. The patient's body has a combination of jerking and stiffening.
d. The patient's muscles stiffen.

12. What is the difference between focal and generalized seizures?
a. Focal seizures affect the entire body, whereas generalized seizures are restricted to one body part.
b. Focal seizures begin in one area of the brain, whereas generalized seizures affect both sides of the brain at the same time.
c. Focal seizures have more obvious symptoms, whereas generalized seizures are milder.
d. Focal seizures are life-threatening, whereas generalized seizures are less risky.

13. What surgical treatment for seizures disconnects the side of the brain that has seizures from the rest of the brain and body?
a. lobectomy
b. corpus callosotomy
c. hemispherotomy
d. thermal ablation

14. What type of patients are likely to develop polyneuropathy?
a. patients with cancer
b. patients with Alzheimer disease
c. patients with multiple sclerosis
d. patients with diabetes

15. How can scrambler therapy help patients with polyneuropathy?
a. by blocking nerve endings from sending pain signals to the brain
b. by removing inflammation that causes polyneuropathy
c. by shrinking tumors that cause polyneuropathy
d. by blocking neurostimulators from sending pain signals to the brain

16. How can antiseizure drugs help patients with fibromyalgia if they are not having seizures?
   a. Antiseizure drugs can also treat restless legs.
   b. Antiseizure drugs can help with constipation and/or bladder issues.
   c. Antiseizure drugs can also treat pain.
   d. Antiseizure drugs can help with fibro fog.

17. What criteria must patients meet before their condition can be diagnosed as fibromyalgia?
   a. ongoing pain for at least six months in at least three body areas
   b. ongoing pain for at least three months in at least three body areas
   c. ongoing pain for at least three months in at least four body areas
   d. ongoing pain for at least six months in at least four body areas

18. What stage of a migraine may be characterized by uncontrollable yawning and cravings for certain foods?
   a. prodrome
   b. aura
   c. attack
   d. postdrome

19. What stage of a migraine may be characterized by both confusion and elation?
   a. prodrome
   b. aura
   c. attack
   d. postdrome

20. If a patient's low back pain is caused by a herniated disk, how is this diagnosed?
   a. electrophysiological test
   b. imaging, such as an MRI or CT scan
   c. nerve conduction study
   d. blood test

21. What type of spinal tumor is located on the inside of the spinal cord?
   a. intramedullary
   b. extradural
   c. dura
   d. intradural-extramedullary

22. How can traction help patients with spinal cord injuries?
   a. help them recover from shock
   b. keep them from developing inflammation after surgery
   c. help them regain skills affected by the injury
   d. keep them immobile and help realign their spine

23. What type of traumatic brain injuries occur gradually in response to reactive processes in the brain that result from trauma?
   a. penetrating
   b. primary
   c. nonpenetrating
   d. secondary

24. For patients with traumatic brain injury, what does the Glasgow Coma Scale assess?
   a. patient's cognitive thinking abilities
   b. patient's swelling and bleeding on the brain
   c. patient's consciousness level

d. patient's pain levels

Check Your Understanding Questions

1. Between increased intracranial pressure and decreased intracranial pressure, which one is an acute medical condition that needs immediate attention and why?
2. Typically, how is ALS diagnosed?
3. What is neurofilament light chain, how is it detected, and why is it important to patients with ALS?
4. What is the prodrome phase of a seizure, and what happens during this phase?
5. What causes a seizure?
6. What is a migraine?
7. What other health conditions can cause symptoms similar to fibromyalgia, and how are these conditions ruled out as a cause for the patient's symptoms?
8. What is the difference between paraplegia and tetraplegia?

Reflection Questions

1. What is the basic principle of the Monro-Kellie doctrine and why is it important?
2. A multiple sclerosis patient is thrilled because their symptoms have disappeared, and they declare themselves cured. But MS cannot be cured. How would you explain to the patient what they are experiencing?
3. A patient appears anxious, confused, and scared, and they have lost control of their bladder and bowel. They also have a headache and muscle weakness, but they cannot remember anything from earlier in the day. What is likely going on with this patient?
4. A patient is frustrated because they cannot function normally and are confident that they have fibromyalgia. They want to begin treatment. But their doctor will not diagnose their condition as fibromyalgia because the symptoms have been ongoing for six weeks and affect only the patient's neck and shoulders. Why is the doctor unwilling to diagnose the patient's condition as fibromyalgia?

What Should the Nurse Do?

1. A patient is being treated for a brain tumor and is at risk for a seizure. What steps should the nurse take to implement seizure precautions?
   a. Keep the head of the bed elevated 90 degrees, provide bedside padding, and have a ventilator nearby.
   b. Keep the bed in the lowest position with the side rails up, provide bedside padding, and have suction equipment set up nearby.
   c. Keep the head of the bed elevated 45 degrees, provide bedside padding, and have suction equipment set up nearby.
   d. Keep the bed in a high position with the side rails up, provide bedside padding, and have a ventilator nearby.

2. An older adult patient is wandering the hallways and seems confused. The patient is unable to state their name, and they also do not know where they are. While trying to answer questions, the patient becomes agitated. What is the nurse's first priority with this patient?
   a. Find the patient's family so they can take the patient home.
   b. Conduct a physical examination of the patient.
   c. Get the patient to a safe, secure location.
   d. Give the patient medicine to help them feel calmer.

3. A patient is being treated for a spinal tumor and has just learned that the tumor is benign and cannot be removed. What should the nurse do?

a. Coordinate with the patient's primary care physician and help them make end-of-life preparations.
b. Provide the patient with educational materials and help them learn how to live with the tumor.
c. Provide the patient with educational materials and help them make end-of-life preparations.
d. Recommend that the patient seek a second opinion.

Competency-Based Assessments

1. Explain each grade—1, 2, 3, and 4—of brain tumors. Be creative and prepare a handout for your patients that helps them understand each grade.
2. Develop a concept map to compare and contrast the types of nerves affected by polyneuropathy, and specify what each set of nerves does.
3. Create several slides describing and explaining the concept of fibro fog and how it affects patients.
4. What are the three classifications of low back pain? Briefly explain each.

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CHAPTER 18
Sensory Organs

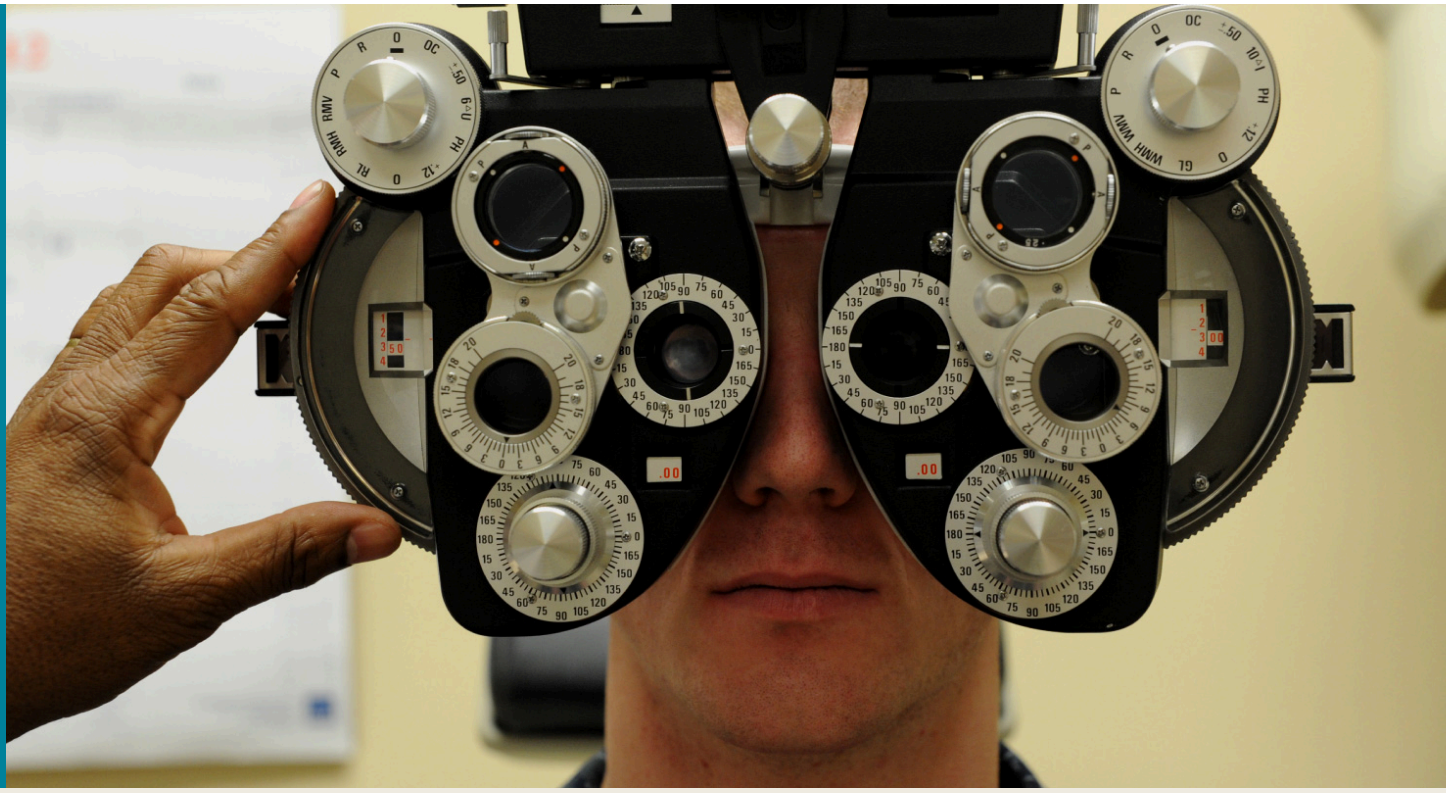

FIGURE 18.1 Eye health is important because early detection and treatment of eye disorders can prevent progression or even loss of vision. (credit: "Optometrists help clear JB Charleston's vision" by Senior Airman Anthony J. Hyatt 628th Air Base Wing Public Affairs/ Joint Base Charleston, Public Domain)

CHAPTER OUTLINE

INTRODUCTION We receive most of the information about the world around us from our vision and hearing. Eye health is directly linked to brain health; in fact, 80 percent of what we perceive comes from our sense of sight (Assi et al., 2021). Without the key senses of sight and sound, our human experience can change drastically. Impaired vision or hearing often impairs quality of life. As primary caregivers, nurses play a crucial role in identifying, assessing, and managing these disorders. Understanding eye and ear disorders is essential for nurses to provide holistic care, optimize patient outcomes, and ensure patient safety.

18.1 Disorders of the Eye

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss pathophysiology, risk factors, and clinical manifestations for ocular diseases and disorders
- Describe the diagnostics and laboratory values for ocular diseases and disorders
- Apply nursing concepts and plan associated nursing care for patients with ocular diseases and disorders
- Evaluate the efficacy of nursing care for patients with ocular diseases and disorders
- Describe the medical therapies that apply to the care of ocular diseases and disorders

Nurses need to possess knowledge about ocular disorders such as cataracts, glaucoma, and macular degeneration, as these conditions can significantly impair visual acuity and affect a patient's quality of life. By recognizing the signs

and symptoms, nurses can promptly refer patients for specialized ophthalmic evaluation and treatment, promoting early intervention and preventing irreversible vision loss. Moreover, nurses must be well-versed in the administration of eye medications, understanding proper dosing, potential side effects, and appropriate patient education. With this knowledge, nurses can collaborate effectively with ophthalmologists and optometrists to provide optimal care and support to patients with ocular disorders, facilitating their recovery and adaptation to visual impairments.

Assessment of the Eye

The eye is a vital sensory organ, playing a fundamental role in a person's daily activities, independence, and overall quality of life. By conducting a comprehensive eye assessment, nurses can identify any abnormalities, changes, or potential disorders of the eye. Early detection of such disorders is critical in preventing or minimizing irreversible damage to the patient's vision. Deteriorating vision can also suggest underlying conditions. For example, both diabetes and hypertension can cause disease of the retina, or **retinopathy**. Certain medications, such as corticosteroids, can increase the risk of developing conditions like glaucoma or cataracts. By regularly assessing the eye, nurses can help to address such issues.

Anatomy and Physiology of the Eye

The eye consists of three layers: the outer fibrous layer, the middle vascular layer, and the inner neural layer (Ball et al., 2020) (Figure 18.2).

- The outermost layer consists of the cornea and sclera. The cornea is a transparent, dome-shaped structure that refracts, or bends, and focuses light onto the retina. The sclera, or white of the eye, provides protection and maintains the shape of the eyeball.
- The middle layer includes the iris, which—a bit like an onion—consists of multiple pigmented layers; each layer contributes to eye color. The muscles of the iris regulate the amount of light entering the eye through the pupil.
- The innermost layer consists of the retina. The retina's photoreceptor cells convert light into electrical impulses, which are then transmitted to the brain for visual interpretation.

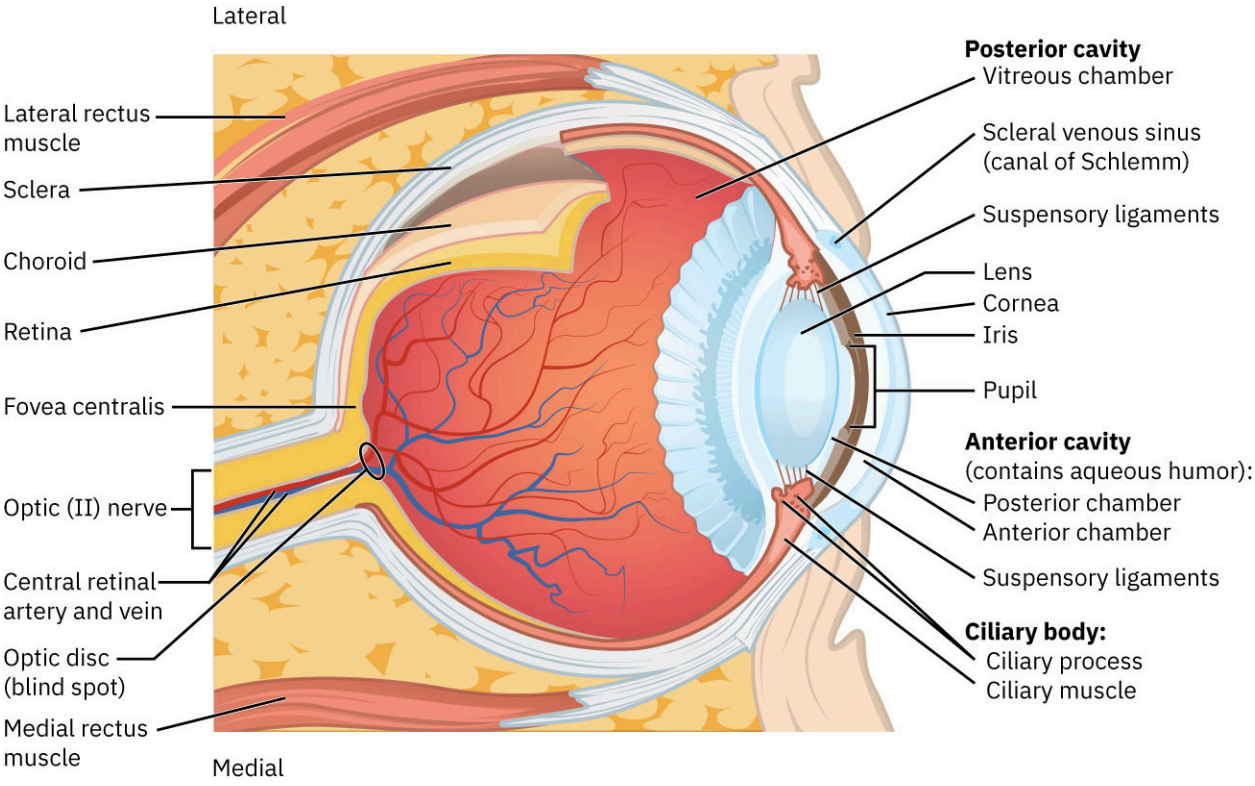

FIGURE 18.2 This cross-section of a human eye reveals the key ocular structures and their various connections. (credit: modification of work from *Anatomy and Physiology*, 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

When light enters the eye, it passes through the cornea, which refracts the light rays to focus them on the retina at the back of the eyeball. The lens, controlled by the ciliary muscles, adjusts its shape to further focus the light onto the retina. The retina has two types of photoreceptor cells: rods and cones. Rods are responsible for vision in low-light conditions, as well as peripheral vision. Cones are responsible for color vision and visual acuity. The rods and cones generate electrical impulses that travel through the neural layers of the retina to the optic nerve. The optic nerve then carries these electrical signals to the brain's visual cortex, which interprets the visual stimuli.

Nurses need to know and understand basic eye anatomy and physiology to perform an effective physical assessment. For example, knowing the sclera should generally be white helps a nurse identify redness, swelling, or streaks as abnormal. When using a penlight, a nurse will recognize whether both pupils are equally sized or whether the patient has **anisocoria**. When using an ophthalmoscope, a nurse will recognize a normal retina and be able to compare it to an abnormal one.

Physical Assessment

A comprehensive eye examination is important for early detection, assessment, and management of ocular disorders. The first step in an eye examination is to obtain a thorough patient history. This history should gather information about the patient's chief complaint, previous eye conditions or surgeries, family history of vision disorders, current medications, and any systemic conditions that may affect ocular health. It is also important to collect information on the patient's occupation, hobbies, and exposure to environmental hazards, all of which may contribute to ocular disorders. For example, a **pterygium**—a raised thickening of the **conjunctiva**: the thin, clear membrane that covers and protects the eye—may be caused by the eye's efforts to protect itself from environmental irritants such as wind, UV light, or dust (Figure 18.3).

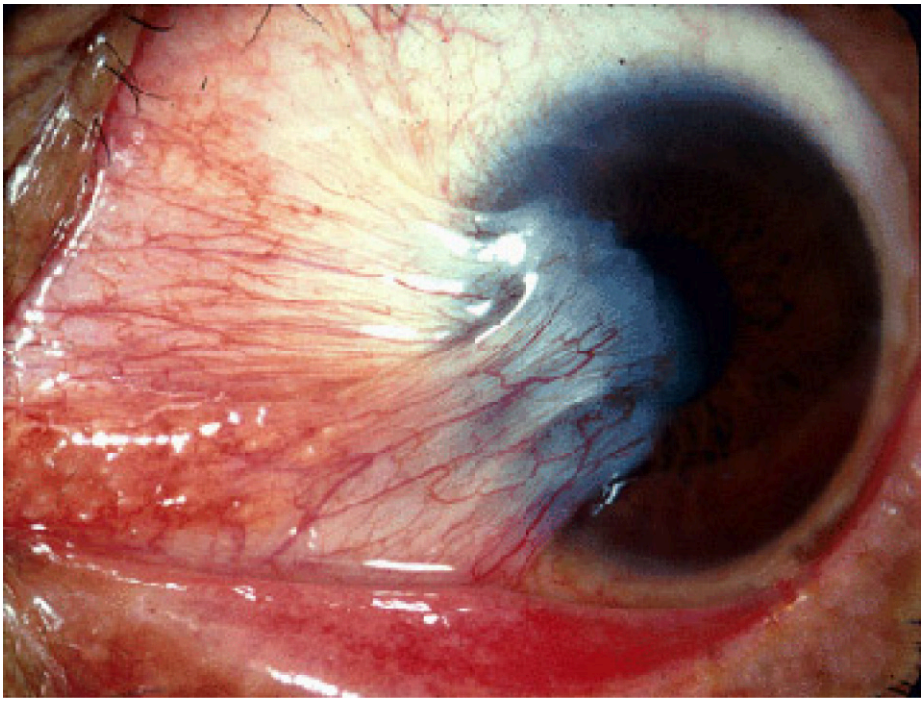

FIGURE 18.3 This pterygium of the right eye shows thickened tissue extending from the lateral side across the iris. (credit: "Pterygium" by Jonathan Trobe, M.D., University of Michigan Kellogg Eye Center/ Wikimedia Commons, CCBY 3.0)

When you think of an exam examination, you may imagine a Snellen chart, which shows the patient rows of letters of varying sizes. However, a complete eye examination has multiple components (Table 18.1).

Component	Nursing Action	Tools	Disorders to Identify
Visual acuity	Measure vision at different distances for each eye.	Snellen chart	Hyperopia myopia
External eye exam	Palpate structures surrounding the eye. Inspect eyelids, eyelashes, conjunctiva, sclera, lacrimal glands, movement of eyelids, tear production, and presence of discharge.	Visual inspection penlight	Infection nerve disorders affecting the eyes eye damage or trauma
Pupil assessment	Assess size, shape, equality, and reaction to light. Assess accommodation, or the eye's ability to focus.	Visual inspection penlight	Abnormalities such as anisocoria, sluggish or nonreactive pupils, or abnormal constriction or dilation may indicate underlying neurological or ophthalmic conditions.
Ocular motility	Evaluate movements of both eyes.	Penlight	Nystagmus or muscle weakness may indicate underlying neurological or ocular abnormalities.
Intraocular pressure (IOP)	Evaluate pressure behind the eyes.	Tonometer	Elevated IOP may warrant further evaluation by an ophthalmologist or optometrist.
Fundoscopic exam	Dilate the eyes to view the fundus.	Ophthalmoscope	Disorders of the retina, optic disc, blood vessels, and macula

TABLE 18.1 Components of an Eye Assessment

Impaired Vision

Vision impairment encompasses a range of conditions that can significantly affect an individual's quality of life and independence. Although an ophthalmologist must make a detailed assessment of a patient's vision, the nurse plays a crucial role in understanding and managing vision impairment. Nurses should understand the common causes of blindness, including cataracts, glaucoma, macular degeneration, diabetic retinopathy, and retinal detachment. They should also be aware of congenital conditions such as congenital cataracts or retinopathy of prematurity.

REAL RN STORIES

Nurse: Julietta
Years in Practice: 7
Clinical Setting: Primary care office
Geographic Location: Kansas City, KS

Julietta, a registered nurse, worked with Mr. Johnson, who was diagnosed with age-related macular degeneration (AMD), a progressive eye condition that can cause severe vision loss. Mr. Johnson was devastated and felt helpless as his visual impairment affected his independence and quality of life.

Julietta took the initiative to provide compassionate support. She engaged in therapeutic communication with Mr. Johnson, allowing him to express his fears and concerns about living with visual impairment. She provided information on low vision aids, such as magnifiers, large-print materials, and adaptive technologies that could

enhance his remaining vision and promote independence. She connected Mr. Johnson with a local support group for individuals with visual impairments. She also arranged for a vision rehabilitation specialist to visit Mr. Johnson at home and assist with environmental modifications to enhance safety and navigation. Julietta collaborated closely with the interdisciplinary health-care team. She invited Mr. Johnson's wife and children to participate in education sessions, teaching them how to provide appropriate support and understanding for someone with visual impairment.

Through the nurse's holistic approach, Mr. Johnson's quality of life improved significantly. Despite his visual impairment, he regained a sense of independence and purpose.

Refractive Errors

Refractive disorders are common visual conditions that result from abnormalities in the eye's ability to refract light properly. Common ocular disorders include **myopia** (commonly called nearsightedness); **hyperopia** (commonly called farsightedness); **astigmatism**, or blurred vision; and age-related macular degeneration (AMD) (Table 18.2).

Disorder	Definition	Causes	Diagnosis	Treatment
Myopia (nearsightedness)	Difficulty seeing distant objects clearly	Genetics Environmental factors Eye strain Anatomical changes	Visual acuity test Retinoscopy Autorefraction	Corrective contact lenses (orthokeratology) Refractive surgery (LASIK)
Hyperopia (farsightedness)	Difficulty seeing close objects clearly	Insufficiently curved cornea Aging Damage to the lens	Visual acuity test Retinoscopy Autorefraction	Reading glasses Surgery
Astigmatism	Blurred vision	Irregularly shaped cornea or lens	Visual acuity test Retinoscopy Autorefraction	Corrective lenses
Age-related macular degeneration (AMD)	Degenerative eye disease affecting the macula	Unknown causes but attributed to aging, smoking, hypertension, or atherosclerosis	Amsler grid test	Treat the causative factor with, for example, antihypertensives, antihyperlipidemic, surgery, or intravitreal injections of anti-vascular endothelial growth factor (VEGF) medications to inhibit abnormal blood vessel growth.
Cataracts	Clouding of the lens	Aging Congenital	Visual inspection	Surgery to remove and replace lens

TABLE 18.2 Common Ocular Disorders

Disorder	Definition	Causes	Diagnosis	Treatment
Glaucoma	Blurred vision from high intraocular pressure	Hypertension Smoking Aging	Tonometry	Medicated eye drops
Diabetic retinopathy	Blindness caused by overgrowth of vessels in the retina	Chronic hyperglycemia Hypertension	Retina scan	Blood glucose control Antihypertensive medications

TABLE 18.2 Common Ocular Disorders

Glaucoma

Glaucoma is a leading cause of irreversible blindness worldwide. This progressive eye disease is typically characterized by increased intraocular pressure (IOP), which can damage the optic nerve and lead to irreversible vision loss if left untreated. Lifelong management is necessary to preserve vision (Kanski & Bowling, 2020).

There are several causes of glaucoma. Some individuals develop glaucoma as they progress past the age of 60. Other individuals—particularly those with a family medical history of glaucoma—may be diagnosed before the age of 60. Pre-existing medical conditions such as diabetes and hypertension can trigger glaucoma development. Glaucoma can also be caused by chronic steroid use or previous eye injuries or surgeries. Understanding the pathophysiology of glaucoma is crucial for nursing professionals as it helps in recognizing early signs and symptoms; treating the condition as soon as possible minimizes vision loss.

Normal IOP is between 11 and 21 mm Hg and shifts throughout the day, with the lowest measurement being in the morning (Assi et al., 2021). It also commonly increases with aging but still should not measure greater than 21 mm Hg. Elevated IOP results when the balance is disrupted between the production and drainage of **aqueous humor**, a clear fluid inside the eye. This leads to an accumulation of fluid and increased pressure within the eye, which damages the optic nerve. Over time, this damage leads to the gradual loss of peripheral and central vision; if left untreated, it can lead to total blindness. It is important to note that whereas increased IOP is a significant risk factor, there are cases of glaucoma where optic nerve damage can occur even with normal IOP. Glaucoma can easily go untreated because early stages of peripheral vision loss can go unnoticed. It is often only when the central vision is affected that patients take steps to treat the illness. At that point, the lost vision can no longer be regained.

There are two general types of glaucoma: open-angle and closed-angle. In the most common type, **open-angle glaucoma**, the drainage angle between the cornea and the iris remains open, but the fluid outflow is impeded. In **closed-angle glaucoma**, the drainage angle suddenly becomes blocked, leading to a rapid increase in IOP and severe symptoms. Elevated IOP can lead to compression of and damage to the optic nerve fibers.

Clinical manifestations of glaucoma can vary depending on the type and stage of the disease. Common clinical manifestations of glaucoma include

- blurred vision,
- gradual loss of peripheral vision,
- halos and glares around lights,
- headaches around the temples or brow region,
- optical nerve changes,
- redness and discomfort in the eye(s), and
- nausea, vomiting, and in some cases abdominal pain.

Assessment and Diagnostics

Assessment and diagnostics play a crucial role in identifying and managing glaucoma. The scope of nurses is

supportive, as the optometrist or ophthalmologist makes the formal diagnosis. Nurses may administer medications, educate patients, collect a patient's health history, and assess their symptoms, and even help with visual acuity testing.

Diagnostics and Laboratory Values

Glaucoma diagnosis primarily relies on clinical assessment and specialized eye examinations. There are no specific laboratory tests to diagnose glaucoma. However, certain diagnostic procedures and tests can provide valuable information to aid in the diagnosis and management of glaucoma. Testing includes **tonometry**, or the measuring intraocular pressure (IOP) (Figure 18.4), as well as visual field testing, optic nerve imaging, and measurements of the corneal thickness and blood flow.

FIGURE 18.4 Tonometry is a test used to check for glaucoma. (credit: "Glaucoma Awareness" by Staff Sgt. Liliana Moreno/ U.S. Air Force, Public Domain)

Nursing Care of the Patient with Glaucoma

Treatment and management of glaucoma focus on reducing IOP to slow down or halt the progression of the disease. Early detection and proactive management can help prevent or delay vision loss. Treatment options include eye drops that lower IOP and prevent optic nerve damage, oral medications that lower IOP, laser therapy, and surgery. Regular monitoring of vision, adherence to treatment, and lifestyle modifications such as avoiding activities that increase IOP (like straining or exercising with a lowered head) are essential components of glaucoma management.

Regardless of the treatment plan, nurses should provide support and education, address concerns, and promote medication compliance to prevent disease progression and vision loss. Nurses should also be aware of complications that result from some treatment options. For example, a major category of medication for glaucoma is a beta blocker, which helps open the eye canals to decrease pressure. A side effect of beta blockers is a decrease in blood pressure if the medication is absorbed systemically. Consequently, it is important for nurses to regularly monitor the blood pressure of glaucoma patients treated with beta blockers.

CLINICAL SAFETY AND PROCEDURES (QSEN)

Quality Improvement Strategies to Guide Patient Care

The Quality and Safety Education for Nurses (QSEN) competencies are essential in guiding nursing practice and ensuring the provision of safe, quality care to patients. When working with patients with ocular disorders, nurses can apply the following QSEN competencies:

- Patient-Centered Care: Nurses prioritize patient-centered care by considering the unique needs, preferences, and goals of patients with ocular disorders. They involve patients in the decision-making process, actively listen to their concerns, and provide education and support tailored to their specific condition.
- Evidence-Based Practice: Nurses use evidence-based practice to inform their interventions and decision-making when caring for patients with ocular disorders. They stay updated with current research, guidelines, and best practices in the field of ophthalmology to provide the most effective and appropriate care.
- Safety: Ensuring patient safety is of utmost importance when working with individuals with ocular disorders. Nurses assess environmental factors that may contribute to falls or accidents related to visual impairment.
- Informatics: Nurses utilize informatics to manage and communicate patient information effectively when caring for patients with ocular disorders. They utilize electronic health records (EHRs) to document and retrieve patient data, including ophthalmic assessments, treatment plans, and medication administration records.
- Teamwork and Collaboration: Collaboration is essential when caring for patients with ocular disorders, as it involves an interdisciplinary approach. Nurses work closely with ophthalmologists, optometrists, ophthalmic technicians, and other health-care professionals to provide comprehensive care.
- Quality Improvement: Nurses embrace the competency of quality improvement to identify areas for improvement and implement changes in the care of patients with ocular disorders.

Medical Therapies and Related Care

Collaborative care and interprofessional communication are essential components of providing comprehensive treatment for patients with glaucoma. Given the multifaceted nature of glaucoma management, involving various health-care professionals in a collaborative, coordinated approach ensures optimal patient outcomes. Collaborative care involves the active participation of different health-care professionals working together to provide comprehensive and holistic care for patients with glaucoma.

INTERDISCIPLINARY PLAN OF CARE

Taking on Glaucoma Care as an Interdisciplinary Team

The interdisciplinary plan of care for a patient with glaucoma includes a variety of health-care professionals who work together to coordinate care. Their goal is to provide continued care management and preventive measures to reduce progression of the disease and improve the patient's quality of life. The interdisciplinary team includes the following members:

- a pharmacist to manage medications and verify compatibility;
- a social worker to coordinate post-discharge resources and referrals;
- an occupational therapist to provide interventions as part of the vision rehabilitation team;
- an ophthalmologist to manage and oversee the patient's plan of care;
- an optometrist to monitor and correct changes to the patient's vision; and
- a nurse educator to provide best practices for preventing disease progression and improving quality of life at home.

Nurses are pivotal members of the glaucoma care team. They assess patients, educate them about the disease, provide information on medication administration and side effects, and reinforce and promote adherence to treatment plans. Nurses also monitor IOP, administer eye drops, and provide guidance on proper technique. They play a vital role in patient education, emphasizing the importance of regular follow-up appointments, lifestyle

modifications, and eye health maintenance. Nurses act as advocates, ensuring patients receive appropriate referrals, support, and access to resources.

CLINICAL JUDGMENT MEASUREMENT MODEL

Recognize and Analyze Cues

Before a nurse can analyze cues to form a hypothesis, they must first make sure they have enough information about a patient's situation to correctly interpret the information and develop a plan of care. Suppose you are educating a patient with diabetes on the need to get a yearly eye examination for early detection of glaucoma. You explain that eye examinations are a preventive measure that can reduce the risk of undiagnosed glaucoma. The patient is hesitant, due to lack of eye care insurance, and claims that yearly eye exams are unnecessary and a waste of money. You explain to the patient that any medical diagnosis that results in eye disease covers one yearly exam. You also explain that although glaucoma cannot be cured, medications can stop the progression and deterioration of vision if caught in the early stages.

In this situation the nurse recognized the patient did not oppose an eye exam but was instead concerned about their lack of vision insurance. Having obtained sufficient information, the nurse is able to address the patient's concerns and develop the most appropriate plan of care.

Cataracts

A **cataract**—the clouding of the lens within the eye—is another common vision disorder and a leading cause of impaired vision (Figure 18.5). Cataracts occur when the balance between water and proteins in the lens is disrupted. When this happens, the proteins undergo structural changes that cause them to clump together and aggregate. This aggregation clouds the lens, making it more difficult for light to pass through it. Consequently, the affected lens becomes increasingly opaque, leading to visual impairment.

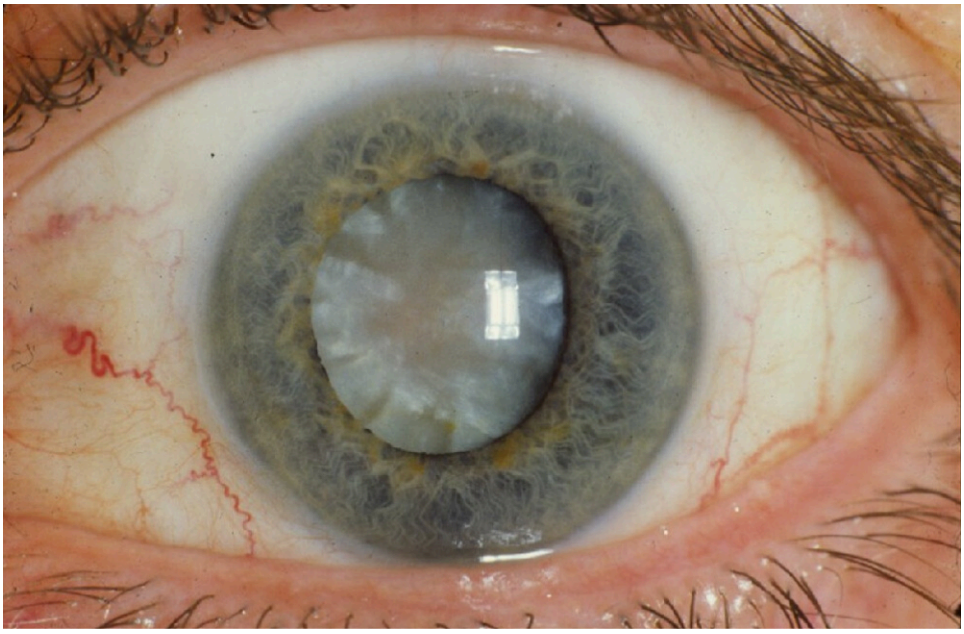

FIGURE 18.5 A cataract looks like an opaque circle in the center of the eye. (credit: "Cataract" by NIH Image Gallery/ Flickr, Public Domain)

The development of cataracts is often age-related, caused by factors such as long-term exposure to ultraviolet light, oxidative stress (periods of reduced oxygenation to the eye), or metabolic changes within the lens. However, younger people can also develop cataracts due to factors such as genetic predisposition, trauma, certain medications, or underlying medical conditions such as metabolic disorders. It is essential to note that the progression and impact of cataracts on vision can vary among individuals. Some may experience gradual deterioration over years, whereas others may notice more rapid changes. Common clinical symptoms associated with cataracts include

- blurred vision,
- increased sensitivity to glare,
- difficulty perceiving colors and contrasts,
- reduced night vision, and
- altered depth perception.

Assessment and Diagnostics

The assessment and diagnostic process for cataracts involves a comprehensive evaluation of the patient's visual symptoms, a medical history, and a thorough eye examination (Table 18.3). Nurses play a vital role in assisting with this process by gathering relevant information, performing initial screenings, and collaborating with other health-care professionals.

Nursing Action	Includes . . .
Take patient history	• Medical history • Onset and duration of symptoms • Health conditions • Smoking history • Trauma • Medications
Assess symptoms	• Vision changes • Sensitivity to light • Difficulty with night vision or depth perception
Test visual acuity	• Use of Snellen chart and penlight • Test for accommodation and confrontation (visual field) • Test for cranial nerves 2, 3, and 6

TABLE 18.3 **Cataract Assessment** (Ball et al., 2020)

Diagnostics and Laboratory Values

The diagnosis of cataracts is primarily based on the patient's reported symptoms and a comprehensive eye examination by an optometrist or ophthalmologist. Lab tests are not typically used as primary diagnostic tools for cataracts.

Nursing Care of the Patient with Cataracts

Nurses play a role in coordinating care and ensuring optimal outcomes for individuals with cataracts. They do this by providing education about the condition, assisting with visual aids (e.g., glasses, magnifiers), and supporting patients through the surgical process if indicated. Collaborative care with ophthalmologists is vital to determine the appropriate treatment approach, which may involve cataract extraction surgery to replace the clouded lens with an artificial intraocular lens (IOL).

Nurses also help to develop a care plan, which involves reviewing and understanding the patient's medical history, visual assessment findings, and reported symptoms. The next step is to identify interventions and strategies to address the diagnosis. These may include helping the patient to adapt to visual changes, recommending regular eye examinations, promoting compliance with prescribed medications or eye drops, collaborating with the health-care team to arrange for surgical interventions, helping the patient to access necessary visual aids or devices, and educating the patient on lifestyle modifications to prevent further cataract progression. Once the plan of action has been established, the nurse should continue to evaluate outcomes and communicate regularly with the patient to determine if modifications are necessary. As always, nurses should aim to involve the patient in the decision-making process to promote patient-centered care.

Medical Therapies and Related Care

Medical therapies and collaborative care for cataracts involve a combination of conservative management strategies, patient education, and coordination with health-care professionals. Although cataract surgery remains the definitive treatment, medical therapies and collaborative care play a crucial role in managing the condition and optimizing visual function. Conservative management involves offering visual aids such as corrective glasses. Collaborative care includes involving the specialist who may plan for and perform any needed surgery.

Corneal Disorders

Common corneal disorders encompass a range of conditions that affect the transparent outermost layer of the eye, the cornea. These include corneal abrasion, corneal ulcer, keratoconus, and corneal dystrophies, all of which may cause vision distortions (National Eye Institute, 2024).

Corneal Abrasion

A **corneal abrasion** is the loss or disruption of the corneal epithelium, the outermost layer of the cornea. It can occur due to trauma, foreign bodies in the eye, or misused contact lenses. A corneal abrasion can produce eye pain, foreign body sensation, excessive tearing, redness, blurred vision, increased sensitivity to light, and conjunctival injection.

Corneal Ulcer

A **corneal ulcer** is an area of tissue breakdown in the cornea. It is usually caused by a bacterial, viral, or fungal infection. When the infection breaches the corneal epithelial barrier, it leads to inflammation and tissue damage. A corneal ulcer can produce severe eye pain, redness, sensitivity to light, blurred vision, foreign body sensation, and excessive tearing. Additionally, a corneal ulcer may present with a visible white or yellowish opacity on the cornea, along with surrounding corneal edema, or swelling.

Keratoconus

A progressive corneal disorder, **keratoconus** is characterized by the thinning and distortion of the cornea, resulting in a conical shape. The weakened corneal structure leads to corneal irregularities and astigmatism. The exact cause is unclear, but genetic factors and chronic eye rubbing may contribute. Patients with keratoconus often experience progressive myopia and astigmatism. Corneal scarring, corneal hydrops (sudden corneal swelling), and contact lens intolerance may develop as the condition advances.

Corneal Dystrophies

The **corneal dystrophies** are a group of inherited disorders characterized by abnormal deposits or changes in corneal structure. Patients with these conditions may experience gradual vision loss, corneal clouding, recurrent corneal erosions, sensitivity to light, and decreased visual acuity. In some cases, corneal dystrophies may lead to corneal opacities, irregular astigmatism, and visual distortion.

Assessment and Diagnostics

Like most other ocular disorders, the assessment and diagnostic process for corneal disorders involves a comprehensive evaluation of the patient's symptoms and medical history and a thorough ophthalmic examination. Testing for corneal disorders should include a visual acuity test and an external eye examination looking for signs of inflammation, swelling, discharge, or eyelid abnormalities. Patients may also require a slit lamp examination to assess the corneal surface for irregularities, opacities, infiltrates, lesions, ulcers, dystrophic changes, or signs of infection. Other necessary tests may include corneal topography imaging to map the corneal surface and tests to identify infections and guide appropriate antimicrobial treatment.

Nursing Care of the Patient with Corneal Disorders

Recognizing and analyzing cues of corneal disorders requires keen observation and assessment skills on the part of the nurse. Nurses can identify potential corneal disorders by listening to patient reports of eye pain, blurred vision, sensitivity to light, grittiness in the eye, or decreased visual acuity. With a physical assessment, nurses can observe the appearance of the conjunctiva and sclera, the transparency of the cornea, localized or diffuse redness, the presence of excessive tearing (epiphora) or ocular discharge, and irregularities or changes in corneal curvature. Patients may demonstrate eye rubbing or shielding their eyes from light. It is important to note that the assessment and analysis of cues should happen in conjunction with a comprehensive eye examination conducted by an eye care professional.

Medical Therapies and Related Care

Medical therapies for corneal disorders vary depending on the specific condition and its underlying cause. Table 18.4 lists some common medical therapies used in the management of corneal disorders.

Type of Management	Examples	Uses
Topical medications	Antibiotics	• Treat bacterial corneal infections • Prevent secondary infections in corneal ulcers
	Antivirals	• Treat viral corneal infections such as herpes simplex keratitis
	Antifungals	• Treat fungal infections
	Anti-inflammatory agents (corticosteroids or NSAIDs)	• Reduce inflammation and associated symptoms in certain corneal disorders
Lubricants and tear substitutes	Artificial tears	• Alleviate dryness • Soothe discomfort • Protect the cornea from further damage
	Tear substitutes	• Provide long-lasting lubrication to treat severe dry eye or inadequate tear production
More-complex treatments	Bandage contact lenses	• Protect the cornea • Promote healing • Improve patient comfort in conditions such as corneal erosions, recurrent corneal erosions, or persistent epithelial defects
	Amniotic membrane transplantation (placement of a thin layer of dehydrated amniotic membrane onto the cornea)	• Promote healing • Reduce inflammation • Improve corneal surface integrity in conditions like corneal ulcers or severe ocular surface diseases
	Collagen cross-linking (application of riboflavin eye drops followed by ultraviolet light exposure)	• Used primarily for the treatment of progressive keratoconus to strengthen the cornea and slow down the progression of the disease
	Corneal transplantation (replacing the damaged cornea with a healthy donor cornea)	• Used to treat advanced corneal disorders • Improve vision and restore corneal integrity when conservative measures fail

TABLE 18.4 Management of Corneal Disorders

Ocular and Orbital Trauma

Nurses should be familiar with common ocular and orbital trauma conditions to provide prompt and effective care. Table 18.5 lists some of the conditions that nurses should be knowledgeable about.

Condition	Clinical Symptoms	Nursing Actions
Chemical eye burn	• Severe eye pain • Redness • Tearing • Blurred vision • Tissue damage	• Eye irrigation with sterile saline or water
Orbital fracture	• Periorbital swelling • Ecchymosis • Diplopia • Limited eye movement	• Pain management • Application of cold compress to reduce swelling • Eye protection • Immediate referral for ophthalmic evaluation
Hyphemia	• Blood in the anterior chamber of the eye • Eye pain • Decreased vision • Photophobia	• Strict bed rest • Elevation of head of bed (HOB) • Administration of prescribed medications (topical corticosteroids)
Globe rupture	• Severe eye pain • Decreased vision • Blood in eye	• Application of rigid eye shield • Elevation of HOB • Administration of IV antibiotics • Consultation with ophthalmic specialist
Blowout fracture	• Periorbital edema • Ecchymosis • Restricted eye movement • Infraorbital numbness • Pain	• Pain management • Application of cold compress • Eye protection

TABLE 18.5 Common Ocular and Orbital Trauma Conditions (Yanoff & Duker, 2018)

Assessment and Diagnostics

Following the collection of a patient history and physical exam of the eyes and orbits of the eyes, nurses should obtain a detailed history of the trauma, time of occurrence, and any associated symptoms. The physical examination should include inspection for signs of injury such as swelling, ecchymosis, deformities, lacerations, and symptoms like pain, as well as changes in visual acuity, signs of orbital or globe penetration, and **diplopia** (or "double vision"). Nurses should also evaluate eye movements, visual acuity, pupillary reactions, and extraocular muscle function. It is also important to conduct a visual acuity test and examine the anterior and posterior segments of the eye.

Diagnostic tests that may be necessary for ocular and orbital traumas include x-rays to identify fractures or foreign bodies in the orbit or eye socket, computed tomography (CT) scans to check for hemorrhage and globe ruptures, and magnetic resonance imaging (MRI) to assess for soft tissue injuries and nerve involvement or to rule out associated intracranial pathology. Other tests include measuring IOP and using ultrasonography to check for globe rupture, intraocular hemorrhage, or retinal detachment. In some cases, providers order blood tests, such as a complete blood count (CBC) or coagulation profile, to assess for bleeding disorders or evaluate the extent of systemic involvement in traumatic injuries.

Nursing Care of the Patient with Ocular and Orbital Trauma

When providing care for patients with ocular and orbital trauma, nurses play a crucial role in implementing appropriate nursing interventions. Throughout the period of assessment and treatment, nurses listen carefully to the patient's self-reported symptoms, concerns, and observations. They should pay attention to nonverbal cues, such as facial expressions, body language, and signs of distress. It is important to also document all assessment findings, including objective data, subjective complaints, and changes in the patient's condition over time. Any significant cues or changes should be promptly and accurately reported to the health-care team. Vigilant and attentive assessment of cues can assist nurses in ensuring timely interventions, preventing complications, and optimizing outcomes for patients with ocular or orbital trauma.

After the nurse has collected and analyzed data, the nurse will move to prioritize possible diagnoses and plan appropriate interventions. The specific interventions may vary depending on the severity and nature of the injury. Table 18.6 lists some general nursing interventions for ocular and orbital trauma.

Nursing Action	Notes
Assess and monitor	• Document vital signs.
Manage pain	• Use pain assessment tools. • Apply cold compresses to reduce swelling.
Protect eye	• Use eye patch, shield, or cup to protect from further trauma.
Maintain proper positioning	• Keep HOB above 30 degrees to minimize edema. • Support with pillows.
Promote eye care and hygiene	• Use eye irrigation and cleaning as needed.
Administer medication	• Properly apply eye drops or ointments.
Educate patient	• Teach patient to avoid rubbing the eye.
Assist with ADLs	• Help patient with grooming, dressing, and eating to promote independence and comfort.
Offer emotional support	• Offer support for impaired vision. • Include family members in the recovery process.
Collaborate with health-care team	• Collaborate with ophthalmologists, ophthalmic specialists, and other health-care professionals to ensure coordinated care and timely interventions.

TABLE 18.6 Nursing Interventions for Ocular and Orbital Trauma (Yanoff & Duker, 2018)

Evaluation of Nursing Care for the Patient with Ocular and Orbital Trauma

Part of evaluating outcomes requires the continuous collection of data from the patient. This means measuring the response of the patient to the nursing interventions—for example, with visual acuity testing, ophthalmic examinations, pain assessments, and observations of the healing process. All data—including any changes from the baseline assessment—should be carefully documented, allowing the nurse to compare the collected data to the

established expected outcomes. Based on the evaluation of outcomes and collaboration with the health-care team, nurses can assist in modifying the care plan, as necessary.

Medical Therapies and Related Care

Medical therapies and collaborative care for ocular and orbital trauma involve an interdisciplinary approach to address the specific needs of the patient. Table 18.7 lists some common medical therapies and collaborative care strategies for ocular and orbital trauma.

Therapy or Strategy	Description
Ophthalmologic consultation	• For diagnosis and treatment
Pharmacological interventions	• Topical antibiotics or ointments • Analgesics • NSAIDs
Surgical interventions	• To repair lacerations, ruptures, or orbital trauma
Wound management	• To ensure proper healing
Pain management	• Cold compresses • Elevation of head • Relaxation techniques
Visual rehabilitation	• Visual aids • Adaptive techniques
Patient education and support	• Eye care • Eye hygiene • Safety measures

TABLE 18.7 Medical Therapies and Collaborative Care Strategies for Ocular and Orbital Trauma (Yanoff & Duker, 2018)

Other Common Ocular Disorders

In addition to refractive or trauma disorders, other common ocular disorders include conjunctivitis, retinal vascular disorders, dry eye, retinitis, trauma, and diabetic retinopathy.

Conjunctivitis

Commonly known as “pink eye,” **conjunctivitis** is the inflammation of the conjunctiva. Conjunctivitis can have various causes, including viral, bacterial, or allergic reactions. Viral conjunctivitis is commonly caused by adenovirus, whereas bacterial conjunctivitis is often caused by *Staphylococcus aureus*, *Streptococcus pneumoniae*, or *Haemophilus influenzae*. Allergic conjunctivitis occurs due to an immune response triggered by allergens such as pollen, dust mites, or pet dander. Patients with conjunctivitis often experience redness in the eye, eye discharge, itching and irritation, tearing, swelling, and sensitivity to light.

The diagnosis of conjunctivitis is primarily based on a thorough patient history and clinical examination. Specific diagnostic tests may include visually inspecting the eye, obtaining and analyzing microbiological cultures, and testing for allergies. The choice of medical treatment for conjunctivitis depends on the underlying cause. Viral conjunctivitis, for example, is self-limiting and resolves without specific treatment. To alleviate symptoms, patients can use cold compresses, artificial tears, and good hygiene practices, such as washing their face and eyes daily. For bacterial conjunctivitis, patients typically are administered topical antibiotic eye drops or ointments. Allergic

conjunctivitis is usually treated with antihistamine eye drops, mast cell stabilizers, or corticosteroid eye drops. Nurses play an important role in the care of patients with conjunctivitis by educating patients on the condition and the importance of good hygiene practices and compliance with medication regimens.

Retinal Vascular Disorders

A **retinal vascular disorder** is any condition that affects the blood vessels supplying the retina. These disorders comprise two main types: occlusive and proliferative. Occlusive disorders involve the obstruction or narrowing of retinal blood vessels, whereas proliferative disorders are characterized by the abnormal growth of new blood vessels in the retina. Common consequences of retinal vascular disorders include blurred vision, floaters (spots or lines in the field of vision), or sudden vision loss. These symptoms may have a variety of causes.

- Retinal hemorrhages happen when damaged blood vessels bleed in the retina.
- Retinal ischemia, or inadequate blood flow to the retina, results in altered metabolic function due to the lack of oxygen flow. Examples of damage include reduced visual acuity, visual field defects, or even complete vision loss.
- Neovascularization is the growth of abnormal blood vessels on the retina's surface.

The diagnosis of retinal vascular disorders involves a comprehensive evaluation and may include visual acuity testing, ophthalmoscopy, optical coherence tomography (OTC), and fluorescein angiography (a test that uses a camera and dye to assess blood vessels in the eye). Depending on the specific condition, retinal vascular disorders may be treated with a variety of procedures including laser photocoagulation, intravitreal injections, and retinal detachment repair.

To manage retinal vascular disorders, it is important to address any underlying conditions, such as controlling blood pressure, blood glucose levels, or cholesterol levels. Nurses can help by providing patient education and visual and emotional support and by facilitating collaboration within the health-care team.

Dry Eye

Dry eye, also known as **keratoconjunctivitis sicca**, is a common ocular disorder characterized by insufficient tear production or poor tear quality, leading to dryness and discomfort of the eyes. Dry eye results from an imbalance between tear production and tear evaporation. In dry eye, there may be decreased tear production from the lacrimal glands or increased evaporation of tears due to factors such as reduced lipid layer integrity. This results in an unstable tear film, leading to dryness, inflammation, and irritation of the ocular surface. Signs and symptoms of dry eye include:

- blurred vision,
- burning,
- dryness,
- excessive tearing,
- foreign body sensation,
- redness,
- scratchiness, and
- sensitivity to light.

The diagnosis of dry eye is typically based on clinical evaluation and patient history. Specific diagnostic tests may include tests that measure the amount of tear production and irregularities on the ocular surface.

The medical treatment of dry eye aims to alleviate symptoms, improve tear film stability, and promote ocular surface health. This can be done with artificial tears to lubricate the eyes, topical medications to reduce inflammation, plugs to reduce tear drainage, moisture chamber glasses to reduce evaporation. Nurses can support patients with dry eye by educating patients on proper eye hygiene and the importance of consistently using prescribed artificial tears or medications.

Ocular Tumors

Ocular tumors refer to abnormal growths that occur within the structures of the eye. These tumors can develop in various parts of the eye, including the retina, iris, choroid, or conjunctiva. Ocular tumors result from the uncontrolled proliferation of cells within the eye. These tumors can be either benign or malignant. Malignant tumors have the potential to invade surrounding tissues and spread to other parts of the body, known as metastasis. The specific

type and location of the tumor determines its effects on ocular function and the overall prognosis. Common signs and symptoms of the presence of ocular tumors include blurred vision or vision loss, eye pain and discomfort, redness and swelling, abnormal eye movements, and the presence of a visible mass on the eye. To diagnose the presence of ocular tumors, health-care specialists use visual acuity testing, ophthalmoscopy to examine the structure of the eye, biopsies to analyze the tumor itself, and different types of imaging, such as CT and MRI, to identify and evaluate the extent of the tumor.

The treatment of ocular tumors depends on various factors, including the type, location, size, and stage of the tumor. Treatment options may include

- surgically removing the tumor with the assistance of advanced technologies, such as laser or cryotherapy;
- using high-energy radiation to target and destroy cancer cells in the eye;
- using chemotherapy to kill cancer cells or inhibit their growth; and
- using specialized medications designed to specifically target cancer cells while minimizing damage to healthy cells.

Nursing interventions for patients with ocular tumors focus on providing comprehensive care and support throughout the treatment process. Nurses should assist in providing patients and their families with information about the diagnosis, treatment options, and potential side effects.

Cytomegalovirus Retinitis

The ocular infection caused by the cytomegalovirus (CMV) that primarily affects the retina is **CMV retinitis**. It occurs most commonly in individuals with weakened immune systems, such as those with advanced human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS), organ transplant recipients, or individuals receiving immunosuppressive therapy. The virus can spread to the retina through the bloodstream, leading to inflammation and damage to the retinal cells. If left untreated, CMV retinitis can progress to cause retinal detachment and vision loss. Patients with CMV retinitis may experience blurred vision, floaters, dark spots or flashes of light, and vision loss.

The diagnosis of CMV retinitis involves a combination of clinical evaluation and specialized tests.

- Ophthalmoscopy is the examination of the retina using an ophthalmoscope to visualize characteristic signs of CMV retinitis, such as areas of retinal inflammation, hemorrhages, or retinal detachment.
- Fluorescein angiography is the injection of a fluorescent dye into the bloodstream, followed by the capturing of sequential images of the retina. This test helps identify abnormal blood vessel growth, leakage, and areas of compromised blood flow.
- Polymerase chain reaction (PCR) is a laboratory test that detects and amplifies the genetic material of the CMV virus to confirm the presence of active infection.

The medical treatment of CMV retinitis aims to control viral replication, manage inflammation, and preserve vision. The condition can be treated with antiviral medications such as ganciclovir, valganciclovir, or foscarnet to inhibit CMV replication and reduce the progression of retinal damage. Nurses can assist in the treatment process by supporting patients in managing their symptoms and educating patients on treatment options and the value of proper medical adherence and follow-up visits.

Diabetic Retinopathy

Diabetic retinopathy is a progressive eye disease that affects individuals with diabetes. It results from long-standing high blood sugar levels and is a leading cause of visual impairment and blindness. Prolonged exposure to high blood sugar levels causes blood vessel abnormalities, including weakened vessel walls, leakage, and the formation of new, fragile blood vessels. These changes disrupt the normal blood supply to the retina, leading to ischemia (decreased tissue perfusion) and subsequent tissue damage. Patients with diabetic retinopathy can experience blurred vision, floaters, blind spots, or vision loss and have difficulty perceiving colors accurately.

The diagnosis and monitoring of diabetic retinopathy involve several specialized tests, including a dilated eye examination, a visual acuity test, fundus photography to monitor changes in the blood vessels, a fluorescein angiography to identify areas of abnormal blood vessel growth, and optical coherence tomography (OCT) to observe the retinal thickness and the presence of fluid or swelling.

The medical treatment of diabetic retinopathy aims to manage the underlying diabetes and prevent or slow down the progression of retinal damage. This can be accomplished by managing the patient's blood sugar, blood pressure, and cholesterol through lifestyle changes and medications. Here are some other treatments.

- Medications such as anti-vascular endothelial growth factor (anti-VEGF) agents or corticosteroids are injected into the vitreous gel of the eye to reduce retinal swelling, prevent abnormal blood vessel growth, and improve visual outcomes.
- Laser photocoagulation is a procedure that uses a laser to treat areas of leaking blood vessels or create small burns on the retina to promote the regression of abnormal blood vessels and the reduction of edema.
- Surgery to remove the vitreous gel (vitrectomy) or repair the retina may be necessary in advanced cases with significant vitreous hemorrhage or retinal detachment.

Visual Changes Due to Hypertension

Chronic hypertension can lead to vascular changes, including arteriosclerosis and endothelial dysfunction, which can affect the small blood vessels in the retina and optic nerve. These changes disrupt the normal blood flow and oxygen supply to the eye structures, leading to various visual problems, such as blurred vision, visual field defects, retinopathy, diplopia, and optic neuropathy in severe cases.

Assessing visual changes related to hypertension often involves a comprehensive eye examination by an ophthalmologist or optometrist, a fundoscopy to examine the retina and blood vessels, an optical coherence tomography to view cross-sectional images of the retina and optic nerve, and regular blood pressure monitoring to evaluate the severity and control of hypertension. Treating visual changes related to hypertension involves managing blood pressure with lifestyle changes around diet and exercise as well as using antihypertensive medications such as angiotensin-converting enzyme (ACE) inhibitors, angiotensin II receptor blockers (ARBs), beta-blockers, diuretics, or calcium channel blockers.

LIFE-STAGE CONTEXT

Age-Related Considerations in Ocular Disorders

Age-related ocular disorders, such as cataracts, macular degeneration, and glaucoma, are more prevalent among older adults. Nurses should be aware of the unique challenges and physiological changes that occur with aging, such as decreased visual acuity, reduced contrast sensitivity, and increased susceptibility to eye conditions. Providing additional support, patient education, and appropriate visual aids can improve communication and ensure patient safety.

Pediatric patients with ocular disorders require special attention. Nurses must adapt their communication techniques and provide age-appropriate explanations to children and their caregivers. Collaboration with pediatric ophthalmologists and child life specialists can help alleviate anxiety and facilitate child-friendly interventions.

18.2 Disorders of the Ear

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for disorders of the ear
- Describe the diagnostics and laboratory values for disorders of the ear
- Apply nursing concepts and plan associated nursing care for patients with disorders of the ear
- Evaluate the efficacy of nursing care for patients with disorders of the ear
- Describe the medical therapies that apply to the care of disorders of the ear

Hearing is an integral source of information about the world around us. Understanding ear disorders that result in hearing loss is crucial for nurses, as these conditions can significantly affect communication, social interactions, and overall well-being. Nurses need to be able to recognize the signs and symptoms of ear disorders and assess their impact on patients' daily activities. The nurse who identifies a hearing impairment can facilitate a timely referral to an **audiologist**, a specialist in hearing testing and treatment, for further evaluation and potential interventions. Nurses must also educate patients on preventive measures, such as proper ear hygiene and noise protection, to

reduce the risk of developing ear disorders. By having a solid understanding of ear disorders, nurses can provide comprehensive care, promote patient advocacy, and enhance the quality of life for individuals affected.

Anatomy and Physiology of the Ear

The ear consists of three main parts: the outer ear, the middle ear, and the inner ear (Figure 18.6).

- The outer ear comprises the pinna (auricle) and the ear canal. The pinna is the visible part of the ear that collects sound waves and directs them into the ear canal. The ear canal, also known as the external auditory canal, is a tube-like structure that channels sound waves from the pinna to the middle ear.
- The middle ear consists of the tympanic membrane, or eardrum, and the tympanic cavity: a space spanned by three small bones called the ossicles. The three ossicles are the malleus, incus, and stapes, which are Latin names that roughly translate to hammer, anvil, and stirrup. The malleus attaches to the tympanic membrane and articulates with the incus. The incus, in turn, articulates with the stapes. The stapes attaches to the inner ear, where the sound waves are transduced into a neural signal. The middle ear also connects to the pharynx via the Eustachian tube, which helps equilibrate air pressure across the tympanic membrane.
- The inner ear is like a bony labyrinth: it consists of a series of canals embedded within the temporal bone. It has two separate regions, the cochlea and the vestibular system. The cochlea is involved in hearing and contains thousands of tiny hair cells that convert sound vibrations into electrical signals. The vestibular system is responsible for maintaining our sense of balance and spatial orientation by detecting the position and movement of our head. It includes three semicircular canals and the vestibule.

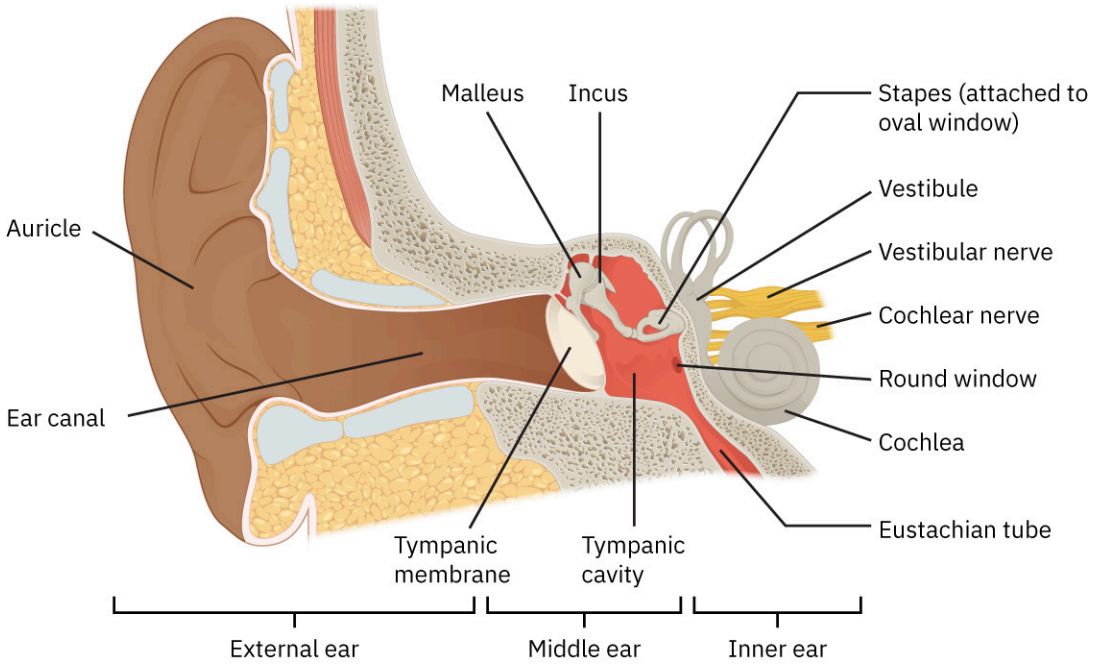

FIGURE 18.6 The main three parts of the ear are the outer ear, middle ear, and inner ear. (credit: modification of work from *Anatomy and Physiology*, 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

The various parts of the ear function together to allow for sound transmission and interpretation. When sound waves reach the outer ear, the pinna directs them into the ear canal. The sound waves then travel through the ear canal, causing the eardrum to vibrate. These vibrations are amplified by the ossicles in the middle ear and then transmitted to the cochlea in the inner ear. Within the cochlea, the vibrations cause the hair cells to bend, stimulating the auditory nerve fibers. These nerve fibers convert the mechanical energy of the sound vibrations into electrical signals, which are then transmitted to the brain for interpretation. The brain processes these electrical signals, allowing us to perceive and interpret various sounds.

Conditions of the External Ear

Common disorders and conditions of the external ear include cerumen impaction, external otitis, and various tumors and masses.

Cerumen Impaction

Cerumen impaction is an accumulation of **cerumen**, or earwax, in the ear canal. Cerumen is a natural substance produced by the ceruminous glands in the ear canal. It serves as a protective barrier, lubricating the ear canal and trapping dust, debris, and microorganisms to prevent them from reaching the eardrum. Over time, however, an excess of earwax can build up and become impacted, creating a blockage in the ear canal. This can lead to hearing loss, an uncomfortable sensation of fullness in the ear, ear pain, **tinnitus** (ringing in the ear), and in rare cases dizziness or imbalance. Cerumen impaction is a common condition that can affect individuals of all ages, but it is more prevalent in older adults due to changes in the consistency and composition of earwax. It can occur in one or both ears.

Diagnosing cerumen impaction is primarily done through physical examination. The nurse or health-care provider will use an otoscope to visualize the ear canal and identify the presence of impacted earwax. In some cases, a hearing test may be conducted to assess the extent of hearing loss caused by the impaction.

Nursing Care of the Patient with Cerumen Impaction

Assessing and analyzing cues is an essential aspect of nursing care when dealing with patients with cerumen impaction. Nurses can identify the presence of cerumen impaction and develop an appropriate care plan by obtaining a patient history, completing a physical exam, and observing how the patient communicates and hears. Nursing interventions may also involve softening the impaction with cerumenolytic agents, medications that break down cerumen; other options include irrigation of the ear canal and manual removal of the earwax by a health-care professional. It is important to approach cerumen impaction with caution to avoid injury to the ear canal or eardrum.

Medical Therapies and Related Care

Cerumen impaction can often be managed by softening the earwax to facilitate its removal. Over-the-counter cerumenolytic agents are available for this purpose; they should be used according to the manufacturer's instructions and health-care provider's recommendations. The nurse typically administers several drops into the ear canal and places a cotton ball at the ear’s opening to keep the drops in place. The patient should then lie on their opposite side for 15–20 minutes to ensure the drops remain in the ear and are fully absorbed. Once the cerumen is softened, the ear can then be irrigated by washing out the loosened wax from the ear. This involves gently flushing the ear canal with warm water using a syringe or specialized irrigation kit. A trained health-care professional should perform ear irrigation to avoid injuring the ear canal or eardrum. Water should be tepid or warm—neither too hot nor too cold, as any extreme temperature can cause dizziness or even pain for the patient.

In cases where cerumen impaction is particularly severe or resistant to other treatment methods, manual removal may be necessary. This procedure is usually performed by an otolaryngologist, or a speech and ear specialist, using specialized instruments to carefully extract the impacted earwax. Medical management also includes teaching patients about prevention. Patients should know never to push cotton swabs directly into the ear; rather, they should be swirled gently around the external canal.

Nurses should monitor the patient's response to the nursing interventions. Evaluate if the patient's symptoms have improved: whether hearing has improved, pain or discomfort have been alleviated, and tinnitus or dizziness have resolved. Gather data using assessment techniques such as **otoscopy**, a visual examination of the ear using an otoscope. Compare the actual outcomes with expected outcomes and refer to the goals established in the nursing care plan. If the patient's response aligns with the expected outcomes and goals, the intervention can be considered effective. If not, reassess the intervention and consider alternative strategies. As always, nurses should accurately document the evaluation findings, including the patient's response to the interventions, any modifications made to the care plan, and the ongoing management plan.

External Otitis

Commonly known as swimmer's ear, **external otitis** is an inflammatory condition affecting the external auditory canal (Medina-Blasini & Sharman, 2023) (Figure 18.7). This condition is often caused by exposure to persistent moisture, which can disrupt the protective barrier of the ear canal, leading to bacterial or fungal infections. External otitis can develop because of prolonged exposure to water, such as from swimming or bathing. Additionally, excessive cleaning of the ear canal with cotton swabs or other objects may cause trauma, making the ear more susceptible to infection. Also, hot and humid climates, dermatological conditions like eczema, and the use of hearing aids or earplugs can contribute to the development of external otitis.

FIGURE 18.7 When the ear canal becomes infected, inflammation can disrupt one's hearing. (credit: "Otitis externa" by Klaus D. Peter, Wiehl, Germany/ Wikimedia Commons, CC BY 3.0)

External otitis involves the disruption of the ear canal's natural defense mechanisms. Normally, the ear canal maintains an acidic pH, which inhibits bacterial and fungal growth. However, when the protective barrier is compromised, microorganisms can invade the skin lining the canal. This invasion triggers an inflammatory response, leading to swelling, pain, and pruritus. In some cases, the infection may extend beyond the ear canal, causing cellulitis or abscess formation on the external helix; this is sometimes known as "cauliflower ear."

Symptoms from external otitis may vary in severity and can include

- decreased hearing,
- pruritus,
- tenderness,
- edema,
- **erythema** (redness),
- **otalgia** (ear pain), and
- **otorrhea** (ear discharge).

Assessment and Diagnostics

Nurses gather relevant information to guide appropriate care and interventions. Begin by obtaining a detailed history, including the patient's chief complaint, previous ear infections, dermatological conditions like eczema, immune system disorders, onset and duration of symptoms, and any precipitating factors (such as recent swimming or water exposure). Assess risk factors, such as the use of hearing aids or earplugs, recent trauma or injury to the ear, or a history of recurrent external otitis.

The physical examination includes the inspection of the external ear and auditory canal for erythema, swelling, discharge, or any visible debris. Palpate the area around the external ear to assess for tenderness or localized swelling. Evaluate the patient's hearing by performing a simple whisper test or using a tuning fork to assess air conduction. Check for regional lymphadenopathy, especially in cases where the infection has spread beyond the ear canal. To rule out other conditions, such as middle ear infections or foreign bodies, an otoscopy may be necessary. In certain cases, you may need to obtain a swab of the ear canal for culture and sensitivity testing to guide antimicrobial therapy. Additional procedures may include a gram stain of the ear canal discharge to evaluate the presence of bacteria or a fungal stain to identify fungal elements such as hyphae or spores.

It is appropriate to include a psychosocial assessment, as a decrease in hearing and pain can affect quality of life.

Explore the patient's understanding of the condition, treatment expectations, and any concerns or fears they may have. This should also include evaluating the patient's support system, including family or caregivers who may assist with treatment adherence and home care.

Nursing Care of the Patient with External Otitis

The primary focus should be on alleviating symptoms, promoting healing, and preventing complications. Nurses assist with pain management by administering analgesics as prescribed, applying warm compresses, and educating the patient about pain management strategies, as well as assisting the patient in the proper use of prescribed medications. Nurses should also educate the patient on how to keep the ear dry and why to avoid cotton swabs, which may further irritate the ear canal.

Observe for any signs of complications, such as cellulitis (skin infection) spreading beyond the ear canal or the infection not responding to treatment. Monitor for worsening symptoms, increased pain, swelling, or fever. If any concerning signs arise, notify the health-care provider promptly. Schedule a follow-up appointment with the health-care provider to monitor the progress of the infection, assess healing, and adjust the care plan if needed. Regularly reassess the patient's condition and modify the care plan accordingly, while maintaining open communication with the health-care provider to ensure optimal care and recovery.

Medical Therapies and Related Care

Medical treatment for external otitis aims to eradicate the infection and alleviate symptoms. It typically involves a combination of antimicrobial or antifungal agents and supportive measures. The specific treatment plan may vary based on the causative organism, severity of infection, and patient factors. Common medical interventions include the following.

- Topical medications such as antibiotic or antifungal eardrops are commonly prescribed to combat the infection. These medications are usually administered several times a day for a specified duration. It is essential to ensure accurate administration and educate the patient about proper techniques for instilling eardrops and applying topical cream.
- Systemic therapy involving oral antibiotics or antifungal agents may be necessary in severe cases or when the infection spreads beyond the ear canal. Systemic therapy is particularly beneficial for individuals with compromised immune systems or widespread infection.
- Nonsteroidal anti-inflammatory drugs (NSAIDs) or analgesics may be used to control pain.

Foreign Bodies and Masses

Foreign bodies and masses in the ears can have a variety of causes, including obstructions, inflammation and infection, injury, and trauma, and can disrupt hearing in numerous ways. A foreign object can introduce bacteria, increasing the risk of infection, the formation of an abscess, and damage to the surrounding structures. Some foreign bodies, particularly sharp objects, can cause physical injury to the delicate structures of the ear canal, such as the tympanic membrane or the skin lining the canal.

Masses or growths within the ear can be benign or malignant tumors, cysts, or abnormal tissue growth. In the case of tumors or abnormal tissue growths, there is an uncontrolled proliferation of cells within the ear that results in a mass that can grow and interfere with normal ear function. As the mass expands, it can compress surrounding structures, such as the ear canal, tympanic membrane, or ossicles. This compression can lead to hearing loss, pain, or changes in the perception of sound. Malignant tumors may also invade nearby tissues and metastasize, spreading to other parts of the body, causing further complications, and potentially affecting overall health.

Assessment and Diagnostics

Signs of a foreign body or mass growth in the ear include hearing loss, ear pain and irritation, tinnitus, discharge and odor, vertigo, and in some cases facial weakness or numbness if the mass affects the facial nerve. Beyond these symptoms, nurses can assess the problem by performing a physical examination of the external ear, ear canal, and surrounding structures using an otoscope or other specialized instruments. This should include looking for signs of inflammation, injury, or the presence of a visible foreign body or mass. Imaging studies can provide detailed information about the foreign body or mass, including its size, location, and impact on surrounding structures.

Different types of imaging may also be required. These include x-ray imaging to view the foreign body or bony erosion, a CT scan to produce a cross-sectional image of the surrounding structures, and an MRI to assess soft

tissue masses, tumors, or any involvement of nerves and blood vessels. To determine the degree of hearing loss, the patient may require audiological tests. Although laboratory tests are not typical for diagnosing foreign bodies or masses, some tests may be requested: for example, a complete blood count (CBC) can detect signs of infection, like an elevated white blood cell count; C-reactive protein and erythrocyte sedimentation rate tests can diagnose inflammation.

Medical Therapies and Related Care

The primary medical therapy for foreign bodies in the ear involves their safe and gentle removal. A health-care professional can do this using specialized tools like forceps, suction devices, or irrigation techniques. For more complex or deeply lodged objects, a referral to an ear, nose, and throat (ENT) specialist may be necessary. If the foreign body is an insect, small debris, or non-irritating material, ear irrigation with warm water or saline solution may help to dislodge and remove it. In certain situations, ear drops may be prescribed to soften earwax or provide lubrication, facilitating the natural expulsion of the foreign body.

For masses in the ear, surgical removal is the common treatment. This may involve procedures such as excision, biopsy, or tumor resection. An ENT specialist will typically perform these surgeries. In cases of malignant tumors or cancerous masses, radiation therapy may be part of the treatment plan. This involves the use of targeted radiation to destroy cancer cells and reduce tumor size. For certain types of malignant tumors, chemotherapy drugs may be prescribed to help shrink or control the growth of the mass. This may involve pain management, supportive care, and efforts to address the patient's emotional and psychological needs. Depending on the size of the tumor removed, the patient may experience deafness and require a cochlear implant to resume the ability to hear.

LINK TO LEARNING

Cochlear implants are interventions to assist deaf patients resume a quality life with little to no disruption in the auditory senses. Read more about cochlear implants (https://openstax.org/r/77CochImplants) in this article by the National Institute on Deafness and Other Communication Disorders.

Nursing Care of the Patient with Foreign Bodies and Masses

As a nurse, recognizing and analyzing cues for a foreign body or mass in the ear require careful assessment and observation of the patient's symptoms and physical findings. This includes gathering a patient history about recent incidents, such as foreign body insertion, trauma, or exposure to potential irritants, as well as inquiring about symptoms such as ear pain, hearing loss, tinnitus, discharge, itching, dizziness, or facial weakness and numbness. During the physical examination, nurses should use an otoscope to inspect the external ear for signs of trauma, redness, swelling, discharge, or abnormal growths within the ear canal or behind the tympanic membrane. Causes include foreign bodies, masses, infections, or other ear-related conditions.

Conditions of the Middle Ear

Recall that the middle ear is where sound waves are amplified by the tympanic membrane and ossicles. Disorders of the middle ear include acute otitis media, chronic otitis media, and tympanic membrane perforation.

Acute Otitis Media

Commonly called a middle ear infection, **otitis media** is primarily caused by the invasion of microorganisms into the middle ear, often preceded by an upper-respiratory tract infection. These microorganisms gain entry to the middle ear through the Eustachian tube, which connects the middle ear to the nasopharynx. The tube's dysfunction, often associated with inflammation or obstruction, disrupts the normal ventilation and drainage of the middle ear, creating an environment conducive to infection.

The development of acute, or short-term, otitis media is common in infants and young children. They are particularly susceptible to the condition because of their shorter, more horizontal Eustachian tubes, which can easily become blocked. Infants who are bottle fed in the supine position are at risk of such an infection because of the possibility of backflow of nasopharyngeal secretions into the Eustachian tube. Additionally, children attending daycare or school also have an increased risk of exposure to upper-respiratory tract infections transmitted from their peers. Other common risk factors include exposure to secondhand smoke, allergies that cause infection, and physical

abnormalities that affect the Eustachian tube, such as cleft palate.

Otitis media typically begins with a viral upper-respiratory tract infection that causes inflammation in the nasopharynx. This leads to edema and increased mucus production. The inflammation and excess mucus can obstruct the Eustachian tube, resulting in impaired ventilation and decreased clearance of middle ear secretions. The stagnant fluid within the middle ear creates an ideal environment for bacterial growth, leading to infection and subsequent inflammation of the middle ear mucosa, which causes pain, erythema, and swelling of the tympanic membrane.

Understanding the typical signs and symptoms associated with acute otitis media is crucial for early detection and intervention. Common signs and symptoms include

- fever,
- hearing loss,
- otalgia,
- tympanic membrane changes,
- tinnitus, and
- balance issues.

Assessment and Diagnostics

Accurate and thorough nursing assessment is vital for identifying and understanding the manifestations of acute otitis media. Nurses collect a detailed health history, including information about symptoms like ear pain, hearing difficulties, tinnitus, fever, and past medical issues like previous episodes of otitis media, chronic ear conditions, craniofacial abnormalities, or recurrent upper-respiratory tract infections. Nurses gather information about allergies and exposure to secondhand smoke.

During the physical examination, nurses must pay particular attention to ear abnormalities, discharge, or inflammation. They should check the tympanic membrane with an otoscope for signs of infection, such as erythema, bulging, or fluid behind the membrane. Nurses should also check for hearing loss and changes in the patient's vital signs that may indicate systemic infection. Accurate documentation of assessment findings is important for ongoing monitoring, evaluating treatment effectiveness, and facilitating continuity of care. Nurses should listen attentively to the patient's description of pain. For very young children, this means watching for signs of pain like touching or pulling their ears and exhibiting irritability or fussiness. Nurses should ask about any changes in hearing acuity. Patients may report muffled sounds or difficulty understanding conversations, particularly in noisy environments. Children may exhibit delayed language development or reduced responsiveness to auditory stimuli. Ask about additional symptoms, such as tinnitus, dizziness, or a sense of imbalance. These cues may indicate involvement of the vestibular system. Assess for signs of systemic infection, including fever, malaise, or decreased appetite. Although fever is not always present, its presence, along with other symptoms, may suggest bacterial otitis media.

To confirm a diagnosis of acute otitis media, health-care providers may employ several diagnostic techniques, such as using an otoscope or testing with audiometry and tympanometry.

Nursing Care of the Patient with Acute Otitis Media

Nurses must critically analyze the data collected during the assessment phase to prioritize hypotheses related to acute otitis media. This involves considering the patient's symptoms, history, and objective findings. Solutions focus on addressing the underlying cause, alleviating symptoms, and preventing complications—often by administering pharmacological or nonpharmacological interventions. Collaboration with the health-care team to initiate appropriate pharmacological interventions is important.

Provide patient and caregiver education about acute otitis media, including the nature of the condition, the importance of medication adherence, the proper method for administering eardrops (if prescribed), and strategies for preventing recurrent infections. Counsel patients on the importance of follow-up appointments and recommended immunizations, such as pneumococcal and influenza vaccines.

Actions to take may include administering medications, monitoring continually, collaborating with other members of the health-care team, making referrals as needed, and documenting nursing actions. Nurses educate patients and caregivers on the importance of completing the full course of antibiotics if prescribed. Regularly assess the patient's vital signs, pain level, and response to interventions. Monitor for any signs of complications, such as worsening

symptoms or the development of complications like mastoiditis or meningitis. Collaborate with the health-care team, including physicians, audiologists, and other specialists, as needed. Facilitate referrals for audiological evaluations, surgical interventions (if necessary), or management of complications. Document all nursing actions, patient responses, and interventions in a timely and accurate manner. This ensures continuity of care, facilitates communication among health-care providers, and provides a record of the patient's condition and progress.

Medical Therapies and Related Care

The management of acute otitis media involves medical therapies aimed at treating infection, alleviating symptoms, and preventing complications. These therapies include certain pharmacological interventions, such as the use of antibiotics to treat the infection, as well as analgesics and decongestants. The choice of antibiotic depends on the causative pathogen and may include amoxicillin, amoxicillin-clavulanate, cefuroxime, or ceftriaxone. Analgesics, such as ibuprofen or acetaminophen, are used to alleviate pain and reduce fever associated with infection. Decongestants, both oral and topical, can relieve nasal congestion and improve middle ear ventilation. However, their use is controversial, and caution should be exercised due to potential side effects and limited evidence of efficacy.

In some cases, surgical interventions may be required for acute otitis media. Otolaryngologists (ENT specialists) typically perform these interventions, which may include **myringotomy** and the use of a **tympanostomy tube**. Myringotomy involves creating a small incision in the tympanic membrane to drain fluid or release pressure. Tympanostomy tubes, also known as ventilation tubes or grommets, may be inserted to maintain middle ear ventilation and facilitate fluid drainage.

Evaluation of Nursing Care for the Patient with Acute Otitis Media

In the case of acute otitis media, evaluating outcomes involves assessing the patient's response to treatment, monitoring symptom resolution, and identifying any complications or persistent issues. Nurses monitor the patient's symptoms and evaluate their resolution over time. This includes assessing for ear pain, hearing acuity, and systematic symptoms such as fever.

Chronic Otitis Media

Chronic otitis media is a long-standing inflammatory condition of the middle ear characterized by persistent or recurrent infection and inflammation. It is typically diagnosed when symptoms and signs of middle ear inflammation and dysfunction last for at least three months or recur multiple times over a prolonged period. This condition can result from unresolved acute otitis media or ongoing inflammation in the middle ear. Clinical manifestations, causes, diagnosis, nursing care, and management are like those for acute otitis media.

Chronic otitis media is often associated with several characteristic features, including otorrhea, hearing loss, and tympanic membrane perforation. The condition may also lead to complications such as **cholesteatoma** (a growth of abnormal skin in the middle ear), **mastoiditis** (infection of the mastoid bone behind the ear), or damage to various middle ear structures.

Patients with chronic otitis media may experience symptoms such as chronic ear pain or discomfort, recurrent ear infections, hearing difficulties or impairment, tinnitus, and occasionally dizziness or imbalance. The severity and presentation of symptoms can vary among individuals.

Management of chronic otitis media typically involves a combination of medical and surgical interventions. Medical therapies may include antibiotic treatment to control infection, ear drops to alleviate inflammation or manage discharge, and medications for symptomatic relief. In cases where medical management is ineffective or complications arise, surgical interventions such as **tympanoplasty** (surgical reconstruction of the eardrum) or **mastoidectomy** (removal of infected cells from the mastoid bone) may be necessary.

Pathophysiology

The pathophysiology of chronic otitis media involves a complex interplay of factors that contribute to persistent inflammation and infection in the middle ear. Causes may include Eustachian tube dysfunction and microbial infection, Risk factors are like those for acute otitis media; they include genetics, anatomical abnormalities, children with smaller Eustachian tubes, secondhand smoke, and recurrent ear infections.

Assessment and Diagnostics

The clinical manifestation of chronic otitis media may resemble those of acute otitis media, but the duration is longer. Ear discharge, perforated tympanic membrane, hearing loss, ear pain, tinnitus, and balance problems may result due to chronic middle ear infections. A comprehensive nursing assessment includes a focused symptom assessment, ear exam, hearing exam, and balance exam.

Diagnostics and Laboratory Values

To confirm the diagnosis of chronic otitis media, health-care providers may order specific diagnostic tests including audiometric testing, tympanometry, imaging studies, culture, sensitivity, and allergy testing.

Nursing Care of the Patient with Chronic Otitis Media

Like nursing management of acute otitis media, chronic otitis media requires nursing care that focuses on medication administration, patient education, and evaluation of outcomes to monitor improvement. The primary focus should be on alleviating symptoms, promoting healing, and preventing complications. Nurses assist with pain management by administering analgesics as prescribed, applying warm compresses, and educating the patient about pain management strategies, as well as assisting the patient in the proper use of prescribed medications such as antimicrobial and antifungal medications. Nurses should also educate the patient on how to keep the ear dry and why to avoid the use of cotton swabs that may further irritate the ear canal.

Monitor for worsening symptoms, increased pain, swelling, or fever. If any concerning signs arise, notify the health-care provider promptly. Schedule a follow-up appointment with the health-care provider to monitor the progress of the infection, assess healing, and adjust the care plan if needed. Regularly reassess the patient's condition and modify the care plan accordingly, maintaining open communication with the health-care provider to ensure optimal care and recovery.

Medical Therapies and Related Care

Nurses should collaborate with the interdisciplinary team, which typically includes otolaryngologists, audiologists, pharmacists, and speech pathologists who provide specialized expertise in diagnosing, treating, and managing ear conditions. Additionally, regular communication and coordination with the otolaryngologist ensure a comprehensive and integrated approach to care over time.

To help prevent chronic otitis media, immunizations may be available. Promote and educate patients about routine immunizations, including the pneumococcal conjugate vaccine and annual influenza vaccine. If allergies are identified as a contributing factor to chronic otitis media, collaborate with an allergist for proper evaluation and management. Encourage smoking cessation for patients and their family members. Teach techniques for equalizing ear pressure during altitude changes, such as swallowing, yawning, or using decongestants if appropriate.

CLINICAL JUDGMENT MEASUREMENT MODEL

Prioritize Cues for a Patient Experiencing Chronic Otitis Media

The treatment plan for chronic otitis media involves a combination of therapeutic interventions, collaborative care, and preventive measures. Managing this condition aims to control symptoms, prevent complications, and improve the patient's quality of life. To provide the patient with optimal quality of care, it is often necessary to prioritize interventions to address the most urgent cues first. For example:

1. Fighting the infection: Antibiotics are commonly prescribed to manage chronic otitis media, particularly if there is evidence of infection. Antibiotic or steroid ear drops may be recommended to directly target the infected or inflamed ear.
2. Alleviating the Pain: Ear drops can help reduce inflammation, control pain, and promote healing. Proper administration techniques should be taught to the patient or their caregiver.
3. Educating the Patient: Patients and their families should be taught how to prevent recurrent infections and limit exposure to triggers.

Tympanic Membrane Perforation

A **tympanic membrane perforation**, also known as a ruptured eardrum, refers to a hole or tear in the thin

membrane that separates the external ear canal from the middle ear. The tympanic membrane (eardrum) plays a vital role in transmitting sound waves from the external environment to the middle ear and facilitating proper hearing.

Tympanic membrane perforations can occur due to various reasons. Direct trauma to the ear—such as a blow to the ear or the insertion of a foreign object—can cause the eardrum to rupture. Severe or recurrent middle ear infections (otitis media) can also lead to eardrum rupture because of the accumulation of fluid and pressure. Other factors that can increase pressure to the point of rupture include exposure to loud noises and sudden changes in air pressure (**barotrauma**), such as during air travel or scuba diving.

Patients with a tympanic membrane perforation may experience sudden pain in the affected ear, which may subside after the rupture occurs. Some may experience drainage from the ear in the form of a clear, bloody, or pus-like substance. Hearing loss, a decrease in hearing acuity, tinnitus, and vertigo are also common.

Assessment and Diagnostics

Diagnosis of a tympanic membrane perforation is typically confirmed through visual examination of the eardrum using an otoscope. Using this tool, providers can observe the perforation, note its location and size, and search for signs of infection or inflammation. Additional tests, such as **tympanometry**, may be performed to assess middle ear function and evaluate the extent of hearing loss. Tympanometry measures the movement of the tympanic membrane in response to changes in air pressure. It involves inserting a probe into the ear canal and creating variations in air pressure while measuring the resulting acoustic energy reflected from the eardrum. Other procedures include **audiometry** (to measure the patient's ability to hear sounds of different frequencies and volumes) and cultures and sensitivity testing (to identify microorganisms causing infection).

Medical Therapies and Related Care

Treatment for tympanic membrane perforation depends on various factors, including the size and location of the perforation, the underlying cause, and associated symptoms. In many cases, small perforations heal spontaneously within a few weeks. However, medical interventions may be required, such as prescribing antibiotic eardrops to prevent infection, placing a temporary patch over the ear, or even surgically repairing the tympanic membrane (tympanoplasty) for larger or non-healing perforations. Tympanoplasty involves the placement of a graft—typically taken from the patient's own tissues or produced from synthetic materials—to close the perforation and promote healing. For cases of recurrent ear infections and chronic middle ear fluid, a tympanostomy tube may be required. This involves inserting a tiny tube through the tympanic membrane to facilitate drainage and equalize pressure in the middle ear. This procedure can help prevent future perforations and improve middle ear ventilation. In cases where the tympanic membrane perforation results in significant hearing loss, the use of hearing aids or other assistive devices may be recommended.

Regular follow-up appointments will be scheduled to monitor the perforation's healing progress. It is also important to manage the underlying conditions contributing to the perforation. If a tympanic membrane perforation is associated with an active infection, such as otitis media, antibiotic therapy may be prescribed. The choice of antibiotic ordered by the provider will depend on the suspected or identified causative organisms. To prevent infection, the patient may be advised to keep water from entering the ear during bathing or swimming.

Nursing Care of the Patient with Tympanic Membrane Perforation

The nursing care of a patient with a tympanic membrane perforation focuses on promoting healing, preventing complications, managing symptoms, and providing education and support.

Nursing care involves completing a physical assessment, assessing for signs of infection, evaluating the patient's hearing, offering patient education, and administering medications as ordered by the provider.

The comprehensive assessment of the patient's condition should include a thorough history of symptoms, previous ear infections, trauma, or exposure to loud noises. The nurse assesses for signs of infection, such as fever, increased pain, redness, or discharge from the ear. The assessment should also test for hearing acuity deterioration and other associated symptoms like tinnitus or vertigo. Nurses should pay attention to the patient's facial expressions and body language for signs of discomfort or pain.

Nurses also play a role in educating the patient and their family about the condition, including the causes, risk factors, and importance of following the prescribed treatment plan. This should include emphasis on the importance

of follow-up appointments and the proper use of prescription medications.

Finally, nurses may offer emotional support and reassurance to the patient and their family, as hearing loss or changes in hearing acuity can be distressing. Encourage the patient to express their concerns or fears and provide information to address their questions and alleviate anxiety. If necessary, collaborate with other health-care professionals, such as audiologists or psychologists, to provide additional support and counseling.

Evaluation of Nursing Care for the Patient with Tympanic Membrane Perforation

Evaluating interventions for a tympanic membrane perforation is important in determining the effectiveness of the care provided and making necessary adjustments to optimize patient outcomes. As a nurse, it is essential to systematically assess the patient's progress and response to interventions. This includes monitoring the patient's reported symptoms and observing for any signs of infection, assessing the patient's response to prescribed medications, and documenting any adverse reactions.

Nurses compare current findings with baseline assessments to determine improvement or worsening of the perforation. This may require repeated audiometry or other hearing tests to assess any changes in the patient's hearing acuity. Encourage the patient to share any concerns, questions, or changes they have noticed. Ongoing communication and collaboration with otolaryngologists, audiologists, or other health-care professionals involved in the patient's care is valuable.

Common Conditions of the Inner Ear

Common disorders of the inner ear may cause hearing loss as well as imbalance. The inner ear changes soundwaves into electrical impulses, which nerves transmit to the brain. The brain then interprets these messages into sound. The inner ear also influences the sense of balance; when fluids within the semicircular membrane are disrupted, so is a normal sense of balance, which often results in vertigo.

Motion Sickness and Vertigo

Two common conditions of the inner ear are motion sickness and vertigo. Motion sickness occurs when there is a conflict between the sensory input received from the inner ear and the eyes or other body receptors. This discordance between visual input and signals from the inner ear disrupts the brain's ability to process and integrate these signals, resulting in symptoms such as nausea, vomiting, dizziness, sweating, and pallor. Common triggers include travel by car, boat, or airplane, as well as amusement park rides. Medications commonly used to alleviate motion sickness symptoms include antihistamines (e.g., dimenhydrinate, meclizine) and scopolamine patches. These medications help to suppress the signals from the inner ear and reduce symptoms.

Vertigo is a sensation of the loss of balance. It results from dysfunction or disturbances in the vestibular system of the inner ear. The inner ear's vestibular organs, along with the brain stem and cerebellum, maintain balance and coordinate eye movements. Any disruption in these structures or their communication pathways can cause a false perception of movement, leading to vertigo symptoms. The medical treatment for vertigo depends on the underlying cause and may include head repositioning techniques such as the **Epley maneuver** for benign paroxysmal positional vertigo (BPPV), as well as medications such as antihistamines (e.g., meclizine) or benzodiazepines (e.g., diazepam) to control symptoms, diuretics or dietary modifications for Meniere's disease, and antiviral medications and corticosteroids for viral-related causes.

Nurses help educate patients about triggers and prevention strategies, such as focusing on a stable object, sitting in the front seat of a vehicle, or avoiding excessive head movements. They can also provide comfort measures during episodes, such as cool cloths, fresh air, or guided relaxation. Nurses should assist with medication administration as prescribed, ensuring proper dosage and monitoring for side effects like drowsiness or dry mouth. They may also encourage patients to keep a journal to identify specific triggers and patterns, aiding in the development of personalized coping strategies.

LINK TO LEARNING

Vertigo or dizziness is often caused by the displacement of small crystals within the inner ear canal. The Epley maneuver is a positioning method to remove these crystals trapped in the inner ear's canal. Learn how to perform

the Epley Maneuver (https://openstax.org/r/77EpleyManeuver) by watching this video.

Tinnitus

Tinnitus is a common condition of the inner ear characterized by the perception of ringing, buzzing, hissing, or other sounds in the absence of external auditory stimuli. Scientists do not understand the exact mechanism of tinnitus, but they think it involves abnormal neural activity in the auditory pathway. It can arise from damage or dysfunction in the inner ear structures, such as the cochlea, auditory nerve, or auditory pathways in the brain. This leads to the perception of sound without any external source. Changes in the neural circuits, neurotransmitter imbalances, and alterations in the processing of sound signals contribute to the development and persistence of tinnitus (Medina-Blasini & Sharman, 2023). Tinnitus can have numerous causes, such as hearing loss, blockage, ear infections, Meniere's disease, joint disorders, temporomandibular joint (TMJ) disorders, head or neck injuries, stress, and certain medication toxicities.

Treating tinnitus commonly involves identifying a specific underlying cause and treating it. There is no specific medication to cure tinnitus, but certain prescriptions may help manage associated symptoms or underlying conditions. For example, antidepressants, antianxiety medications, and anticonvulsants can help reduce the perceived intensity of tinnitus or alleviate related anxiety or depression. Types of sound therapy may help to mask or distract from the perception of tinnitus by introducing soothing external sounds via white noise machines, hearing aids, or wearable sound generators.

Ototoxicity

Certain medications or chemicals are characterized by **ototoxicity**: they have toxic effects on the structures of the inner ear, leading to hearing loss, balance problems, or other auditory-related symptoms. The exact mechanisms of ototoxicity vary depending on the specific medication or chemical involved. However, the common pathway involves damage to the sensory cells (hair cells) of the cochlea or vestibular system in the inner ear. This damage disrupts the normal transmission of sound signals or balance information to the brain, resulting in hearing loss, tinnitus, dizziness, or imbalance. Several medications can have ototoxic effects, including certain antibiotics (e.g., aminoglycosides like gentamicin), chemotherapy drugs (e.g., cisplatin), nonsteroidal anti-inflammatory drugs (NSAIDs), loop diuretics (e.g., furosemide), and some antimalarial drugs. Exposure to certain chemicals, such as solvents (e.g., toluene) or heavy metals (e.g., lead or mercury), can also cause ototoxicity.

In some cases, stopping or adjusting the dosage of the ototoxic medication may help prevent further damage or minimize the symptoms. If possible, alternative medications that are less ototoxic may be considered under the guidance of a health-care provider. Depending on the severity of symptoms, various interventions may be employed, such as hearing aids, assistive listening devices, or balance rehabilitation therapy.

Acoustic Neuroma

Also known as a vestibular schwannoma, an **acoustic neuroma** is a benign tumor that develops on the vestibular nerve between the inner ear and the brain. Acoustic neuromas arise from the Schwann cells that normally wrap around and support the vestibular nerve. The overgrowth of these cells leads to the formation of a tumor. As the tumor enlarges, it can compress nearby structures, including the vestibulocochlear nerve (responsible for hearing and balance), cranial nerves, and brain stem. This compression disrupts the normal functioning of these structures, leading to symptoms such as hearing loss, tinnitus, dizziness, imbalance, and facial weakness or numbness. Although most cases are sporadic, a small percentage may be associated with a genetic condition called neurofibromatosis type 2 (NF2).

For small tumors that are not causing significant symptoms, providers may recommend close monitoring with regular imaging to observe tumor growth and assess any changes in symptoms. For larger tumors, surgical removal is a common treatment option. Another treatment is radiosurgery, which is the delivery of highly focused radiation to the tumor, aiming to halt its growth. Radiosurgery is typically used for smaller tumors or in cases where surgical removal poses a higher risk. After treatment, patients may require rehabilitation therapy to address any residual deficits in hearing, balance, or facial function. This may involve working with audiologists, physical therapists, and occupational therapists.

Nurses play a role in the treatment and recovery of patients with acoustic neuroma by providing education and emotional support to patients and their families before surgery. They should monitor the patient closely after

surgery, assessing vital signs, neurological status, and wound healing. This includes assisting with pain management, wound care, and medication administration. Finally, nurses can support and educate the patient on rehabilitation exercises, assistive devices, and coping strategies to optimize recovery.

REAL RN STORIES

Nurse: Kevin, RN
Years in Practice: Six
Clinical Setting: Acute care hospital
Geographic Location: Oregon

In a busy hospital setting, Kevin was assigned to care for a patient with documented hearing impairment. The patient had difficulty hearing and relied heavily on lip reading and written communication. Kevin recognized the importance of effective communication and took several steps to ensure the patient receives high-quality nursing care.

Kevin began by thoroughly assessing the patient's hearing impairment, including the degree and type of hearing loss, preferred communication methods, and any assistive devices or strategies the patient uses. Kevin also reviewed the patient's medical history, including any related conditions or concerns that may affect communication.

Prepared with this information, Kevin adopted appropriate strategies to facilitate effective communication with the patient. These included facing the patient directly, speaking clearly and at a moderate pace, and avoiding covering the mouth or speaking with food or objects in hand. Kevin ensured that the patient's vision was unobstructed, allowing for lip-reading cues. Recognizing the patient's reliance on written communication, Kevin provided written instructions, explanations, and important information—using a whiteboard, notepad, or electronic device—whenever possible. Kevin verified the patient understood the information and encouraged them to ask questions or seek clarification as needed. Kevin also explored available assistive listening devices, amplification systems, and other resources to enhance communication. This involved collaborating with the hospital's audiology department.

Kevin took the time to educate the patient and their family about strategies for communicating effectively and optimizing the patient's environment. Kevin also provided information on available resources, such as support groups and organizations for individuals with hearing impairments, to promote patient empowerment and self-advocacy. Kevin collaborated with other health-care team members, including speech-language pathologists and sign language interpreters, to ensure comprehensive care and effective communication across disciplines. Kevin facilitated open communication among the team to ensure everyone was aware of the patient's hearing impairment and communication needs.

Throughout the care process, Kevin demonstrated respect, empathy, and patience. He ensured that the patient's privacy and confidentiality were maintained during all interactions.

By providing these interventions and creating a supportive environment, Kevin demonstrated high-quality nursing care for the patient with hearing impairment.

Summary

18.1 Disorders of the Eye

Ocular disorders encompass a wide range of conditions that affect the eyes and visual system. Clinical symptoms of ocular problems include blurred vision, eye pain, redness, tearing, and vision changes.

Ocular disorders require collaborative care with ophthalmologists and optometrists. Medical treatments include protecting the eyes, administering medication, and educating the patient about eye hygiene, protection, and safety. Nursing duties include collecting a patient's medical history and conducting a baseline-focused exam of the eyes. Health promotion includes advocating for regular eye exams and promoting preventive measures such as UV protection, eye safety goggles, smoking cessation, and controlled blood pressure.

18.2 Disorders of the Ear

The pathophysiology of ear disorders includes obtaining a detailed history, including the patient's chief complaint, previous ear infections, dermatological conditions like eczema, immune system disorders, onset and duration of symptoms, and any precipitating factors (such as recent swimming or water exposure). Risk factors include recent upper-respiratory tract infections, exposure to secondhand smoke, allergies that cause sinus infections, and physical abnormalities that affect the Eustachian tube, such as cleft palate. Other risk factors include the use of hearing aids or earplugs, recent trauma or injury to the ear, and a history of recurrent external otitis.

Clinical manifestations of ear disorders may include otorrhea, hearing loss, and tympanic membrane perforation. Severe ear conditions may lead to complications such as loss of hearing, abnormal growths, infection, or damage to various ear structures. Diagnostics and labs associated with ear disorders include audiometric testing, tympanometry, imaging studies, and culture, sensitivity, and allergy testing. Medical therapies for disorders of the ear include antibiotic or antifungal eardrops. In severe cases or when the infection spreads beyond the ear canal, oral antibiotics or antifungal agents may be necessary. Nonsteroidal anti-inflammatory drugs (NSAIDs) or analgesics may be used to control pain.

As primary caregivers, nurses must possess a thorough understanding of ear disorders to provide holistic care, facilitate early interventions, and optimize patient outcomes. By recognizing the signs and symptoms, collaborating with health-care professionals, and educating patients, nurses can play a vital role in preventing and managing ear disorders, ensuring the well-being and satisfaction of their patients. Evaluating the efficiency of nursing care includes monitoring the patient's response to nursing interventions and determining if symptoms have improved: for example, has there been a reduction in hearing loss, alleviation of discomfort, or resolution of associated symptoms like tinnitus or dizziness? Compare the patient's actual response to the desired outcomes. If the patient's response aligns with the expected outcomes, the intervention can be considered effective.

Key Terms

acoustic neuroma benign tumor of the vestibular nerve
anisocoria unequally sized pupils
aqueous humor one of the clear fluids inside the eyeball
astigmatism blurred vision caused by irregularities in the cornea or lens
audiologist specialist in hearing testing and treatment
audiometry comprehensive hearing test that measures a person's response to frequencies and volumes of sound
barotrauma rapid or extreme changes in air pressure that cause the eardrum to rupture
cataract clouding of the lens within the eye
cerumen earwax
cholesteatoma growth of abnormal skin in the middle ear
closed-angle glaucoma type of glaucoma in which the drainage angle between the cornea and iris suddenly becomes blocked, leading to a rapid increase in intraocular pressure and other severe symptoms
CMV retinitis ocular infection caused by the cytomegalovirus (CMV) that primarily affects the retina
conjunctiva thin, clear membrane that covers and protects the eye
conjunctivitis inflammation of the conjunctiva
corneal abrasion loss or disruption of the corneal epithelium, the outermost layer of the cornea

corneal dystrophies group of inherited disorders characterized by abnormal deposits or changes in corneal structure
corneal ulcer area of tissue breakdown in the cornea
diplopia double vision
Epley maneuver repositioning of the head through physical therapy to treat vertigo
erythema redness of the skin or mucus membranes
external otitis inflammation of the external ear
hyperopia (also: *farsightedness*) the condition of seeing distant objects more clearly than closer objects
keratoconjunctivitis sicca (also: *dry eye*) common ocular disorder characterized by insufficient tear production or poor tear quality, leading to dryness and discomfort of the eyes
keratoconus progressive corneal disorder characterized by the thinning and distortion of the cornea, resulting in a conical shape
mastoidectomy removal of infected cells from the mastoid bone
mastoiditis infection of the mastoid bone behind the ear
myopia (also: *nearsightedness*) the condition of seeing closer objects more clearly than distant objects
myringotomy surgical incision in the tympanic membrane
open-angle glaucoma type of glaucoma in which the drainage angle between the cornea and iris remains open but the fluid outflow is impeded
otalgia ear pain
otitis media (also: *middle ear infection*) prevalent condition caused by the invasion of microorganisms into the middle ear via the Eustachian tube
otorrhea ear discharge
otoscopy visual examination of the ear using an otoscope
ototoxicity toxic effects of certain medications or chemicals on the structures of the inner ear, leading to hearing loss, balance problems, or other auditory-related symptoms
pterygium raised thickening of the conjunctiva which extends into the cornea
retinal vascular disorder condition that affects the blood vessels supplying the retina
retinopathy disease of the retina
tinnitus ringing or buzzing in the ear
tonometry measurement of the pressure within the eyes
tympanic membrane perforation ruptured eardrum
tympanometry physical test to measure the function of the tympanic membrane
tympanoplasty surgical reconstruction of the eardrum
tympanostomy tube small tube placed within the tympanic membrane to prevent fluid buildup behind the ear

Assessments

Review Questions

1. What condition is characterized by clouding of the lens of the eye?
   a. cataracts
   b. glaucoma
   c. diabetic retinopathy
   d. ocular trauma

2. What ocular disorder is associated with increased intraocular pressure and optic nerve damage?
   a. cataracts
   b. glaucoma
   c. diabetic retinopathy
   d. ocular trauma

3. What ocular disorder is commonly seen in individuals with diabetes and is caused by damage to the blood vessels in the retina?
   a. cataracts

b. glaucoma
c. diabetic retinopathy
d. ocular trauma

4. What is normal intraocular pressure (IOP) of the eye?
a. 15–25 mm Hg
b. 10–20 mm Hg
c. 12–24 mm Hg
d. 11–21 mm Hg

5. What ocular disorder is characterized by the gradual loss of central vision and is a leading cause of visual impairment in older adults?
a. cataracts
b. glaucoma
c. diabetic retinopathy
d. macular degeneration

6. You are the nurse caring for a patient with cataracts. You anticipate what medical treatment?
a. Remove the cataracts.
b. Treat for increased intraocular pressure.
c. Manage blood glucose control.
d. Prescribe corrective lenses.

7. What tool tests the patient's visual acuity?
a. otoscope
b. Snellen chart
c. FACES pain scale
d. Glascow coma scale

8. The nurse is preparing to assess the ears of a patient who has complained of hearing loss. What instrument will the nurse use to assess the ear during a physical examination?
a. stethoscope
b. ophthalmoscope
c. otoscope
d. sphygmomanometer

9. The nurse is caring for a 4-year-old child with suspected acute otitis media. What is a common symptom of acute otitis media?
a. tinnitus
b. vertigo
c. hearing loss
d. cerumen impaction

10. What would indicate the interventions applied to the plan of care for a child with acute otitis media have been effective?
a. reduced pulling at the ear lobe
b. crankiness or inability to be comforted
c. reduced feedings throughout the day
d. completion of prescribed antibiotic

11. What are examples of medical therapies for disorders of the ear? Select all that apply.
a. antibiotic drops
b. antifungal eardrops

c. nonsteroidal cream
d. nonsteroidal anti-inflammatory drugs (NSAIDs)

Check Your Understanding Questions

1. Explain the difference between open-angle and closed-angle glaucoma.
2. What should be included in the treatment plan for a patient diagnosed with keratoconjunctivitis sicca?
3. How is the diagnosis of a tympanic membrane perforation confirmed?
4. Often the provider orders ear drops for a patient with an ear infection or build-up of earwax. Describe how to administer ear drops.

Reflection Questions

1. Describe nursing interventions you might implement for a patient diagnosed with age-related macular degeneration. What impact might they have on the patient's well-being and overall experience?
2. Reflecting on your response to the previous question, consider any areas where you could have further enhanced your care delivery or patient education. How will you apply this experience to future encounters with patients with ocular disorders?
3. What special accommodations and resources would you need to best serve a patient who is hearing impaired?

What Should the Nurse Do?

1. You are a nurse working with a 65-year-old patient recently diagnosed with glaucoma. The patient appears worried and mentions experiencing increasing difficulty with her peripheral vision. What should the nurse do?
2. What treatments should the nurse anticipate for a patient suspected of closed-angle glaucoma? What should the nurse do in an emergency like this?

Competency-Based Assessments

1. Imagine you are caring for a patient diagnosed with an ocular disorder. How will your knowledge and understanding of the specific ocular disorder influence your approach to patient care? Develop a pamphlet outlining the specific ocular disorder and identifying three cues you would recognize and analyze before developing a hypothesis for care.
2. Develop a brief presentation to share with your peers outlining the medical management a of patient diagnosed with a retinal vascular disorder.
3. Develop a table that outlines the differences between acute otitis media and chronic otitis media.
4. Develop a pamphlet explaining how nurses should educate the parents of an infant who has been diagnosed with acoustic neuroma.

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CHAPTER 19

Gastrointestinal System and Disorders

FIGURE 19.1 Gastrointestinal disorders can cause discomfort when left untreated. (credit: "Home remedies to get relief from stomach aches – 1" by News Fibers/Flickr, Public Domain)

CHAPTER OUTLINE

INTRODUCTION The gastrointestinal (GI) system (also referred to as the digestive system) is responsible for several functions, including digestion, absorption, elimination, and immune response. It breaks down food and then absorbs nutrients into the bloodstream via the small intestine and large intestine. Because good health depends on good nutrition, any disorder affecting the functioning of the digestive system can significantly affect overall health and well-being and increase the risk of chronic health conditions. Nutrients from food and fluids are used by the body for growth, energy, and bodily processes. Essential nutrients must come from dietary intake. The carbohydrates, lipids, and proteins in foods are used for energy to power molecular, cellular, and organ system activities.

19.1 Nutritional Disorders

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology of, risk factors for, and clinical manifestations of obesity, anorexia nervosa, and malabsorption
- Describe the diagnostics for and laboratory values monitored in the management of obesity, anorexia nervosa, and malabsorption
- Apply nursing concepts and plan associated nursing care for the patient with obesity, anorexia nervosa, or malabsorption
- Evaluate the efficacy of nursing care for patients with obesity, anorexia nervosa, or malabsorption
- Describe the medical therapies that apply to the care of obesity, anorexia nervosa, and malabsorption

Diet—what you eat and how much you eat—has a dramatic impact on your health. Eating too much or too little food can lead to serious medical issues, including cardiovascular disease, cancer, anorexia, and diabetes, among others. Combine an unhealthy diet with unhealthy environmental conditions, such as smoking, and the potential medical complications increase significantly. This module examines the common nutritional disorders of obesity, anorexia, and malabsorption. Because each disorder creates unique patient care needs, the nurse must be familiar with the appropriate medical care to develop effective care plans.

Obesity

The term **obesity** is defined as abnormal or excess fat accumulation (World Health Organization, n.d.) and a state of malnutrition by excess (Khanna et al., 2022). It is the result of having a chronic positive energy balance from consuming more calories than are being used by the body. This chronic excess of calories is stored as glycogen in the liver, muscle, and fat cells. Understanding the hormonal control of the digestive system is an important area of ongoing research. Scientists are exploring the role of each hormone in the digestive process and developing ways to target these hormones. Advances could lead to knowledge that may help battle the obesity epidemic.

Pathophysiology

Fatty foods are **calorie-dense**, meaning that they have more calories than carbohydrates or proteins per unit mass. One gram of carbohydrates has four calories, 1 gram of protein has four calories, and 1 gram of fat has nine calories. The signals of hunger (time to eat) and satiety (time to stop eating) are controlled in the hypothalamus region of the brain. Foods that are rich in fatty acids tend to promote satiety more than foods that are rich only in carbohydrates.

Excess carbohydrate and adenosine triphosphate (ATP) are used by the liver to synthesize glycogen. The pyruvate produced during glycolysis is used to synthesize fatty acids. When there is more glucose in the body than required, the resulting excess pyruvate is converted into molecules that eventually result in the synthesis of fatty acids within the body. These fatty acids are stored in adipose cells—the fat cells in the mammalian body whose primary role is to store fat for later use.

Risk Factors

There are several behavioral, genetic, and social determinants of health that can contribute to obesity. The more risk factors a person has, the greater chance for obesity.

Poor eating patterns or food choices, inadequate sleep, and insufficient activity are all behavioral risk factors for obesity. Eating large portions and consuming large amounts of calorie-dense foods creates an excess of calories needed by the body to survive. An inactive or sedentary lifestyle also makes it easy to consume more calories than needed to remain healthy. Insufficient sleep causes an imbalance of **leptin** (the hormone that makes you feel full) and **ghrelin** (the hormone that makes you feel hungry), causing you to overeat.

Genetic risk factors for obesity are still being researched. Some variants in certain genes can cause increasing hunger and increased food intake. In rare instances, a mutation of a single gene can cause inherited obesity within a family (CDC, 2024).

The environment and conditions we live in are called social determinants of health. People who have limited access to healthy food choices or safe access to physical activity are more likely to have obesty. Affordability, social supports, marketing and advertising, and policy are all other community factors that can contribute to obesity.

Other factors that can contribute to obesity are certain illnesses and medications. Microbiome and chemical exposures are also being researched to determine a connection to obesity (CDC, 2024).

Clinical Manifestations

Obesity is defined as having a **body mass index (BMI)** of 30 or greater (Table 19.1). An individual's BMI is calculated by dividing their weight (in kilograms) by the square of their height (in meters): kg/m^2. BMI classifications range from severely underweight to obese, with three classifications of obesity. BMI should be used alongside other measurements, because it doesn't account for differences based on a person's ethnicity, body type/shape, or age. For example, the traditional BMI chart underestimated the Asian population risk, so their classification has slight alterations. Genetically, Asian and South Asian people have 3 to 5 percent more body fat, which alters the range (Weir & Jan, 2023).

Weight Status	BMI (kg/m^2)
Severely underweight	<16.5
Underweight	<18.5
Normal range	18.5–24.9
Overweight	25.0–29.9
Obese	≥30.0
Obesity class I	30–34.9
Obesity class II	35–39.9
Obesity class III	≥40 (also known as severe, massive, or extreme obesity)
Asian and South Asian Population	
Overweight	23–24.9
Obesity	≥25

TABLE 19.1 **Classification of Weight Status by BMI** (Weir & Jan, 2023)

A large waist circumference is an indicator of high levels of **visceral fat**, or abdominal fat. This type of body fat is found deep in the abdominal wall and surrounds the organs. High levels of visceral fat can lead to heart disease, diabetes, and stroke. Patients can have a normal BMI and still have a large waist circumference, so many practitioners also measure a person's waist circumference to help guide treatment decisions. Weight-related health problems are more common in males with a waist circumference of greater than 40 inches and in females with a waist measurement of greater than 35 inches (NIH, n.d.).

Assessment and Diagnostics

A thorough nutritional assessment provides information about an individual's nutritional status, as well as risk factors for nutritional imbalances, including obesity. Diagnostics can be used to evaluate for comorbid conditions that can occur with obesity.

Diagnostics and Laboratory Values

Diagnostics and laboratory studies will generally focus on ruling out other comorbidities or health conditions, according to the subjective and objective assessment data found. Laboratory studies that may be performed include a basic metabolic panel, liver function study, kidney function study, lipid profile, thyroid-stimulating hormone and other hormone-level studies, vitamin D levels, urinalysis, hemoglobin A_{1c}, and C-reactive protein. An

electrocardiogram may be ordered to evaluate cardiac rhythm and function. A sleep study can evaluate for sleep apnea, if warranted (Panuganti et al., 2023). Other potential diagnostic studies include

- computed tomography (CT) scan to evaluate internal organ structure
- dual x-ray absorptiometry (DEXA) scan to measure bone density
- hydrostatic weighing (weight while submerged in water) to more accurately measure body fat
- skinfold thickness evaluation to measure subcutaneous body fat

Nursing Care of the Patient with Obesity

Care for patients with obesity is individualized, according to any underlying causes of obesity and any comorbid conditions. Treatment includes behavioral interventions, nutritional modification, medications, and surgical intervention, if appropriate (Panuganti et al., 2023). Nursing management focuses on reinforcement of treatment, patient support, and health teaching and education.

REAL RN STORIES

Nurse: Tommy
Years in Practice: Eight
Clinical Setting: Hospice
Geographic Location: Texas

I had been caring for Ms. C, 55 years old, who had a massive decubitus ulcer to her upper legs and buttocks, for a week. Ms. C weighed 600 pounds. She was a super sweet lady, and she had coronary artery disease, diabetes, and hypertension. Turning Ms. C required the assistance of three other nursing staff members. I spent a large amount of time with Ms. C because of her extensive wound care. She was also cheerful and talkative, so I really didn't mind. One day, Ms. C shared with me that she hadn't been able to get out of bed for a long time, so her son helped her with meals and personal care. Her son, Dominic, was in the room and said he wanted his mom to lose weight, but he was unsure of how to accomplish that while she was bedridden. I asked Dominic what types of foods he prepared for his mom. When he began to list the foods, it became apparent that they often ordered takeout, and when Dominic did cook, he cooked processed, calorie-dense foods that weren't very healthy. After he finished, I asked them both if they'd be willing to have a conversation with me and a nutritional counselor to come up with a realistic diet for Ms. C that Dominic would be able to cook. They both said yes, very enthusiastically. So after I was finished, I set up the meeting. I realized then that one of the reasons Ms. C and Dominic struggled with her weight was because they lacked the knowledge to make healthy changes.

Recognizing Cues and Analyzing Cues

Targeted subjective information focuses on screening for any underlying causes contributing to obesity, such as childhood weight history, family history, sleep patterns, prior weight loss efforts and results, physical activity, surgical history, social history of alcohol and tobacco use, and medications that can cause weight gain. An associated past medical history may reveal thyroid disease, diabetes, cardiovascular disease, or psychosocial disorders such as mood disorders (Panuganti et al., 2023).

Objective assessment data are obtained through inspection, auscultation, and palpation. The nurse begins the physical examination by making general observations about the patient's status. Height, weight, BMI, and waist circumference should be accurately measured and documented. Focused findings may include a crowded oropharynx, abdominal pannus, pedal and/or tibial edema, abdominal striae, distant breath and cardiac sounds, gynecomastia, signs of venous insufficiency, and gait abnormalities (Panuganti et al., 2023).

Prioritizing Hypotheses, Generating Solutions, and Taking Action

The patient's psychosocial well-being and motivation to comply with treatment are important factors in weight reduction. Ways the nurse can reinforce treatment include encouraging healthy eating, reinforcing the importance of positive self-esteem and self-care, developing a food diary for the patient to use, and being realistic about weight-loss goals. Promote increased physical activity through participation in exercise programs, including group exercise programs, to provide the patient with feelings of support. Allow the patient to express their feelings about their weight, appearance, and food, and positively reinforce the patient's efforts to promote weight loss. Educating the

patient, family, and caregivers about the importance of healthy sleep habits, eating schedules, portion control, and a healthy diet can help positive reinforcement and adherence continue after discharge.

Evaluation of Nursing Care for the Patient with Obesity

The process of evaluating nursing care requires the nurse to evaluate each intervention, how the patient responded to it, whether goals were met. It entails a reflection of what could have been done differently to improve the patient's state. Goals of nursing care for a patient with obesity may include

- The patient will have 30 minutes of activity three times a week.
- The patient will have a reduction in depression symptoms within 2 months.
- The patient will have a reduction in snoring within 6 months.
- The patient will have an increased tolerance to activity in 1 month.
- The patient will lose 10% of their body weight in 4 months.

Each goal should have a timeline, and goals can be short term or long term. As the patient reaches goals, a new goal should be made with the patient to direct the next portion of care.

Evaluating Outcomes

The primary patient outcome related to obesity is management of weight loss. The nurse evaluates the patient's meal choices, level of activity, and engagement of care. If the patient is struggling with an exercise regimen, for example, the nurse should evaluate if the patient is not engaged enough to participate or if the exercise is too complicated for the patient to do.

Medical Therapies and Related Care

The goal of obesity treatment is to assist the patient to reach and maintain an ideal weight for their height, body build, and their health. This can improve the overall health and lower the risk of developing complications related to obesity. Medical therapy includes dietary modification, behavior intervention, medications, and possible surgical intervention. The collaborative, interdisciplinary health team may include a dietitian or nutritionist, endocrinologist, bariatric nurse, and behavioral counselor to help the patient understand and make changes in their eating and activity habits. The goal is to create a permanent lifestyle change for the patient, not just something temporary.

The initial treatment goal is incorporation of a low-calorie diet, with frequent emphasis on patient adherence. Maintaining realistic weight loss goals increases patient success. Cognitive therapy, motivational interviewing, and interpersonal psychotherapy may also be used to increase patient compliance.

Behavioral Interventions

The provider may encourage the patient to participate in behavioral modification therapy (BMT) with a therapist who has experience in bariatrics. Through BMT, the patient will learn structured ways to improve lifestyle habits, such as diet choices, exercise, and other behavior choices (Olateju et al., 2021). BMT will also teach the patient about self-monitoring, goal setting, stimulus control, stress management, cognitive restructuring, and problem solving. Patients who participate in BMT are more likely to succeed in long-term weight loss (Olateju et al., 2021).

Medications

Anti-obesity medications may be prescribed for patients with a BMI of 30 or higher or those with a BMI of 27 or higher who have comorbidities. The most common first-choice medication prescribed is orlistat, because of its limited absorption and lack of systemic effects (Panuganti et al, 2023). Other commonly prescribed, U.S. Food and Drug Administration (FDA)-approved medications are listed in (Table 19.2).

FDA-Approved Weight Loss Medication	Mechanism of Action	Contraindications
Orlistat (Alli, Xenical)	Blocks absorption of fat during digestion	Digestive problems, cholestasis, hypothyroidism, kidney stones, seizures
Phentermine-topiramate (Qsymia)	Lessens hunger; makes patients feel full sooner	Glaucoma, hyperthyroidism, mood disorders, cardiac disease, kidney disease Do not use if pregnant or breastfeeding.
Naltrexone-bupropion (Contrave)	Lessens hunger; makes patients feel full sooner	Hypertension, seizures, opioid-use disorder, history of eating disorders May increase suicidal ideation
Liraglutide (Saxenda, Victoza)	Mimics glucagon-like peptide-1 (GLP-1), which regulates appetite in the brain	May increase risk of pancreatitis
Semaglutide (Ozembic, Rybelsus Wegovy)	Mimics GLP-1, which regulates appetite in the brain	Not for use in combination with other GLP-1 agonists or weight loss products; may increase risk of pancreatitis
Setmelanotide (Imcivree)	May reduce appetite and increase resting metabolism	Only for use by patients with proopiomelanocortin deficiency, proprotein convertase subtilisin/kexin type 1 deficiency, or leptin receptor deficiency

TABLE 19.2 **Commonly Prescribed, FDA-Approved Weight Loss Medications** (National Institute of Diabetes and Digestive and Kidney Disease [NIDDK], 2024)

Surgery

The branch of medicine that researches and treats obesity is called **bariatrics**. Bariatric surgery is a consideration for patients with a BMI of 40 kg/m^2 or patients with a BMI of 35 kg/m^2 with significant health issues that would be expected to improve with weight loss. Before preoperative consideration, the patient must show efforts to lose weight for a period of 12 months or more. A dietitian will collaborate with the patient in these efforts and start preoperative teaching for bariatric surgery at the appropriate time. Two common procedures performed are a vertical sleeve gastrectomy and Roux-en-Y gastric bypass.

A **vertical sleeve gastrectomy** is a surgical procedure in which a portion of the stomach is removed, and the size of the stomach is reduced to 3 to 4 ounces (Figure 19.2). This can be done laparoscopically or as an open surgical procedure. A vertical sleeve gastrectomy also reduces the production of ghrelin, resulting in the patient feeling full quickly after consuming a small amount of food. Complications patients may experience from this type of surgery include gastroesophageal reflux, strictures, and gastric ulcers from nonsteroidal anti-inflammatory drug (NSAID) use or smoking.

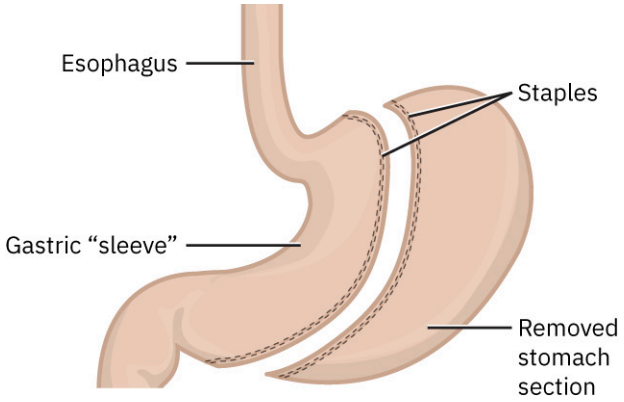


FIGURE 19.2 A gastric sleeve drastically reduces the size of the stomach, to promote weight loss. (credit: modification of work from Anatomy and Physiology 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

A **Roux-en-Y gastric bypass** is the most common type of malabsorption bypass surgery performed in the United States. The procedure involves creating a small, 1-ounce gastric pouch at the gastroesophageal junction, separating the rest of the stomach and bypassing the duodenum to connect the gastric pouch to the lower segment of the small intestine (Figure 19.3). Bypassing part of the small intestine causes malabsorption of vitamins, macronutrients, and minerals. The combination of restrictive stomach size and malabsorption causes rapid weight loss. Complications of gastric bypass include gastric ulcers from NSAID use or smoking, dumping syndrome, steatorrhea, stricture, reactive hypoglycemia, and vitamin and mineral deficiencies.

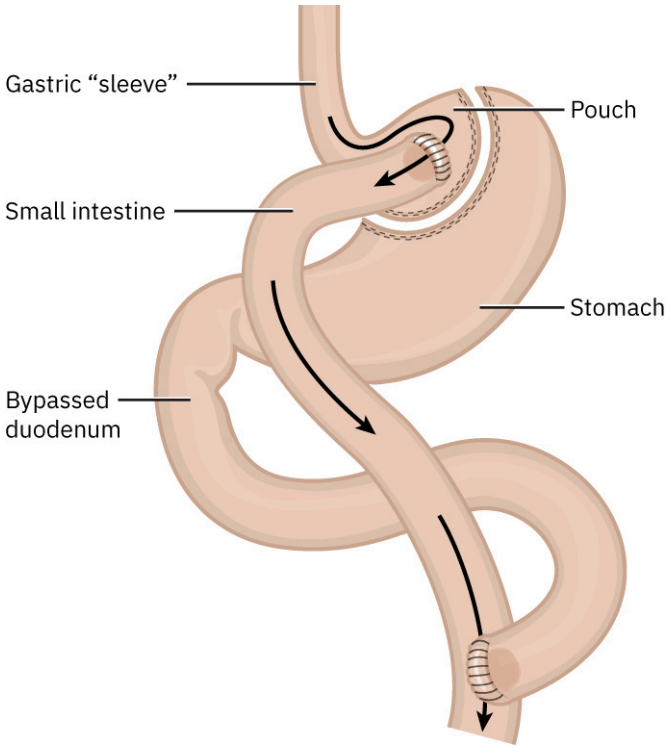


FIGURE 19.3 A gastric bypass significantly reduces food intake and absorption, resulting in rapid weight loss. (credit: modification of work from Anatomy and Physiology 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

LINK TO LEARNING

Dumping syndrome (https://openstax.org/r/77dumpsyndrome) is a common complication of bariatric surgery.

Anorexia Nervosa

The eating disorder **anorexia nervosa** is characterized by the maintenance of a body weight well below average

through severe dietary restriction and/or excessive exercise. Individuals with anorexia nervosa often view themselves as overweight even though they are not. This distorted body image is considered a type of **body dysmorphia**, which is a mental illness characterized by constant worrying over a perceived or slight defect in appearance. Estimates of the prevalence of anorexia nervosa vary from study to study but generally range from just under 1 percent to just over 4 percent in females. Generally, prevalence is considerably lower among men.

Although anorexia nervosa occurs in people from many cultures, White girls and women from Western societies tend to be the most at-risk population. Recent research indicates that girls between the ages of 15 and 19 years are most at risk, and it has long been suspected that eating disorders are culture-bound phenomena that are related to messages of a thin ideal often portrayed in popular media and the fashion world. Although social factors play an important role in the development of eating disorders, there is also evidence that genetic factors may predispose people to this disorder.

Pathophysiology

Anorexia nervosa deprives the body of the basic nutrition necessary to properly function. Studies have evaluated the role of biological and environmental factors that contribute to the development of anorexia nervosa. Patients with anorexia nervosa have deficits in dopamine and serotonin neurotransmitters, which are responsible for eating behavior, reward, impulse control, and neuroticism (Moore & Bokor, 2023). Endocrine abnormalities can include decreased production of thyroid hormones from lack of iodine, increased production of cortisol in response to stress on body from lack of nutrition, and decreased levels of gonadal hormones, such as estrogen and testosterone. Patients often have comorbid psychiatric disorders, such as generalized anxiety disorder and major depressive disorder (Moore & Bokor, 2023).

Clinical Manifestations

Patients with anorexia nervosa usually report symptoms of endocrine dysfunction, such as **amenorrhea** (cessation of the menstrual period), cold intolerance, fatigue, loss of libido, irritability, and extremity edema. Many will also exercise compulsively for extended periods of time and have restrictive behaviors related to food intake, such as calorie counting and portion control (Moore & Bokor, 2023).

Assessment, Diagnostics, and Laboratory Values

Anorexia nervosa is associated with several important negative health outcomes, namely, bone loss, heart failure, kidney failure, reduced function of the gonads, and, in extreme cases, death. Furthermore, there is an increased risk for several psychological problems, including anxiety disorders, mood disorders, and substance misuse. Assessment and treatment of anorexia nervosa focus on understanding the patient's experience and concerns, as well as determining potentially reversible causes. Psychiatric evaluation and diagnosis of anorexia nervosa are based on criteria provided by the American Psychiatric Association. These criteria include the patient having a distorted view of themselves and their condition, intense fear of gaining weight, and a significantly low body weight resulting from severe conscious restriction of calories.

Initial laboratory tests will focus on disease complications based on signs and symptoms gathered from assessment data. Basic laboratory work will include complete blood cell count (CBC), complete metabolic profile, 25-hydroxyvitamin D concentration, testosterone (male patients), and thyroid-stimulating hormone. Urine testing will evaluate beta-hCG in females, as well as a drug screen (illicit and prescription).

An echocardiogram will be completed for patients with cardiopulmonary symptoms, such as dyspnea, syncope, or heart murmur, to assess for arrhythmias. A CT scan of the abdomen may also be done for patients with prolonged amenorrhea or to rule out superior mesenteric artery conditions that could affect the duodenum.

Nursing Care of the Patient with Anorexia

Although anorexia nervosa is a treatable disease, patients have a high risk for relapse. Close monitoring, constant positive reinforcement, and patient education are important interventions to optimize outcomes.

Recognizing Cues and Analyzing Cues

The nurse providing care to a patient with anorexia nervosa uses subjective and objective data to optimize care. Subjective data may include body image disturbances, GI complaints, dizziness, feeling cold, sleep problems, menstrual problems, and muscle weakness. Objective data may include general body emaciation, dry skin, cold extremities, poor wound healing, lower extremity edema, and abnormal laboratory values. Vital signs should focus

on blood pressure and apical heart rate.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Patients being treated for anorexia nervosa in the hospital setting are usually medically unstable due to potential electrolyte imbalances; they may have an increased risk of self-harm due to existing psychiatric disorders. Safety measures the nurse should take to ensure patient safety include following facility protocol for suicide precautions to ensure the patient environment is safe, supervising feedings, and frequent collaboration with the interdisciplinary team.

Evaluation of Nursing Care and Outcomes for the Patient with Anorexia

The nurse will evaluate each nursing action and determine how the patient responded. In addition, the nurse determines if the goals are met using patient input. Among possible goal examples are that the patient will eat 75 percent of their meals every day; the patient will gain 1 pound a week; and the patient will state three things they like about their body every day.

The primary patient outcome for anorexia nervosa management is an increase in caloric intake to sustain healthy bodily function. Collaboration with psychiatry is important in understanding and overcoming the patient's negative thoughts about food and body image.

Medical Therapies and Related Care

Nutritional rehabilitation and psychotherapy are the primary components of treatment for anorexia nervosa. In addition to the nurse and provider, the interdisciplinary team can include a dietitian, psychologist, social worker, and gastroenterologist. In some instances, pharmacotherapy may help. Antipsychotics, such as olanzapine, may help with weight restoration. Patients with comorbid psychiatric conditions may be prescribed serotonin reuptake inhibitors along with psychotherapy.

Malabsorption

The term **malabsorption** refers to the condition whereby the GI tract is unable to properly absorb nutrients, such as proteins, carbohydrates, fats, vitamins, minerals, or trace elements. This can occur with one vitamin or macronutrient, several, or all.

Pathophysiology

Malabsorption occurs when an abnormality in the GI tract impedes the body from absorbing nutrients correctly. Most absorption occurs in the large intestine, but some occurs in the small intestine and stomach. Malabsorption can occur at any phase of the digestion: luminal, mucosal, or postabsorptive (Table 19.3).

Phase of Digestion	Process
Luminal	Carbohydrates, dietary fats, and proteins are hydrolyzed and solubilized by secreted digestive enzymes and bile.
Mucosal	Intestinal epithelial cells transport digested products from the lumen into the cells.
Postabsorptive	Reassembled lipids and other nutrients are transported from intestinal epithelial cells to other parts of the body.

TABLE 19.3 **Phases of Digestion** (Hammami, 2019)

Clinical Manifestations

The most common clinical manifestations of malabsorption are diarrhea, **steatorrhea** (fatty stool), fatigue, abdominal bloating and cramping, increased flatulence, and unintentional weight loss. If the malabsorption is of a vitamin, the patient will have symptoms of that vitamin deficiency (Table 19.4). If the malabsorption is of a macronutrient, the patient will have symptoms resulting from a lack of fat, carbohydrate, or protein.

Vitamin/Mineral Deficiency	Symptoms
Iron	Anemia
Vitamin A	Night blindness
Vitamin B_{12}	Anemia, poor balance
Vitamin K	Abnormal bleeding, ecchymosis
Vitamin D	Osteopenia, osteomalacia, bone pain, motor weakness
Calcium	Secondary hyperparathyroidism, tetany
Magnesium	Tetany
Vitamin B_1 (thiamine)	Peripheral neuropathy
Vitamin B_5	Motor weakness
Vitamin B_7 (biotin)	Seizures

TABLE 19.4 Symptoms Associated with Vitamin and Mineral Deficiencies

Assessment, Diagnostics, and Laboratory Values

The nurse will obtain a history including health history and a general physical assessment, including the course of symptoms. Medical history may reveal a disorder that causes malabsorption, such as celiac disease, lactose intolerance, pancreatic insufficiency, ulcerative colitis, parasite infection, inflammatory bowel disease, or Whipple disease.

When malabsorption is suspected, general testing is done to try to narrow down areas that need more specific testing. Blood tests will include a comprehensive metabolic panel to check liver and kidney function and evaluate for electrolyte imbalances; a CBC count will evaluate for anemia, zinc, phosphorous, albumin, and magnesium; and vitamin levels will be evaluated.

Fecal testing may be done to evaluate for fat malabsorption. Jejunal aspirate samples will be cultured to check for bacterial overgrowth in the small intestine. A breath test can evaluate for carbohydrate malabsorption. Some examples of studies for specific conditions include

- colonoscopy and biopsy to diagnose ulcerative colitis
- CT scan to diagnose pancreatitis
- endoscopic retrograde cholangiopancreatography (ERCP) to diagnose pancreatic insufficiency in patients with a history of pancreatitis or alcohol use disorder
- endoscopy to diagnose Crohn disease or jejunoileitis
- magnetic resonance elastography to diagnose liver fibrosis or stiffness
- magnetic resonance cholangiopancreatography to diagnose exocrine pancreatic insufficiency

Nursing Care of the Patient with Malabsorption

The care of the patient with malabsorption focuses on ongoing assessments and patient and family education. If the cause of malabsorption is determined, then more focused care can be provided. A general measure that may be helpful to the patient is food journaling, logging symptoms and the time symptoms occur.

Recognizing Cues and Analyzing Cues

Patients with malabsorption may present with common GI symptoms, along with symptoms of vitamin or mineral deficiencies. Objective data may include signs of muscle wasting, distended abdomen, ascites, ecchymosis, peripheral neuropathy, oral mucus membrane ulcers, peripheral edema, a positive Chvostek or Trousseau sign, and

pale skin. Evaluate vital signs with a focus on blood pressure. The nurse may note orthostatic hypotension. It is important to ask the patient about their medical and surgical history and the history of their symptoms, including when they began and how they have progressed. A history of GI surgery, especially weight loss surgery, also increases a patient's risk for malabsorption.

LINK TO LEARNING

Watch this video to learn more about the signs and symptoms of malabsorption (https://openstax.org/r/77malabsorption) along with causes and treatment of the condition.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

The patient's GI symptoms may be the primary condition or a symptom of a disease. The nurse will assist with diagnostic testing and educate the patient about any diagnostic procedures performed. The nurse will provide emotional support to the patient (Zuvarox & Belletieri, 2020).

Evaluation of Nursing Care and Outcomes for the Patient with Malabsorption

Evaluation of care centers around improvement of symptoms and diet modifications. Accurately understanding the cause of malabsorption can improve the nurse's ability to evaluate outcomes. The nurse evaluates if the patient is receiving adequate nutrition. The nurse monitors vital signs and completes a physical assessment to evaluate symptom improvement. Laboratory blood values can reveal improvements in vitamin, mineral, and electrolyte balance.

Medical Therapies and Related Care

Medical treatment is focused on finding and treating the underlying cause of malabsorption, avoiding any food triggers, and symptom management. Treatment can vary from dietary changes and supplementation to surgical intervention, if necessary. Consider referral to a gastroenterologist.

19.2 Disorders of the Oral Cavity

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss pathophysiology, risk factors, and clinical manifestations for oral cavity disorders
- Describe the diagnostics for and laboratory values monitored in the management of oral cavity disorders
- Apply nursing concepts and plan associated nursing care for the patient with oral cavity disorders
- Evaluate the efficacy of nursing care for patients with oral cavity disorders
- Describe the medical therapies that apply to the care of oral cavity disorders

Digestion begins in the upper gastrointestinal tract at the mouth, where individuals chew food—a process called **mastication**. Mastication results in mechanical digestion when food is broken down into small chunks and swallowed. Masticated food is formed into a bolus as it moves toward the pharynx in the back of the throat and then into the esophagus (Figure 19.4). Dental caries, periapical abscesses, oral cancer, salivary calculus, or temporomandibular joint (TMJ) disorders can prevent a patient from this first step of digestion. This section will look at common oral cavity disorders, as well as how the nurse can effectively care for these patients.

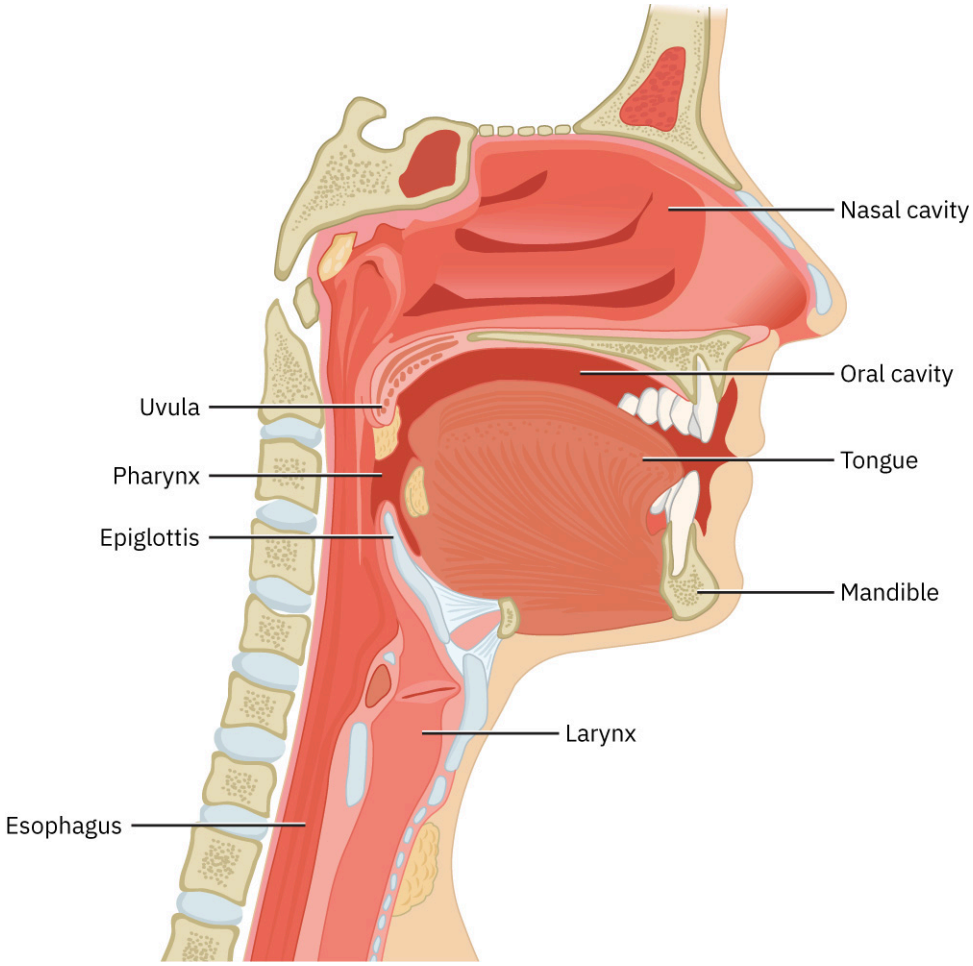


FIGURE 19.4 This illustration shows the anatomy of the mouth and throat, where digestion begins. (credit: modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Dental Caries and Plaque

The term **plaque** refers to a sticky film on the teeth made up of leftover food particles and bacteria. Poor dental hygiene allows plaque to break down or demineralize tooth enamel, causing **dental caries** or cavities. Dental caries (Figure 19.5) are one of the most common chronic oral cavity diseases, even though they are easily preventable with good oral hygiene (CDC, 2022b). Caries may cause pain, make it difficult to chew foods and drink liquids, and can also affect an individual's self-esteem when the caries are easily visible.

FIGURE 19.5 This image shows a patient with multiple dental caries. (credit: Centers for Disease Control and Prevention/Public Health Image Library, Public Domain)

Pathophysiology

Dental caries are caused by **cariogenic bacteria**, bacteria that cause tooth decay, in the mouth. These bacteria live in plaque and biofilm on the teeth and convert carbohydrates, such as starches and sugars, into acids (Rathee & Sapara, 2023). This acidic environment causes the calcium on enamel to be slowly dissolved or demineralized, resulting in caries. The caries will continue to expand until appropriately treated. Factors that contribute to an increased chance of dental caries include tobacco use, diabetes, high carbohydrate intake (including high amounts of sugar), advanced age, and dry mouth.

Clinical Manifestations

Initially, dental caries can be asymptomatic. A patient may complain of tooth pain or sensitivity when eating foods that are hot, cold, or sweet. Physical signs ultimately include brown, black, or white discoloration or staining of the tooth. With more advanced disease, a small hole or cavity may appear.

Prevention

Prevention of dental caries starts with brushing teeth two times a day with a fluoride toothpaste and flossing daily. The recommendation is for individuals to see a dentist every 6 months to get a professional teeth cleaning, identify and treat troublesome areas early, and apply a fluoride treatment. Toothbrushes should be replaced every 3 to 4 months. Smoking cessation can also reduce the incidence of dental caries. Other interventions, such as drinking fluorinated water and eating a well-balanced diet, also prevent caries.

In the inpatient setting, it is important for nurses to provide mouth care for patients who are unable to perform self-care. This includes brushing the teeth with a soft-bristled toothbrush or oral sponge and placing water soluble ointment or gel on the lips to prevent drying.

LIFE-STAGE CONTEXT

Older Adult Oral Health

Caries and tooth loss can increase with age because of decreased saliva production, receding gums, chronic disease, and vision, cognitive, and physical limitations. Because older adults often have receding gums, cavities are more likely to develop at the root of the tooth. Dry mouth also causes bacteria to build up in the mouth more easily, leading to tooth decay (NIDCR, 2021). Loss of dental benefits upon retirement can contribute to difficulty accessing appropriate dental care (CDC, 2020).

Cancer of the Oral Cavity or Pharynx

Cancer of the oral cavity or pharynx can develop on the tissue of the mouth and gums, on or under the tongue, and at the back of the mouth or throat. It is diagnosed most often in people over the age of 40 years, and accounts for about 3 percent of the yearly diagnosed cancers in the United States (NIDCR, 2023). The 5-year relative survival rate for these types of cancers is 68% in the United States.

Pathophysiology

Oral cancer is caused by DNA mutations in the cells of the mouth, causing a growth of mutated cells to occur. Although the immune system usually detects and eliminates mutated cells in the body, these cells can multiply unnoticed. Although it is unknown what exactly causes the DNA mutations, factors that have been shown to increase the risk of oral cancer include tobacco use, heavy alcohol use, exposure to human papillomavirus, excessive sun exposure to the lips, and a weak immune system.

Clinical Manifestations

Oral cancer is suspected when an oral lesion will not heal and is in place for 2 weeks or longer. The lesion may be an unusual color compared with the surrounding tissues. The cancer may grow or cause bleeding. Generally, the patient is otherwise asymptomatic (Figure 19.6), which delays diagnosis and treatment.

FIGURE 19.6 Oral cancer is seen on the tongue of the patient. (credit: Welleschik/Wikimedia Commons, CC BY 4.0)

Assessment, Diagnostics, and Laboratory Values

When assessing a patient for oral cancer, signs and symptoms to seek include loose teeth, lip or mouth sores that do not heal, white or red patches inside the mouth, lumps (visible in the mouth or palpated around the jaw or neck), pain in the ears or mouth, hoarseness, and difficulty swallowing, chewing, or moving the jaw. Be sure to accurately document and report findings appropriately.

When a patient is suspected to have oral cancer, the selection of diagnostic testing is dependent on the area of the lesion or tumor. Diagnostic tests that may be used to diagnose oral cancer include endoscopy, biopsy, oral brush biopsy, human papillomavirus testing, x-ray, CT scan, barium swallow study, magnetic resonance imaging (MRI), ultrasound, and positron emission tomography (PET) scan. If metastasis is suspected, other areas of the body may be evaluated.

Nursing Care of the Patient with Cancer of the Oral Cavity

Nursing care of the patient with oral cancer focuses on patient support during therapy and treatment, nutrition promotion, pain control, and providing emotional support. Patient teaching is done, with a focus on smoking and alcohol cessation, a healthy diet, and sun safety, and regular exercise should be emphasized. The nursing plan of care should be evaluated and updated as the patient progresses through treatment.

Recognizing Cues and Analyzing Cues

Follow-up is important when discovering lesions or growths in the oral cavity or neck. Asking focused and specific questions, such as when the patient noticed the growth or lesion, if it is painful, and if it has changed at all, will give the nurse cues to further evaluate. Assess the patient for any breathing, chewing, or swallowing difficulties, and report findings to the provider.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

The priorities of care during treatment are maintaining a patent airway and healthy nutritional status, and providing emotional support, pain relief, and patient education. Frequent airway assessments may be necessary. The patient may require enteral (i.e., through the GI tract) or parenteral (i.e., through an intravenous [IV] access) nutrition during treatment. The nurse should ensure the patient has access to a pen and paper so they can communicate postoperatively. Developing an appropriate care plan based on nursing diagnoses and developing SMART goals will aid the nurse in patient care.

Evaluation of Nursing Care and Outcomes for the Patient with Cancer of the Oral Cavity

To evaluate the effectiveness of nursing actions, review the goal and see if it was achieved by the set deadline. If the goal is not met, goals and interventions will need to be modified. The ideal outcome of care related to oral or oropharangeal cancer is to cure the disease. The nurse maintains an active role in administering and monitoring therapies, including noting the patient's response. The nurse also evaluates how well symptoms are being managed and collaborates with the provider frequently.

Medical Therapies and Related Care

Medical therapy for the treatment of oral and oropharyngeal cancer depends on the type or nature of the lesion and the preference of the physician and patient. Smaller lesions on the lip may be surgically excised; larger lesions may need radiation therapy. Tongue lesions may be treated with radiation, chemotherapy, surgery, or a combination of therapies. Some cases necessitate removal of part or all of the tongue. For larger neck or mouth dissections, reconstructive surgery may be required using a skin flap from the arm or chest. Depending on the progression of disease and care, the patient may require a temporary or permanent tracheostomy and feeding tube for management. Multiple people make up the interdisciplinary team and can include an oncologist, surgical oncologist, radiation oncologist, plastic surgeon, oncologic dentist, physical therapist, speech language pathologist, psychologist, audiologist, and nutritionist.

Temporomandibular Disorders

The TMJ is a sliding hinge (Figure 19.7) that connects the mandible to the skull. This sliding joint, located on each side of the jaw, allows for the range of motion needed during mastication. Temporomandibular disorder (TMD) is a collection of more than 30 disorders that cause pain and dysfunction of jaw movement. TMD is twice as common in women, especially those between 35 and 44 years old (NIDCR, 2023).

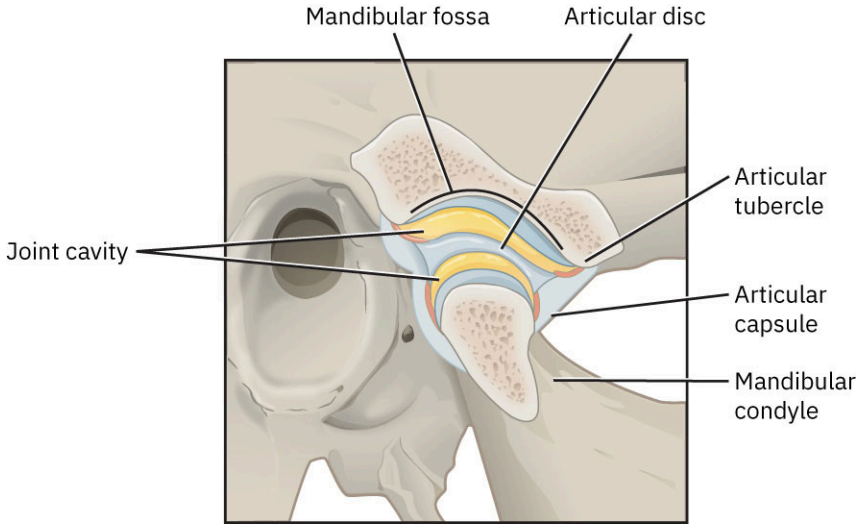


FIGURE 19.7 The temporomandibular joint is a sliding hinge between the temporal bone and the mandible. (credit: modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Pathophysiology

The pathophysiology of TMD is unclear. Research suggests it is caused by a combination of psychological stressors, life stressors, genes, jaw trauma, grinding the teeth, and arthritis or other inflammatory conditions.

Clinical Manifestations

The patient may present with pain in the jaw area that may radiate to the face, neck, or ears; limited movement or locking of the jaw; clicking or popping when opening or closing the mouth; and a change in bite alignment.

Assessment and Diagnostics

To assess for TMD, perform a focused assessment of the jaw. Inquire when the symptoms started, what makes them worse or better, and their frequency. Assess the range of movement of the jaw and ask the patient to identify any aggravating factors. Ask if there are any accompanying symptoms, such as headaches or back pain.

LINK TO LEARNING

This animation shows a healthy TMJ (https://openstax.org/r/77healthyTMJ) in motion.

The three main classes of TMD (Figure 19.8) are disorders of the joints, disorders of the muscles, and headaches associated with TMD (NIDCR, 2023).

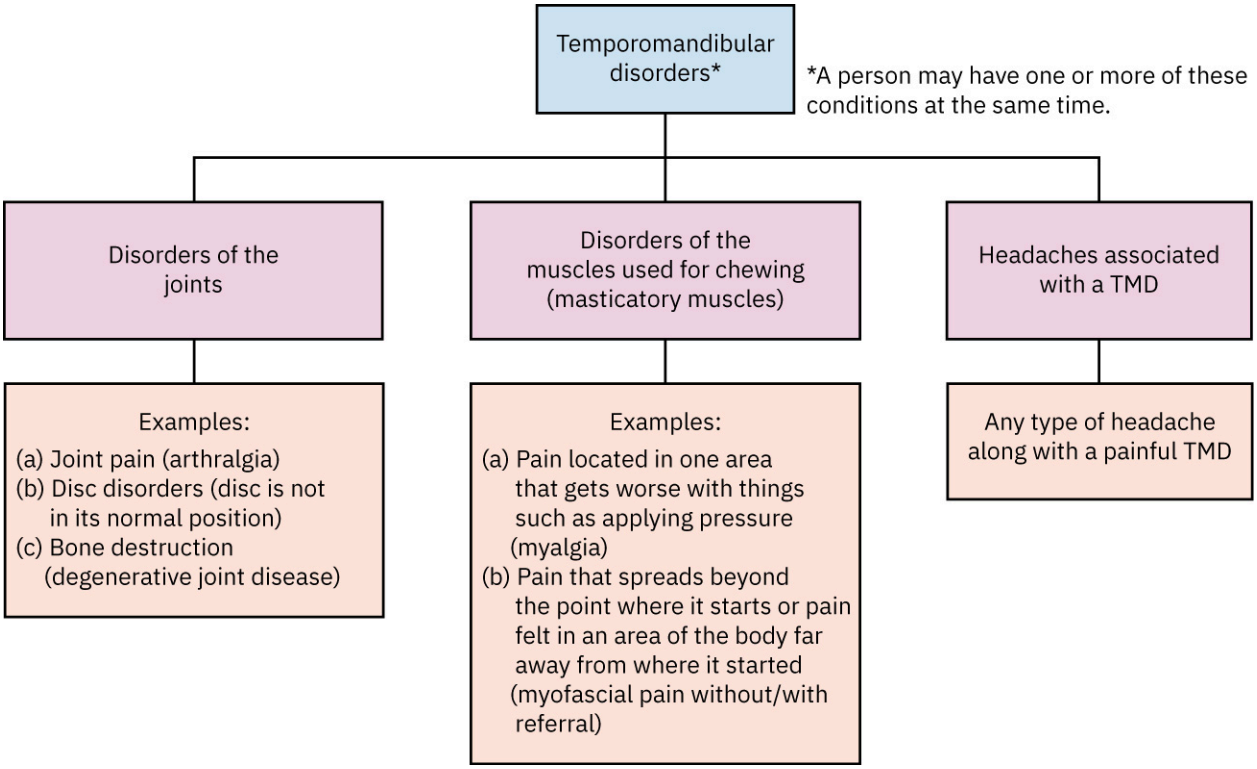


FIGURE 19.8 TMD is classified into three categories. (credit: "Classification of Temporomandibular Disorders (TMDs) with Examples" by National Institute of Dental and Craniofacial Research, Public Domain)

Generally, diagnosis is based on symptoms, physical assessment, and medical history. An x-ray, CT scan, or MRI may be performed for further evaluation and to rule out other conditions.

Nursing Care of the Patient with Temporomandibular Disorders

Nursing care should focus on pain relief and education about prevention. Prevention education should include self-management strategies, such as stress management to prevent grinding teeth and jaw clenching, that the patient can use in conjunction with other treatments.

Recognizing Cues and Analyzing Cues

A patient who presents with a complaint of jaw pain and also has a history of jaw clenching when experiencing stress, may have TMD. After collecting and recording assessment data, the nurse presents the findings to the provider for further evaluation.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

The priority of care would be symptom improvement along with pain management and patient teaching. Teaching should include avoiding eating hard foods, reducing the habit of jaw clenching or gum chewing, application of heat or cold to area, taking NSAIDs, and gently performing stretching exercises of the jaw.

Evaluation of Nursing Care and Outcomes for the Patient with TMD

The nurse will evaluate the care provided to see if symptoms of jaw pain have improved. It is important to note that symptom improvement may happen over time and the patient will have to be educated on the importance of therapy compliance. The primary patient outcome for TMD is improvement of symptoms. The nurse evaluates how often the patient is experiencing pain, including if or how often it is preventing the patient from performing normal tasks, such as eating. It is also important for the nurse to assess if there is improvement to any underlying factors, such as stress management or healthy coping mechanisms the patient has developed.

Medical Therapies and Related Care

TMD is usually a temporary disorder that resolves without aggressive treatment. Physical therapy may be helpful by stretching the soft tissues and muscles supporting the joint to increase range of motion and reduce pain. Medications, such as NSAIDs, muscle relaxants, opioids, or antidepressants, may be prescribed as pain management measures. An intraoral orthotic, or bite guard, may protect the jaw at night from nocturnal teeth grinding (Figure 19.9). Psychological and behavioral therapy can also help the patient with stress management and grinding prevention.

FIGURE 19.9 A bite guard provides a cushion for the teeth in patients who grind their teeth when they sleep, helping to protect the TMJ. (credit: Linkhiei/Wikimedia Commons, CC BY 1.0)

19.3 Parenteral and Enteral Nutrition

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Describe the indications for parenteral and enteral nutrition
- Identify the nurse's role in administering parenteral and enteral nutrition

Nutrients from food and fluids are used by the body for growth, energy, and bodily processes. When the patient is unable to eat, they need to receive nutrition in a different way. This section discusses the different ways nutrition can be administered, and the role of the nurse in managing and evaluating their effectiveness.

Parenteral Nutrition

The term **parenteral nutrition** refers to a concentrated solution containing glucose, amino acids, minerals, electrolytes, and vitamins that is administered to a patient intravenously. An IV fat emulsion solution is typically administered as a separate infusion one to three times a week. Parenteral nutrition is administered via a large central IV catheter (also known as a "line"), typically in the subclavian or internal jugular vein, because the high dextrose concentration is irritating to small blood vessels and can cause chemical phlebitis.

Parenteral nutrition is typically used when the patient's intestines or stomach are not working properly and must be bypassed, such as during paralytic ileus, in which peristalsis has completely stopped, or after postoperative bowel surgeries, such as bowel resection. It may also be prescribed for conditions such as severe malnutrition, severe burns, metastatic cancer, liver failure, or hyperemesis with pregnancy.

Total Parental Nutrition

Parenteral nutrition that includes an **intravenous fat emulsion** (IV administration of fat) provides complete nutritional support and so is called **total parental nutrition (TPN)**. The provider orders the TPN daily for the patient

(Figure 19.10), based on the patient's electrolytes laboratory values. TPN rates should be strictly followed. If administered too fast, the patient can go into fluid overload (hypervolemia) and become hyperglycemic; if administered too slowly, the patient can become hypoglycemic.

FIGURE 19.10 This is an example of a total parenteral nutrition bag in which the glucose, amino acids, and fats are kept separate to enable room temperature storage. Before use, they are all mixed together. (credit: "Tpn 3bag.jpg" by Tristanb/Wikimedia, CC BY SA 3.0)

TPN may be administered through a central or peripheral IV site. The decision is made based on the formula prescribed by the provider and a discussion with the patient. Whichever is chosen, the purpose is to provide needed nutrients. The central line is the most likely route for TPN. The central line is inserted by the provider, then a chest x-ray is ordered and read prior to using the site. The chest x-ray ensures proper placement of the line and that placement did not cause a **pneumothorax**, or collapsed lung. If the chest x-ray shows a pneumothorax, the patient may require a chest tube to reinflate the lung (for more discussion, see Chapter 11 Gas Exchange, Airway Management, and Respiratory System Disorders). If the chest x-ray shows the central line is in position and there is no pneumothorax, the TPN will be started. Commonly, the central line may have a double or triple lumen so the patient can receive fluids and medications without disruption of the TPN.

Peripheral TPN, also called peripheral parenteral nutrition, is typically used for shorter-term nutritional support or for a patient who cannot tolerate a central line. If the peripheral line infiltrates, the line must be restarted promptly. A delay in restarting the IV line is a safety concern because it places the patient at risk for hypoglycemia.

Nursing Management

Administering parenteral medications, as with other injectable medications, is considered an invasive procedure. It is imperative to take additional measures when administering parenteral medications to prevent health care–associated infections. These measures include hand hygiene, prevention of needle or syringe contamination, preparation of the access site, prevention of contamination of the solution, and use of new, sterile tubing for each bag of nutrition.

Nursing management of the patient receiving parenteral nutrition includes

- verifying the appropriateness of the parenteral nutrition
- assessing the patient's response to the infusion
- monitoring for complications, such as electrolyte imbalances or central line–associated bloodstream infection
- monitoring the patient's glucose levels regularly and managing hypoglycemia or hyperglycemia promptly
- if administering peripheral parenteral nutrition, ensuring the site is monitored frequently and per facility protocol for signs of complications such as infiltration

Enteral Nutrition

Nutrition provided directly into the GI tract through an enteral tube that bypasses the oral cavity is called **enteral nutrition (EN)**, or tube feeding. EN is used widely in rehabilitation, long-term care, and home settings. EN requires an interdisciplinary team approach, including a registered dietitian, health care provider, pharmacist, and bedside nurses. The registered dietitian performs a nutrition assessment and determines what type of EN is appropriate to promote improved patient outcomes. The health care provider writes the order for the EN. Prescriptions for EN should be reviewed by the nurse for the following components: type of EN formula, amount and frequency of free water flushes, and administration route, method, and rate. Any concerns about the components of the prescription should be verified with the provider before tube feeding is administered.

Clinical Indications

Enteral feeding is indicated for patients who cannot maintain adequate oral intake to meet nutritional demands. Indications for EN include

- comatose patients with a traumatic brain injury or receiving mechanical ventilatory support
- conditions associated with higher nutritional demands, such as burns, critical illness, and cystic fibrosis
- mental illness such as dementia
- neuromuscular disorders, such as advanced Parkinson's disease
- severe anorexia from human immunodeficiency virus (HIV), chemotherapy, or sepsis
- Upper GI obstruction, stricture, or tumor

Types of Enteral Feeding Tubes

There are several different types of EN tubes; they differ in their location in the GI system as well as their function. Three commonly used enteral tubes are the nasogastric (NG) tube, the percutaneous endoscopic gastrostomy (PEG) tube, and the percutaneous endoscopic jejunostomy (PEJ) tube (Figure 19.11).

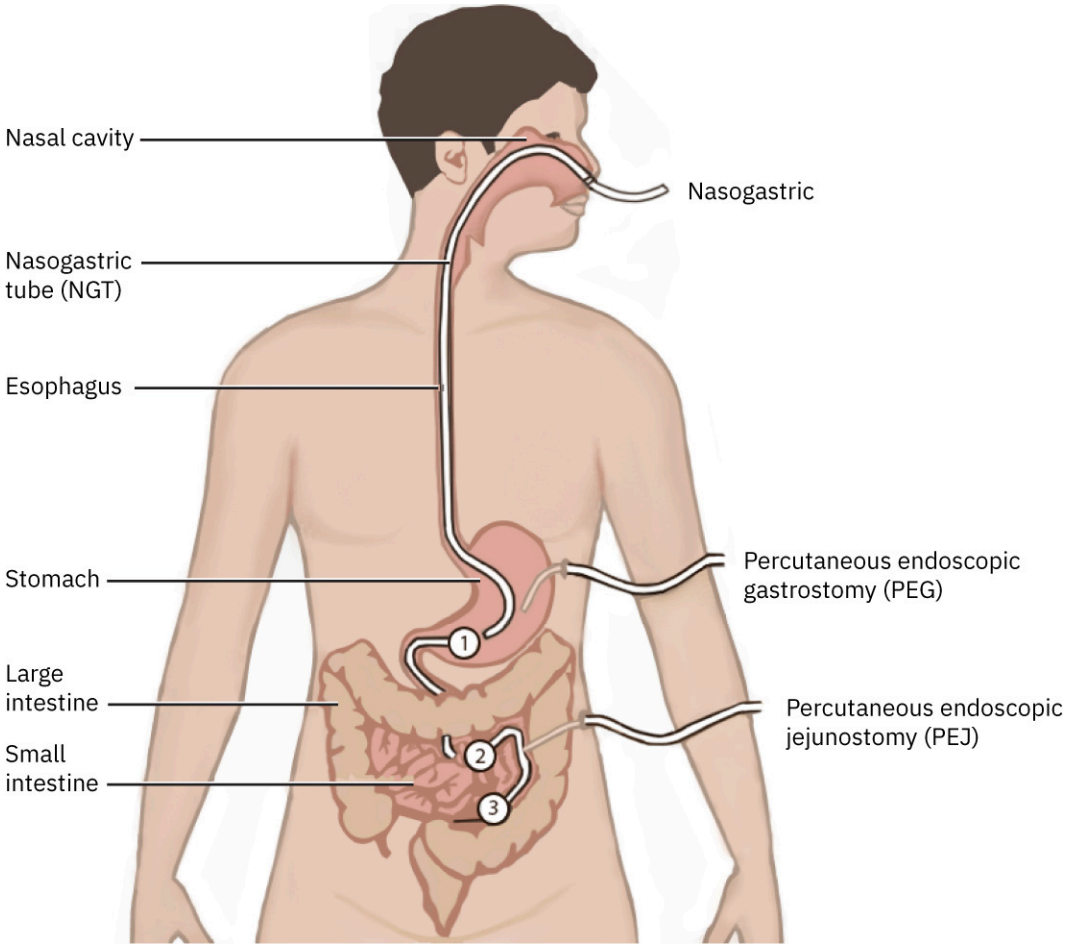


FIGURE 19.11 Enteral feeding tubes can be placed through the nose or through the skin and reach several places in the digestive system. (credit: "Types and Placement of Enteral Tubes" by OpenRN/*Nursing Skills*, 2e, CC BY 4.0)

An NG tube is a single- or double-lumen tube that is inserted into the nasopharynx, then down through the esophagus, and into the stomach. NG tubes can be used for feeding, medication administration, and suctioning. NG tubes used for feeding and medication administration are small and flexible, whereas NG tubes used for suctioning are larger and more rigid. NG tubes are secured externally to the patient's nose or cheek by adhesive tape or a fixation device, so this area should be assessed daily for signs of pressure damage.

Other types of tubes are placed through the patient's abdominal wall and are used for long-term enteral feeding. A PEG tube is placed into the stomach via an endoscopic procedure. Alternatively, a PEJ tube is placed in the jejunum of the small intestine for patients who cannot tolerate the administration of enteral formula or medications into the stomach, due to medical conditions such as delayed gastric emptying.

Nursing Management

The most serious complication of enteral feeding is inadvertent respiratory aspiration of gastric contents, which can cause life-threatening aspiration pneumonia. Other complications include tube clogging, tubing misconnections, and patient intolerance of enteral feeding. To prevent tubing misconnections, the nurse should take the following precautions:

- Make tubing connections under proper lighting.
- Do not modify or adapt IV or feeding devices, because doing so may compromise the safety features incorporated into their design.
- When making a reconnection, routinely trace lines back to their origins and then ensure they are secure.
- As part of a hand-off process, recheck connections and trace all tubes back to their origins.
- Clearly label all tubing at both the proximal and distal ends (Boullata et al., 2017).

Nurses perform interventions to prevent aspiration. The American Association of Critical-Care Nurses recommends

the following guidelines to reduce the risk for aspiration:

- Assess feeding tube placement at 4-hour intervals.
- Assess for GI intolerance at 4-hour intervals (Boullata et al., 2017).
- Maintain the head of the bed at 30° to 45° unless contraindicated.
- Monitor the nare for skin integrity. Adhere to facility protocol for adhesive and medical device pressure injury prevention strategies.
- Observe for change in the amount of external length of the tube. The centimeter mark at the nare should be documented and verified with at each assessment.
- Use sedatives as sparingly as possible.

Feeding tubes are prone to clogging for a variety of reasons, including size or location of the tube, insufficient water flushes, aspiration for **gastric residual volume** (GRV; the volume of stomach contents), contaminated formula, and incorrect medication preparation and administration. Research supports water as the best choice for initial declogging efforts (Boullata et al., 2017). If water does not work, a pancreatic enzyme solution, an enzymatic declogging kit, or mechanical devices for clearing feeding tubes are the best second-line options. To prevent EN tube clogging, the nurse should:

- Flush feeding tubes at a minimum of once a shift.
- Flush feeding tubes immediately before and after intermittent feedings. During continuous feedings, flush at standardized, scheduled intervals.
- Flush feeding tubes before and after medication administration and follow appropriate medication administration practices.
- Limit GRV checks because the acidic gastric contents may cause protein in enteral formulas to precipitate within the lumen of the tube.

REAL RN STORIES

Nurse: Tommy
Years in Practice: Fifteen
Clinical Setting: Emergency department and intensive care unit (ICU)
Geographic Location: Northwest Texas

I was working in the ICU and received an order to insert a weighted feeding tube with a wire guide for Mr. R, who was sedated and on a ventilator. I was able to insert the tube without difficulty, and a chest x-ray was ordered. The x-ray showed the tube was inserted into the trachea and into the lung. I paged the critical care provider to come and together we were able to reposition the tube into the correct position. A second x-ray confirmed proper placement.

At first, I have to admit it bothered me that I didn't get it on the first try, but I then realized that sometimes these things happen. The hospital had a process for nurses to be credentialed to insert the weighted feeding tubes with a wire guide, and I followed the whole procedure. I was so sure I had the tube in the correct spot; thank goodness we're required to confirm placement by x-ray, or I would've been infusing feedings into Mr. R's lungs.

19.4 Disorders of the Upper GI System

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations of upper GI disorders
- Describe the diagnostics for and laboratory values monitored in the management of upper GI disorders
- Apply nursing concepts and plan associated nursing care for the patient with upper GI disorders
- Evaluate the efficacy of nursing care for a patient with upper GI disorders
- Describe the medical therapies that apply to the care of upper GI disorders

This section focuses on common disorders of the esophagus and stomach that can prevent proper digestion and absorption of nutrients, and how the nurse can effectively plan and implement care. Recall that masticated food from the mouth is formed into a bolus as it moves toward the pharynx in the back of the throat and then into the

esophagus. Coordinated muscle movements in the esophagus, called **peristalsis**, move the food bolus into the stomach, where it is mixed with acidic gastric juices and further broken down into **chyme** through a chemical digestion process. As chyme is moved out of the stomach and into the duodenum of the small intestine, it is mixed with bile from the gallbladder and pancreatic enzymes from the pancreas for further digestion.

Barrett's Esophagus

A condition called **Barrett's esophagus** entails the cells lining the esophagus change, becoming more like intestinal cells. It is more common in men and usually is diagnosed around age 55 years (Spechler, 2022). The cells that develop on the esophagus can be precancerous and increase the patient's chance of developing esophageal adenocarcinoma (Souza & Spechler, 2022).

Pathophysiology

Although the exact pathophysiology is unknown, researchers believe that damage to the squamous esophageal cells resulting from gastroesophageal reflux disease (GERD) causes the cells to undergo constant repair and wound healing. The continuous damage and wound healing causes progenitor cells (cells that can differentiate into a specific cell type) from the esophagogastric junction to travel to the esophagus to aid in wound healing and replace the squamous epithelial cells. Along with GERD, other risk factors for developing Barrett's esophagus include central obesity, smoking, and family history.

Clinical Manifestations

Barrett's esophagus is frequently asymptomatic, but patients tend to have other symptoms of GI conditions, such as frequent heartburn and acid regurgitation or reflux. In some cases, Barrett's esophagus can cause ulceration and stricture, and patients may have the symptoms of dysphagia or **odynophagia** (painful swallowing).

Assessment, Diagnostics, and Laboratory Values

Assessment is primarily based on focused subjective data gathered by the nurse and provider. Although often there are no signs or symptoms of Barrett's esophagus, it is often discovered when completing diagnostic testing for other more common GI issues, such as heartburn or reflux.

An upper endoscopy will confirm visual changes to the tissues in the esophagus. A biopsy of the tissues will ultimately confirm Barrett's esophagus. Tissue changes that are 3 cm or longer are termed long-segment Barrett's, and tissue changes that are 1 cm or shorter are termed short-segment Barrett's (Spechler, 2022).

Nursing Care of the Patient with Barrett's Esophagus

Patients in the hospital setting with Barrett's esophagus have often had surgical intervention to remove parts of the esophagus. Nursing care consists of administration of prescribed medications such as antireflux agents to control reflux and monitoring for symptom improvement.

Recognizing Cues and Analyzing Cues

When providing care to a patient with Barrett's esophagus, the nurse relies heavily on a focused subjective assessment, because there are often no physical signs or symptoms of disease. Subjective data may include a history of frequent GERD, heartburn, dysphagia, or odynophagia. The nurse inquires about the frequency, severity, and duration of symptoms, and if symptoms interrupt the patient's sleep.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Foods that are spicy, fatty, acidic, or contain caffeine, carbonation, or alcohol can exacerbate symptoms of reflux and heartburn and trigger episodes of odynophagia or dysphagia. The nurse may ensure the patient receives prescribed proton pump inhibitors as ordered. A **proton pump inhibitor (PPI)** is a medication that binds to the hydrogen-potassium ATPase enzyme system of the parietal cell, thereby pumping hydrogen ions into the stomach. The nurse should provide patient education about food choices that help prevent acid reflux, such as whole grains, root vegetables, and green vegetables.

Evaluation of Nursing Care and Outcomes for the Patient with Barrett's Esophagus

Symptom improvement and patient understanding of the importance of diet modification and medication adherence are the goals of treatment for Barrett's esophagus. Reassessment of symptoms reported and monitoring of the patient's food choices can determine areas that need further intervention. A patient who is still having symptoms, or not experiencing symptom improvement, may need additional medical or dietary intervention. It is important to

collaborate with the interdisciplinary team when evaluating outcomes so treatment therapies can be modified to be more effective.

Medical Therapies and Related Care

Patients diagnosed with Barrett's esophagus are prescribed a PPI, such as omeprazole or pantoprazole, to eliminate GERD symptoms and prevent further esophageal irritation. When reflux symptoms are not controlled by PPI therapy, antireflux surgery (fundoplication) may be performed. Diet modification is also important, and patients are encouraged to eat a low-acid, GERD-friendly diet.

Gastritis

Inflammation and redness of the lining of the stomach is called **gastritis**. The incidence of gastritis in the United States is 8 out of 1,000 people (Cleveland Clinic, 2023b). It may be acute or chronic, and erosive or nonerosive; once the underlying cause is treated, it usually resolves. A common complication of gastritis, **peptic ulcer disease (PUD)** is a defect in the lining of the stomach or duodenum and can occur when gastritis is left untreated. Approximately 10% of the U.S. population has had PUD at some time (Malik et al., 2023).

Pathophysiology

Acute gastritis is usually caused by an irritant, such as aspirin or NSAID use, heavy alcohol use, smoking, and certain infections. It can also be stress induced, caused by a decrease in bicarbonate concentration in the mucosal lining of the stomach. Chronic gastritis most commonly is caused by *Helicobacter pylori* infection (Figure 19.12) but can also be caused by autoimmune disease, Crohn's disease, gastric surgery, and other infections, such as HIV. There is an increased risk for complications, including gastric cancer, peptic ulcers, and gastric bleeding or perforation, when gastritis is untreated (Azer et al., 2023).

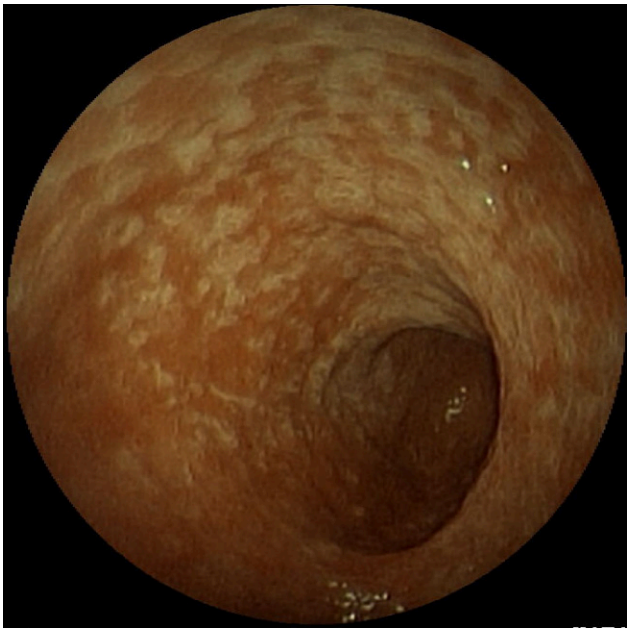


FIGURE 19.12 This image shows chronic gastritis caused by *H.* pylori infection. (credit: "Helicobacter gastritis 2.jpg" by Med_Chaos/ Wikimedia Commons, Public Domain)

Clinical Manifestations

Patients with acute gastritis may present with epigastric pain, nausea, vomiting, or a feeling of fullness in the upper abdomen after eating. In chronic gastritis, patients are usually asymptomatic.

Patients with PUD will most commonly present with epigastric pain after meals, with pain being more immediate in gastric ulcers, and 2 to 3 hours after eating in patients with duodenal ulcers. Other symptoms include heartburn, dyspepsia, chest discomfort, hematemesis (vomiting of blood), melena (black tarry stools), fatigue, and dyspnea

Assessment, Diagnostics, and Laboratory Values

Gastritis is difficult to diagnose based on symptoms alone. It is important to take a detailed medical and social history so proper diagnostic testing can be performed. Endoscopy with biopsy is the gold standard for diagnosing

gastritis (Azer et al., 2023). *H. pylori* infection can be diagnosed through endoscopy and biopsy, or through a urease breath test. Other testing is focused on finding the underlying cause of the gastritis.

LINK TO LEARNING

Watch this video for an explanation and demonstration of the urea breath test (https://openstax.org/r/77ureabrtest) for *H. pylori* infection.

An upper GI series, or barium swallow, can check for GERD, dysphagia, hiatal hernia, ulcers, tumors, or achalasia. Serological tests will evaluate for the presence of autoantibodies. Bloodwork will check for the presence of *H. pylori* infection and will also check for iron deficiency anemia that can be caused by blood loss in the GI tract. A stool sample may be evaluated to check for bacteria or the presence of blood.

Nursing Care of the Patient with Gastritis

Nursing care of the patient with gastritis focuses on symptom improvement and patient education. It is important to teach the patient the importance of avoiding any foods, drinks, or medications that irritate their stomach. Smoking cessation education is also important.

Recognizing Cues and Analyzing Cues

Subjective data for a patient with gastritis can include the patient's report of presence of gastric pain, belching or hiccups, nausea or vomiting, blood in vomit or stool, or loss of appetite. Inquire about any history of smoking, alcohol use, regular NSAID or aspirin use, or high stress levels.

For PUD, life-threatening, or alarm symptoms that warrant immediate action are

- bleeding or anemia
- early satiety
- family history of GI cancers
- progressive dysphagia or odynophagia
- recurrent vomiting
- unexplained weight loss

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Signs of GI bleeding are a high priority to be addressed. Monitor the patient's stool for the presence of blood in the stool; bloody stool may present as a fresh, bright red color (frank) or dark and tarry. Be sure to notify the provider immediately.

Evaluation of Nursing Care and Outcomes for the Patient with Gastritis

While providing care, the nurse will evaluate outcomes to see if goals have been achieved. Goal priorities are improvement of symptoms and patient education. Treatment of the underlying cause and prevention therapy ensure an excellent prognosis. The nurse will examine every intervention taken and the patient's response. The nurse evaluates how often the patient experiences symptoms, including timing, severity, and what could have triggered them. When comparing the patient's history of symptoms before care, the nurse can evaluate if the interventions provided are adequate or if modifications are needed.

Medical Therapies and Related Care

Treatment can be singular or a combination of antibiotics, PPIs, vitamin supplementation, **immunomodulatory therapy** (medications that change the body's immune response), and dietary modifications (Azer et al, 2023). PPIs bind to the hydrogen-potassium ATPase enzyme system of the parietal cell, also referred to as the proton pump, because it pumps hydrogen ions into the stomach. PPIs inhibit the secretion of hydrochloric acid, and the antisecretory effect lasts longer than 24 hours (Table 19.5). Treatment is dependent on the underlying cause. Other treatments for gastritis include smoking and alcohol cessation, stress management, and discontinuation of anti-inflammatory medications.

Medication	Indication	Nursing Considerations
Pantoprazole	GERD Zollinger-Ellison syndrome *H. pylori* infection	Can interfere with the liver metabolism of other drugs IV pantoprazole can potentially exacerbate zinc deficiency. Long-term therapy can cause hypomagnesemia.
Raberprazole	GERD Peptic and esophageal ulcers Erosive esophagitis *H. pylori* infection Zollinger-Ellison syndrome	May cause kidney damage Can interfere with the liver metabolism of other drugs Long-term therapy can cause hypomagnesemia. May cause vitamin B_{12} deficiency
Dexlanosoprazole	GERD Esophageal erosion (treatment and prevention)	Can interfere with the liver metabolism of other drugs Long-term therapy can cause hypomagnesemia.
Esomeprazole	GERD Stomach and peptic ulcers Esophageal erosion Zollinger-Ellison syndrome	May cause kidney damage May cause vitamin B_{12} deficiency Can interfere with the liver metabolism of other drugs Long-term therapy can cause hypomagnesemia.
Lansoprazole	GERD Esophageal erosion Zollinger-Ellison syndrome Duodenal and gastric ulcers (treatment and prevention) *H. pylori* infection (in combination with antibiotics)	Can interfere with the liver metabolism of other drugs Long-term therapy can cause hypomagnesemia (Gillson, 2023).

TABLE 19.5 **Comparison of Proton Pump Inhibitors**

Gastric Cancer

Stomach cancer, or **gastric cancer**, is the fifth most frequently diagnosed cancer and the third leading cause of cancer deaths worldwide (Mukkamalla et al., 2023). Stomach cancers tend to develop slowly and often do not have symptoms until disease has progressed. Ethnicity variations are noted, with highest incidence in Hispanic Americans, Black Americans, and American Indians. Risk factors linked to stomach cancer include *H. pylori* infection; obesity; a diet high in salted foods or grilled or charcoaled meats; heavy alcohol use; and smoking (American Cancer Society, 2021).

Pathophysiology

Most stomach cancers begin at the cells that line the stomach and produce mucus. These cancers are called adenocarcinomas. There are two main types of adenocarcinomas: intestinal and diffuse. Intestinal cells are more clustered, more likely to have cell mutations, and more receptive to targeted therapy. Diffuse cells are more scattered and harder to see on the surface.

Clinical Manifestations

Because stomach cancer is slow growing, cancer in most patients who present with symptoms is usually at an

advanced stage (Mukkamalla et al., 2023). Symptoms include nonspecific weight loss, dysphagia, persistent abdominal pain, anorexia, nausea, hematemesis, early satiety (fullness when eating), and indigestion.

Assessment and Diagnostics

Most patients with symptoms will present with advanced disease. A palpable abdominal mass may be found, indicating advanced disease. An upper endoscopy with biopsy is the most common way stomach cancer is diagnosed. A barium swallow study may also be done in certain circumstances. Other studies to rule out **metastasis**, or secondary malignant growths in other parts of the body, may include abdominal CT scans, x-ray, endoscopic ultrasound, and serum studies.

Interdisciplinary Management

The provider will give the patient treatment options. Potential treatments for stomach cancer may include surgery, chemotherapy, radiation therapy, targeted drug therapy, and immunotherapy. The nurse will coordinate care, complete ongoing assessments, provide patient education, and plan and evaluate nursing care.

Medical Therapies and Related Care

Surgery is the primary treatment for stomach cancer. Surgery may be performed via endoscopy, laparoscopy, or open surgery, depending on the stage and location of the cancer. The goal is to remove the tumor and all affected tissues and leave a surgical margin that is negative for cancer cells. Common surgical procedures performed in patients with stomach cancer are total gastrectomy, partial gastrectomy, esophagogastrectomy, lymph node dissection, gastrojejunostomy, gastrostomy tube insertion, and jejunostomy tube insertion. Systemic therapy, such as chemotherapy, chemoradiation, immunotherapy, or targeted therapy, may be initiated to kill any remaining cancer cells after surgical resection.

19.5 Disorders of the Lower GI System

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations of lower GI disorders
- Describe the diagnostics for and laboratory values monitored in the management of lower GI disorders
- Apply nursing concepts and plan associated nursing care for the patient with lower GI disorders
- Evaluate the efficacy of nursing care for patient with lower GI disorders
- Describe the medical therapies that apply to the care of the patient with lower GI disorders

This section focuses on common alterations in function of the large intestines. These alterations result in common symptoms of several diseases and conditions of the GI system that can impede proper absorption of nutrients and elimination of stool. After upper GI digestion, the muscles of the small intestine push the contents onward for further digestion in the lower GI tract. Bacteria in the GI tract, called normal flora make up part of the **microbiome**, which is all of the microorganisms in the GI tract. These normal flora assist with digestion. As peristalsis continues, the waste products of the digestive process move into the large intestine. The large intestine absorbs water and changes the waste from liquid into stool. The rectum, at the lower end of the large intestine, stores stool until it is pushed out of the anus during a bowel movement.

Constipation

Constipation is difficult or infrequent passage of stools associated with hard, dry feces. Typically, a patient is diagnosed with constipation if they have fewer than three bowel movements per week.

Pathophysiology

Constipation can be caused by slowed peristalsis due to decreased activity, dehydration, lack of fiber, medications like opioids, depression, or surgical procedures in the abdominal area. As the stool moves slowly through the large intestine, additional water is reabsorbed, resulting in the stool becoming hard, dry, and difficult to move through the lower intestines.

Clinical Manifestations

The patient may experience associated symptoms, such as rectal pressure, abdominal cramps, bloating, distension, and straining. In more serious cases, constipation can be a sign of fecal impaction, intestinal obstruction, or paralytic ileus. A **fecal impaction** is a blockage that occurs when stool accumulates in the rectum, usually due to the

patient not feeling the presence of stool or not using the toilet when the urge is felt. An **intestinal obstruction** is a partial or complete blockage of the intestines so that contents of the intestine cannot pass through.

When peristalsis is not propelling the contents through the intestines or when there is a obstruction, such as severe fecal impaction, **paralytic ileus** may result. Patients who have undergone abdominal surgery or received general anesthesia are at increased risk. Other risk factors include the chronic use of opioids, electrolyte imbalances, bacterial or viral infections of the intestines, decreased blood flow to the intestines, or kidney or liver disease.

If an obstruction blocks the blood supply to the intestine, infection and tissue death (gangrene) can result. Symptoms of an intestinal obstruction or paralytic ileus include

- abdominal distention or a feeling of fullness
- abdominal pain or cramping
- constipation
- diarrhea
- frequent belching
- inability to pass gas
- vomiting

Because of the common occurrence of paralytic ileus in postoperative patients, nurses routinely monitor for these symptoms, and diet orders are not upgraded until the patient is able to pass gas (Phillips, 2022).

Assessment and Diagnostics

The nurse will complete a history and a physical assessment. The history will include the last time the patient had a bowel movement and the usual frequency and consistency of bowel movements. The patient's medications need to be examined for the potential of constipation. Physical assessment may reveal a tender abdomen, and stool may be palpated in the lower abdomen.

Nursing Care of the Patient with Constipation

The goal of interventions to treat constipation is to establish what is considered a normal bowel pattern for each patient and to set an expected outcome of a bowel movement at least every 72 hours, regardless of intake.

Recognizing Cues and Analyzing Cues

The prevailing cue during an assessment will be the lack of ability to have a bowel movement. There may be accompanying abdominal cramping, abdominal distention, or discomfort. The nurse may find contributing history or medications.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

The nurse will hypothesize that the patient has constipation. The exact intervention will depend on the setting and the patient's preferences. The patient may drink a hot beverage, which may stimulate peristalsis. Fiber may be added to the diet. Finally, a laxative may be used. These are available in pill form, liquid form, and as suppositories. The patient can use an enema if not contraindicated by other medical conditions such as fluid and electrolyte imbalances, cardiac history, immunocompromise, or suspected bowel perforation.

In cases of paralytic ileus, treatment may include insertion of an NG tube attached to suction to help relieve abdominal distention and vomiting until peristalsis returns. Obstructions may require surgery if the tube does not relieve the symptoms or if there are signs of tissue death.

Evaluation of Nursing Care and Outcomes for the Patient with Constipation

A successful outcome is the patient having a bowel movement. The nurse should support the patient and help develop an appropriate treatment plan. The goals evaluated may be, for example, the patient will have a bowel movement by (set a time), and the patient will verbalize a plan to prevent further constipation episodes.

The nurse will evaluate the outcomes of care. A bowel movement would indicate that treatment interventions were successful. If the patient is still struggling to have a bowel movement, further collaboration and modification of interventions may be needed.

Medical Therapies and Related Care

Treatment typically includes a prescribed daily bowel regimen, such as oral stool softeners (e.g., docusate) and a

mild stimulant laxative (e.g., a sennoside). Stronger laxatives (e.g., magnesium hydroxide [e.g., Milk of Magnesia] or bisacodyl), rectal suppositories, or enemas are implemented when oral medications are not effective.

Diarrhea

Diarrhea is defined as having more than three unformed stools in 24 hours. The Bristol Stool Form Scale may be used to assess the characteristics of stools. Diarrhea can cause dehydration, skin breakdown, and electrolyte imbalances.

LINK TO LEARNING

Read this article about the development of a new version of the Bristol Stool Form Scale (https://openstax.org/r/77stoolscale) for assessing stool.

Pathophysiology

Diarrhea is caused by increased peristalsis causing the stool to move too quickly through the large intestines for water to be effectively reabsorbed, resulting in loose, watery stools.

Many conditions can cause diarrhea, such as infectious processes, food poisoning, medications, food intolerances, allergies, anxiety, and medical conditions. Patients are at risk for dehydration due to this water loss.

Clinical Manifestations

An individual with diarrhea will present with frequent bowel movements accompanied by the need for immediate toileting, abdominal cramping, and, perhaps, nausea. Dehydration symptoms may be present, such as urinating less than usual, fatigue, thirst, and light-headedness, and an elevated temperature if the patient is infectious.

Diagnostics and Laboratory Values

The provider will determine diagnostic testing based primarily upon medical history and physical examination. Bloodwork may be done to rule out conditions that can cause diarrhea, such as certain diseases, conditions, or infections. Monitor the patient's electrolyte levels because diarrhea can cause electrolyte deficiencies. A stool specimen may be checked for the presence of blood, bacteria, or parasites. If food intolerance or food allergy is suspected, such as lactose intolerance or celiac disease, diet modifications may be recommended to see if symptoms improve. Diagnostic testing, such as endoscopy, colonoscopy, or flexible sigmoidoscopy, may be done to see if the diarrhea is from a structural issue in the digestive tract. Biopsies may be performed of the GI tract during these procedures to rule out cancer or other cell abnormalities.

Nursing Care of the Patient with Diarrhea

Maintaining adequate fluid intake is the priority of care for a patient with diarrhea. Nurses should administer IV fluids as ordered and encourage oral intake of fluids.

Recognizing Cues and Analyzing Cues

The nurse providing care to a patient with diarrhea uses both objective and patient-reported data to optimize care. The patient may report feeling thirsty along with having frequent loose stools. Assessment of skin turgor may revel dehydration, and hyperactive bowel sounds may be heard on auscultation. Vital signs should be completed with a focus on blood pressure and heart rate to monitor for dehydration (Table 19.6).

Degree	Signs and Symptoms
Mild to moderate	Increased thirst Dry mucus membrane Low urine output Dark, concentrated urine Dry, cool skin Headache Muscle cramps
Moderate to severe	Low or absent urine output Very dry skin Dizziness Tachycardia Tachypnea Hypotension Sunken eyes Sleepiness, lack of energy, confusion or irritability Fainting

TABLE 19.6 **Signs and Symptoms of Dehydration** (WebMD, 2023)

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Signs of dehydration are a high priority. Monitor laboratory values for electrolyte depletion and report abnormalities to the practitioner. The nurse will anticipate administering over-the counter antidiarrheal products, if appropriate, and encourage fluids.

Evaluation of Nursing Care and Outcomes for the Patient with Diarrhea

Symptom improvement and prevention of complications are signs of effective nursing care. The nurse evaluates how often the patient is having bowel movements to see if there is improvement in the consistency and frequency of stools. Evaluation of vital signs can help determine if the patient has adequate fluid balance. The primary outcome is resolution of the diarrhea and return to normal fluid balance. The nurse evaluates trends in the patient's intake and output, vital signs, and electrolytes to assess care.

Medical Therapies and Related Care

Treatment of diarrhea includes promoting hydration with water or other fluids (e.g., electrolyte-containing drinks) that improve electrolyte status. IV fluids may be required if the patient becomes dehydrated. Medications, such as loperamide, psyllium, and anticholinergic agents, may be prescribed to treat diarrhea that is causing dehydration. In some cases, rectal tubes may be prescribed to collect watery stool, but strict monitoring is required due to possible damage to the rectal mucosa.

Irritable Bowel Syndrome

A disorder called **irritable bowel syndrome (IBS)** affects the large intestine and causes changes in bowel movements and abdominal pain. It is the most commonly diagnosed GI disorder in the United States, with 10% to 15% of the population being affected (Patel & Shackelford, 2022), and can be broken down into more specific diagnoses: IBS-D (with diarrhea), IBS-C (with constipation), or IBS-M (with mixed bowel patterns).

Pathophysiology and Clinical Manifestations

The exact cause of IBS is unclear. It can occur after infection, be triggered by stress, or be caused by food intolerances, brain-gut interaction, and inflammatory processes (Figure 19.13).

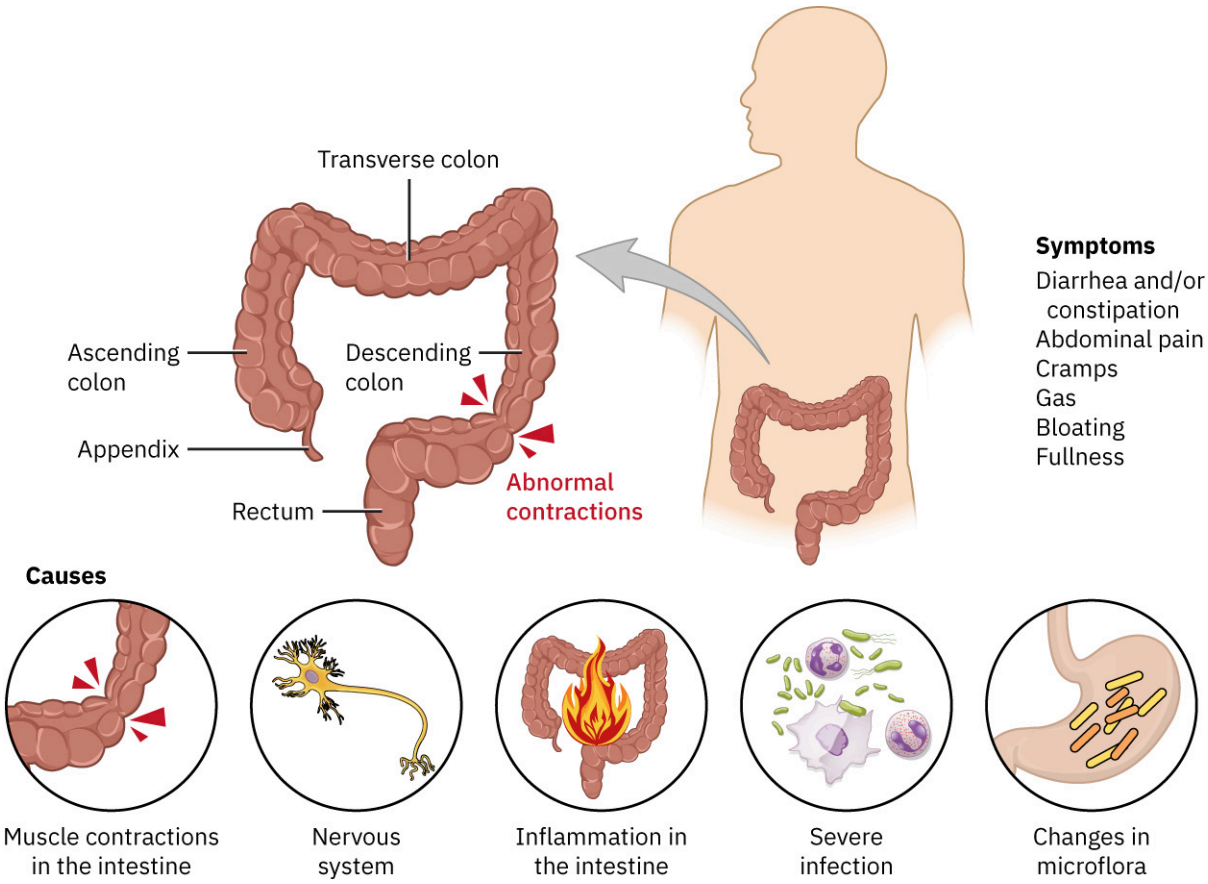


FIGURE 19.13 The exact cause of IBS is unknown; there are several suspected symptoms and causes. (credit: modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

IBS primarily presents with diarrhea and/or constipation with abdominal pain. Other symptoms include abdominal pain, cramps, gas, boating, and fullness. Pain usually increases when bowel habits change and subsides after a bowel movement.

Assessment and Diagnostics

A focused assessment on GI signs and symptoms, stressors, food intolerances, and related factors would be completed. Without any alarming findings, such as iron deficiency, weight loss, or **hematochezia** (passage of fresh blood in stool), diagnostic testing is not usually done. Serum studies to rule out infection or other disease may be performed.

Nursing Care of the Patient with IBS

The nursing care of a patient with IBS will be focused on ongoing physical assessments, creating a plan with the patient, and implementing the measures. An evaluation process will be completed with the patient.

Recognizing Cues and Analyzing Cues

The nurse will complete the history and physical assessment. The findings will be nonspecific, such as abdominal pain and constipation or diarrhea. The patient may have a history of mucus in the stool. Focused patient history information should include stool frequency, amount, and any precipitating factors. This may help determine what part of the intestines is affected.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Ulceration, vascular engorgement, and highly vascular granulation tissue can put the patient at risk for complications, such as perforation and bleeding. Signs and symptoms to report to the provider include fever, lethargy, tachycardia, and increased anxiety. Provide pain management as appropriate and monitor serum blood electrolyte and CBC values closely.

Evaluation of Nursing Care and Outcomes for the Patient with IBS

Nursing care for patients with IBS is driven primarily by symptom improvement as reported by the patient. Vital signs and laboratory values should show adequate fluid balance. The nurse will evaluate how often the patient is experiencing symptoms to see if interventions have caused symptom improvement. A decrease in pain medication use is another indication that symptoms are improving.

Medical Therapies and Related Care

Because IBS is a symptom-based disorder, treatment is aimed at symptom resolution. A combination of anticholinergics, antidepressants, antibiotics, fiber supplements, laxatives, and/or antidiarrheals may be ordered, depending on patient symptoms (Patel & Shackelford, 2022). Increased physical activity and dietary changes may also be recommended.

Celiac Disease

An autoimmune disorder, **celiac disease** is triggered by gluten ingestion, which causes damage to the small intestine; **gluten** is a protein found in the wheat plant and other grains, such as barley and rye. Approximately 1 percent of the population is affected by celiac disease (Celiac Disease Foundation, n.d.). It is hereditary and can occur at any age and any time after gluten has been consumed.

Pathophysiology

In patients with celiac disease, the ingestion of gluten causes the body's immune system to attack the **villi** (small, finger-like cells that absorb nutrients) of the small intestine. This results in permanent damage over time, causing a scalloping of the folds and a cracked appearance of the mucosa, and disrupts the absorption of nutrients (Figure 19.14). The causes are unknown, and it is present when people with a genetic predisposition consume gluten.

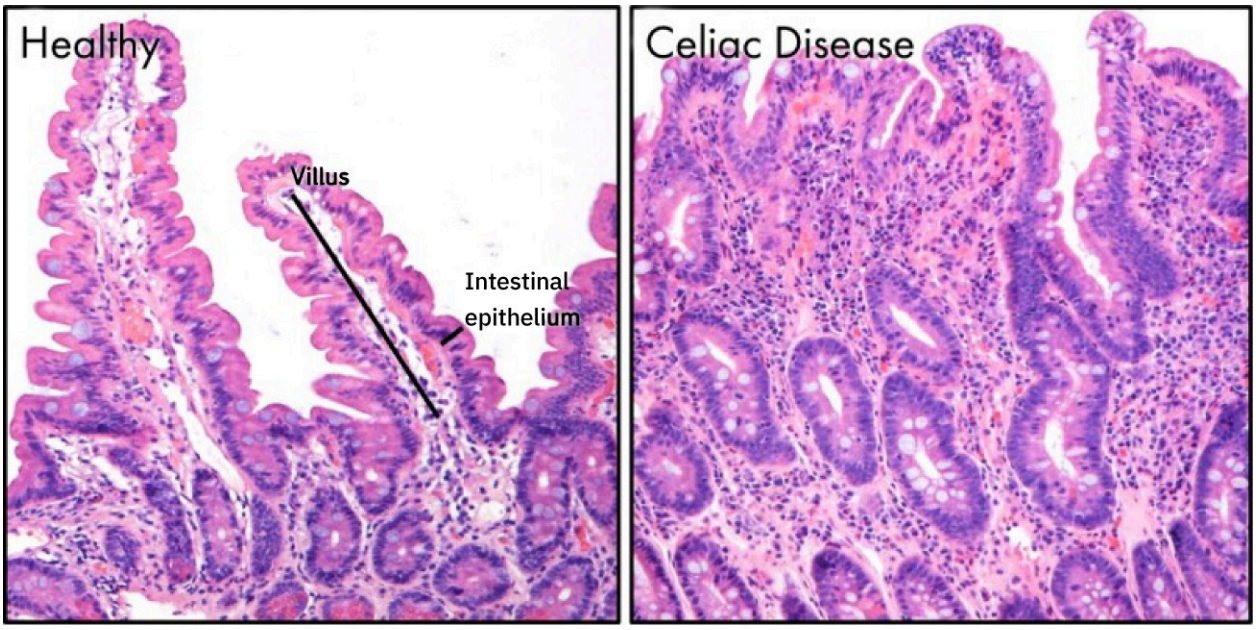


FIGURE 19.14 (a) In a healthy intestine, the villi are well-defined. (b) In patients with celiac disease, the villi are damaged, leading to malabsorption. (credit: "Histopathology of villous atrophy in celiac disease" by GeneFood/Openverse, CC BY 4.0)

Clinical Manifestations

Patients with celiac disease present with GI symptoms, including

- abdominal pain
- bloating
- chronic diarrhea
- constipation
- gas
- lactose intolerance

- nausea
- vomiting
- weight loss

Other symptoms may include fatigue, anxiety, depression, bone or joint pain, canker sores, dry mouth, or itchy rash (NIH, 2023).

Assessment and Diagnostics

Assessment will focus on the GI symptoms and detailed patient history. Diagnostic workup will include serologic studies focused on antibodies associated with celiac disease. A duodenal mucosal biopsy will confirm diagnosis. Other diagnostic tests may be completed and laboratory values evaluated to assess for complications such as vitamin deficiencies, electrolyte imbalances, anemia, or bleeding.

Nursing Care of the Patient with Celiac Disease

The nursing care of the patient with celiac disease is focused on education about a gluten-free diet (Table 19.7), identifying symptoms, and evaluating medication side effects and effectiveness.

Type of Food	Example
Gluten containing	Barley, farina, farro, rye, semolina, spelt, and wheat (e.g., durum, einkorn, emmer, graham flour, Khorasan wheat), including triticale (a blend of wheat and rye) and wheat berries
Gluten free	Amaranth, arrowroot, beans, buckwheat groats (also known as kasha), cassava, chia, corn, flax, gluten-free oats, millet, nut flours, potato, quinoa, rice, sorghum, soy, tapioca, teff, yucca

TABLE 19.7 Gluten versus Gluten Free Foods

It is important to educate the patient about the importance of reading food labels. For instance, oats are naturally gluten-free but may be contaminated when grown or processed in an area that also processes gluten-containing foods.

Recognizing Cues and Analyzing Cues

Often, symptoms of celiac disease are nonspecific. They can include abdominal pain, bloating, gas, diarrhea, weight loss, depression, fatigue, headaches, joint pain, nausea, and vomiting. A physical assessment may reveal skin rash, peripheral neuropathy, mouth ulcers, or canker sores. Vital signs should be completed with a focus on blood pressure and heart rate, especially in the patient having diarrhea, to evaluate for signs of dehydration, such as tachycardia and hypotension.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Patients with celiac disease often have malabsorption. Signs and symptoms of malabsorption include steatorrhea (fatty stools), diarrhea, and weight loss. Nurses will review results of laboratory values and administer vitamin, electrolyte, and/or mineral repletion as ordered. IV fluids may be administered to correct dehydration.

Evaluation of Nursing Care and Outcomes for the Patient with Celiac Disease

Goals for taking care of the patient with celiac disease are symptom improvement and patient education about diet modification. With symptom improvement and patient education in mind, the nurse should monitor the frequency and severity of symptoms as reported by the patient. Laboratory values and intake and output should be balanced. The patient should be able to name gluten-containing foods to avoid and understand the importance of diet adherence to prevent further disease progression.

Medical Therapies and Related Care

Treatment is a lifelong, strict, gluten-free diet. Diet maintenance will prevent symptoms from returning, as well as prevent complications, such as malabsorption, anemia, bone weakening, infertility and miscarriage, lactose intolerance, cancer, seizures, or peripheral neuropathy (Mayo Clinic, 2023).

Colorectal Cancer

Cancer with an origin in the colon or rectal tissue is called **colorectal cancer**. It accounts for about 8 percent of all new cancer cases in the United States annually and has a 5-year survival rate of 65% (National Cancer Institute, 2023). Because of an increased emphasis on prevention screening, colorectal cancer is often detected before symptoms occur. Patients who present with symptoms usually have advanced disease.

LINK TO LEARNING

The U.S. Preventive Services Task Force developed colorectal cancer screening recommendations (https://openstax.org/r/77colorectalscr) based on a patient's age and medical history in order to detect cancer at an early stage.

Pathophysiology

Abnormal or mutated cells that the immune system is unable to eliminate begin to grow on the tissue of the colon or rectum. These cells then begin to multiply. Colorectal cancer is caused by genetic factors, diet, and inflammatory conditions of the GI tract.

Clinical Manifestations

Patients with colorectal cancer may present with a change in bowel habits, bloody stools, unexplained weight loss, fatigue, gas pains, bloating, or abdominal cramping. Patients may have a history of colorectal polyps, a genetic condition such as Lynch syndrome, chronic inflammatory bowel disease, heavy alcohol use, obesity, smoking, or a family history of colorectal cancer.

Assessment and Diagnostics

Assessment may be nonspecific or may demonstrate GI symptoms, such as abdominal tenderness, a palpable abdominal mass, rectal bleeding, ascites, or hepatomegaly (Dragovich, 2023). A rectal examination and colonoscopy with biopsy will enable the health care provider to diagnose colorectal cancer. Other serum studies, such as CBC count, complete metabolic panel, and liver function studies, may be done to assess organ function (Dragovich, 2023). Imaging, such as CT and MRI scans of the abdomen and pelvis, is obtained for staging purposes.

Nursing Care of the Patient with Colorectal Cancer

Nursing care of the patient with colorectal cancer is focused on symptom management, pain relief, and prevention of complications. Collaboration with the interdisciplinary team is important to optimize care. The nurse will assist with preparing the patient for surgery, provide education about adjunct therapies prescribed, manage side effects, and administer palliative therapy, if appropriate. Patients with a stoma (see 19.7 Ostomy Care) may experience body image disturbances, and the nurse will have to help the patient manage self-esteem issues during treatment.

Recognizing Cues and Analyzing Cues

Patients with colorectal cancer will present with nonspecific GI signs and symptoms, such as a change in bowel habits, bloody stools, diarrhea, constipation, abdominal pain, unexplained weight loss, and fatigue. Vital signs may reveal hypotension or tachycardia in patients who are dehydrated. The patient may also have abdominal pain on palpation and poor skin turgor.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Signs of infection are a priority when caring for the patient with colorectal cancer. The nurse may frequently assess the patient's temperature, vital signs, pain level, surgical incision(s), and IV access site to monitor for infection, especially if the patient is receiving chemotherapy. Patient education topics include maintaining a clean environment, signs and symptoms of infection to report to the nurse or provider, and staying away from family and friends who are sick.

Evaluation of Nursing Care and Outcomes for the Patient with Colorectal Cancer

Evaluation of nursing care will be based on treatment preferences and patient goal preferences. Symptom improvement, decrease in pain, and prevention of complications are all signs of effective nursing care. A patient with colorectal cancer may have dysfunctional GI motility as a side effect of the disease process and treatment. The

patient remaining free of signs and symptoms of GI motility dysfunction (e.g., distention, cramping, pain) and maintaining normal bowel sounds and regular formed stools would indicate that the outcomes have been reached. If the patient continues to have signs and symptoms of GI motility dysfunction, interventions may need adjustment.

Medical Therapies and Related Care

Most cases of colorectal cancer require surgical intervention (Figure 19.15). Chemotherapy may be used in adjunct with surgery in patients with advanced disease. Radiation therapy is used for palliative purposes in certain cases of metastasis.

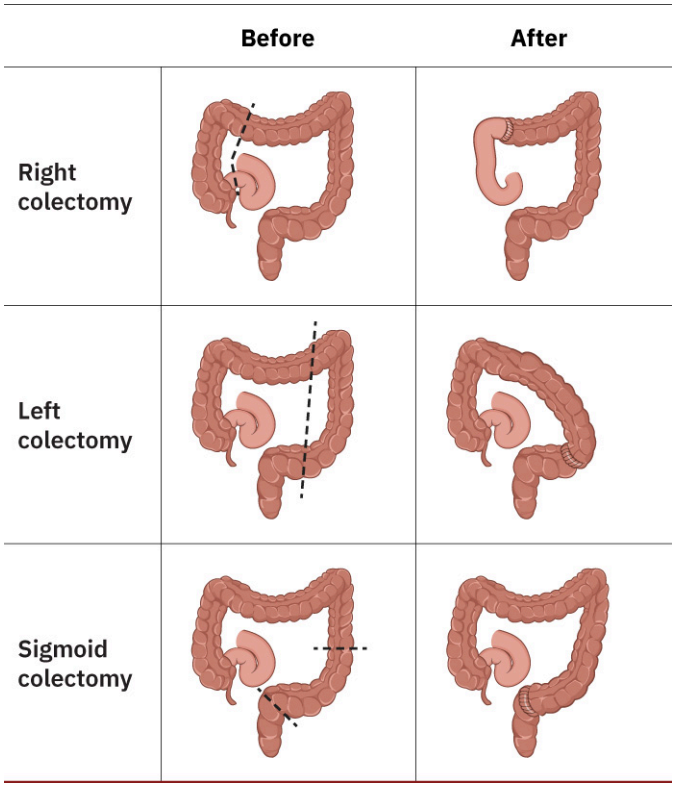


FIGURE 19.15 This illustration shows three common types of surgical resection to treat colorectal cancer. (credit: modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Appendicitis

Inflammation of the appendix is called **appendicitis**. It occurs more often in men and is most common in people aged 10 to 30 years (Jones et al., 2023). It occurs acutely without warning.

Pathophysiology

Appendicitis is most often caused by an obstruction within the appendiceal orifice. This creates an inflammatory response, which can lead to local ischemia and perforation. Perforation causes the spilling of bacteria and bowel contents into the peritoneal cavity, causing a contained abscess or peritonitis. When peritonitis is left untreated, it can lead to fatal complications, such as sepsis and septic shock.

LINK TO LEARNING

Watch this video for an explanation about the pathophysiology of appendicitis (https://openstax.org/r/77appendicitis) as well as examination, diagnosis, and treatment.

Clinical Manifestations

A patient with appendicitis will present with right lower quadrant or periumbilical pain. The patient may also report anorexia, nausea, vomiting or diarrhea, fever malaise, and urinary frequency or urgency.

Assessment and Diagnostics

An initial abdominal assessment will reveal right lower quadrant pain. A positive **Rovsing sign** (palpation of the left lower quadrant worsens right lower quadrant pain) is also an indicator of appendicitis. The patient may also have a fever, tachycardia, and tachypnea.

Common signs of acute peritonitis found during a physical assessment are:

- guarding: the patient consciously tenses the abdominal muscles in anticipation of pain
- rebound tenderness: pain that occurs after the removal of manual pressure to the abdomen
- rigid abdomen: stiffness of the abdominal muscles that the patient cannot relax

Other signs of peritonitis are fever, fluid in the abdomen, chills, abdominal distention and pain, constipation, and vomiting. Bloodwork and imaging can confirm appendicitis. The patient's white blood cell (WBC) count may be elevated, indicating infection. Ultrasound or CT scan of the abdomen may be performed for diagnosis or to visualize the extent of disease. Diagnostic tests for peritonitis include blood, urine, x-ray, and CT imaging.

Interdisciplinary Management

The patient will most likely need surgical removal of the appendix, called **appendectomy**. This can be done laparoscopically or by open surgery, depending on the severity of disease. Antibiotics will be given to treat infection. IV fluids may be necessary of the patient has to remain NPO for a time. Interdisciplinary care will involve the nurse, provider, surgeon, nutritionist, and infectious disease provider.

Treatment for peritonitis depends on the severity of the infection, and can range from IV antibiotics, surgery, medications for organ support, IV fluids, or a combination of treatments (Jones et al., 2023)

Diverticular Disease

The condition **diverticulosis** is the asymptomatic presence of **diverticula**, or sac-like protrusions, on the walls of the large intestine (Figure 19.16). Diverticulosis occurrence is 20% in adults aged 40 to 60 years, but up to 60% after the age of 60 (Pemberton & Strate, 2023). When diverticulosis becomes symptomatic, **diverticular disease** occurs; it is estimated to occur in 25% of people with diverticulosis (Tursi et al., 2020). A similar term, **diverticulitis**, refers to inflammation of the diverticula. The inflammation can remain contained or spread from the perforation to cause peritonitis.

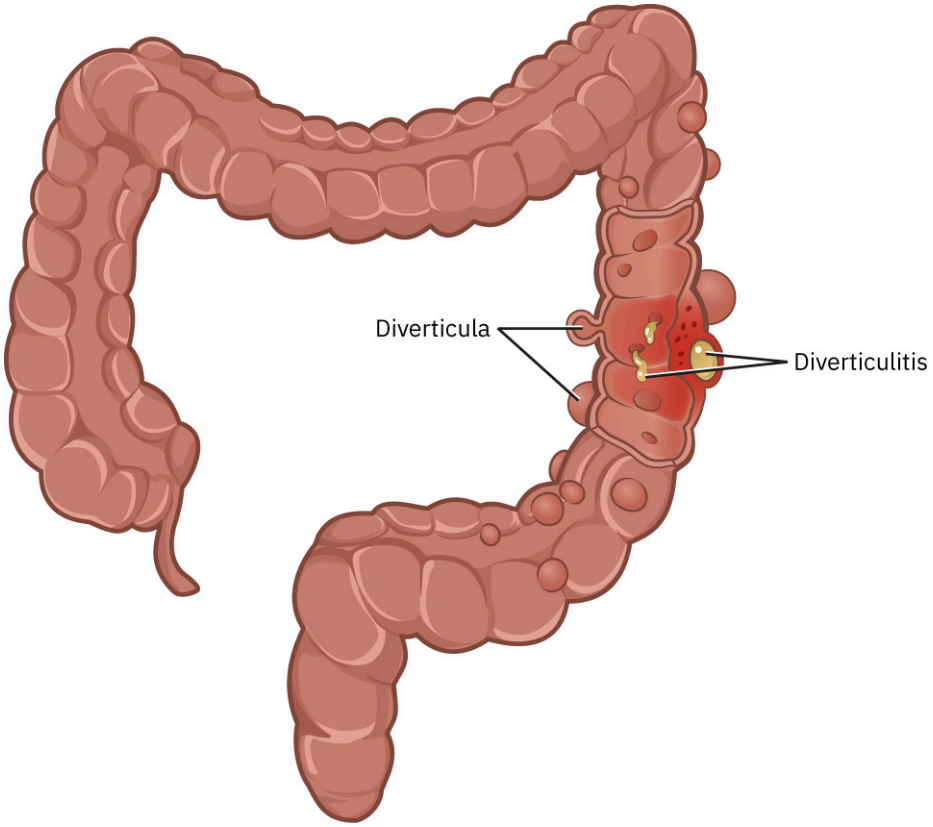


FIGURE 19.16 Diverticulosis is the asymptomatic presence of diverticula, or protrusions, on the walls of the large intestine. When the diverticula become inflamed, the condition is known as diverticulitis. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Pathophysiology

Although the exact pathophysiology of diverticular disease is unknown, it is thought to have various manifestations. Connective tissue abnormalities in the intestine are thought to be the cause of development of asymptomatic diverticulosis. Gut microbial changes and certain medications are believed to cause acute diverticulitis and diverticular hemorrhage. The disease can be acute or chronic. Risk factors for diverticulosis include older age, male sex, smoking history, and higher BMI.

Clinical Manifestations

Patients with diverticular disease may present with nonspecific GI symptoms such as lower abdominal pain, bloating, and diarrhea. In severe cases, fever or bloody stools may be present.

Assessment and Diagnostics

Subjective and objective data are gathered, and any clinical manifestations are noted. A physical assessment may reveal abdominal pain on palpation. Routine testing, such as bloodwork, urinalysis, and stool testing, may be done to narrow down a cause for symptoms. A CT scan of the abdomen can show any inflammation in the intestines. A colonoscopy and sigmoidoscopy can show the pockets of inflammation and disease within the intestines.

Interdisciplinary Management

In some cases, mild disease may resolve on its own. The interdisciplinary team, including the nurse, gastrointestinal provider, and nutritionist, work together to develop a treatment plan. Treatment may include

- a liquid diet to rest the intestines, reduce inflammation, and promote healing
- antibiotics, if infection is the suspected cause
- over-the-counter pain relief

If there is active bleeding in the intestines, the patient may need blood transfusions. If the bleeding does not resolve, surgical intervention may be necessary. Abscess drainage may be performed by a radiologist using local anesthesia. In serious instances, a **fistula** (a hole in the wall of the intestine) may occur. This requires surgical

intervention to remove the section of the colon involved.

READ THE ELECTRONIC HEALTH RECORD

Caring for a Patient with Abdominal Pain

Patient Information
Name: Johanna Dear
Age: 65 years
Sex: Female
Chief complaint:

- Severe abdominal pain, primarily in the lower left quadrant, for the past 48 hours

Medical history:

- Diagnosed with diverticular disease 5 years ago.
- History of hypertension, well-controlled with medication
- Previous episodes of mild diverticulitis, treated successfully with antibiotics

Vital signs:

- Temperature: 101.3°F (38.5°C)
- Heart rate: 95 bpm
- Blood pressure: 140/85 mm Hg
- Respiratory rate: 20 breaths per minute
- Oxygen saturation: 98% on room air

Recent laboratory results:

- WBC count: 14,000 /µL (elevated)
- Hemoglobin: 13.5 g/dL (normal)
- Hematocrit: 40.5% (normal)
- Platelets: 250,000 /µL (normal)
- C-reactive protein (CRP): 50 mg/L (elevated)
- Electrolytes:
  - Sodium: 138 mmol/L (normal)
  - Potassium: 4.0 mmol/L (normal)
  - Chloride: 102 mmol/L (normal)
  - Bicarbonate: 22 mmol/L (normal)
- Blood urea nitrogen: 18 mg/dL (normal)
- Creatinine: 1.0 mg/dL (normal)

Imaging Results

- CT scan of abdomen and pelvis: Findings consistent with acute diverticulitis. Presence of inflamed diverticula in the sigmoid colon with pericolonic fat stranding. No abscess or free air noted.

Progress notes:

- Patient reports increased severity of abdominal pain and tenderness over the past 2 days.
- Appetite has decreased, and he has experienced occasional nausea.
- No vomiting, diarrhea, or changes in bowel habits reported.
- Patient has been compliant with hypertension medications.
- Mild fever observed upon admission.

Current medications:

- Lisinopril 10 mg daily (for hypertension)
- Acetaminophen 500 mg every 6 hours as needed for pain
- Ciprofloxacin 500 mg twice daily
- Metronidazole 500 mg three times daily

1. What information in the patient's chart concerns you?
2. What information is the most concerning?
3. What is an expected finding?
4. What information should you question?

Inflammatory Bowel Disease

Chronic inflammation of the GI tract is called **inflammatory bowel disease (IBD)**. The two main types of IBD are Crohn's disease and ulcerative colitis. **Crohn's disease (CD)** is inflammation that can occur in multiple layers of the bowel, in any segment of the GI tract. The second main type, **ulcerative colitis (UC)**, is inflammation that occurs only in the innermost wall of the large intestine and colon. IBD occurs in 1.3% of adults in the United States (CDC, 2022a) and most often in people aged 15 to 30 years old (McDowell et al., 2023).

Pathophysiology

Chronic mucosal inflammation in the GI tract occurs in IBD, leading to edema, bleeding, ulcers, and electrolyte loss. In UC, inflammation usually begins in the colon, then spreads, whereas CD can begin anywhere throughout the tract and can create a **skip lesion**, or a patchy area of inflammation that skip over some areas. CD can lead to complications, such as strictures and fistulas, and can predispose patients to other diseases, such as arthritis, kidney disease, and gallstones (McDowell et al., 2023

Clinical Manifestations

The clinical manifestations of IBD are weight loss, abdominal pain and bloating, and diarrhea. There may be secondary symptoms present, such as vomiting, fever, redness or pain of the eyes, skin rash, and joint pain. Stress can worsen the symptoms but is not the cause of the disease.

Assessment and Diagnostics

As the nurse performs a physical assessment, tachycardia, fever, anxiety, pallor, and signs of dehydration may be noted. In more serious cases of IBD, anal fistulas, abscesses, or rectal prolapse may be seen. A patient may also have a history of unexplained weight loss, distended painful abdomen, and diarrhea.

An IBD diagnosis will be based on clinical and imaging findings, endoscopic biopsies, and inflammatory laboratory markers. Endoscopy, colonoscopy, or both will allow the practitioner to biopsy tissue and confirm an IBD diagnosis (Table 19.8) (McDowell et al., 2023). Parasitic diseases will also be ruled out. An abdominal x-ray may be performed to rule out bowel obstruction, free air, or **toxic megacolon** (nonobstructive dilation of the colon that is associated with systemic toxicity).

Test	Purpose	Nursing Considerations
Endoscopy	Visualizes the lining of the esophagus, stomach, and small intestines; can be used to collect tissue samples; treat small issues, such as bleeding vessels; clip growths; or remove foreign objects	Monitor the patient after testing for breathing or swallowing difficulty.
Colonoscopy	Visualizes the lining of the large intestines, colon, and rectum; can be used to collect tissue samples; treat small issues, such as bleeding vessels; clip growths; or remove foreign objects	Monitor for abdominal cramping and bloating; encourage the patient to pass gas.

TABLE 19.8 Common Diagnostic Testing for IBD

Nursing Care of the Patient with IBD

The nursing care of the patient with IBD will involve ongoing assessments and encouragement of nutrition. Patient education and reassurance about any testing or procedures will be done.

Recognizing Cues and Analyzing Cues

The nurse providing care to a patient with IBD uses both objective and patient-reported data to optimize care. Subjective data may include the patient's report of acute abdominal pain, bloating, diarrhea, nausea, and vomiting. Vital signs are evaluated, with a focus on blood pressure and heart rate. Physical assessment may reveal abdominal pain on palpation.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Signs of acute infection or bleeding are a high priority. Monitor the patient's vital signs for an increase in temperature and heart rate, or reduction in blood pressure. Review diagnostic studies and laboratory test results and assist as necessary to prepare the patient for any procedures. Provide patient education about the disease process, diagnostic testing, and treatment plan.

Evaluation of Nursing Care and Outcomes for the Patient with IBD

Symptom improvement and prevention of complications are indications of optimal nursing care. The patient should also have a good understanding of the disease process, treatment plan, and dietary modifications needed to prevent recurrence. The primary patient outcome related to IBD management is symptom improvement. The nurse should evaluate how often symptoms are occurring and note a reduction in the frequency and severity. The patient should also be able to recite information about the disease process and remain compliant with treatment and diet modifications. If these goals are not met, interventions may have to be adjusted.

Medical Therapies and Related Care

Treatment goals are to induce remission of IBD and maintain management of the disease. Drug therapy may be introduced for symptom relief, long-term remission, and to reduce risk of complications. Medications may include

- antibiotics to treat infection
- anti-inflammatory drugs to reduce inflammation
- biologics to neutralize proteins that may be causing inflammation
- immunosuppressant therapy to prevent the body's immune response from attacking healthy intestinal cells
- pain relievers, such as acetaminophen
- vitamins and supplements to treat any deficiencies

Surgery may be indicated in more severe cases to repair or remove diseased bowel. Dietary recommendations may include avoiding carbonated beverages and high-fiber foods.

19.6 Hepatic and Biliary Disorders

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations of hepatic and biliary disorders
- Describe the diagnostics for and laboratory values monitored in the management of hepatic and biliary disorders
- Apply nursing concepts and plan associated nursing care for the patient with hepatic and biliary disorders
- Evaluate the efficacy of nursing care for the patient with hepatic and biliary disorders
- Describe the medical therapies that apply to the care of hepatic and biliary disorders

The liver plays a critical role in the body. It contributes to metabolism, storage of fat-soluble vitamins, protein synthesis, detoxification, and bile production. Bile helps the body digest fats. The pancreas assists in regulation of blood sugar and in digestion of food. This section discusses jaundice, ascites, liver failure, cirrhosis, hepatic encephalopathy, pancreatitis, and pancreatic cancer.

Manifestations of Liver Dysfunction

Manifestations of liver dysfunction are jaundice, hemolytic jaundice, hepatocellular and obstructive jaundice, and portal hypertension.

Jaundice

Jaundice occurs when skin and **sclera** (whites of the eyes) (Figure 19.17) turn yellow as a result of too much bilirubin in the body. Bilirubin is a yellow chemical in hemoglobin, the substance that carries oxygen in red blood

cells. As red blood cells break down, the old ones are processed by the liver. If the liver cannot properly process the old blood cells, bilirubin builds up and causes the skin and sclera to appear yellow. New onset of jaundice should always be reported to the health care provider. Jaundice can be classified into three types: hemolytic (prehepatic), hepatocellular (hepatic), and obstructive (posthepatic). For nursing care consideration, the nurse is to monitor the underlying cause for the jaundice and report any changes in patient condition or worsening jaundice.

FIGURE 19.17 Jaundice can be seen on the skin and sclera. ("Jaundice" by OpenRN/*Nursing Skills*, 2e, CC BY 4.0)

Hemolytic Jaundice

Hemolytic occurs when there is excessive red blood cell break down that overwhelms the ability of the liver to process the breakdown. It is commonly seen in newborns and resolves rapidly. In adults, the causes can include penicillin, inherited blood disorders (sickle cell anemia or thalassemia), *Escherichia coli* infections, blood transfusion complications, bone marrow failure, and autoimmune conditions. In this instance, the nurse will continue to monitor hemolytic parameters and manage underlying causes to reduce hemolysis.

Hepatocellular and Obstructive Jaundice

Hepatocellular jaundice is a sign of dysfunction of the liver cells and indicates the liver is not properly conjugating bilirubin. Causes include infection, alcoholic liver disease, hereditary or autoimmune conditions, and cancer. Obstructive jaundice is caused by an obstruction preventing biliary drainage. The most common cause of obstructive jaundice is a gallstone blocking the common bile duct, but it can also be caused by certain cancers, strictures, or drug-induced cholestasis (Teach Me Surgery, 2022).

Portal Hypertension

Another liver condition, **portal hypertension**, is an increase in pressure within the portal venous system because of resistance to portal blood flow. This is often caused within the liver from cirrhosis, or outside the liver from thrombosis or pericarditis (Oliver et al., 2023). This increased pressure can cause **varices** (abnormal dilation of the veins) in the stomach (Figure 19.18), esophagus, spleen, and pancreas. Without treatment, portal hypertension can cause complications such as variceal bleeding, ascites, hepatorenal syndrome, infection, and cardiomyopathy.

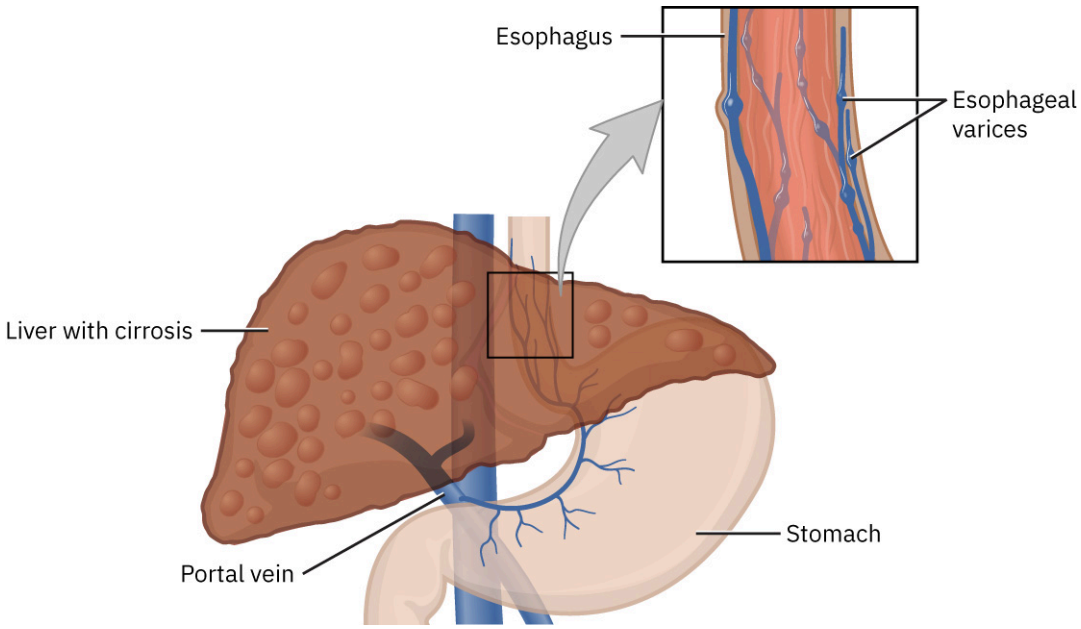


FIGURE 19.18 Varices in the esophagus caused by increased pressure in the portal vein. (credit: modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Ascites

Ascites is an accumulation of fluid in the peritoneal cavity (Figure 19.19) that is caused by cirrhosis of the liver. Less than 2 percent of the population is diagnosed with liver disease. Ascites can cause discomfort and affect the patient's quality of life as it progresses.

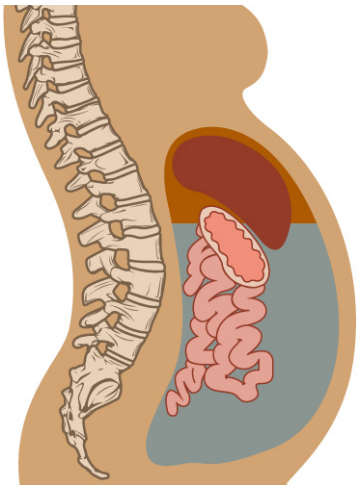


FIGURE 19.19 Ascites is a condition in which the abdominal cavity fills with fluid that shifts from the intravascular to the interstitial space, resulting in hypovolemia. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license.)

Nursing Care of the Patient with Ascites

Nursing care for the patient with ascites includes monitoring for complications, patient education, and assistance with treatment ordered. These include

- administering medications
- documenting daily weights and abdominal girth measurement
- educating patients
- monitoring laboratory values, such as sodium levels
- monitoring vital signs and intake and output

Recognizing Cues and Analyzing Cues

Physical assessment findings may include jaundice, bruises, muscle wasting, peripheral edema, tachypnea, and

abdominal distention and tenderness. Vital signs may reveal tachypnea. Provide oxygen as ordered and appropriate.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Signs of respiratory distress and inadequate oxygenation are a high priority. Lack of ability to take deep breaths can cause the patient to develop pneumonia. Encourage the patient to use an incentive spirometer and perform cough and deep breathing exercises while lying in bed to clear mucosal secretions and prevent pneumonia. Assist with obtaining any laboratory studies or blood cultures ordered, as appropriate.

Evaluation of Nursing Care and Outcomes for the Patient with Ascites

Symptom improvement is a sign of effective nursing care. The patient should have a decrease in abdominal growth, decrease in pain, improved oxygenation, and stable vital signs. It is important to monitor interventions and adjust as necessary to meet goals. The primary patient outcome related to ascites management is treatment of the underlying cause and reduction of ascites. The patient reporting an improvement in symptoms, improved laboratory studies, and the patient demonstrating knowledge of their disorder and the importance of treatment compliance are all indications of positive outcomes.

Medical Therapies and Related Care

A sodium-restricted diet will help control fluid retention. A dietitian will also be involved in the patient's care to help create a healthy meal plan that is low in sodium. Diuretics may also be prescribed to limit fluid retention. A paracentesis may need to be done periodically to remove ascetic fluid. A transjugular intrahepatic portosystemic shunt (TIPS) procedure may be performed in advanced cases of liver disease to lower portal vein pressure and decrease fluid buildup (Figure 19.20).

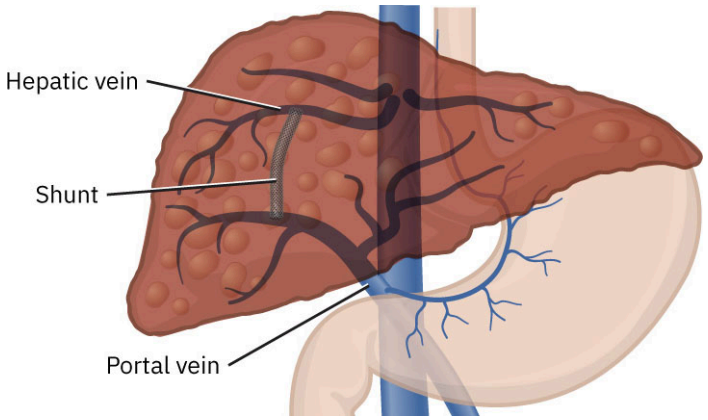


FIGURE 19.20 This illustration shows a TIPS procedure, whereby blood is shunted from the portal vein into the hepatic vein to decrease pressure and fluid buildup. (credit: modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Liver Disease

Any condition that causes damage to the liver and prevents it from properly functioning is called **liver disease**. Liver disease can be acute (occur over days or weeks) or chronic (occur gradually over months or years). In the United States, liver disease is the twelfth leading cause of death (American Liver Foundation, 2022). Chronic liver disease progresses in four stages: inflammation, fibrosis, cirrhosis, and end-stage liver disease (ESLD). Once ESLD occurs, the liver no longer can function or heal itself. Liver disease is caused by conditions, such as hepatitis (Table 19.9) or other viral infections, cancer, toxins, genetic conditions, and autoimmune disorders. Inflammation of the liver caused by exposure to drugs, alcohol, toxins, or autoimmune disease is called **nonviral hepatitis**; **viral hepatitis** is inflammation of the liver caused by a virus. The most common types of viral hepatitis are A, B, C, D, and E.

Hepatitis Virus Type	Cause	Symptoms	Treatment
C	Exposure to blood or semen of an infected person; commonly transmitted through needle sharing from drug use or tattoos; can also be transmitted to an infant born to an infected mother	Occur 2–12 weeks after exposure; can include • chronic Fatigue • depression • abdominal pain • nausea • vomiting • loss of appetite • fever • fatigue • dark urine • clay-colored bowel movements • joint pain • jaundice	95% curable within 2–3 months with medications
D	Can only infect a patient who already has hepatitis B virus infection (called superinfection) or by being exposed to both simultaneously (called coinfection); transmitted through blood or body fluids	Occur 3–7 weeks after infection; can include • abdominal pain • nausea • vomiting • loss of appetite • fever • fatigue • dark urine • clay-colored bowel movements • joint pain • jaundice	There is no cure; treatment is based on supportive care.

TABLE 19.9 **Hepatitis** (CDC, 2023)

Hepatitis Virus Type	Cause	Symptoms	Treatment
E	Fecal-oral route; transmitted by consuming contaminated or uncooked meats, such as pork, boar, venison, or seafood	Occur approximately 40 days after exposure; include • anorexia • nausea • vomiting • abdominal pain • jaundice	Self resolves without treatment
G; GB virus type C	Exposure to blood or semen of an infected person; on occasion from mother to neonate	HGV is often asymptomatic. In some cases, mild symptoms include fatigue abdominal discomfort mild jaundice GBV-C is typically asymptomatic; occasionally associated with mild hepatitis symptoms	HGV has no specific antiviral treatment required as it generally does not cause chronic liver disease; management focuses on monitoring liver function and addressing any associated liver conditions. GBV-C has no specific antiviral treatment available; typically, management involves monitoring and supportive care, especially if there is coinfection with other hepatitis viruses.

TABLE 19.9 Hepatitis (CDC, 2023)

LINK TO LEARNING

Click here to learn about Recommendations for Testing, Managing, and Treating Hepatitis C (https://openstax.org/r/77hepatitisCrec) developed by the American Association for the Study of Liver Disease and Infectious Diseases Society of America.

Pathophysiology

In chronic liver disease, inflammation occurs as a natural response to injury, but liver cells are not able to properly regenerate. An overproduction of collagen is created from the persistent inflammatory state, stiffening the area and causing scarring or fibrosis to occur. Without treatment, the fibrosis continues, replacing healthy cells and leading to **cirrhosis**, or severe scarring of the liver (Figure 19.21). It is most commonly caused by chronic alcohol use and hepatitis. The cirrhosis continues until there are no healthy liver cells left and the liver is no longer able to function, causing ESLD.

Acute liver disease progresses much more quickly and begins with inflammation, massive necrosis, and autonomous cellular dismantling of liver cells. The inflammation in the liver can trigger microglia activation in the brain, cause disruptions in the blood-brain barrier, and lead to astrocyte swelling and cerebral edema (Shah et al., 2023).

Causes of cirrhosis include

- alcohol-induced hepatitis from chronic heavy alcohol use
- autoimmune diseases, such as autoimmune hepatitis, primary biliary cholangitis, or primary sclerosing cholangitis

- cardiovascular disease, such as congestive heart failure
- chronic hepatitis B infection
- chronic hepatitis C infection
- genetic disorders, such as cystic fibrosis, glycogen storage disease, or Wilson disease
- nonalcohol-related steatohepatitis (fatty liver disease) from high lipids, diabetes, or hypertension
- toxic hepatitis from long exposure to environmental toxins or use of certain medications

Treatment for liver disease includes treating the underlying cause with antivirals, corticosteroids, immunosuppressants, and substance use disorder treatment; healthy diet and lifestyle; and treating complications appropriately, such as endoscopy for esophageal varices, paracentesis for ascites, and beta blockers for portal hypertension (Cleveland Clinic, 2023a).

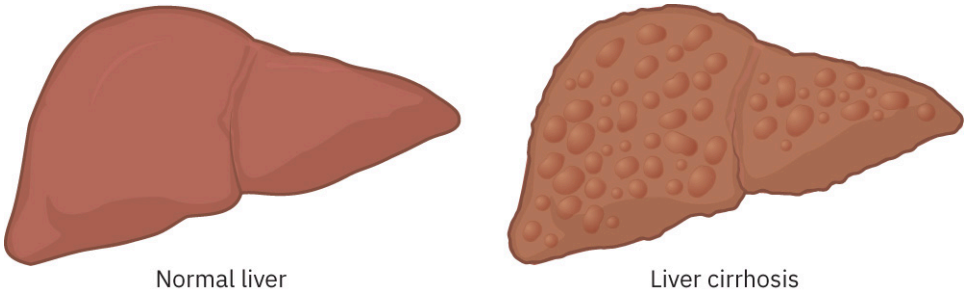


FIGURE 19.21 Compared with a normal liver, a liver with cirrhosis shows severe scarring. (credit: modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Clinical Manifestations

Signs of chronic liver disease may be nonspecific and include anorexia, weight loss, fatigue, ascites, esophageal varices, or jaundice (Sharma & Nagalli, 2023). Signs of acute liver failure may include hypotension, altered mental status, fever, jaundice, right upper quadrant pain, ascites, jaundice, or fluid overload (Shah et al., 2023). Signs and symptoms of cirrhosis include

- ascites
- dark-colored urine
- decreased urine output
- digestive problems
- edema
- hepatic encephalopathy
- jaundice
- light-colored stools
- motor dysfunction
- pruritus
- shortness of breath
- unexplained weight loss

Assessment and Diagnostics

A physical assessment may reveal a change in mental status, jaundice, ascites, peripheral edema, **gynecomastia** (enlarged breast tissue in male patients), **testicular hypertrophy** (enlarged testis), or **testicular atrophy** (testes reduced in size), muscle wasting, signs of GI bleeding, pruritus, encephalopathy, and right upper quadrant pain.

Liver function tests may show increased alanine transaminase (ALT) level and aspartate aminotransferase (AST) levels, bilirubin and prothrombin times will be increased, and albumin level decreased. Blood ammonia levels may be elevated, indicating hepatic encephalopathy (Table 19.10).

Category	Description
Symptoms	• Asterixis, or flapping movements, when the patient holds out the arms • Hyperreflexia • Muscle twitching • Cognitive impairment • Anxiety or irritability • Balance or coordination problems
Diagnosis	• Confirm liver disease. • Rule out other causes, such as alcohol withdrawal syndrome; stroke; intracranial lesions, masses, or infection; or postseizure encephalopathy. • Serum ammonia levels are often increased.
Treatment	Identify and treat the underlying cause. Treatment may include • Antibiotics • Lactulose • L-ornithine and l-aspartate preparation • Zinc • Prophylactic intubation to protect from aspiration or respiratory compromise

TABLE 19.10 Hepatic Encephalopathy (Mandiga et al., 2023)

Abdominal ultrasound can diagnose cirrhosis, portal hypertension, or thrombus. A CT or MRI scan will help the radiologist evaluate the shape and size of the liver and measure its fibrosis or elasticity (Cleveland Clinic, 2023a). A liver biopsy can confirm chronic liver disease. A toxicology screen, acetaminophen level, and serologies for viral hepatitis, HIV, and autoimmune markers may be ordered to determine causes.

Nursing Care of the Patient with Liver Disease

Nursing care of the patient with liver disease focuses on supporting body systems, reducing risk of injury, monitoring and managing complications, improving nutritional status, providing skin care, and education. The patient's mental status may range from alert to lethargic. The head of the bed should remain elevated. This helps facilitate venous drainage from the head (because of gravity), reducing intracranial pressure. Elevating the head of bed also helps with aspiration prevention during meals. Ensure the patient's skin is kept clean and dry and apply lotion to prevent itch. Educate the patient and family about the importance of maintaining a healthy diet.

Recognizing Cues and Analyzing Cues

The nurse caring for a patient in acute liver failure needs to be alert for cues. Any change could indicate a worsening in condition. Cues could include a decline in mental status, bleeding from an old venipuncture sites and orifices, or a reduction in urine output.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

A mental status decline accompanying an increase in ammonia level may indicate hepatic encephalopathy. The bleeding at a venipuncture site followed by oozing of blood from every site or orifice available could indicate coagulopathy, such as disseminated intravascular coagulation. A drop in urine output could indicate that kidney function is compromised.

Evaluation of Nursing Care and Outcomes for the Patient with Liver Disease

The evaluation of nursing care will explore all aspects of care. The first evaluation will be to determine if the goal was met. Goals may include (1) The patient will maintain urine output of at least 30 mL/hour by end of shift; and (2) the patient will experience no signs or symptoms of infection. Other goals may be written that are patient specific.

The primary patient outcome related to liver disease management is to preserve health and reduce complications. Subjective data reported by the patient can inform the nurse if symptoms of dyspnea and pain have improved.

Reviewing trends of vital signs, weight, and abdominal girth measurements can provide objective data about improvements in fluid retention. Comparing other data, such as laboratory values, can indicate trends reflecting the patient's liver function, effectiveness of medications, and nutritional status.

Medical Therapies and Related Care

Treatment of liver disease is interdisciplinary and involves stopping progression of disease and preventing complications. Although cirrhosis is not curable, treatment of the underlying cause can slow or prevent the progression to liver failure.

Common complications seen with chronic liver disease are esophageal varices, hepatic encephalopathy, **hepatorenal syndrome** (kidney dysfunction in patients with advanced liver disease), and hepatocellular carcinoma. Complications of acute liver disease can include sepsis, cerebral edema, multiorgan failure, and death.

Other specific treatments include viral suppression for viral hepatitis; alcohol abstinence; treatment of metabolic syndromes; identification and cessation of use of drugs or toxins; and immunosuppression and prescription of corticosteroids for autoimmune disorders. Once a patient has reached ESLD, organ transplantation is the final option for treatment.

ESLD and Liver Transplantation

Liver transplantation is the proven treatment for patients with ESLD. The healthy liver may be a whole liver from a deceased organ donor or a partial liver from a living donor (Figure 19.22). A partial liver can regenerate to full size within a few months. The **Model of End-Stage Liver Disease (MELD) Score** is used to predict survival of patients with cirrhosis and is a tool used to prioritize organ allocation for liver transplantation.

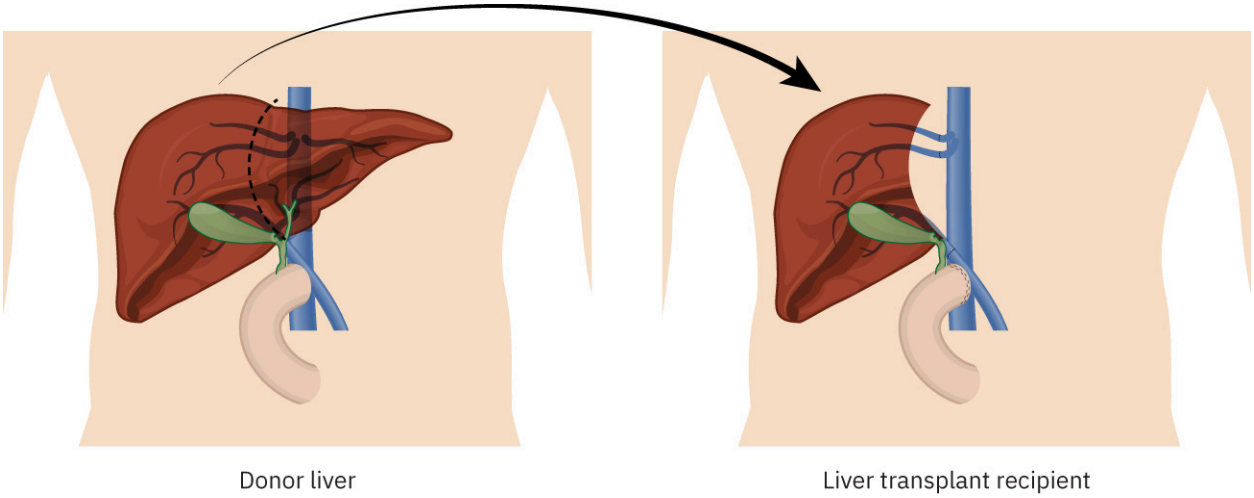


FIGURE 19.22 This illustration shows a right-side lobe, living-donor liver transplant. (credit: modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Indications

The indication for liver transplantation is ESLD. It can be caused by conditions such as:

- acute liver failure
- alcohol-related liver disease
- autoimmune hepatitis
- chronic hepatitis C
- hepatitis B
- hepatocellular carcinoma
- nonalcoholic steatohepatitis
- primary biliary cirrhosis
- primary sclerosing cholangitis
- Wilson disease

Contraindications to liver transplantation include a MELD score less than 15, advanced cardiac or pulmonary

disease, acquired immunodeficiency syndrome, active substance and/or alcohol use disorder, metastatic cancer, lack of psychosocial support, severe psychologic disease, and untreated shock or sepsis.

Immunosuppression

The goals of immunosuppression are to reduce the risk of graft rejection and minimize recurrent disease and adverse effects. Although most drug regimens are transplant-center specific, most programs use a glucocorticoid (prednisone), a calcineurin inhibitor (tacrolimus), and an antimetabolite (mycophenolate) (Vierling & Brandman, 2023). Immunosuppression medications must be taken for life, and the patient must be educated on the importance of not missing a dose and ensuring they do not run out of medication. A complication of immunosuppression is increased susceptibility to infection. Provide patient education about proper hand hygiene and avoiding large crowds.

Ethical Considerations

Alcohol-related liver disease is the leading cause for liver transplantation in the United States. There is controversy regarding the ethical issues that arise from determining which patients with a history of alcohol or drug use disorders can receive organs, especially in patients with less than 6 months of sobriety. Patients who are determined to be a high risk for future drug or alcohol use are often not considered for transplantation. Patients with poor social support systems, recent mental health crisis, and a history of medical noncompliance can also be contraindicated for transplant.

Black people and women have lower rates of referral to transplant centers, and patients with public insurance have worse post-transplant outcomes than patients with private insurance (Wahid et al., 2020). Locations of transplant centers also tend to be in predominantly White neighborhoods, causing non-White patients to have to travel farther for care.

Care of the Patient Receiving a Liver Transplant

On the inpatient side, the patient will be admitted to the ICU and will have vital signs recorded a minimum of every hour, as well as intake and output data. Any parameter that falls outside the desired will be referred to the critical care provider. This will occur for 2 to 3 days. Then, the patient will be transferred to a medical-surgical unit. The patient will have a routine postoperative experience: tolerating foods, ambulation, incentive spirometry, splinting, and lots of education on liver transplant care. The patient must know when to call the provider, signs and symptoms of an infection, organ rejection, lymph node enlargement, and skin changes. All routine cancer screenings should be completed in a timely manner.

Food and nutrition are important, and the patient should strive to eat healthy, balanced meals. Alcohol should be avoided. Consumption of water from lakes or rivers, unpasteurized milk, and raw or undercooked eggs, meats, and seafood may increase risk of infection. In addition, the patient should limit their intake of salt, cholesterol, fat, and sugar.

Disorders of the Gallbladder

The gallbladder stores and concentrates bile from the liver. The bile is then released into the duodenum, where it helps the body break down and absorb fats from food. Inflammation of the gallbladder is **cholecystitis**. A gallbladder stone is called a **cholelithiasis**. It is made from substances in the gallbladder and is benign unless it moves and blocks the common bile duct, a condition called **choledocholithiasis**, in which case, urgent surgery is required (Figure 19.23).

Women of all ages are more likely than men to have gallbladder disease and gallstones, possibly due to estrogen levels. Age and family history also are risk factors. American Indians have genes that affect cholesterol in bile, resulting in the highest rate of gallstones in the United States. Additionally, Mexican Americans are also at a significant risk of developing gallstones. Individuals with metabolic syndrome, diabetes with insulin resistance, and fast weight loss are all at elevated risk.

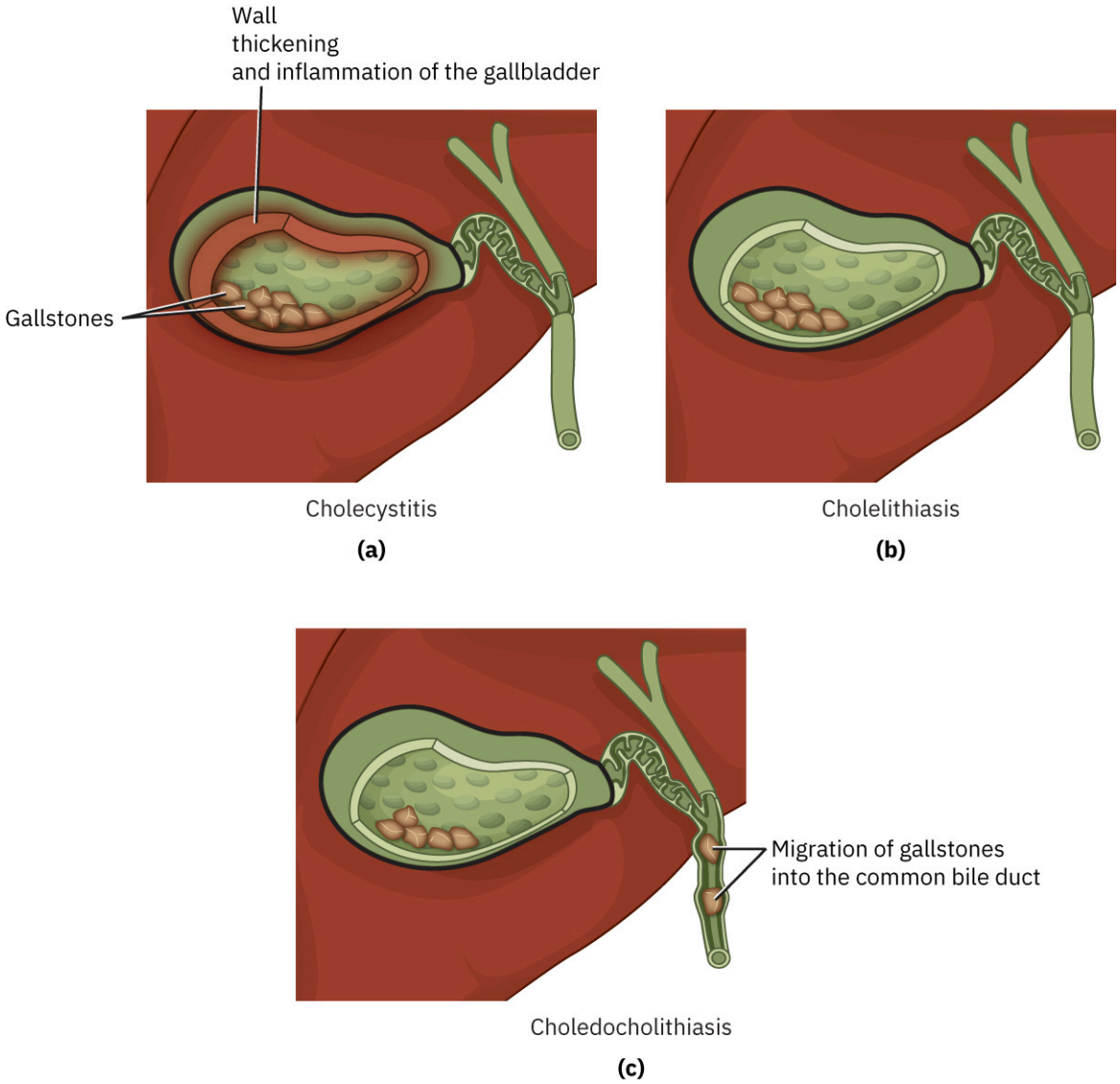


FIGURE 19.23 The illustration here shows the differences among(a) cholecystitis, (b) cholelithiasis, and (c) choledocholithiasis. (credit: modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Pathophysiology

Gallstones can be formed by cholesterol or bilirubin and can range in size. Stones may temporarily block the cystic duct or pass into the common bile duct, creating temporary symptoms called biliary colic (Steel, 2022). Occlusion of the cystic duct for an extended period can cause acute cholecystitis. Occlusion of the common bile duct causes choledocholithiasis. This can lead to infection and inflammation of the bile duct system.

Clinical Manifestations

Gallstones are often asymptomatic and do not produce symptoms unless they block the common bile duct. Symptoms can include sudden severe pain in the right upper abdomen, nausea, and vomiting. Symptoms of cholecystitis include

- abdominal bloating
- chills
- dark urine
- fever
- jaundice
- nausea, vomiting
- severe, sudden right upper quadrant pain that becomes sharp when palpated

- sharp pain when breathing in

Assessment and Diagnostics

The nurse will complete a focused subjective history and physical assessment. The patient may present with classic reports of severe right upper quadrant pain, nausea and vomiting. A physical assessment may reveal jaundice, abdominal bloating, and stiff abdominal muscles.

Although laboratory values may be normal in cases of cholelithiasis, the patient's WBC count may be elevated. AST, ALT, and alkaline phosphatase levels may also be elevated, which increase the patient's risk for bleeding. Blood cultures may be completed if the patient is febrile. Other bloodwork may be completed to rule out other conditions, such as pancreatitis. An ultrasound is the most common diagnostic imaging procedure performed to diagnose both cholecystitis and cholelithiasis. Other diagnostic imaging, such as a CT scan or hepatic 2,6-dimethyliminodiacetic acid (HIDA) scan, may be completed.

Nursing Care of the Patient with Gallbladder Disorders

Patients with gallbladder disorders are at risk for fluid volume deficit and imbalanced nutrition. Nursing care to prevent these risks include

- accurate monitoring of intake and output
- administering pain medications as ordered
- assessing for abnormal bleeding
- encouraging food intake
- monitoring for increased or continued nausea and vomiting
- providing patient education about the disease, treatment, and prevention

Recognizing Cues and Analyzing Cues

Using both subjective and objective data will help optimize care. Subjective data can include the patient's report of pain, nausea, and vomiting. Vital signs may show hypotension from fluid loss and fever caused by infection. Jaundice would indicate that the common bile duct is blocked and surgery may be required. The nurse educates the patient about treatment, assists with diagnostic testing, and prepares the patient for surgery.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Patients with gallbladder disorders are at risk for imbalanced nutrition. Interventions the nurse can do to promote adequate nutrition include administering prescribed antiemetic medications, collaborating with the nutritionist to provide foods the patient prefers, encourage ambulation to promote peristalsis, and providing nutritional supplements as ordered.

Evaluation of Nursing Care and Outcomes for the Patient with Gallbladder Disorders

In evaluating the nursing care provided, the nurse examines the goals created and evaluates if they were met. Interventions may be adjusted as needed during care to reach goals. A primary goal for patients with gallbladder disorder is pain relief. The nurse asks the patient about their pain level and if it has improved. The nurse can also look at objective data, such as pain medication use trends. If the patient is not getting adequate pain relief but is not requesting pain medications, the nurse knows that re-education may be needed about pain medication use and the healing process.

Medical Therapies and Related Care

Initially, patients will be NPO and receiving IV fluid therapy to rest the gallbladder and decrease inflammation. Surgery is the recommended treatment for cholecystitis, to either remove the gallstone causing the inflammation or to remove the gallbladder. Surgery can be emergent or scheduled, depending on the severity of symptoms. IV antibiotic therapy is also prescribed in the presence of infection. Pain medications may also be prescribed to control pain. Education about diet encourages patients to avoid foods that can increase recurrence of disease, such as fried foods, fast foods, sugary foods, foods high in saturated fat, cruciferous vegetables, and pectin.

Disorders of the Pancreas

The pancreas has two main functions in the body. It produces insulin to regulate blood sugar levels and produces enzymes to aid in food digestion. When the pancreas cannot function to produce digestive enzymes, malnutrition can occur. This section explores pancreatitis and pancreatic cancer.

Pancreatitis

Inflammation of the pancreas, **pancreatitis**, is the leading cause of GI hospitalizations in the United States (Gapp et al., 2023). Pancreatitis can be acute or chronic. Hospitalization rates for acute pancreatitis are three times higher among Black people than White people (Tang, 2021). Common risk factors to developing pancreatitis include alcohol use disorder, recent history of operative or invasive procedures, a family history of hypertriglyceridemia and gallstones.

Pathophysiology

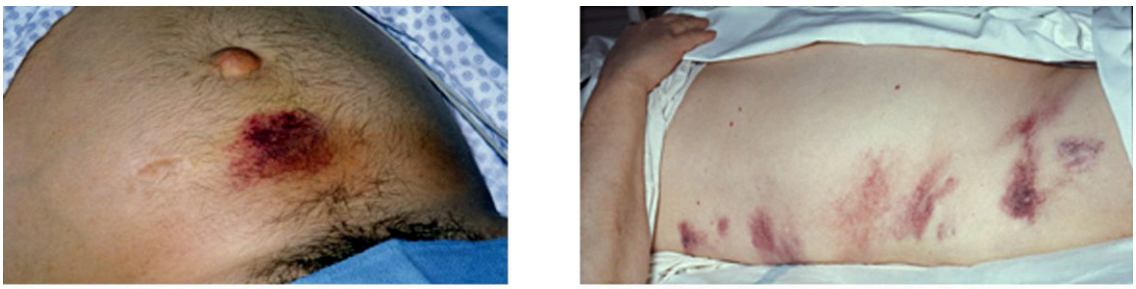
Pancreatitis is caused by an inflammatory response to a duct obstruction, pH imbalance, or problems with calcium homeostasis (Tang, 2021). These may prevent bile from being released to aid in food digestion. Inflammation of the pancreatic tissues eventually leads to tissue damage. If it continues to progress, the pancreas could become necrotic and cause multiorgan dysfunction syndrome.

Clinical Manifestations

Patients may present with severe abdominal pain that may radiate to the chest or back, accompanied by nausea, vomiting, tachycardia, fever, hypotension, and jaundice. Pain may become worse after eating fatty foods. Three assessment signs associated with bleeding in pancreatitis are the Cullen's sign, Grey-Turner's sign, and Fox's sign (Table 19.11 and Figure 19.24).

Assessment	Characterization
Cullen's sign	Ecchymosis over the periumbilical area; indicates peritoneal hemorrhage
Grey-Turner's sign	Flank ecchymosis; indicates retroperitoneal hemorrhage
Fox's sign	Bruising over the inguinal ligament (upper outer thigh); indicates retroperitoneal bleeding

TABLE 19.11 Assessments for Pancreatic Hemorrhage



(a) **(b)**

FIGURE 19.24 (a) Cullen's sign presents as ecchymosis over the periumbilical area and indicates peritoneal hemorrhage. (b) Grey-Turner's sign presents as ecchymosis over the flank area and indicates retroperitoneal bleeding. (credit: Herbert L. Fred, MD and Hendrik A. van Dijk/Wikimedia Commons, CC BY 2.0)

Assessment and Diagnostics

Patients with pancreatitis may present with nonspecific symptoms, such as nausea, vomiting, abdominal pain, tachycardia, and fever. The nature of the pain may vary, depending on the cause of the pancreatitis. Initial bloodwork would be completed to narrow down a cause of symptoms. Pancreatitis will result in an elevated lipase or amylase level. Elevation of liver enzyme levels (e.g., AST, ALT, total bilirubin) may indicate gallstones as the cause of pancreatitis. Calcium, triglyceride, and cholesterol levels will be evaluated depending on the cause of pancreatitis. Glucose levels may be elevated secondary to beta-cell injury in the pancreas. An elevated WBC count may indicate infection. Arterial blood gas samples may be obtained if the patient is experiencing dyspnea. Abdominal ultrasound can detect gallstones. Endoscopic ultrasonography can visualize the pancreas and biliary tract.

Prioritizing Hypotheses, Generating Solutions, and Taking Action
The patient with acute pancreatitis will need aggressive fluid resuscitation, pain management, and strict intake and output monitoring. Blood glucose levels will also be monitored. The patient will need frequent assessments of respiratory status and fluid and electrolytes status. Patient education will be provided on an ongoing basis.

Analysis of subjective and objective data will allow the nurse to provide optimal care. Although subjective data may be nonspecific and include abdominal pain, nausea, and vomiting, objective physical assessment data may reveal jaundice, a positive Cullen's sign, and abdominal rigidity. These would cue the nurse to suspect pancreatitis.

The nurse recognizes that fluid resuscitation is a priority for the first 24 hours. Vital signs should be monitored for signs of overhydration, such as hypertension. Strict intake and output monitoring can allow the nurse to monitor fluid balance.

Evaluation of Nursing Care and Outcomes for the Patient with Pancreatitis
The evaluation of nursing care will include determining if the patient's condition has improved and if goals have been met. Examples of goals are:

- The patient will state pain is reduced to [insert number between 0 and 10].
- The patient will state what causes pancreatitis.
- The patient will verbalize a commitment to follow-up care.

These goals are evaluated, care is adjusted, and the patient continues to receive care unless the health issue does not require the nurse to follow-up. The nurse must evaluate each intervention and the outcome. To evaluate the effectiveness of pain management, the nurse evaluates subjective data provided by the patient, such as ability to rest comfortably with pain at a tolerable level.

Medical Therapies and Related Care
For acute pancreatitis, medical management includes fluid resuscitation and nutritional support. Antibiotics may be ordered if the cause is suspected to be infection. Surgical intervention is indicated in the presence of gallstones, duct disruption, infective pancreatic necrosis, or abscess. If the patient cannot maintain nutritional needs, parenteral nutrition may be initiated.

For chronic pancreatitis, treatment goals include decreased abdominal pain and increased nutrition absorption. Nonopioid pain regimens may be used, and pancreatic enzymes will be prescribed to aid in food absorption. The provider will order a high-protein, high-calorie diet. The dietitian will assist the patient with meal planning as needed. Interventional radiology procedures or surgical resection of the pancreas may be required in certain cases, depending upon the patient's general health condition, previous procedures, and symptoms.

Pancreatic Cancer

Pancreatic cancer typically grows in the head of the pancreas and accounts for 3 percent of all cancer in the United States (Cancer.net, 2023). It is more common in men than women. Black men have a higher incidence of pancreatic cancer than other racial groups. Risk factors are cigarette smoking, diabetes, obesity, chronic pancreatitis, cirrhosis of the liver, *H. pylori* infection, work exposure to chemicals, and family history. The most common type of pancreatic cancer is pancreatic ductal adenocarcinoma. It may spread to the liver, lung, or more distant sites. The 5-year survival rate is 12.5% (Cancer.net, 2023).

Pathophysiology
The pathophysiology of pancreatic cancer is a growth, typically adenocarcinoma, of abnormal cells. The immune system does not stop the growth of the tumor.

Clinical Manifestations
Pancreatic cancer is rarely found at an early stage, because it lacks clinical manifestations until disease has advanced. Common signs and symptoms include abdominal pain, unexplained weight loss, jaundice, itching, dark urine, light-colored stools, fatigue, or history of recurring deep vein thrombosis from hypercoagulability. Patients may also have a new diagnosis of diabetes or diabetes that is harder to control than normal.

Assessment, Diagnostics, and Laboratory Values
Physical assessment may reveal the presence of a palpable mass. Clinical manifestations and assessment findings

will prompt the provider to suspect cancer. Initial laboratory findings will show elevated liver function tests and elevated levels of direct and total bilirubin, lipase, amylase, and pancreatic tumor markers.

Multidetector CT is the preferred imaging modality to evaluate the extent of disease. PET scanning can detect distant metastatic disease. ERCP with endoscopic ultrasound may be performed and suspicious tissues may be biopsied.

Nursing Care of the Patient with Pancreatic Cancer

The care of the patient with pancreatic cancer will start with teaching the patient about the biopsy process. When the results are available and the provider has given the patient the diagnosis, the nurse can provide education and emotional care. Nursing care may be to support patient's decisions on surgery, radiation, or chemotherapy. This can also progress to coordinating palliative or hospice care.

As part of nursing care, the nurse will recognize and analyze cues. The nurse will complete the history and the physical assessment. Of all the symptoms of pancreatic cancer, a significant cue is the ability to palpate an abdominal mass. The nurse will then prioritize hypotheses, generate solutions, and take action. The nurse makes the hypothesis that the problem is a pancreatic tumor. Immediate reporting is completed, and the nurse starts addressing prescriptions as they are ordered.

Evaluation of Nursing Care and Outcomes for the Patient with Pancreatic Cancer

Nursing care must be evaluated. Two examples of goals that need to be evaluated are (1) the patient will verbalize all the details for having a biopsy completed, and (2) the patient will state how to care for skin while jaundice is present.

In caring for a patient with pancreatic cancer, the outcomes may be different than those discussed in this chapter. Certainly, the patient should understand the diagnosis and the treatment options. Ultimately, the goal is for the patient to reach a place of acceptance regarding the terminal nature of their diagnosis. Success in this context is not about finding a cure but rather providing compassionate care and support throughout their journey.

Medical Therapies and Related Care

Medical treatment depends on location and advancement of disease. Surgery is an option in only 20% of pancreatic cancer cases (Cancer.net, 2023). The surgical procedure often performed is a Whipple procedure (Figure 19.25), or a pylorus-preserving Whipple procedure. The head of the pancreas, the bile duct, gallbladder, and duodenum are removed. The pancreas may even be removed, and the patient may need to take insulin.

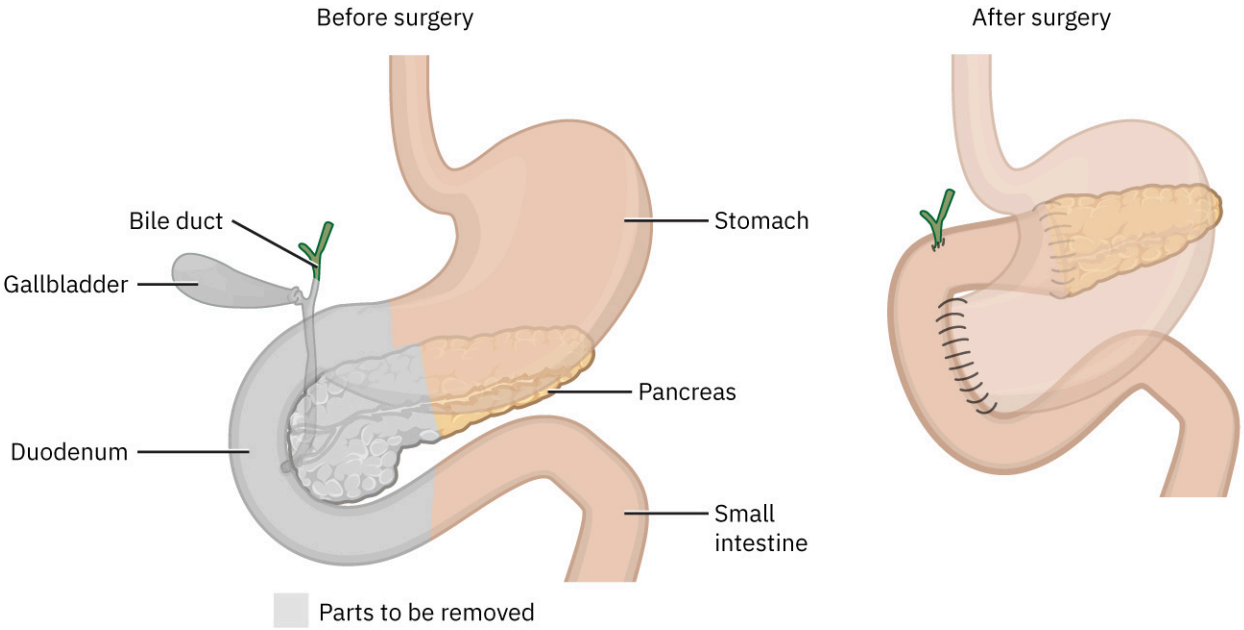


FIGURE 19.25 This image shows the parts of the body removed during a Whipple procedure. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license.)

Supportive surgery and palliative procedures are often recommended to help with symptoms affecting a patient's

quality of life. Examples of palliative procedures and surgery can include bypass surgery, stent placements, and nerve blocks to alleviate jaundice, nausea and vomiting, and tumor-associated pain.

Other therapies, such as chemotherapy and/or radiation, targeted therapies, and immunotherapy, may also be performed alone or in conjunction with other treatments. Psychological and clerical support are also an important aspect of treatment.

19.7 Ostomy Care

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the role of the nurse pre- and postoperatively for the patient with an ostomy
- Describe the nursing care of a patient with a colostomy and continent ileostomy
- Identify troubleshooting methods when skin breakdown occurs with an ileostomy

Some patients have surgical diversions for diseases such as diverticulitis or cancer. A surgical opening in the abdomen for the expulsion of stool into a bag-like appliance is called an **ostomy**. In ostomies related to elimination, a **stoma** is an opening on the abdomen that is connected to the GI or urinary system to allow waste (i.e., urine or feces) to be collected in a pouch. This unit focuses on ostomy care and the nurse's role in the patient's positive coping and self-image.

Nursing Care of the Ostomy Surgical Patient

Approximately 500,000 individuals in the United States have an ostomy. A stoma can be permanent, such as when an organ is removed, or temporary, to allow for organ healing. Ostomies are created for patients with conditions such as cancer of the bowel, inflammatory bowel diseases, or perforation of the colon.

The two common types of ostomies related to elimination are:

- **ileostomy**: the lower end of the small intestine (ileum) is attached to a stoma to bypass the colon, rectum, and anus.
- **colostomy**: the colon is attached to a stoma to bypass the rectum and the anus.

Figure 19.26 compares the anatomic locations of ileostomies and various sites of colostomies. It is important for the nurse to understand the site of a patient's colostomy because the site affects the characteristics of the waste. For example, due to the natural digestive process of the colon and absorption of water, waste from an ileostomy or a colostomy placed in the anterior ascending colon will be watery compared with waste from an ostomy placed in the descending colon.

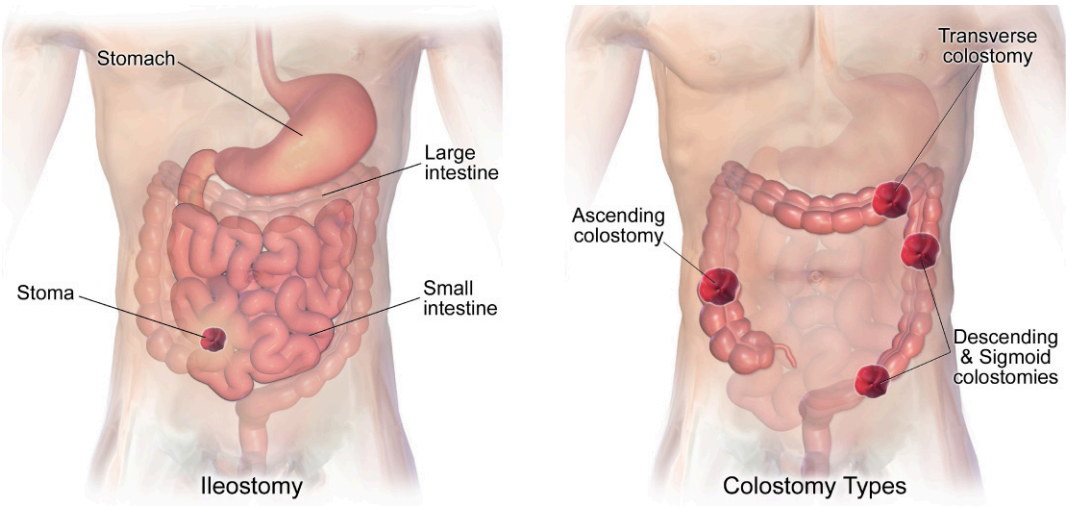


FIGURE 19.26 This diagram depicts anatomic locations of ostomy sites. (credit a: "Ileostomy.png" by BruceBlaus/Wikimedia Commons, CC BY 4.0; credit b: "Blausen 0247 Colostomy.png" byBruceBlaus/Wikimedia Commons, CC BY 3.0)

Preoperative Care

In preparing for surgery, preoperative education and ostomy site marking are completed, allowing the patient to

prepare for ostomy care and ensure optimal ostomy location (WOCN et al., 2021). This is usually done by a certified wound and ostomy nurse who collaborates with the surgeon. During the patient education session, the nurse will explain ostomy care, give an overview of the different types of supplies used, and provide the patient a rationale about the anatomic placement of the stoma (WOCN et al., 2021). It is important that the primary nurse collaborate with the surgical team to answer patient questions honestly, emphasize that a quality of life is still available with a stoma, and encourage family involvement during these education sessions.

LIFE-STAGE CONTEXT

Advanced Age with an Ostomy

Quality of life of older patients with an ostomy is an area of concern but not as much as it is for younger clients. A research study showed that patients aged 66 to 75 years had a reduced activity level when compared with other individuals of the same age. In those older than 76 years who had an ostomy, there was a reduction in social and physical functioning compared with other individuals in the same age range. The study then compared younger adults with ostomies with other individuals without an ostomy in their age range. The former were even more likely to experience decreased functionality than those of advanced age. The conclusion was that although the ostomy reduced quality of life, it actually was less of a factor for those of advanced age than for younger adults.

(Verweij et al., 2018)

Postoperative Care

The tissue of a stoma is very delicate. Immediately after surgery, a stoma is swollen, but it will shrink over several weeks. A healthy, healed stoma appears moist and dark red or pink (Figure 19.27). Stomas that are swollen, dry, have malodorous discharge, or are bluish, purple, black, or pale should be reported to the provider. The skin surrounding a stoma can easily become irritated from the pouch adhesive or leakage of fluid from the stoma, so the nurse must perform interventions to prevent skin breakdown. Any identified signs of skin breakdown should be reported to the provider. The ostomy nurse will be visiting intermittently to perform education, which should be regularly enforced by the primary nurse. The stoma should start producing stool in 2 to 3 days.

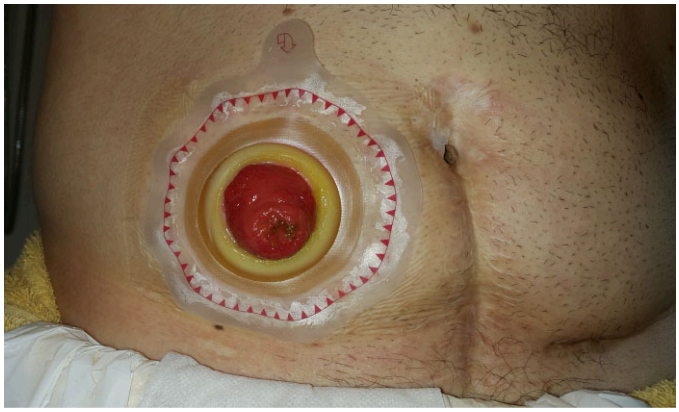


FIGURE 19.27 A healthy stoma is moist and dark pink or red. (credit: "Ostomy wafer being worn by an ileostomy patient" by Eric Polsinelli (VeganOstomy)/Wikimedia Commons, CC-BY 4.0)

Emotional Support and Education

The emotional burden of coping with an ostomy may be devastating for some patients and may affect their self-esteem, body image, quality of life, and ability to be intimate. Providing education is important throughout patient care and before discharge. It is common for patients with ostomies to struggle with body image and their altered pattern of elimination. Nurses can promote healthy coping by ensuring that the patient has appropriate referrals to a wound and ostomy nurse specialist, a social worker, and support groups. Nurses should also be aware of their nonverbal cues when assisting a patient with their appliance changes. It is vital not to show signs of disgust at the appearance of the ostomy or at the odor that may be present when changing an appliance or pouching system.

When a patient is discharged from acute care with a new ostomy, ensure they are able to empty the pouch system independently or with the assistance of the caregiver. Provide enough supplies for 2 or 3 days of home care or until

ordered supplies are expected to arrive. Provide education and evaluate the patient's and caregiver's understanding of the signs of complications. Instruct them to call the provider if the stoma becomes swollen, dry, discolored, or develops a malodorous discharge. Topics to be included are:

- adequate fluid intake
- appliance options, supply needs, and self-care process
- bag leakage prevention and troubleshooting
- colostomy irrigation, if desired
- community support
- conditions to call the provider, such as signs of infection, stoma prolapse, retraction or color change, change in stool appearance, signs of electrolyte imbalance
- exercise adaptions
- foods to avoid reducing gas
- ileostomy special needs
- sexual activity adjustment

CLINICAL SAFETY AND PROCEDURES (QSEN)

Nursing Care of a Patient with a Colostomy

Purpose: To ensure nurses provide comprehensive, safe, and patient-centered care for individuals with a colostomy, promoting optimal health outcomes and quality of life.

QSEN Competencies: Patient-Centered Care, Safety, Evidence-Based Practice (EBP), Teamwork and Collaboration

Clinical Safety and Procedures: Nursing Care of a Patient with a Colostomy

Steps:

1. Hand hygiene and PPE (Safety):
    - Perform hand hygiene thoroughly.
    - Don appropriate personal protective equipment (PPE) before handling the ostomy site to prevent infection.
2. Patient assessment (Patient-Centered Care, Safety):
    - Assess the stoma for color, size, and output. A healthy stoma should be pink to red and moist.
    - Evaluate the peristomal skin for signs of irritation, redness, or breakdown.
3. Emptying and changing the ostomy bag (Safety, EBP):
    - Empty the ostomy bag when it is one-third to one-half full to prevent leakage and skin irritation.
    - Change the ostomy bag and wafer every 3 to 5 days or as needed if there is leakage or skin irritation.
    - Use warm water and mild soap to gently clean the stoma and peristomal skin, avoiding alcohol-based or harsh products.
4. Application of a new ostomy bag (Safety, EBP):
    - Measure the stoma to ensure the opening of the new wafer is appropriately sized to fit snugly around the stoma without causing constriction.
    - Apply skin barrier products if necessary to protect the peristomal skin.
    - Attach the new ostomy bag securely, ensuring there are no gaps or leaks.
5. Monitoring and documentation (Safety, Teamwork and Collaboration):
    - Monitor the patient's ostomy output, noting any changes in color, consistency, or volume.
    - Document the stoma's appearance, condition of the peristomal skin, and any patient-reported symptoms or concerns.
6. Patient Education and Support (Patient-Centered Care, Teamwork and Collaboration):
    - Educate the patient on proper ostomy care techniques, including emptying and changing the bag, skin care, and signs of complications.
    - Provide emotional support and resources, such as support groups or counseling services, to help the patient adjust to life with an ostomy.

- Involve the patient in care planning and decision-making, respecting their preferences and needs.

Skin and Stoma Care

Stoma appliances are supplied as a one- or two-piece set (Figure 19.28). A two-piece set consists of an ostomy barrier (also called a wafer) and a pouch. The ostomy barrier is the part of the appliance that sticks to the skin; it has a hole that is fitted around the stoma. The pouch collects the waste and must be emptied regularly. It attaches to the ostomy barrier in a clicking motion to secure the two parts, similar to how a plastic storage-container cover snaps to a container to create a seal. The pouching system must be completely sealed to prevent leaking of the waste and to protect the surrounding skin. The pouch has an end with an opening where the waste is drained and is closed using a plastic clip or Velcro strip. In a one-piece stoma appliance set, the ostomy barrier and the pouch are one piece.

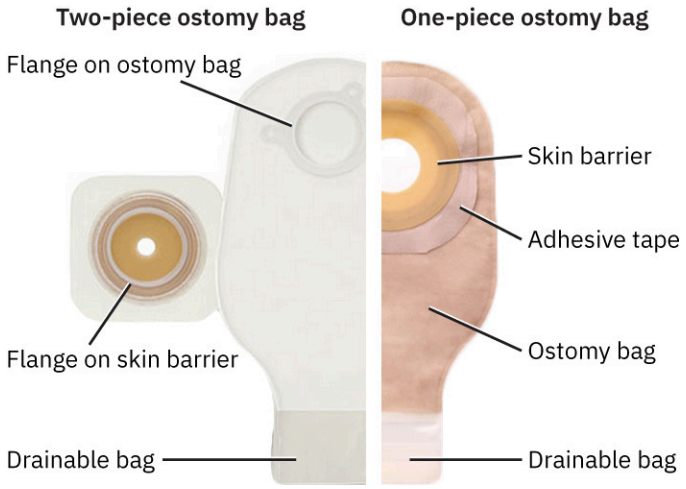


FIGURE 19.28 Ostomy bags can come in one- or two-piece units. (credit: "Short Comparison between One-Piece and Two-Piece Ostomy Bags" by Theresa Maclachlan/Flickr, CC BY 2.0)

Individuals with colostomies and ileostomies have no sensation and no control over the output of the stoma. Depending on the type of system, the ostomy appliance can last from 4 to 7 days, but the pouch must be changed if there is leaking, odor, excessive skin exposure, or itching or burning under the skin barrier. Patients with pouches can swim and take showers with the pouching system on.

LINK TO LEARNING

This video compares different types of ostomy bag systems (https://openstax.org/r/77ostomybags) and the pros and cons of each.

Irrigation

One way to help train the colon to empty at a regular time each day is **colostomy irrigation**. This can be done with a descending or sigmoid colostomy and allows the patient the freedom of fewer pouch changes and ability to wear lower-profile ostomy pouches (Hollister, n.d.). The procedure is similar to an enema in the stoma and takes about an hour to complete. To be effective, it must be done at the same time, every other day. Contraindications include stoma abnormalities such as prolapse or an irregular functioning stoma, cancer treatments such as chemotherapy or pelvic or abdominal radiation treatments, and medications that have diarrhea as a side effect (Agastya & Bettina, 2023).

Colostomy

The presence of a colostomy is a life-changing event. Evaluation of nursing care of a patient with a colostomy includes the patient providing care of the colostomy, discussion of feelings, and identifying signs to the ostomy nurse or provider. The abdominal incision should be well approximated and free of excessive redness or drainage.

Continent Ileostomy

When a continent ileostomy is formed, there is an internal pouch created inside the abdomen. There is a stoma on the abdominal wall. Approximately 3 times a day, the patient will need to empty the contents with a catheter through the stoma. There is another option called ileoanal pouch surgery. This is created by two or three surgeries. An ileal pouch is created and attached to the anus. The patient is then continent, but the bowel movements will be liquid and require six to seven bowel movements a day, including one at night; this allows continence (NIDDK, 2021).

Preventing Complications

Minor complications of ostomies include repeated appliance leakage, offensive smell, and frequent need to empty the appliance bag. The nurse can help the patient manage these through repetitive counseling on appliance application, the use of stoma deodorant drops in the collection bag, and the suggestion of dietary changes to reduce odors (e.g., avoidance of fish, eggs, onions). Other complications are skin excoriation, diarrhea, and constipation. Validating the size of the appliance, proper cleaning of the skin around the stoma site in between appliance changes, and the appropriate use of creams, skin barriers, or powders to the skin around the stoma can protect it from further irritation from stool.

Diarrhea in a colostomy can be problematic. If it persists, fluid and electrolyte imbalance may occur. Antidiarrheal medications may be ordered. The patient may be checked for infections, such as with *Clostridioides difficile* bacteria.

Frequent visual assessment of the stoma and auscultation of bowel sounds are important in the first 2 to 4 days after surgery. Serious colostomy complications include stomal gangrene, stomal retraction, colostomy prolapse, surgical site infection, herniation, dehiscence, atelectasis and pneumonia (Agastya & Bettina, 2023).

INTERDISCIPLINARY PLAN OF CARE

Recovery from Ostomy Surgery Interdisciplinary Plan of Care

The inderdisciplinary plan of care for a patient recovering from an ostomy surgery can involve several health care disciplines working collaboratively. Members of the team may include physical therapists, occupational therapists, social workers, nutritionists, case managers, and a wound and ostomy nurse, each with their own role.

The physical therapist aims to improve the patient's mobility and strength after surgery, initiating ambulation within 24 hours and conducting range of motion exercises. The occupational therapist focuses on promoting independence in daily activities despite the ostomy, teaching ostomy care techniques, and providing adaptive equipment. The social worker assesses psychosocial needs, offers emotional support, and facilitates counseling for adjustment.

The nutritionist or dietitian optimizes nutrition for wound healing and advises the patient on dietary adjustments related to the ostomy. The case manager coordinates care across disciplines, develops a comprehensive care plan, and arranges necessary services. The wound and ostomy nurse monitors stoma and skin integrity, educates the patient on proper ostomy care, and intervenes promptly in case of complications.

Together, these disciplines ensure holistic support for recovery and adjustment to living with an ostomy.

Summary

19.1 Nutritional Disorders

- Diet—both what you eat and how much you eat—has a dramatic impact on health. Eating too much or too little food can lead to serious medical issues, including cardiovascular disease, cancer, anorexia, and diabetes, among others.
- An unhealthy diet combined with unhealthy environmental conditions, such as smoking, significantly increases the potential medical complications.
- Obesity is defined as abnormal or excess fat accumulation and a state of malnutrition by excess and is the result of having a chronic positive energy balance from consuming more calories than are being used by the body.
- Diagnostics and laboratory studies for patients with obesity will generally focus on ruling out other comorbidities or health conditions.
- Care for patients with obesity is individualized, according to any underlying causes of obesity and any comorbid conditions. Treatment includes behavioral interventions, nutritional modification, medications, and surgical intervention, if appropriate.
- Bariatric surgery is a consideration for patients with a BMI of 40 kg/m^2 or patients with a BMI of 35 kg/m^2 with significant health issues that would be expected to improve with weight loss.
- Anorexia nervosa is an eating disorder characterized by the maintenance of a body weight well below average through severe dietary restriction and/or excessive exercise. Patients with anorexia nervosa have deficits in dopamine and serotonin neurotransmitters, which are responsible for eating behavior, reward, impulse control, and neuroticism.
- Psychiatric evaluation and diagnosis of anorexia nervosa is based on criteria provided by the American Psychiatric Association. These criteria include the patient having a distorted view of themselves and their condition, intense fear of gaining weight, and a significantly low body weight from severe conscious restriction of calories.
- The primary patient outcome for anorexia nervosa management is an increase in caloric intake to sustain healthy bodily function.
- Malabsorption occurs when the GI tract is unable to properly absorb nutrients, such as proteins, carbohydrates, fats, vitamins, minerals, or trace elements. This can occur with one vitamin or macronutrient, several, or all. Malabsorption can occur at any phase of the digestion and absorption of food: luminal, mucosal, or postabsorptive.
- Medical treatment of malabsorption is focused on finding and treating the underlying cause of malabsorption, avoiding any food triggers, and managing symptoms.

19.2 Disorders of the Oral Cavity

- Dental caries are common chronic oral cavity diseases, even though they are easily preventable with good oral hygiene.
- In the inpatient setting, it is important for nurses to provide mouth care for patients who are unable to perform self-care.
- Cancer of the oral cavity or oropharynx can develop on the tissue of the mouth and gums, on or under the tongue, and at the back of the mouth or throat.
- The priorities of care during treatment are maintaining a patent airway and healthy nutritional status and providing emotional support, pain relief, and patient education. Frequent airway assessments may need to be completed.
- Temporomandibular disorder (TMD) is a collection of more 30 disorders that cause pain and dysfunction of jaw movement; research suggests it is caused by a combination of psychological stressors, life stressors, genes, jaw trauma, grinding the teeth, and arthritis or other inflammatory conditions.
- TMD is usually a temporary disorder that resolves without aggressive treatment.

19.3 Parenteral and Enteral Nutrition

- Parenteral nutrition is a concentrated IV solution containing glucose, amino acids, minerals, electrolytes, and vitamins, administered via a large central IV line.

- Parenteral nutrition is typically used when the patient's intestines or stomach are not working properly and must be bypassed, such as during paralytic ileus, in which peristalsis has completely stopped, or after postoperative bowel surgeries, such as bowel resection.
- Peripheral TPN is typically used for shorter-term nutritional support or for a patient who cannot tolerate or does not desire a central line.
- Enteral nutrition (EN) refers to nutrition provided directly into the GI tract through an enteral tube that bypasses the oral cavity. EN may be indicated in patients with mental illness, neuromuscular disorders, upper GI obstruction, and traumatic injuries, such as burns or traumatic brain injury.
- Nursing management of the patient receiving parenteral nutrition includes verifying the parenteral nutrition order, assessing the patient's response to the infusion, and monitoring for complications.
- The most serious complication of enteral feeding is inadvertent respiratory aspiration of gastric contents, causing life-threatening aspiration pneumonia. Other complications include tube clogging, tubing misconnections, and patient intolerance to the feeding.

19.4 Disorders of the Upper GI System

- Barrett's esophagus is a condition in which the cells that line the esophagus change and become more like intestinal cells. It is more common in men and usually diagnosed around age 55 years.
- Barrett's esophagus is frequently asymptomatic, and patients tend to have other symptoms of GI conditions, such as frequent heartburn and acid regurgitation or reflux.
- Symptom improvement and patient understanding of the importance of diet modification and medication adherence are the goals of treatment for Barrett's esophagus.
- Patients diagnosed with Barrett's esophagus are prescribed a proton pump inhibitor (PPI), such as omeprazole or pantoprazole, to eliminate gastroesophageal reflux disease (GERD) symptoms and prevent further esophageal irritation.
- Gastritis is inflammation and redness of the lining of the stomach; it may be acute or chronic, and erosive and nonerosive. Once the underlying cause is treated, it usually resolves.
- Patients with acute gastritis may present with epigastric pain, nausea, vomiting, or a feeling of fullness in the upper abdomen after eating.
- Endoscopy with biopsy is the gold standard for diagnosing gastritis, and treatment can be singular, or a combination of antibiotics, PPIs, vitamin supplementation, immunomodulatory therapy, and dietary modifications.
- Gastric cancer, or stomach cancer, is the fifth most frequently diagnosed cancer and the third leading cause of cancer deaths worldwide; most patients with symptoms will present with advanced disease.
- Potential treatments for stomach cancer may include surgery, chemotherapy, radiation therapy, targeted drug therapy, and immunotherapy.

19.5 Disorders of the Lower GI System

- Constipation is defined as a decrease in normal frequency of defecation accompanied by difficult or incomplete passage of stool and/or passage of excessively hard, dry stool.
- In more serious cases, constipation can be a sign of fecal impaction, intestinal obstruction, or paralytic ileus; treatment typically includes a prescribed daily bowel regimen, such as oral stool softeners and a mild stimulant laxative
- Diarrhea is caused by increased peristalsis causing the stool to move too quickly through the large intestines for water to be effectively reabsorbed, resulting in loose, watery stools; many conditions can cause diarrhea.
- Maintaining adequate fluid intake is the priority of care for a patient with diarrhea.
- Irritable bowel syndrome (IBS) is a disorder of the large intestine that causes changes in bowel movements and abdominal pain. It can occur after infection, be triggered by stress, or be caused by food intolerances, brain-gut interaction, and inflammatory processes.
- Because IBS is a symptom-based disorder, treatment is aimed at symptom resolution.
- In patients with celiac disease, the ingestion of gluten causes the body's immune system to attack the villi of the small intestine; this results in permanent damage over time, causing a scalloping of the folds and a cracked appearance of the mucosa, and disrupts the absorption of nutrients.
- Treatment for celiac disease is a lifelong, strict, gluten-free diet.

- Colorectal cancer is often detected before symptoms occur; patients who present with symptoms usually have advanced disease.
- Appendicitis is most often caused by an obstruction within the appendiceal orifice. This creates an inflammatory response, which can lead to local ischemia and perforation.
- Diverticular disease occurs when diverticulosis becomes symptomatic, such as such as with lower abdominal pain, bloating, and diarrhea.
- Inflammatory bowel disease (IBD) is characterized by chronic inflammation of the GI tract; the two main types of IBD are Crohn's disease and ulcerative colitis.
- Treatment goals are to induce remission of IBD and maintain management of the disease.

19.6 Hepatic and Biliary Disorders

- Jaundice is a symptom of gallbladder or liver disease. It is yellowing of the skin or sclera.
- Liver failure causes bleeding and jaundice, contributes to blood sugar management, can cause decreased level of consciousness and neurological status, and medication toxicity. It can be acute.
- Hepatic encephalopathy causes impairment of judgment and coordination; in later stages, coma can occur.
- Cirrhosis is a hardening of the liver, causing blood flow through the liver to be difficult.
- Hepatitis can occur from viruses and nonviral causes, including toxins and being drug induced. The liver is inflamed.
- A liver transplant may be considered for many conditions. The challenges with a transplant are the possibility of organ rejection and living with being immunocompromised.
- Gallbladder dysfunctions can include cholecystitis and cholelithiasis. These disorders may also cause jaundice and pain. Endoscopic retrograde cholangiopancreatography (ERCP) to remove a gallstone or gallbladder removal surgery (usually laparoscopically) may be required.
- Pancreatitis dysfunction includes pancreatitis and pancreatic cancer. Pancreatitis can be acute or chronic. Pancreatitis refers to inflammation of the pancreas. Acute pancreatitis treatment focuses on fluid and electrolyte balance, pain management, GI rest, glucose management, and nutritional support. For chronic pancreatitis, pancreatic enzymes will be taken daily.
- Pancreatic cancer is usually far progressed before it is diagnosed. Most patients are past the point of being eligible for surgery when diagnosed. The mortality rate is low at the 5-year mark (12.5%). Hyperglycemia may be present. The surgical procedure that can be performed is called the Whipple procedure.

19.7 Ostomy Care

- Ostomies are surgically placed when the bowel is unable to work or is diseased.
- Placement of a stoma may be an ileostomy (connects to the ileum) or a colostomy (connects to the colon above the ileum).
- Extensive teaching is required, including appliance use, self-catheterization of a continent ileostomy, or frequent bowel movements for the ileal pouch.
- Emotional adjustment is a factor.

Key Terms

amenorrhea cessation of the menstrual period
anorexia nervosa eating disorder characterized by the maintenance of a body weight well below average through starvation and/or excessive exercise
appendectomy surgical removal of the appendix
appendicitis inflammation of the appendix
bariatrics branch of medicine that researches and treats obesity
Barrett's esophagus condition in which the cells that line the esophagus change and become more like intestinal cells
body dysmorphia mental illness characterized by constant worrying over a perceived or slight defect in appearance
body mass index (BMI) measurement calculated by dividing weight by height, using the formula kg/m^2
calorie-dense foods that have more calories per unit mass than do carbohydrates or proteins
cariogenic bacteria those that cause tooth decay

celiac disease autoimmune disorder that is triggered by gluten ingestion, which causes damage to the small intestine
cholecystitis inflammation of the gallbladder
choledocholithiasis occlusion of the common bile duct
cholelithiasis gallbladder stone
chyme food bolus in the stomach that has been broken down and mixed with acidic gastric juices
cirrhosis severe scarring of the liver
colorectal cancer cancer with an origin in the colon or rectal tissue
colostomy colon is attached to a stoma to bypass the rectum and the anus
colostomy irrigation way to help train the colon to empty at a regular time each day
Crohn's disease inflammation that can occur in multiple layers of the bowel in any segment of the GI tract
dental caries one of the most common chronic oral cavity diseases, it is the breakdown or demineralization of tooth enamel
diverticula sac-like protrusions on the walls of the large intestine
diverticular disease symptomatic diverticulosis
diverticulitis inflammation of the diverticula
diverticulosis asymptomatic presence of diverticula on the walls of the large intestine
enteral nutrition (EN) nutrition provided directly into the GI tract through an enteral tube that bypasses the oral cavity
fecal impaction blockage that occurs when stool accumulates in the rectum, usually due to the patient not feeling the presence of stool or not using the toilet when the urge is felt
fistula hole in the wall of the intestine
gastric cancer stomach cancer; cancer that has an origin in the stomach
gastric residual volume (GRV) volume of stomach contents
gastritis inflammation and redness of the lining of the stomach
ghrelin hormone that makes one feel hungry
gluten protein found in the wheat plant and other grains such as barley and rye
gynecomastia enlarged breast tissue in men and boys
hematochezia passage of fresh blood in stool
hepatorenal syndrome kidney dysfunction in patients with advanced liver disease
ileostomy lower end of the small intestine (ileum) is attached to a stoma to bypass the colon, rectum, and anus
immunomodulatory therapy medications that change the body's immune response
inflammatory bowel disease (IBD) chronic inflammation of the GI tract
intestinal obstruction partial or complete blockage of the intestines so that contents of the intestine cannot pass through
intravenous fat emulsion IV administration of fat; commonly used with parenteral nutrition
irritable bowel syndrome (IBS) disorder of the large intestine that causes changes in bowel movements and abdominal pain
leptin hormone that makes one feel full
liver disease any condition that causes damage to the liver and prevents it from properly functioning
malabsorption occurs when the GI tract is unable to properly absorb nutrients, such as proteins, carbohydrates, fats, vitamins, minerals, or trace elements
mastication chewing food
metastasis secondary malignant growths in other parts of the body
microbiome all microorganisms in the GI tract
Model of End-Stage Liver Disease (MELD) Score used to predict survival of patients with cirrhosis, and a tool used to prioritize organ allocation for liver transplantation
nonviral hepatitis inflammation of the liver caused by exposure to drugs, alcohol, toxins, or autoimmune disease
obesity abnormal or excess fat accumulation and a state of malnutrition by excess characterized as having a BMI of 30 or greater
odynophagia painful swallowing
ostomy surgical opening in the abdomen for the expulsion of stool into a bag-like appliance
pancreatitis inflammation of the pancreas

paralytic ileus condition in which peristalsis is not propelling the contents through the intestines
parenteral nutrition concentrated IV solution containing glucose, amino acids, minerals, electrolytes, and vitamins
peptic ulcer disease (PUD) defect in the lining of the stomach or duodenum
peristalsis coordinated muscle movements in the esophagus
plaque sticky film on the teeth made up of leftover food particles and bacteria
pneumothorax collapsed lung
portal hypertension increase in pressure within the portal venous system
proton pump inhibitor (PPI) medication that binds to the hydrogen-potassium ATPase enzyme system of the parietal cell, thereby pumping hydrogen ions into the stomach
Roux-en-Y gastric bypass weight loss surgery that involves bypassing the duodenum to connect the gastric pouch to the lower segment of the small intestine
Rovsing sign palpation of the left lower quadrant worsens right lower quadrant pain
sclera whites of the eyes
skip lesion patchy area of inflammation that skip over some areas
steatorrhea fatty stool
stoma opening on the abdomen that is connected to the gastrointestinal system to allow waste to be collected in a pouch
testicular atrophy testis reduced in size
testicular hypotrophy enlarged testis
total parental nutrition (TPN) parenteral nutrition that includes IV fat emulsions and is considered complete nutrition
toxic megacolon nonobstructive dilation of the colon that is associated with systemic toxicity
ulcerative colitis inflammation that occurs only in the inner most wall of the large intestine and colon
varices abnormal dilation of the veins
vertical sleeve gastrectomy weight loss surgery in which a portion of the stomach is removed and the size of the stomach is reduced to 3 to 4 ounces
villi small, finger-like cells that absorb nutrients
viral hepatitis inflammation of the liver caused by a virus
visceral fat abdominal fat

Assessments

Review Questions

1. The nurse is caring for a patient with anorexia. What is an example of an intervention would be most effective?
   a. Have the nutrition department send a meal on the standard menu with two desserts.
   b. Suggest the patient order food of choice when they are hungry.
   c. Reinforce mealtimes to get in the habit of eating on a schedule.
   d. Request patient drink two glasses of water before every meal.

2. What assessment would be of most concern to a patient with obesity?
   a. a BMI of 32
   b. presence of a gait abnormality
   c. a large abdominal circumference
   d. joint pain

3. A patient is admitted to the emergency department with abdominal pain and diarrhea. Your clinical assessment reveals positive Chvostek and Trousseau signs. What electrolyte deficiency do you suspect this patient may have?
   a. a low calcium level
   b. a high calcium level
   c. a low potassium level

d. a low iron level

4. A patient states they have constant pain in the jaw joint when eating. Which is the most probable cause?
   a. dental caries
   b. TMD
   c. salivary calculi
   d. oral cancer

5. When doing an oral assessment, the nurse observes a discolored portion of the inside of the cheek. What intervention should the nurse take?
   a. Notify the provider of the finding.
   b. Instruct the patient to brush teeth and floss.
   c. Encourage patient to increase water intake.
   d. Assess for jaw clicking.

6. The nurse is caring for a patient receiving enteral feeding through a nasogastric tube. What is an example of an assessment that would cause the nurse to intervene?
   a. The head of bed is elevated 30°.
   b. The GRV is 10 mL at the beginning of the shift.
   c. The NG tube is longer than recorded on previous shift.
   d. The continuous tube feeding is running via a pump.

7. When the nurse is administering medications through a gastrostomy tube, what is an example of a finding that would cause the nurse to intervene?
   a. An enteric coating tablet is ordered.
   b. Most medications ordered are in liquid form.
   c. The patient's blood pressure (BP) is 130/90 mm Hg and their BP medication is due.
   d. The medications are all labeled.

8. The nurse is preparing to hang a new bag of TPN. What is an example of a finding that would concern the nurse?
   a. The TPN bag provided matches the latest provider's orders.
   b. The patient's last blood glucose was 90 mg/dL.
   c. The central line site is red and hot.
   d. The tubing for the TPN was changed this morning.

9. Your patient is postoperative after a complicated bowel surgery for Crohn's disease. Because the patient will be allowed nothing by mouth (NPO) for a few days, what type of nutrition would you expect to be ordered?
   a. TPN
   b. PEG tube feedings
   c. IV fluids
   d. NG tube feedings

10. The nurse is caring for a patient with stomach cancer. What assessment finding would be of greatest concern?
   a. The patient states they feel tired.
   b. The patient is vomiting.
   c. The patient has hypoactive bowel sounds.
   d. The patient has bloody stools.

11. Your patient is admitted with a suspicion of Barrett's esophagus. What diagnostic test would you expect to be performed?
   a. upper endoscopy with biopsy
   b. colonoscopy with biopsy

c. barium swallow study
d. stool culture

12. You are educating your patient with gastritis prior to discharge. What is an example of a statement made by the patient that would indicate that they have a good understanding of the condition?
a. "It's OK that I eat greasy foods because it will soothe my stomach."
b. "I'll make the switch to decaffeinated coffee and limit my caffeine intake."
c. "After smoking, I'll rinse my mouth out so my stomach doesn't get irritated."
d. "I don't need stress management if I'm going to take medications."

13. What electrolyte would you expect to be ordered for your patient who has been receiving long-term PPI therapy?
a. sodium
b. calcium
c. magnesium
d. phosphate

14. What treatment is a possible option for patients with Barrett's esophagus whose reflux symptoms are not controlled by PPI therapy?
a. chemotherapy
b. fundoplication
c. radiation therapy
d. antiviral medication

15. The nurse performs a fecal occult stool test. Noting a positive sample, what laboratory result will the nurse check next?
a. WBC count
b. hemoglobin
c. electrolytes
d. liver enzyme levels

16. A lethargic patient with cool skin is passing bright red blood from the rectum. Vital signs are blood pressure, 86/56 mm Hg; temperature, 98°F; heart rate, 120 bpm; respiratory rate, 22 breaths/minute. What action should the nurse take next?
a. Notify provider for IV fluid orders.
b. Insert nasogastric tube.
c. Administer IV antibiotics.
d. Administer loperamide.

17. The nurse is providing patient education about a gluten-free diet to a patient who has been newly diagnosed with celiac disease. What should the nurse emphasize as important when shopping for groceries?
a. Low amounts of gluten are OK.
b. Nutrition labels should always be checked before purchasing food items.
c. If a food is naturally gluten-free, nutritional labels are not important.
d. Asking the store manager if a food is gluten-free is good enough.

18. What should the nurse monitor to evaluate the effectiveness of dietary modifications for a patient with IBS?
a. frequency and consistency of bowel movements
b. patient's heart rate
c. blood pressure levels
d. patient's pain level

19. Your patient with liver disease begins to become irritable, forgetful, and is having coordination problems.

What disorder is the patient showing symptoms of?

a. cirrhosis
b. portal hypertension
c. hepatic encephalopathy
d. jaundice

20. What is an example of effective nursing care for a patient with cholelithiasis?

a. The patient continues to choose fatty foods from the hospital menu.
b. The patient is reluctant to take prescribed medications.
c. The patient ambulates in the hallways to encourage peristalsis.
d. The patient eats large meals.

21. The nurse is developing a plan of care for their patient with ascites. What would be an appropriate goal for care of the patient?

a. Check pupil reaction.
b. Monitor for rebound tenderness.
c. Provide foods high in fiber.
d. Monitor daily weights and abdominal girth measurements.

22. A patient with acute pancreatitis is describing the symptoms that caused them to seek medical attention. The patient explains that they experienced nausea, a rapid pulse, and vomiting. What other patient statement should the nurse recognize as a symptom of pancreatitis?

a. "After I ate some ice cream, my stomach started hurting really badly."
b. "My hands started shaking uncontrollably for about 5 minutes."
c. "I noticed that I had a severe headache after I started vomiting."
d. "I had diarrhea for 2 days after I started feeling poorly."

23. The nurse is providing ostomy care and notices that the stoma is ashen in color. What action should the nurse take after the completion of ostomy care?

a. Encourage fluid intake.
b. Notify the surgeon.
c. Consult a dietitian.
d. Call the ostomy nurse.

24. The nurse is caring for a patient who had a colostomy placed 2 days earlier. The nurse notes that the stoma is moist and beefy red. What action should the nurse be expected to take based on these findings?

a. Notify the physician of the findings immediately.
b. Remove the bag and apply pressure to the stoma.
c. Document the assessment findings of the stoma.
d. Change the appliance pouch and clean the skin.

25. The nurse is providing patient education on the care of an ostomy. What is an example of a statement by the patient that would indicate that further education is necessary?

a. "I should plan to replace the pouch system every 4 to 7 days."
b. "Wafer should be cut 1/16″ to 1/8″ larger than the stoma."
c. "It is important to chew all foods completely and slowly."
d. "I will keep a diary of the foods I eat and my stool pattern."

Check Your Understanding Questions

1. Which key diagnostics are used in the management of obesity, anorexia nervosa, and malabsorption? How do they differ for each condition?

2. You are caring for a patient receiving enteral feeding. The morning weight shows the patient gained 1 lb. over

the past week. What does this mean?

3. When caring for a patient with gastric cancer, what symptoms would you expect to find?
4. Describe how medical therapies for hepatic and biliary disorders are designed to manage symptoms and improve patient outcomes. Consider the challenges of tailoring treatments to meet individual patient needs and conditions.

Reflection Questions

1. What information might you need to detail regarding a patient who presents with mouth pain?
2. Which medical therapies might a nurse anticipate for a patient recently diagnosed with mouth cancer?
3. If you were on a liver transplant team, how would you feel about a patient with chronic liver disease from alcohol abuse receiving a liver? Discuss it with two peers. The activity should last 5 minutes.

What Should the Nurse Do?

1. Anna, a patient with anorexia nervosa, is being monitored by her nurse, who has noticed some improvement in Anna's condition. Although Anna reports feeling better, she struggles with eating enough and is fearful of gaining weight. The nurse acknowledges these challenges and reassures Anna about the goal of achieving a healthy and strong state.
   How can the nurse determine if the implemented nutritional strategies are effective for Anna?

John, a patient recently diagnosed with mouth cancer, has just completed his first week of radiation therapy. He reports experiencing severe oral pain and difficulty swallowing, which have made it hard for him to maintain adequate nutrition. The nurse caring for John notes he appears fatigued, and he complains of weight loss.

2. Which diagnostics and laboratory tests will the nurse review first for John to determine the next steps in care?
3. How will the nurse evaluate the effectiveness of John's care plan?

You are caring for a patient who has recently undergone ileostomy surgery. Despite initial success with ostomy care, you notice during your assessment the peristomal skin around the ileostomy is red and irritated, and the patient complains of itching and burning in the area.

4. Describe how you would approach this scenario to provide effective care and support for the patient.
5. The patient refuses to look at the stoma or participate in changing the pouching system. What are some suggestions to help your patient adjust to the stoma?

Competency-Based Assessments

1. Prepare a table to compare nursing actions for patients with obesity, anorexia nervosa, and malabsorption. Identify what interventions work for more than one disorder.
2. Write a list of problems and the interventions expected in a patient with gastritis.
3. Compare and contrast IBD using the following format. Compare with your peers. In which areas were there were differences, and why? Teach in small group the areas one student knows that another does not.

Disorder	Ulcerative Colitis	Crohn's Disease
Pathology		
Risk factors		
Clinical manifestations		
Diagnostic tests		
Laboratory values		

Nursing concepts		
Nursing care		

4. Use the internet to develop a 5-minute presentation about liver disease and the impact a poor diet can have on liver health.
5. Go to the skills laboratory during open hours on your own or with peers and gather ostomy supplies and a mannequin. Practice applying supplies. Teach the "patient" as you progress.

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CHAPTER 20

Genitourinary and Reproductive Systems

FIGURE 20.1 The genitourinary and reproductive systems are assessed during a well-woman exam. (credit: Deidre Smith/Naval Hospital Jacksonville/Tricare, CC0)

CHAPTER OUTLINE

INTRODUCTION In addition to sexual function and reproduction, the genitourinary and reproductive systems serve many important functions, including filtration and excretion of waste products, fluid and electrolyte balance, and blood pressure control. These two systems are frequently assessed together because the male urethra shares the same anatomic tube for elimination as the reproductive transmission of sperm. Impairment of either of these systems can result in unpleasant effects, including infertility, sexual dysfunction, or the inability to urinate effectively. These effects are not only physically detrimental, they can also have devastating effects on mental and social health. Nurses caring for patients with disorders of the genitourinary and reproductive systems must be able to adequately treat the physical conditions and effectively provide emotional support and comfort.

20.1 Brief Review of Genitourinary and Reproductive Anatomy and Physiology

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the anatomy and physiology of the male genitourinary and reproductive systems.
- Discuss the anatomy and physiology of the female genitourinary and reproductive systems.

Because of their anatomic proximity, the term **genitourinary system** is used to describe organs of both the reproductive and urinary systems. The reproductive portion of the genitourinary system consists of the male or female genitalia and associated components involved in biological reproduction of offspring. The urinary portion of the genitourinary system, also known as the renal system, includes the kidneys, ureters, bladder, and urethra, all of which play a major role in fluid and electrolyte balance and the excretion of waste as urine. Because of the anatomic proximity of these organs, it is not uncommon for a disorder of one system to potentially affect the other organs.

Anatomy and Physiology of the Male Genitourinary and Reproductive Systems

The male genitourinary system consists of two major organs—the penis and the testicles—in addition to several other internal structures, which are depicted in Figure 20.2. The penis is located external to the body, and its components include the glans, urethra, and external urethral opening. The urethra is a long, thin tube that runs the length of the penis and carries semen or urine for eventual excretion from the body. It is approximately 20 cm (7–8 inches) long, on average, and transports both urine and semen. The glans is the bulbous structure at the distal end of the penis and is responsible for excreting both semen during **ejaculation** and urine as waste from the external urethral opening. Urine is normally carried from the urinary bladder through the urethra for excretion, but this function ceases during times of sexual arousal and semen ejaculation. Therefore, although the penis can release both urine and semen from the same urethral opening, they cannot be excreted simultaneously (Cleveland Clinic, 2020b).

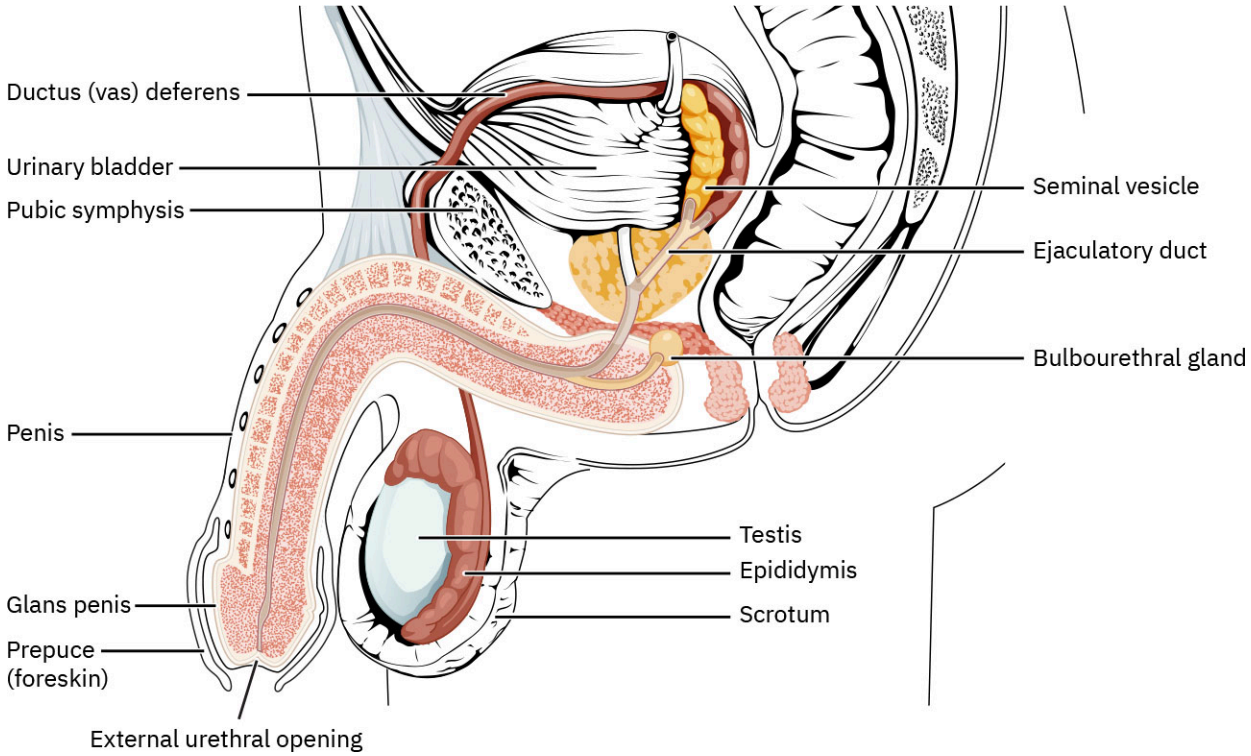


FIGURE 20.2 The male genitourinary and reproductive systems consist of the penis, testicles, and several internal components. (credit: modification of work from *Anatomy and Physiology 2e*. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Male reproduction is a complicated process with several internal components that affect the function. The testicles (testes), referred to as the male sex glands, are found in the scrotum, which is an outpouching of skin located below the penis. The testes contained in this sac are at a slightly lower temperature than the rest of the body, allowing for

spermatogenesis, or sperm production, to occur at the ideal temperature, which is approximately 4 degrees lower than normal internal human temperature. In addition to producing sperm, the testicles are also responsible for secreting testosterone, the male sex hormone, which affects male secondary sex characteristics and libido. The testicles secrete sperm into the epididymis, a tube where sperm can grow and mature. After maturation, the sperm is sent from the epididymis through the vas deferens to the seminal vesicle, where sperm collects in preparation for eventual ejaculation through the urethral opening. Two small glands, known as bulbourethral (or Cowper's) glands are located on either side of the urethra and secrete fluid, called pre-ejaculate, for lubrication and movement through the urethra during ejaculation. Another important part of the male reproductive system is the prostate gland. This gland sits just below the urinary bladder and is responsible for secreting a substance that helps lubricate, nourish, and expel the sperm during ejaculation.

Anatomy and Physiology of the Female Genitourinary and Reproductive Systems

The female genitourinary system consists of several parts; these are depicted in Figure 20.3 and Figure 20.4. The female urinary bladder connects to the urethra, which is approximately 3 to 4 cm (1.5 inches) long, and allows for excretion of urine as waste. The clitoris, a small mound of tissue that is highly sensitive to stimulation, is directly above the urethral opening. Directly below the urethral opening is the vaginal opening, through which blood exits the body during **menstruation** and through which the infant is delivered during childbirth. In contrast to male anatomy, which only provides one opening for both urine and semen for reproduction, the female anatomy consists of two different openings, one for urine excretion and one for reproductive function (Cleveland Clinic, 2022).

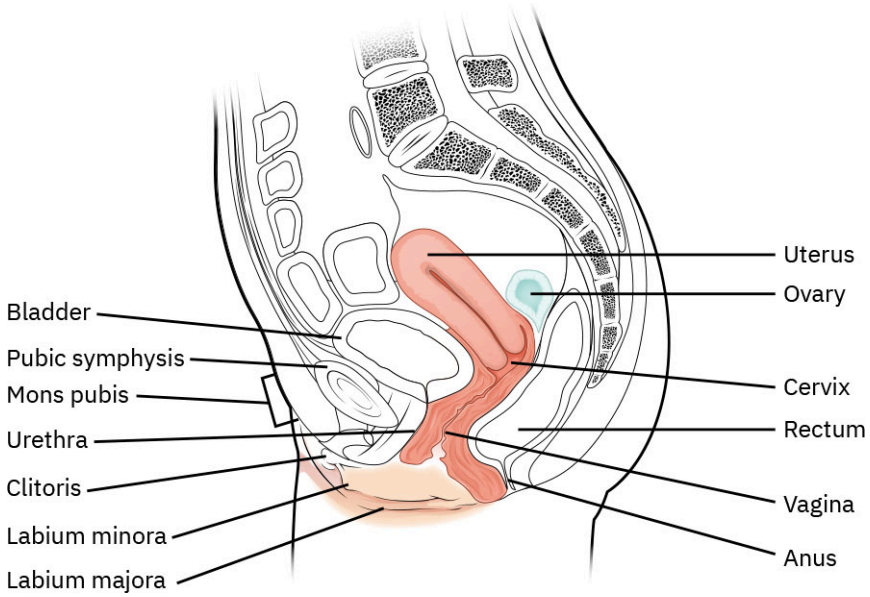


FIGURE 20.3 The internal portions of the female genitourinary and reproductive systems include the uterus, ovaries, fallopian tubes, vagina, bladder, and urethra. (credit: modification of work from *Anatomy and Physiology 2e*. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

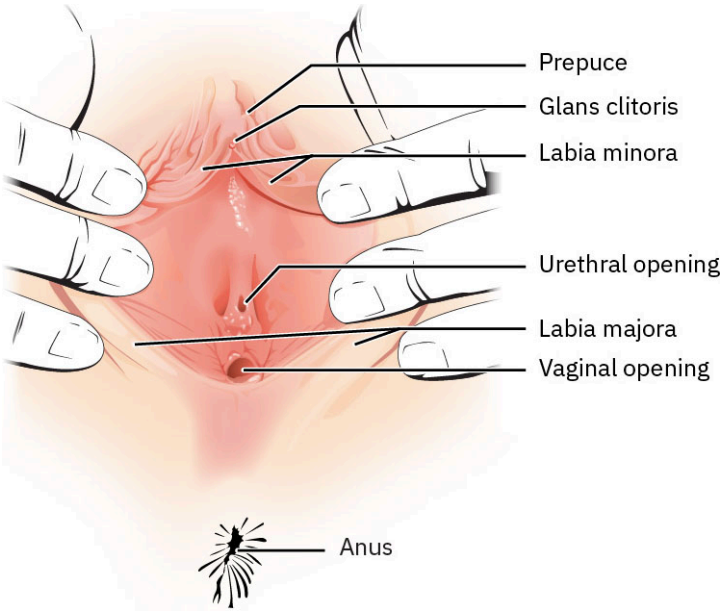


FIGURE 20.4 The external parts of the female genitourinary and reproductive systems include the clitoris, labia, urethral opening, and vagina. (credit: modification of work from *Anatomy and Physiology 2e*. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

The vagina is a tube-like muscular organ, also known as the vaginal canal or birth canal. The external opening of the vagina is surrounded by connective tissue, divided into two folds of tissue called the labia majora and labia minora. The vagina is connected to the cervix, which is the lower opening of the uterus. The cervix serves as a barrier between the vaginal canal and the uterus, which helps protect a growing fetus from developing an infection during pregnancy. The uterus is a large, hollow organ that holds the fetus during pregnancy, allowing it to grow and mature in preparation for childbirth. The female reproductive system also includes the ovaries and the fallopian tubes. The ovaries produce eggs for reproduction and estrogen, the female sex hormone. It is estimated that each ovary contains up to 1 million eggs at birth and begins a cycle of maturation and release after puberty. The release of an egg from one of the ovaries is known as **ovulation** and occurs generally once a month based on the cycle of female hormones. The egg travels through one of the fallopian tubes to the uterus. If the egg is joined by sperm from a male, fertilization and conception may occur, resulting in pregnancy.

Menstrual Cycle

The female reproductive system is controlled by a monthly hormone fluctuation referred to as the menstrual cycle. Cycle lengths vary, but a typical cycle lasts for approximately one month, or about 28 days. Figure 20.5 depicts the different phases and hormones associated with each day of the cycle. The first 14 days of the menstrual cycle represent the follicular phase. During the first three to seven days of this phase, menstruation, or the shedding of the uterine lining through the vagina, is occurring. While this is happening, the ovaries develop mature eggs for potential reproduction. Approximately 11 to 15 days after menstruation, one of the eggs matures enough to be released, resulting in ovulation. The transition from menstruation to ovulation is triggered by changes from estrogen to progesterone and follicle-stimulating hormone made in the anterior pituitary gland. The egg travels from the ovary through a fallopian tube to the uterus for possible fertilization with a sperm. After ovulation, the luteal phase begins. This phase marks the second half of the menstrual cycle, lasting approximately 14 days. Levels of follicle-stimulating hormone and luteinizing hormone decrease, which triggers the next phase. During this phase, the hormone progesterone is produced in large amounts, which results in thickening of the uterine lining in readiness for the possible implantation of a fertilized egg. If the egg does become fertilized, it will implant into the uterine wall, which will result in pregnancy, cessation of the menstrual cycle, and eventual childbirth. If the egg is not fertilized by sperm during this phase, pregnancy does not occur and the uterine lining begins to break down in preparation of shedding, marking the start of a new menstrual cycle.

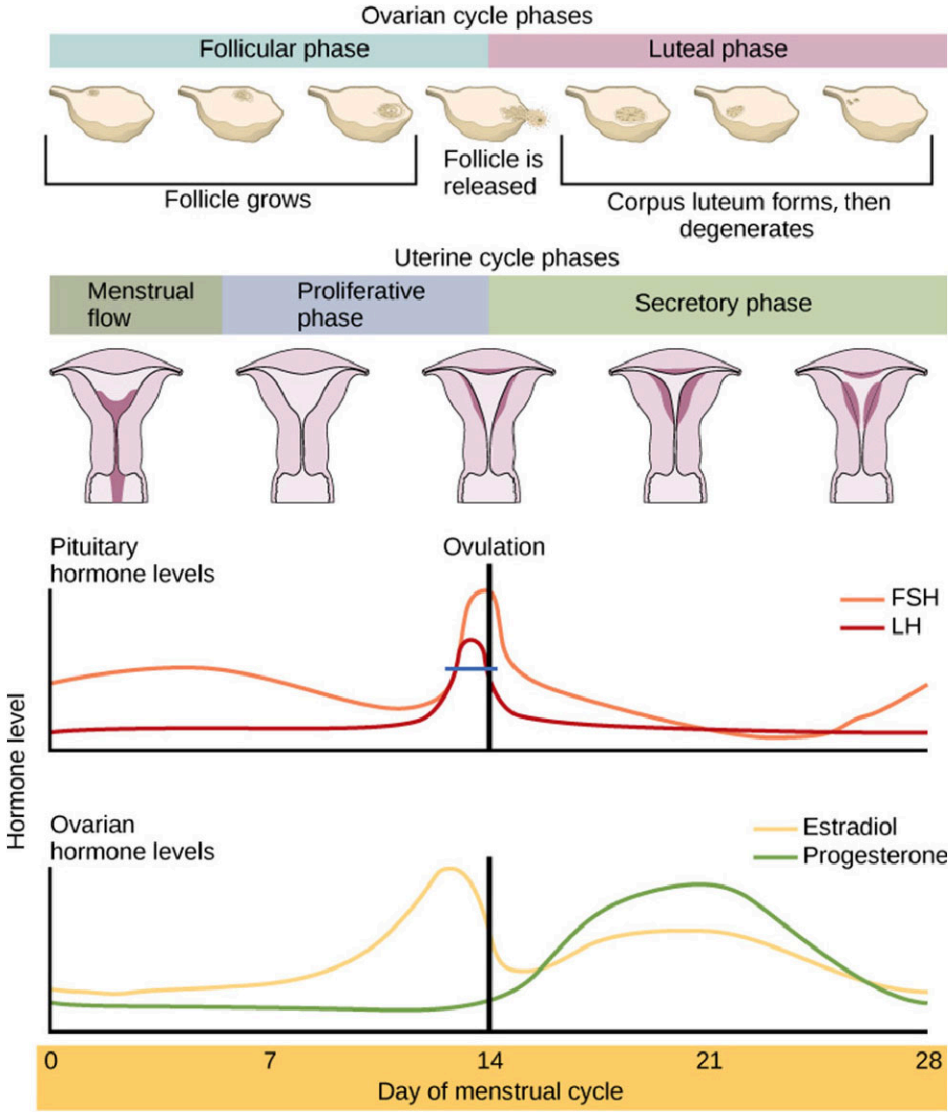


FIGURE 20.5 Hormone levels vary throughout the menstrual cycle by day as the uterus prepares for a possible pregnancy. The uterine lining is shed if implantation does not occur. (credit: Warren et al./*Frontiers in Global Women's Health*, CC BY 4.0)

Both the male and female genitourinary systems are complex and consist of many different structures and organs that must function optimally for reproduction to occur. Some of the many disorders and conditions that can affect both systems will be discussed in more detail in this chapter.

CULTURAL CONTEXT

Gender Identity Considerations

It is important to understand that a patient's biological sex may not always match their gender identity. Gender identity is "one's innermost concept of self as male, female, a blend of bother or neither—how individuals perceive themselves and what they call themselves" (HRC Foundation, n.d.). For example, a patient who is assigned male sex at birth may identify with socially traditional characteristics and interests of women and wish to identify as a woman. Although some patients may simply identify as a different gender than their assigned birth gender, other patients may actively pursue medical treatment and interventions to physically change their body and sex organs to match their preferred gender. Every patient is unique, and nurses should approach each patient in a nonjudgmental manner to ensure optimal care and improved patient outcomes. It is important to note that during medical care, it is reasonable for clinicians to ask a person about their biological sex at birth, because implications of sex hormones are relevant in many health conditions and knowing a patient's biological sex helps direct guidelines for preventive

screenings.

20.2 Sexually Transmitted Infections

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations of sexually transmitted infections.
- Describe the diagnostics and laboratory values in sexually transmitted infections.
- Apply nursing concepts and plan associated nursing care for the patient with a sexually transmitted infection.
- Evaluate the efficacy of nursing care of the patient with a sexually transmitted infection.
- Describe the medical therapies that apply to the care of patients with sexually transmitted infections.

A **sexually transmitted infection (STI)** may develop after transmission of bodily fluids from an infected individual to a sexual partner. These infections can range from asymptomatic to severe, depending on the specific type of infection and the baseline health status of the infected person. Safe sex practices, such as limiting one's number of sexual partners or using appropriate protection (e.g., condoms), can decrease the risk for contracting STIs. Nurses caring for patients at risk for STIs must be able to adequately treat the physical condition and symptoms, as well as provide counseling and education regarding effective prevention strategies.

Overview and Pathophysiology of Common STIs

According to the Centers for Disease Control and Prevention (CDC) (2024d), there are approximately 68 million current cases of STIs in the United States. People aged 15 to 24 years account for approximately 50 percent of all new cases. These numbers indicate that nearly one in five Americans has been diagnosed with an STI. However, these numbers may be skewed due to asymptomatic individuals unknowingly transmitting infections to their sexual partners.

STIs cost the US health care system billions of dollars each year, account for major losses in societal productivity, and result in increased morbidity and mortality rates (CDC, 2021). Some of the most encountered STIs and their associated clinical manifestations, assessment findings, and diagnostic criteria are discussed in the next several sections.

Chlamydia and Gonorrhea

Chlamydia trachomatis, commonly known as chlamydia, is a bacterium that is spread through infected bodily fluids, including vaginal fluid and semen, and is transmitted orally and rectally. Often, patients who become infected with chlamydia also have a coinfection with gonorrhea, a bacterial infection caused by the bacterium *Neisseria gonorrhoeae.* These bacterial STIs can be spread through all kinds of sexual contact, including vaginal, anal, and oral sex, and the sharing of sex toys. They can also be spread from a parent to child during a vaginal childbirth.

Chlamydia (CDC, 2024a) and gonorrhea (CDC, 2024b) infections are often asymptomatic especially in female individuals, but if symptoms do occur, they will likely become evident between a week and three months after transmission. Clinical manifestations of chlamydia and gonorrhea in women often mimic those of a urinary tract infection (UTI), such as foul-smelling vaginal discharge, painful urination, increased urinary frequency, itching, or burning of the vagina, and a dull ache or pain in the lower abdomen. As many as 15% of untreated women will develop **pelvic inflammatory disease (PID)** (Jennings & Kryko, 2023). In men, symptoms may manifest as a white, yellow, or green discharge from the penis and painful urination. Both chlamydia and gonorrhea are diagnosed by using specific tests, such as Gram stains or nucleic acid amplification tests, to detect the presence of bacteria in the urine or from vaginal or urethral swabs. Additionally, the provider or nurse should obtain a full sexual history and perform a physical examination to look for symptoms that assist in confirming the diagnosis. Typically, patients with a suspected STI are tested and treated for both chlamydia and gonorrhea at the same time because they often occur together and cause similar symptoms. Standard guidelines for treatment are doxycycline for chlamydia and single-dose ceftriaxone intramuscular injection for gonorrhea (American Family Physician, 2022).

Herpes Simplex Virus

Herpes simplex virus (HSV) causes a viral infection that can be classified into two different types: herpes simplex type 1 (HSV-1) and herpes simplex type 2 (HSV-2). Although both types of herpes are caused by the same virus,

they cause different symptoms. HSV-1, known as oral herpes, causes cold sores on the mouth and lips (Figure 20.6) and HSV-2 ("genital herpes") results in a type of sore called a **genital vesicle**, or a painful fluid-filled lesion on the genitals. The herpes virus is spread through sexual contact, including vaginal, anal, and oral sex, or contact with a sore (either on the mouth or on the genitals). Although usually asymptomatic, individuals infected with HSV will have "outbreaks" during which they develop oral or genital sores that last approximately one week. Occasionally, these outbreak periods are accompanied by flu-like symptoms, such as a fever or chills. Typically, the first outbreak is the worst one, and there may be long periods of remission between outbreaks. Herpes virus infection is a lifelong condition, and the frequency and severity of outbreaks will vary depending on the person and health status. Diagnosis is made by the provider or nurse through clinical assessment of active sores on the mouth or genitals. If a diagnosis is unable to be made based on clinical assessment alone, a swab of the sore can be tested to determine the presence or absence of the virus. Additionally, there is an antibody test that can be used to detect whether the body has previously made antibodies to HSV, indicating that the individual has been exposed before.

FIGURE 20.6 Cold sore lesions are caused by the HSV-1 virus. (credit: Robert E. Sumpter/CDC/Public Health Image Library, Public Domain)

Human Papillomavirus

Human papillomavirus (HPV) is the most common STI in the United States. There are more than 100 different types of HPV, encompassing a wide range of severity. Most types do not cause symptoms or require treatment, but more severe types can result in the development of genital warts. The most severe types of HPV can cause cancers of the cervix, vagina, or anus. Human papillomavirus has also been linked to the development of oral-laryngeal cancers, especially in men. Because even asymptomatic infections can eventually cause cancer, it is important for sexually active individuals to be tested for HPV frequently. Current practice guidelines recommend testing every three years between the ages of 21 and 29. For patients who test positive for HPV, further testing may be indicated to identify the specific type and determine if early cancer screening should be instituted. Fortunately, a vaccine for HPV was developed in 2009 that decreases the risk of contracting the virus. This vaccine is recommended for all children between the ages of 11 and 12 years as a prophylactic measure to prevent HPV infection and potential cancers later in life (Quinlan, 2021).

Syphilis

Syphilis is a bacterial STI caused by *Treponema pallidum*. It is transmitted through sexual contact, blood exposure, and close contact with open skin lesions. The first clinical sign of a syphilis infection is the presence of a **chancre**, a painless sore that develops where the organism entered the body (Figure 20.7). Chancres are most commonly found on or around the penis, vagina, anus, lips, and/or mouth. Typically, the chancre becomes noticeable within a few weeks of the initial infection and heals on its own.

FIGURE 20.7 A chancre is the first clinical sign of a syphilis infection. (credit: CDC/Public Health Image Library, Public Domain)

If the chancre goes undetected, the patient may not be aware they are infected and may not seek treatment until further symptoms occur months later, marking the more severe, secondary phase of the infection. In this stage of infection, the patient will exhibit flu-like symptoms, such as fever, sore throat, swollen lymph nodes, and headaches. They also usually develop a skin rash on the palms of the hands or soles of the feet. Figure 20.8 shows an image of a typical syphilis rash on the palms of the hands. The lesions of the rash are highly contagious and should not be touched with bare hands. This rash will clear up on its own within a few months, marking the start of the latent phase of infection. During this phase, the patient does not have any noticeable symptoms, but the infection remains present in the body. The later stage of syphilis, also called the tertiary stage, is systemic and life-threatening, and is characterized by neurological dysfunction. Symptoms during this stage include headache, uncoordinated muscle movements, mental status changes, and dementia. Because syphilis can be effectively treated with antibiotics, it does not typically enter the tertiary stage. This stage of the disease is possible, however, especially in populations with limited access to health care and other resources.

FIGURE 20.8 A syphilis rash on the palms of the hands may be seen during the secondary stage of infection. (credit: CDC/Public Health Image Library, Public Domain)

Nursing Care of the Patient with an STI

Caring for patients with STIs is complex, and treatment and nursing interventions will vary depending on the specific infection. Nursing goals always include early detection, intervention, and initiation of effective treatment options. A mnemonic to help you remember are the "Five P's" approach of questions, which reminds you to ask about partners, practices, prevention of pregnancy, protection against STIs, and past history Table 20.1. The first step in caring for patients at risk for or recently diagnosed with an STI is obtaining a complete health and sexual history. This allows the nurse to identify factors that place the patient at risk for developing STIs, such as unsafe sexual practices or lack of knowledge related to infection transmission modes. For example, individuals with concurrent substance use or mental health disorders are at higher risk for STIs related to increased risk-taking behaviors. Based on these findings, the nurse can determine if there is a need for further assessment, intervention, and/or counseling.

P	Assessment Questions to Ask Patient
Partners	• How many sexual partners have you had? How many sexual partners do you currently have?
Practices	• Tell me about your sexual practices? • Have ever been tested for STIs? • Have you used strategies to reduce the risk for STI exposure (e.g., use of condoms or diaphragms)? • Do you have genital, anal, and/or oral sex? • Have you or any of your partners used drugs? • Have you exchanged sex for needs?
Protection	• Do you and your partner talk about STI prevention? • What prevention methods have you used? How often? • Have you received any vaccines (e.g., HPV, hepatitis A, hepatitis B vaccines)?
Past history of STIs	• Have you ever been treated for STIs or human immunodeficiency virus (HIV)? • Have you been diagnosed with an STI in the past? • Do you have any symptoms that come back? • Has your current partner or former partner even been diagnosed with an STI?
Pregnancy intention	• Would you like children at some point? • When would you like to become pregnant? • How important is pregnancy prevention to you? • What contraception measures do you practice? (CDC, n.d.)

TABLE 20.1 5 P's of Patient Conversation for STI Screening

Recognizing and Analyzing Cues

Though many STIs can be asymptomatic, most do have some associated symptoms that should be assessed for by the nurse. To effectively detect and diagnose STIs in their early stages, the nurse must be able to recognize specific symptoms associated with each type of infection. Common clinical manifestations of different types of STIs are listed in Table 20.2.

Sexually Transmitted Infection	Clinical Manifestations
Chlamydia	• Abnormal, foul-smelling discharge from vagina or penis (typically white, yellow, or gray) • Irregular vaginal bleeding • Painful urination with itching or burning • Pelvic or abdominal pain • rinary frequency
Gonorrhea	• Same as chlamydia, but discharge is typically white or yellow and does not have a foul smell
Herpes simplex virus	• Itching or tingling sensation called prodrome noticed a few days before outbreak of sores • Presence of blisters or sores on mouth/lips or genitals • Flu-like symptoms (e.g., headaches, fever, chills)
Human papillomavirus	• Warts on or near the genitalia
Syphilis	• Presence of chancres in the oral mucosa or near genitalia • Rash on the hands and/or feet

TABLE 20.2 Clinical Manifestations Associated with Different Types of STIs

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Once the nurse identifies symptoms of an STI, the nurse should refer the patient to the appropriate resources for further diagnostic testing. If the patient is being cared for in the hospital setting, the next step would be to notify the care team and request any necessary further testing and treatment. In outpatient centers, the nurse may be able to perform point-of-care STI testing and initiate a request for immediate treatment by a provider with antibiotics or other medications. Actions taken by the nurse will vary depending on the practice setting and specific STI present, but the goals of care include early diagnosis and intervention to effectively eradicate the infection. Another important aspect of nursing care of patients with STIs is caring for the mental aspects associated with the disorder. There is a stigma associated with STIs that can negatively affect the mental health of those affected, so nurses must be aware of this stigma and treat patients without judgment.

Medical Therapies and Related Care

Most STIs can be treated effectively on an outpatient basis, but if the infection is caught late and/or has become severe, it is possible that nursing care will need to be provided in the hospital setting. Additionally, it is common for patients who present to the hospital for other medical reasons to be diagnosed with an STI during their stay. This highlights the importance of all nurses being familiar with and recognizing common STIs, regardless of their specific practice setting. Treatments for common STIs are listed in Table 20.3. Nurses are often tasked with administering them either orally, intramuscularly, or intravenously, so it is important that the nurse is familiar with the different treatment options they may see in clinical practice.

Sexually Transmitted Infection	Treatments
Chlamydia	• Antibiotics (usually azithromycin or doxycycline) • Longer course of antibiotics indicated if patient also has gonorrhea
Gonorrhea	• Antibiotics (usually intramuscular ceftriaxone and oral azithromycin) • Longer course of antibiotics indicated if patient also has chlamydia
Herpes simplex virus	• Analgesic medications for painful lesions • Antiviral medications (e.g., acyclovir)
Human papillomavirus	• Colposcopy can be used to biopsy cervix for potential cancerous lesions • Procedures to remove genital warts (e.g., cryotherapy, electrocautery, laser removal) • Topical treatments for genital warts (e.g., salicylic acid)
Syphilis	• Antibiotics (most often a penicillin)

TABLE 20.3 Treatment Options for Common STIs

Evaluation of Nursing Care of the Patient with an STI

When caring for a patient with an STI, the nurse will need to review the patient's care and make decisions about the effectiveness of the interventions. This can include physical and psychological care, as well as patient education and resource identification. Nurses will evaluate treatment efficacy and screen for symptom resolution or progression of infection.

Evaluating Outcomes

The purpose of evaluating outcomes after a patient has been treated for an STI is to determine whether the treatment was effective and if the patient requires further care. During the evaluation,

- The nurse should ask the patient about their symptoms and if they feel as though they have been fully resolved.
- The nurse will also perform a physical assessment to determine if the physical symptoms such as rashes or warts have cleared up completely.
- If treatment appears to have been effective, the next step in the evaluation process is to provide counseling and appropriate resources to the patient. Patient education should include information about safe sexual practices to help limit their risk of developing another STI in the future.
- The nurse will provide information about the future course of the disease. Although some STIs, like chlamydia and gonorrhea, can be effectively treated with antibiotics, other infections, such as herpes, are lifelong conditions with chronic symptoms and flare-ups.
- Nurses should evaluate the patient's knowledge about symptoms of **infertility**. In these cases, the nurse should provide information about testing and treatments that may be necessary throughout the patient's lifetime so they are prepared and know what to expect in the future.

CULTURAL CONTEXT

Human Trafficking Victims

At-risk populations, such as victims of sex trafficking, are at an especially high risk for STIs. The nurse must ensure privacy while conducting a thorough comprehensive history, inquiring about any history of pregnancy, previous STIs,

and any gaps in gynecological care. Sex-trafficking victims often have other conditions, including undiagnosed comorbidities such as heart disease and diabetes, and may have nutritional deficiencies. A psychiatric history should include an assessment of substance use and domestic partner abuse, as well.

20.3 Male-Specific Disorders of the Reproductive Tract

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations of disorders of the male reproductive tract.
- Describe the diagnostics and laboratory values for disorders of the male reproductive tract.
- Apply nursing concepts and plan associated nursing care for the patient with disorders of the male reproductive tract.
- Evaluate the efficacy of nursing care for the patient with disorders of the male reproductive tract.
- Describe the medical therapies that apply to the care of disorders of the male reproductive tract.

The male reproductive system consists of both external and internal genitalia. The external structures include the penis and scrotum, and the major internal parts are the tests and prostate gland. The major functions of the male reproductive system are the production of the male sex hormone, testosterone; control of sexual function and characteristics; and production and secretion of sperm, which is used for biological reproduction.

Pathophysiology of Common Disorders of the Male Reproductive Tract

Common disorders of the male reproductive system include erectile dysfunction (ED), testicular cancer, and testicular torsion. These types of disorders are often highly personal because they can significantly affect the patient's sexuality and reproductive function. It is important that nurses and other health care professionals promote an environment that is nonjudgmental and comfortable for the patient to allow them to fully express their concerns and obtain adequate treatment and support.

Erectile Dysfunction

One of the most common disorders of the male reproductive system is **erectile dysfunction**. Erectile dysfunction, also referred to as "impotence," is a condition in which the man cannot maintain a full erection of the penis for sexual intercourse Mayo Clinic, 2022a). This condition affects nearly 30 million men in the United States and may cause distressing feelings such as guilt, rejection, shame, and frustration (CDC, 2022). These feelings tend to negatively affect intimate relationships, with both the patient and their partner expressing sexual dissatisfaction. Erectile dysfunction can be caused by many different conditions, including

- benign prostatic hyperplasia (BPH)
- diabetes
- heart disease
- hyperlipidemia
- hypertension
- low testosterone levels
- medications (e.g., antidepressants, antihypertensives)
- neurological disorders (e.g., Parkinson's disease, multiple sclerosis)
- obesity
- penile trauma
- psychological disorders (e.g., depression, anxiety, stress)
- substance misuse

Testicular Disorders

There are two main disorders of the male reproductive system that affect the testicles: testicular cancer and testicular torsion. Testicular cancer is rare, affecting only 1 of every 250 male individuals in the United States (American Cancer Society, 2023b). This cancer is typically diagnosed in men in their 20s or 30s, but there have been some cases diagnosed in children and older men. Risk factors for the development of testicular cancer include

- **cryptorchidism** (undescended testicle)

- family or personal history of testicular cancer
- human immunodeficiency virus (HIV)/acquired immunodeficiency syndrome (AIDS) infection
- marijuana use

The condition **testicular torsion** occurs when the spermatic cord, the supplier of blood to the testicles, becomes twisted (Figure 20.9). This is a medical emergency and, without immediate intervention, could result in irreversible damage to the testicles and infertility (Mayo Clinic, 2022b). This condition may occur spontaneously, most often in young male individuals between the ages of 12 and 18 years, or because of physical trauma to the testicles. Without treatment, the testicle tissue may die, resulting in infertility.

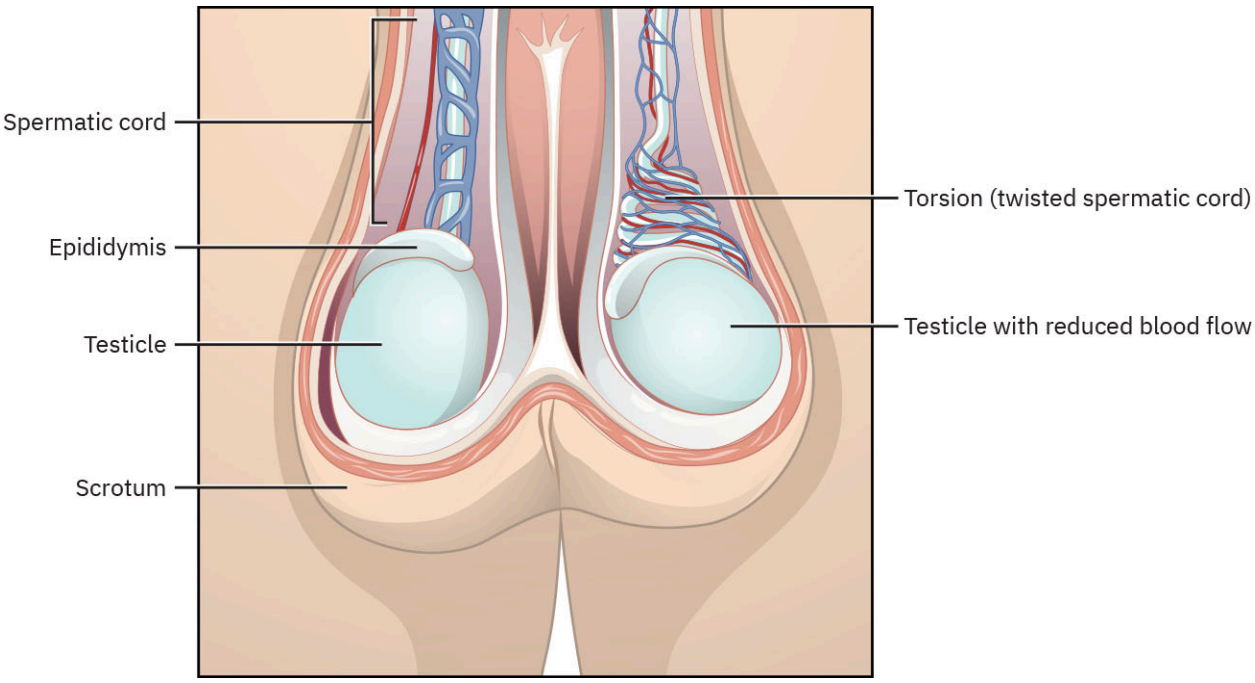


FIGURE 20.9 Testicular torsion occurs when the spermatic cord becomes twisted, resulting in reduced blood flow to the testicle. (credit: modification of work from *Anatomy and Physiology 2e*. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Assessment and Diagnostics

Initial steps in caring for a patient with a male reproductive system disorder is obtaining a thorough health history and performing a physical examination. It is important to remember that many patients are uncomfortable discussing sexual function with others, so nurses must attempt to provide a comfortable, friendly environment that allows for open and honest discussion.

Recognizing and Analyzing Cues

Clinical manifestations associated with disorders of the male reproductive tract vary depending on the specific condition. Common clinical manifestations associated with testicular cancer, testicular torsion, and ED are listed in Table 20.4.

Disorder	Clinical Manifestations
Erectile dysfunction	• Decreased libido • Patient reports inability to initiate and/or maintain penile erection during sexual intercourse.
Testicular cancer	• Dull ache in the lower abdomen • Gynecomastia • "Heavy" feeling in the scrotum • Painless, hard lump in testicle • Some patients may report testicular pain, but this is rare. • Sudden swelling in the testicle
Testicular torsion	• Sudden, severe pain in the testicles • Lower abdominal pain • Nausea/vomiting • Scrotal swelling and erythema • Urinary frequency

TABLE 20.4 Clinical Manifestations of Disorders of the Male Reproductive System

Diagnostics

There are not many diagnostic tests available for most disorders of the male reproductive system. For example, for ED, a diagnosis is made based on the symptoms reported to the provider by the patient. The provider may order blood tests after a diagnosis is made, but this is mostly to determine if there might be an underlying medical cause of ED, not to diagnose ED itself. Additionally, sometimes an ultrasound of the penis is performed to determine if there might be a physical blood flow issue that is not allowing a full erection to occur. Most patients diagnosed with ED are also screened for psychological disorders, such as anxiety or depression, that may be contributing to the condition.

When a patient presents with symptoms that indicate the possibility of testicular torsion (e.g., sudden lower abdominal pain), an emergent ultrasound of the scrotum is ordered. This imaging test is used to check for blood flow to the testicles and determine the extent of any damage. It is important that this imaging be performed quickly in case the patient requires surgery to restore blood flow to the testicles. Diagnosis of testicular cancer is also often made with the use of ultrasound imaging. If the patient reports a lump in the testicles, ultrasound can be used to further investigate its characteristics and determine if it appears to be cancerous. In addition to imaging, blood tests can be performed to look at various tumor markers that may be indicative of cancer. Markers that may indicate the presence of testicular cancer include

- alpha-fetoprotein
- beta–human chorionic gonadotropin
- lactate dehydrogenase

Medical Therapies and Related Care

Most male reproductive disorders are easily treated with medications or surgical procedures. Treatment options for male reproductive system disorders are described in Table 20.5.

Disorder	Treatments
Testicular cancer	• Nonsurgical therapy options (e.g., chemotherapy, radiation therapy) • Surgical removal of affected testicle, called **orchiectomy**
Testicular torsion	• Urgent surgical intervention • Manual manipulation if surgery is not available immediately
Erectile dysfunction	• Lifestyle changes to fix underlying cause (e.g., weight loss, blood pressure management) • Oral medications (e.g., phosphodiesterase-5 inhibitors) • Penile implants • Penile injections with prostaglandins • Vacuum-assisted erection devices

TABLE 20.5 **Treatment Options for Common Disorders of the Male Reproductive System**

Nursing Care of the Patient with Disorders of the Male Reproductive Tract

Care for a male patient with a reproductive disorder may be complex and can include physical interventions, psychological screening, and patient education. The nurse needs to create an open environment for the patient while also focusing on proper diagnosis, intervention, and initiation of effective treatment options

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Nursing care of patients with male reproductive system disorders must be delivered in a nonjudgmental, friendly manner. This assists the nurse to develop rapport with the patient so they are more comfortable sharing information about their condition. Specifically, care for the male patient with ED requires the nurse to provide a safe environment where the patient can discuss their sexual concerns comfortably. Other nursing interventions for the patient with ED include providing education about lifestyle modifications, medications, and psychotherapy, all three of which are main treatment options. Education about medications for ED is an especially important aspect of nursing care. For example, patients receiving current antihypertensive therapy should be educated about their potential cumulative effects, to prevent serious episodes of hypotension and syncope. Additionally, patients taking medications for ED should be instructed to never take nitrates for chest pain, because this could also result in severe hypotension.

One of the main nursing interventions in the care of patients with testicular torsion is immediate referral for imaging and potential surgery. As mentioned, this condition is an emergency and must be treated immediately to restore blood flow and function to the affected testicle. Patients with testicular torsion are often encountered in the emergency department and present with new-onset, severe lower abdominal or scrotal pain. Nurses must be aware of this common clinical manifestation and understand the severity of this condition. If the nurse suspects a patient is experiencing testicular torsion, they will need to contact the provider quickly for immediate medical intervention.

Most of the nursing care of patients with testicular cancer is performed as part of the patient's hospital stay following orchiectomy, because this is the most common treatment option for this disorder. Preoperative care is similar to that of most other surgical procedures, including obtaining informed consent, ensuring the patient ingests nothing by mouth for the number of hours ordered by the provider, and preparing the patient for surgery. Postoperative care of the patient after orchiectomy may involve caring for an indwelling catheter until the patient is ready to void on their own. The nurse will provide meticulous cleaning and care to the catheter site to prevent infection and other complications. Additionally, these patients will require education about the importance of maintaining follow-up appointments and the potential impact of the surgery on their fertility.

LIFE-STAGE CONTEXT

Testicular Cancer

Because testicular cancer is often diagnosed in young males in their early 20s or 30s, they may not be thinking about their future fertility yet. However, it is important that they are provided education about the potential for orchiectomy to negatively affect fertility. Most often, only one testicle is removed, allowing for the other to compensate and produce adequate testosterone and sperm. However, sometimes the remaining testicle does not function adequately, or both testicles are affected and must be removed. In any case, it is important to counsel the patient about these potential outcomes and give them the option to undergo cryopreservation, or "sperm banking." As part of this process, before the orchiectomy, the patient will provide a sperm sample that can be frozen for future reproduction.

Evaluation of Nursing Care of the Patient with Disorders of the Male Reproductive Tract

As a nurse, evaluation is an important part of patient care. The nurse must determine whether the treatment was effective and if the patient requires further care or education. The nurse can determine if there has been resolution of symptoms or if further learning needs require further support.

Evaluating Outcomes

During evaluation of a patient who has been treated for ED, the nurse will ask about the patient's sexual function to determine whether prescribed medications or lifestyle modifications have helped improve the condition. If the patient reports the interventions have not been effective, this would warrant further investigation and possible referral to specialists who may be able to prescribe different medications or therapies. For patients recovering from orchiectomy, it is important for the nurse to inquire about postoperative pain or discomfort to evaluate their recovery process. Although minimal postsurgical pain is common, if the patient reports experiencing more severe or frequent pain than expected, the nurse should report the findings to the surgeon to determine next steps.

Patients who have experienced disorders of the male reproductive system often require lifelong counseling or psychotherapy, because these conditions can have negative effects on both mental and social health. It is important for the nurse to facilitate these experiences by providing the patient with appropriate referrals for counseling and therapy. Though nurses are not trained to provide official psychotherapy or counseling, it is important that they create a safe space where the patient can openly discuss their health and sexual concerns free from judgment and without embarrassment.

CLINICAL SAFETY AND PROCEDURES (QSEN)

Patient-Centered Care: Testicular Self-Examinations

Disclaimer: Always follow agency policy.

Definition: Recognize the patient or designee as the source of control and full partner in providing compassionate and coordinated care based on respect for the patient's preferences, values, and needs.

Male patients between the ages of 14 and 45 years are at risk for testicular cancer. Nurses can help patients with primary prevention by teaching testicular self-examination. The nurse can advise the following correct method for testicular self-exam:

1. Perform a testicular self-exam once a month during or right after a warm shower.
2. Examine each testicle with thumbs and middle fingers, rolling gently, noting lumps, nodules, or changes or pain.
3. Examine each testicle in the mirror, looking for swelling or redness (Testicular Cancer Society, n.d.).

(QSEN Institute, n.d.)

20.4 Disorders of the Prostate

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations of disorders of the prostate.
- Describe the diagnostics and laboratory values for disorders of the prostate.
- Apply nursing concepts and plan associated nursing care for patients with disorders of the prostate.
- Evaluate the efficacy of nursing care for the disorders of the prostate.
- Describe the medical therapies that apply to the care of patients with disorders of the prostate.

The prostate gland is a major organ of the male reproductive system and is located just below the urinary bladder and anterior to the rectum (see Figure 20.2). Though it is quite small at only 3 cm long, it is very important for male reproduction. The major function of the prostate gland is the production of fluid that is mixed with sperm for ejaculation as semen (InformedHealth.org, 2016). The muscles of this gland also assist with the mechanical expulsion of semen during ejaculation. The two most common pathological conditions associated with the prostate gland are benign prostatic hyperplasia (BPH) and prostate cancer, both of which are discussed in more detail in this section.

Pathophysiology of BPH

Benign prostatic hyperplasia is quite common, affecting over half of men between the ages of 51 and 60 years and 70% of men older than 60 years (National Institute of Diabetes and Digestive and Kidney Diseases, 2014). This condition is benign and results when the prostate becomes enlarged as a normal side effect of aging. As the prostate gland grows larger, it eventually presses against the urethra, resulting in urinary dysfunction and difficulty with the stream of urine flow.

Pathophysiology of Prostate Cancer

Prostate cancer is the most common type of cancer in males, with about 288,300 new cases diagnosed in 2023 in the United States (American Cancer Society, 2023a). Approximately one of every eight men will be diagnosed with prostate cancer in their lifetime, highlighting its significant prevalence. Though it is a common cancer, most patients diagnosed do not die of the condition, because of the availability of advanced treatment options. The underlying pathophysiology of prostate cancer involves a mutation in the normal prostate cells that results in overproduction of cancerous cells within the gland, known as hypertrophy. A disparity of prostate cancer identification affects more Black men than White men, with earlier manifestation, aggressive disease, and a higher mortality rate (Lillard et al., 2022).

Assessment and Diagnostics

The best way to physically assess the size and shape of the prostate gland is by performing a **digital rectal examination (DRE)**. During this assessment, the provider inserts a gloved, lubricated finger into the rectum to feel the prostate gland and determine if it is enlarged or has any other abnormalities, such as nodules. Enlargement of the prostate gland often indicates BPH, whereas the palpation of a hard nodule on the prostate may indicate prostate cancer. If either of these abnormalities is noted during the DRE, further tests will be ordered to assist in confirming the diagnosis.

Often, the next diagnostic test used after an abnormality is noted during the DRE is the prostate-specific antigen (PSA) test. This blood test checks for the presence of PSA which is a protein made by the prostate gland. If this value is elevated, it can be indicative of either BPH or prostate cancer. Occasionally, the provider may also order a urinalysis at this time to check for additional urinary system problems, including UTI and kidney stones, which often occur because of BPH. Current screening guidelines recommend prostate cancer retesting every two years for men with a PSA level less than 2.5 ng/mL and annual testing for men with a PSA level greater than 2.5 ng/mL.

If prostate cancer is suspected, other diagnostic tests may be ordered to confirm the diagnosis and determine its severity. First, imaging is usually ordered to better visualize the gland. This is typically done with use of a transrectal ultrasound. During this procedure, the provider will insert a small ultrasound probe into the rectum to look at the prostate gland and determine if there are any nodules present that are indicative of cancer. If a nodule is noted at this time, a biopsy specimen is usually taken and sent to the laboratory for further analysis. Once the laboratory

confirms the diagnosis of prostate cancer, the patient will often undergo other imaging such as computed tomography scan or magnetic resonance imaging to determine if the cancer has spread beyond the prostate gland or if it remains localized.

Recognizing and Analyzing Cues

Because of the high prevalence of BPH and prostate cancer in older adult males, it is important for nurses to be aware of symptoms that may indicate the patient has either of these conditions. Often, while obtaining the health history, the nurse will use a standardized questionnaire to determine whether the patient is exhibiting symptoms indicative of BPH or prostate cancer. The most used scale is the International Prostate Symptom Score (I-PSS). There are also some key assessment findings that the nurse should look for during a physical assessment, including

- chronic urinary retention and inability to fully empty bladder
- **hematuria** (blood in urine) – this is a *late* sign of prostate cancer
- increased urinary frequency
- **nocturia** (increased urinary frequency during nighttime hours)
- pain during intercourse or ejaculation
- recurrent UTIs and/or kidney stones due to urinary stasis
- **urinary hesitancy** (difficulty starting urinary stream)
- urinary leaking and incontinence
- urine flow "dribbling" at end of stream
- urine stream that starts and stops intermittently

LINK TO LEARNING

The International Prostate Symptom Score (IPSS) (https://openstax.org/r/77IPSS) is used widely to assess for BPH and severity of symptoms of the lower urinary tract. This calculator provides a quick method for the assessment.

Medical Therapies and Related Care

Though BPH and prostate cancer often cause similar symptoms, treatment goals and options differ between the two conditions. These treatments are discussed in more detail in the following two sections.

Medical Treatment for BPH

Before attempting any invasive procedures to treat BPH, there are some behavioral changes and pharmacological therapies that are offered to the patient. First, patients with BPH are counseled about fluid intake, especially caffeine and alcohol, which have diuretic effects. Patients with BPH should drink enough fluids to maintain adequate hydration but refrain from drinking too much, especially within four hours of bedtime, which can contribute to worsening urinary frequency and retention, and nocturia. A voiding schedule, whereby the patient is instructed to void every two hours, is another helpful intervention to avoid urinary dribbling. In addition to limiting fluid, caffeine, and alcohol intake and trying a voiding schedule, patients with BPH are often prescribed medications to help improve BPH symptoms. Common medication classes prescribed for BPH as well as their mechanisms of action and common adverse effects are listed in Table 20.6.

Drug Class	Mechanism of Action	Common Adverse Effects
α_1-Adrenergic antagonists • terazosin • doxazosin • prazosin • tamsulosin • alfuzosin	Relaxation of smooth muscle in the bladder and prostate gland, which allows easier flow of urine	• Dizziness • Headache • Hypotension, especially orthostatic • Syncope • Weakness
5-α-Reductase inhibitors • finasteride • dutasteride	Decreased production of dihydrotestosterone, which causes reduced growth of prostate gland	• Decreased ejaculatory volume • Decreased libido • Dizziness • ED • Gynecomastia • Orthostatic hypotension • Weakness
Phosphodiesterase-5 inhibitors* • tadalafil (Cialis)	Relaxation of smooth muscle in the urinary tract, which can aid effective urine flow	• Abdominal pain • Diarrhea • Facial flushing • Headache • Nasal congestion • Nausea • Upper respiratory infection

*Note: This class of medications is typically only used to treat ED, but it has been shown to have some effectiveness for treating symptoms associated with BPH.

TABLE 20.6 Common Medication Classes Prescribed for BPH

If behavior modifications and medications are ineffective for treating symptoms associated with BPH, more invasive procedures can be considered. These procedures are described in Table 20.7.

Procedure	Description
Transurethral needle ablation (TUNA)	Low-radiofrequency needles are placed through the urethra and into the excess prostate tissue. Waves are sent through the needles, which kill prostate tissue and decrease the size of the prostate gland.
Transurethral microwave thermotherapy (TUMT)	A small microwave antenna is inserted through the urethra toward the prostate, where microwave energy is delivered to destroy excess prostate tissue.
Photovaporization of the prostate (PVP)	GreenLight laser is used to vaporize excess prostate tissue.

TABLE 20.7 Procedures for the treatment of BPH

Procedure	Description
Transurethral resection of the prostate (TURP)	A resectoscope is inserted through the urethra and small parts of prostate tissues are trimmed away (Figure 20.10). These pieces are then flushed out with irrigation fluid at the end of the procedure. This procedure requires an indwelling catheter immediately after surgery and usually a one- to two-day postoperative hospital stay. Some patients require a three-way foley that promotes continuous bladder irrigation, if clinically required.
Transurethral incision of the prostate (TUIP)	Small incisions are made in the prostate tissue where it meets the bladder. This allows for improved flow of urine.
Prostatic urethral lift (UroLift)	Permanent implants are placed in the urethra where it is obstructed, to hold back the enlarged prostate tissue and improve urine flow through the urethra.
Simple prostatectomy	Removal of excess prostate tissue through incisions in the lower abdomen or perineum. This is one of the most invasive treatment options and requires a two- to four-day postoperative hospital stay, with a longer recovery period.

TABLE 20.7 Procedures for the treatment of BPH

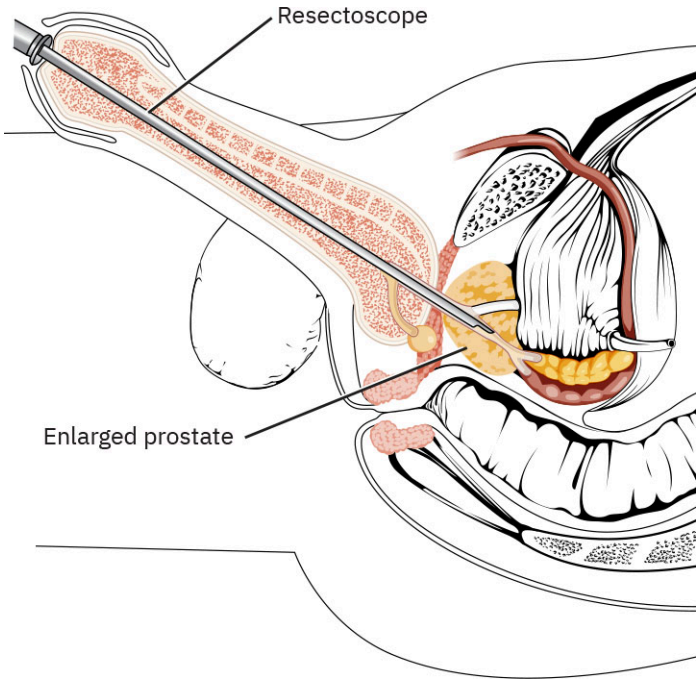


FIGURE 20.10 Through a TURP, a resectoscope is placed into the patient's urethra and the prostate is surgically resected by this canulated scope and fully removed. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Medical Treatment for Prostate Cancer

Because prostate cancer grows slowly and often does not affect men until later in life, treatment is not always required. In these situations, the provider may choose a "wait and see" approach. During this time, the patient is monitored at regular intervals with DREs and PSA tests. If symptoms become bothersome or the cancer progresses, further intervention may be warranted.

Radiation therapy is usually the first treatment option for patients with prostate cancer that is in an early stage and

localized to the prostate gland. The two main types of radiation used for treatment of prostate cancer are external beam radiation therapy (EBRT) and brachytherapy (internal radiation). EBRT involves using radiation beams on the external skin located over the prostate gland. Typically, patients receive this kind of radiation therapy five days a week for several weeks on an outpatient basis. This procedure is quick, painless, and highly effective for curing early-stage prostate cancer. An approach called brachytherapy involves placement of radioactive seeds inside the prostate tissue that are left in place and give off radiation to kill excess prostate tissue over several weeks to months. The amount of radiation emitted by the seeds is low, so there is minimal risk of damage to surrounding healthy tissue with this kind of procedure. With radiation therapy, adverse side effects may include ED, urinary incontinence, fatigue, and **radiation proctitis**, or inflammation of the rectum lining, which can result in diarrhea and rectal leakage.

Pharmacological interventions, including hormone therapy and chemotherapy, can also be used in the treatment of prostate cancer. Hormone therapy includes the use of luteinizing hormone-releasing hormone agonists and antiandrogens. Luteinizing hormone-releasing hormone agonists work by preventing the production of testosterone, which results in slower cancer cell growth. Antiandrogens, also known as androgen deprivation therapy, prevent the body from being able to use the male sex hormones, and this can also assist in slowing cancer growth. Chemotherapy is a systemic pharmacological treatment option typically reserved for patients with more severe and metastatic prostate cancer. Depending on the severity of the cancer and other specific patient characteristics, surgery may be another treatment option considered for prostate cancer. A radical prostatectomy (removal of the entire prostate gland) or bilateral orchiectomy (removal of both testicles) is performed in some cases.

Nursing Care of the Patient with BPH

The two main priorities of care for patients with BPH are related to improving urinary elimination flow and providing psychosocial support. The nurse should take both aspects of care into consideration when planning intervention for a patient with BPH.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

To assist with the improvement of urinary elimination, the nurse should provide education about lifestyle changes such as limiting fluid and caffeine intake, especially before bedtime, to prevent nocturia and other BPH-associated symptoms. If the patient has been prescribed medications for the treatment of BPH symptoms, the nurse should ensure the patient understands how to take the medications correctly and any adverse effects to monitor for. Additionally, the nurse should emphasize the importance of taking medications as prescribed and reporting their effectiveness to the provider so changes in dosing can be made as necessary.

When caring for a patient with BPH who is scheduled to undergo a more invasive procedure such as a TURP or TUNA, the nurse will ensure the patient understands the nature of the procedure and obtain informed consent. During this process, the nurse confirms that the patient understands the information the provider gave them about the procedure, because the provider ultimately has the legal responsibility associated with procedural education. Postoperatively, the nurse will provide care that is tailored to the specific procedure performed. In most cases, the patient will return to the unit with an indwelling urinary catheter, so one of the main nursing interventions is to complete meticulous catheter care to prevent infection. Occasionally, these patients will also be receiving **continuous bladder irrigation (CBI)**, a procedure in which a three-way urinary catheter is used to constantly irrigate the bladder and allow for adequate urinary drainage (Figure 20.11). The nurse will need to adjust the flow of the bladder irrigation solution to maintain patency and monitor for complications such as severe bleeding. Color of the urine may direct urethral patency; urine that is pink tinged and few to no clots is an ideal response with continuous bladder irrigation.

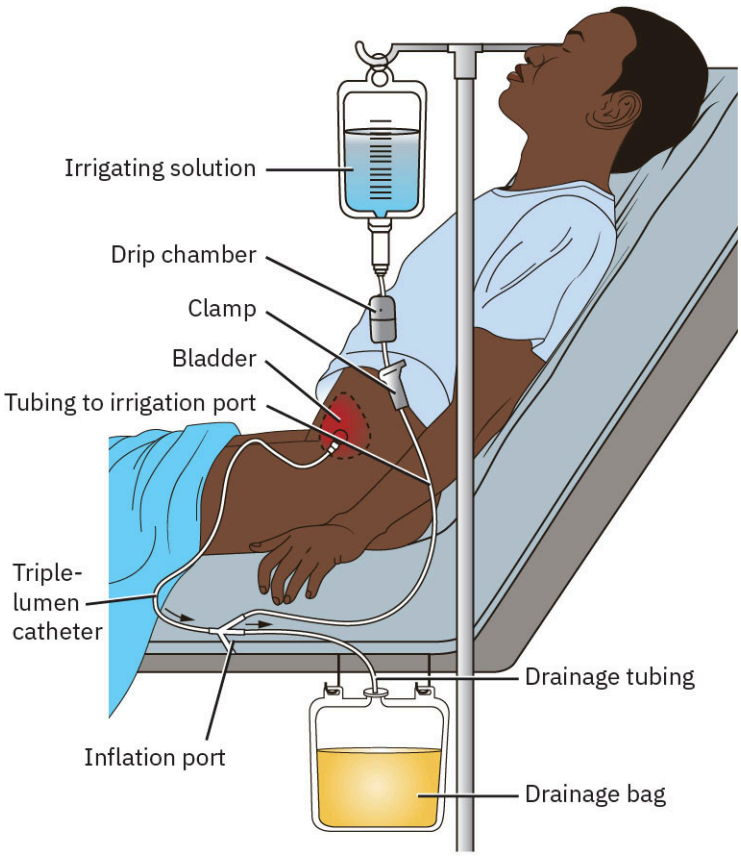


FIGURE 20.11 Continuous bladder irrigation uses a three-way catheter to irrigate the bladder to allow for adequate urinary drainage. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

In addition to providing care that addresses physical symptoms, the nurse is also tasked with providing psychosocial support to the patient. Disorders of the male reproductive and urinary systems are highly personal and can have a significant impact on mental health. It is important for nurses to remain empathetic to these feelings and provide care that is nonjudgmental and supportive. These patients may also benefit from referrals to various social support groups, so it is important for the nurse to be knowledgeable about these options and provide referrals to this extra support as needed or requested by the patient.

Evaluation of Nursing Care of the Patient with BPH

As part of patient care, the nurse must evaluate interventions and treatment options. The nurse should make sure to assess and consider all aspects of the patient's well-being, including psychological and educational needs.

Evaluating Outcomes

After treatment, the best outcome is that patients will report improvement in urinary elimination patterns. If the patient reports that symptoms have not improved, the nurse should be sure to escalate the patient's concerns to the provider and formulate a new plan of care with different treatment options to attempt to improve elimination patterns. While evaluating patient outcomes, the nurse should also assess the patient's feelings about their disorder. A major part of caring for patients with BPH involves treating the psychosocial aspect of the illness, so the nurse would hope to see improvements in this area as well. If this is not the case, the nurse can refer the patient to counseling or other supportive services that can assist the patient in coping with their disorder.

Nursing Care of the Patient with Prostate Cancer

The nurse will be one member of an interprofessional health care team that will provide care for the patient with prostate cancer. The nurse plays a vital role on the team by creating a comfortable environment and providing necessary interventions, ensuring the best possible outcome.

Recognizing and Analyzing Cues

During the physical examination of a patient with prostate cancer, the nurse should assess for signs that would indicate the condition is not improving, such as worsening nocturia or an inability to empty the bladder completely. It is also important that the nurse assess the patient's mental health and coping strategies. Though prostate cancer is typically curable, it can still cause feelings of fear and anxiety. The nurse should allow the patient to express and explore these feelings as needed.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Patients diagnosed with prostate cancer are often faced with many treatment options, so one of the main nursing interventions is to help guide the patient through this decision-making process. The nurse will not make the treatment decision for the patient, but it is important that they assist the patient in fully understanding their treatment options and the associated risks and benefits. With this information, the patient can make a better-informed decision about their health. If the patient chooses to try pharmacological options, the nurse should provide education about the medications, their mechanisms of action, and associated side effects. If the patient plans to undergo surgery, the nurse will ensure the patient understands the procedure and obtain an informed consent. Postoperative care for prostate cancer surgery will likely involve catheter care and interventions for reducing postoperative pain.

Evaluation of Nursing Care of the Patient with Prostate Cancer

As with other conditions, the nurse must evaluate any interventions and treatment options for the patient with prostate cancer. The nurse should be sure to assess all aspects of the patient's well-being, including psychological and educational needs, throughout all of the patient's follow-up care.

Evaluating Outcomes

After receiving treatment for prostate cancer, the nurse should assess the patient for optimal outcomes, including improved urinary elimination patterns and the complete eradication of cancer cells. It is also important for the nurse to stress the importance of maintaining follow-up appointments even after receiving cancer treatment, because recurrence may occur, necessitating repetition of the procedure or treatment interventions.

INTERDISCIPLINARY PLAN OF CARE

Interprofessional Care of the Patient Receiving Treatment for Prostate Cancer

- Dietitian: formulates nutritional plan, which is especially important for patients receiving cancer treatment because they often lose weight from lack of appetite associated with treatment
- Medical physicist: assists oncologist in creating treatment plan for patients opting to receive radiation therapy
- Nurse: provides holistic care for the patient and is a facilitator of both physical and psychosocial interventions
- Oncologist: determines presence and severity of the cancer and oversees the treatment planning process
- Pharmacist: assists in selecting appropriate pharmacological options and doses for cancer treatment
- Social worker: assists patient with psychosocial and financial aspects of cancer treatment

20.5 Female-Specific Disorders of the Reproductive Tract

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations of disorders of the female reproductive tract
- Describe the diagnostics of and laboratory values seen in disorders of the female reproductive tract
- Apply nursing concepts and plan associated nursing care of patients with disorders of the female reproductive tract
- Evaluate the efficacy of nursing care of the patient with disorders of the female reproductive tract
- Describe the medical therapies that apply to the care of disorders of the female reproductive tract

Common disorders of the female reproductive system discussed in this section include pelvic inflammatory disease, endometriosis, and uterine fibroids. These conditions may be highly personal to the patient because they often

result in issues relating to sexuality and fertility. Care of the patient with disorders of the female reproductive system should be provided in a gentle, empathetic manner. These patients often require not only physical interventions and medical care but also psychosocial support.

Pathophysiology of Common Disorders of the Female Reproductive Tract

One of the most common disorders of the female reproductive system is pelvic inflammatory disease (PID), which affects nearly one million women annually (Pennsylvania Department of Health, 2023). This condition results from an infection within the reproductive tract that causes permanent scarring in the tissues. The infection is typically caused by a bacterium but can also be due to a virus, fungus, or parasite. Often, the infectious disease that results in PID is either gonorrhea or chlamydia, both of which are transmitted through sexual contact. This is significant because this condition often results in infertility and an increased risk of **ectopic pregnancy** (pregnancy occurring outside of the uterus, most often in the fallopian tube) which can be life-threatening.

Another common condition of the female reproductive tract is **endometriosis**, which affects approximately 10 percent of female individuals, or 190 million, annually (World Health Organization, 2023). The underlying pathophysiologic mechanism of this disorder is growth of uterine tissue in areas located outside of the uterus (Figure 20.12), which results in severe pain and possible infertility. The cause of this abnormal tissue growth is unknown and there is no cure, but there are treatments available for its associated symptoms.

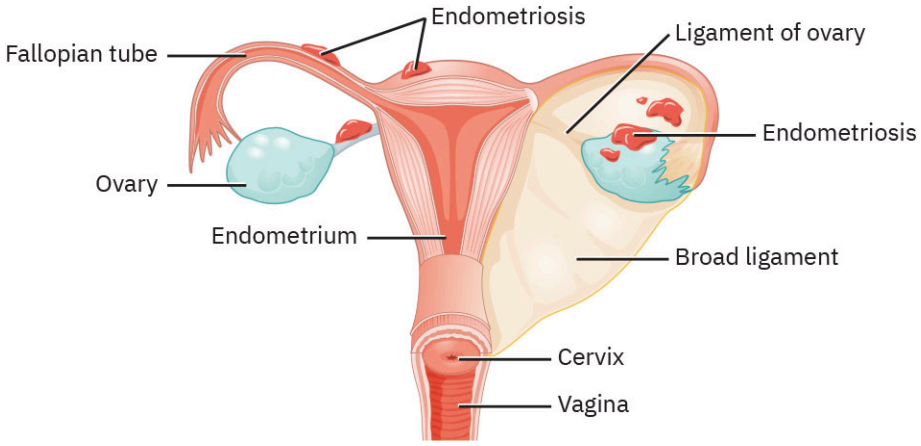


FIGURE 20.12 Common sites of endometriosis include the fallopian tubes and ovaries. (credit: *Anatomy and Physiology 2e.* attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

The most common type of benign tumor affecting women is the **uterine leiomyoma**, more commonly called a **uterine fibroid**. More than half of all women will experience a uterine fibroid by the time they turn 50 years old (Mayo Clinic, 2022c). The exact cause of these slow-growing, noncancerous tumors is unknown, but they result from an inappropriate growth pattern of the smooth muscle located within the uterus.

Assessment and Diagnostics

One of the first steps in caring for a patient with a female reproductive system disorder is obtaining a thorough health history and performing a physical examination. It is important to remember many patients are uncomfortable discussing sexual function and details about menstrual cycles; therefore, the nurse should promote a warm, safe environment to facilitate an open dialogue with the patient.

Recognizing and Analyzing Cues

Clinical manifestations associated with disorders of the female reproductive tract vary depending on the specific condition. Common clinical manifestations associated with PID, endometriosis, and uterine fibroids are listed in Table 20.8.

Disorder	Clinical Manifestations
Pelvic inflammatory disease	• Abnormal vaginal discharge • Fever • Irregular menstrual bleeding • Lower abdominal pain • Painful sexual intercourse • Reported history of STI
Endometriosis	• Bloating • Fatigue • Heavy periods or bleeding between periods • Infertility • Nausea • Painful sexual intercourse • Painful urination • Pelvic or general abdominal pain that is worse during menstrual periods
Uterine fibroids	• Abdominal bloating/distension • Anemia • Constipation • Heavy menstrual cycles • Long menstrual cycles (e.g., longer than one week) • Pelvic pain • Spotting or bleeding between periods • Urinary frequency • Urinary retention and difficulty emptying the bladder

TABLE 20.8 **Clinical Manifestations of Disorders of the Female Reproductive System**

Diagnostics

Pelvic inflammatory disease is typically diagnosed on the basis of symptoms alone, but, if necessary, diagnostic tests or procedures such as sonograms or biopsies can be used to confirm the diagnosis. Endometriosis is also diagnosed mostly on the basis of symptoms; occasionally, the provider can confirm the diagnosis by palpation of pelvic nodules. If pelvic nodules are felt, the provider is likely to order a laparoscopic exploratory procedure and collect a biopsy specimen to confirm the diagnosis and determine its severity. If uterine fibroids are suspected, they can be confirmed and diagnosed with use of a transvaginal ultrasound to assist the provider in visualizing the tumors. There are no specific laboratory tests for any of the disorders of the female reproductive system, often making them difficult to accurately diagnose and treat. A full laboratory workup of female hormones is often completed because female reproductive system disorders are often affected by the normal menstrual cycle hormones. Additionally, if a patient has a heavy menstrual cycle, a complete blood cell count often is ordered to determine if the patient has anemia as a result.

Medical Therapies and Related Care

Most female reproductive disorders can be treated with medications or surgical procedures. Treatment options for female reproductive system disorders are described in Table 20.9. Additionally, because these disorders may result in infertility, it is common for women with these disorders to seek fertility treatments when they reach reproductive age and decide that they would like to try to get pregnant.

Disorder	Treatments
Pelvic inflammatory disease	• Antibiotics (usually a combination of ceftriaxone, doxycycline, and metronidazole) • Treatment of STIs in sexual partner is indicated.
Endometriosis	• Analgesic medications • Gonadotropin-releasing hormone agonists • Hormonal therapy (e.g., oral contraceptives) • Surgical removal of lesions
Uterine fibroids	• Analgesic medications • Blood transfusions or iron supplementation if condition is causing heavy menstrual cycles • Endometrial ablation, surgical removal of smaller fibroids, or hysterectomy (for larger fibroids) • Gonadotropin-releasing hormone agonists • Hormonal contraceptives

TABLE 20.9 Common Female Reproductive Disorders and Treatments

Nursing Care of the Patient with Disorders of the Female Reproductive Tract

Complex care is often needed for a patient with a disorder of the female reproductive tract, and can include physical interventions, psychological screening, and patient education. The nurse needs to address these areas with the patient while also creating a welcoming environment for the patient, and focusing on proper diagnosis, intervention, and initiation of effective treatment options

Recognizing and Analyzing Cues

During the health history and physical examination process, it is important that the nurse assess for symptoms that may indicate a female reproductive disorder. Specifically, the nurse should ask about any changes or irregularities of the patient's menstrual cycle. Symptoms such as a heavier menstrual flow or increased abdominal cramps may be the first indicators of a female reproductive disorder.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Because of the sensitive nature of female reproductive system disorders, it is important for nurses to provide gentle and supportive care to promote a comfortable environment for the patient. Psychosocial needs of the patient with a female reproductive disorder will vary, but in all cases, the nurse should remain sensitive to the patient's feelings and let them fully express their concerns. In some cases, the nurse may need to initiate referrals to social work or counseling to better help the patient navigate their condition and develop adequate coping skills.

One of the main nursing interventions when caring for patients with female reproductive system disorders is related to patient education. First, nurses must educate the female patient about expected physical symptoms associated with each disorder and when to seek help. The nurse will let the patient know that certain symptoms indicate a possible emergency and should be reported to the provider immediately. For example, bleeding between periods is an expected symptom of many female reproductive disorders, and the patient needs to report significantly heavier menstrual bleeding immediately because this may indicate a sign of more severe disease and could become life-threatening if left untreated. Typically, saturating one tampon or pad per hour is indicative of a heavy flow and should be reported to the provider for follow-up and intervention. Another important aspect of patient education as it relates to female reproductive disorders is their potential effects on future fertility. It is important that the nurse obtain appropriate referrals for these patients for counseling and fertility treatments as needed or as requested by the patient.

Evaluation of Nursing Care of the Patient with Disorders of the Female Reproductive Tract

To ensure proper patient care, the nurse must evaluate interventions and treatment options. This includes the patient's psychological and educational needs, as well as any immediate or future physical needs.

Evaluating Outcomes

The main purpose of evaluating outcomes after a patient has been treated for a female reproductive system disorder is to determine whether the treatment was effective and if the patient requires further care or education. The nurse should perform a physical assessment and collect subjective data from the patient to determine whether symptoms such as heavy menstrual bleeding have improved. Ideally, symptoms will be gone or will at least be tolerable, but if not, the nurse should relay the information to the provider so a new treatment plan can be established. During the follow-up and evaluation period after receiving treatment, the nurse should also conduct a psychosocial assessment. As mentioned, these disorders can have negative impacts on fertility, which can significantly affect the female patient's mental health. If, during the assessment, the nurse feels the patient is having difficulty coping with the diagnosis, the nurse can provide the patient additional resources, such as names of counselors or support groups.

LINK TO LEARNING

Check out the US Department of Health and Human Services, Office on Women's Health (https://openstax.org/r/77WomenHealth) for further information on women's health and associated disorders.

20.6 Disorders of the Breast

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations of disorders of the breast.
- Describe the diagnostics of and laboratory values seen in disorders of the breast.
- Apply nursing concepts and plan associated nursing care for patients with disorders of the breast.
- Evaluate the efficacy of nursing care for disorders of the breast.
- Describe the medical therapies that apply to the care of patients with disorders of the breast.

Breast cancer is the second most common cancer experienced by women, second only to skin cancer. This cancer affects more than two million women in the annually in the United States, highlighting its significant prevalence (World Health Organization, 2024. Fortunately, there are many treatment options available, and the five-year survival rate remains greater than 90 percent, which is higher than for most other types of cancer. In recent years, there has been much research and focus on developing better treatment options and improving access to early screening, which should improve survival rates. Black women, unfortunately, develop more aggressive breast cancers with lower survival rates in comparison to White women, with a 42 percent increased risk of breast cancer mortality (Yedjou et al., 2019).

Pathophysiology of Breast Cancer

The breasts are considered part of the female reproductive system and are composed of tissue that produces and secretes breast milk to feed offspring. Each breast contains approximately 15 to 20 lobes that branch into several lobules where milk is produced (Johns Hopkins Medicine, 2023). The lobules are connected via small ducts to the nipple, which is located centrally in the breast and contains openings for the milk to be secreted. Figure 20.13 shows an illustration of the different parts of the breast.

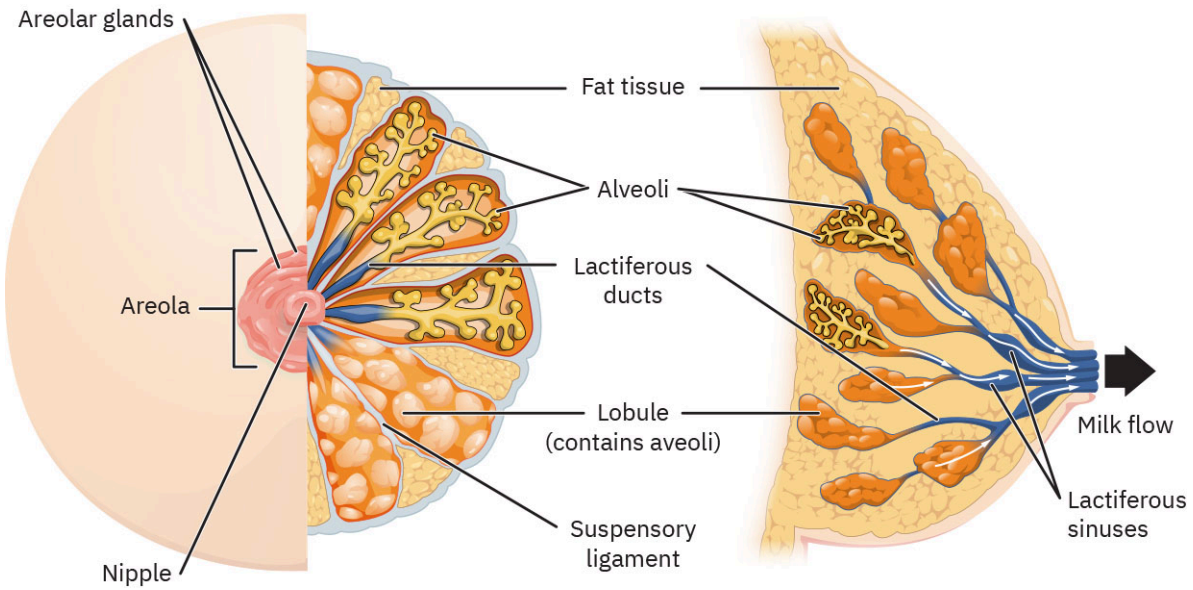


FIGURE 20.13 The main function of the female breast is to produce and secrete milk to feed offspring. (credit: *Anatomy and Physiology 2e*. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

The underlying pathophysiology of breast cancer is intricate and thought to be multifactorial, caused by a combination of genetics, hormones, and environmental risk factors. There are several specific types of breast cancer that are classified by their anatomic location and **histology**, or the study of the microanatomy of cell and tissue types, but all types involve an overgrowth of cancerous cells within the breast tissue. The growth rate of these cancerous cells can also be influenced by the presence of the female sex hormone, estrogen. The following are risk factors for breast cancer development (Alkabban et. al., 2022):

- alcohol and tobacco use
- *BRCA1* or *BRCA2* genetic mutations
- early menarche and/or late menopause
- environmental factors (e.g., contaminated water, radiation exposure, some pesticides)
- female sex
- first-degree relative with or personal history of breast or ovarian cancer
- history of using hormone replacement therapy
- increasing age
- **nulliparity** (having no children) or late age at birth of first child
- obesity and/or high-fat diet

Clinical Manifestations of Breast Cancer

The most common and often first clinical manifestation of breast cancer is the development of a lesion (or lump) within the breast tissue. Because screening has become more readily available, breast cancer nodules are often found before any other signs or symptoms of cancer appear.

Assessment and Diagnostics

After a lump in the breast has been palpated by the patient or provider, further diagnostic tests are indicated. These screening tests are also indicated for patients without the presence of a palpable lesion but who have multiple risk factors for developing breast cancer. Current screening recommendations suggest that women should begin mammograms as early as age 40 years and every other year from ages 40 to 74 (Breast Cancer Research Foundation, 2023). For women at especially increased risk because of family history or genetic mutations, annual screening may start at an even earlier age.

Mammograms are usually the first diagnostic test indicated. This procedure involves taking low-dose X-ray images of the breast tissue. These X-rays can enable visualization of growths in the breast that may be indicative of cancer. It is important for women to obtain mammograms as suggested by current screening guidelines, because tumors may be detected on X-ray before they are physically palpable, allowing for earlier intervention and effective

treatment. If suspicious lesions are found on the mammogram, it is likely the patient will need to undergo further imaging tests, such as an ultrasound of the breast tissue to confirm the presence and characteristics of the tumor. If the presence of a tumor(s) has been confirmed, the next step is a biopsy of the mass or tumor.

During the biopsy procedure, breast tissue and fluid are removed and sent to the pathology laboratory for analysis and staging of the cancer. The different types of biopsy procedures are described in Table 20.10.

Biopsy Procedure	Description
Fine needle aspiration (FNA)	A thin, hollow needle is attached to a syringe to withdraw a small amount of tissue and/or fluid from the breast.
Core needle biopsy	Large, hollow needle is used to withdraw tissue or fluid samples from the breast tissue.
Surgical biopsy	Surgical removal of the entire tumor and surrounding margins for cancer analysis.
Lymph node biopsy	Removal of axillary lymph nodes to monitor for cancer spread outside of breast tissue. This is often performed in conjunction with biopsy of breast tissue.

TABLE 20.10 Types of Biopsy Procedures for Diagnosis and Staging of Breast Cancer

Medical Therapies and Related Care

With focused research over the past several years, treatment options for breast cancer have become more readily available and much more effective. In some cases, treatment can even be provided before the patient receives an official cancer diagnosis. The complete removal of breast tissue before any cancer diagnosis is known as **prophylactic mastectomy** and greatly decreases the patient's risk of developing breast cancer. This procedure should be considered for patients with certain risk factors, including a strong family history of breast cancer, presence of genetic mutations, or personal history of other cancers. In most cases, the patient will undergo the prophylactic procedure and immediately undergo reconstructive breast surgery for cosmetic benefits.

Mastectomy can also be performed after receiving a breast cancer diagnosis and is used to treat more invasive types of cancer that affect large portions of the breast tissue. This can be performed as a **total mastectomy** (removal of the entire breast and surrounding tissue), or a mastectomy with breast conservation, for which the aim is to remove as much of the tumor as possible while maintaining as much breast tissue as possible for cosmetic purposes. The surgical procedure is made with consideration of the cancer's stage and characteristics, surgeon recommendations, and patient preferences.

In addition to surgery, treatment with radiation therapy or chemotherapy may be considered. These therapies may be instituted after surgery or as a standalone therapy, depending on specific patient and cancer characteristics. There are two main types of radiation therapy that can be used: EBRT and brachytherapy. External beam radiation therapy is administered externally, meaning it is noninvasive and administered on top of the skin to treat the underlying breast tissue. This therapy is typically administered daily (5 days/week) for a month or two. The goal of this therapy is to irradiate cancer cells within the breast tissue to completely destroy the cancer and cause remission. Brachytherapy, on the other hand, is administered internally. Radioactive seeds are placed within the breast tissue and continuously give off radiation, killing cancer cells in the breast. The type of radiation therapy to be used depends on the specific cancer type present and its stage and severity. Both types of radiation therapy have some associated adverse effects, including pain or redness at radiation site, infection, breast tissue damage, and fatigue.

Chemotherapy is another option for the treatment of breast cancer. This therapy is systemic, meaning it is administered throughout the entire body as opposed to just treating localized breast tissue, like with radiation therapy. Chemotherapy involves the administration of powerful drugs that kill the fast-growing cells in the body, which includes cancer cells. It is often performed as an adjuvant therapy, meaning that it is given in conjunction with

another therapy, often before or after surgical intervention. When administered before surgery (neoadjuvant chemotherapy), the goal of therapy is to shrink the tumor so it is easier to remove during surgery. If administered after surgery (adjuvant chemotherapy), the goal is to eliminate any residual cancer cells that may not have been fully removed during the initial surgical intervention. Chemotherapy is typically administered through a central venous catheter, most often an implanted port in the patient's chest. This allows for easy and quicker administration into the patient's systemic circulation. Though highly effective at destroying cancer cells, chemotherapy is also potent to healthy cells, which can result in unpleasant side effects, including

- anemia
- fatigue
- gastrointestinal disturbances (e.g., anorexia, nausea, vomiting, diarrhea)
- hair loss
- immunosuppression (and associated low white blood cell count)
- mouth sores

Hormone therapy is another treatment option that may be indicated for breast cancer. This therapy is also usually a type of adjuvant therapy and involves the administration of medications that either lower levels of estrogen in the body or block estrogen from binding to receptors. By limiting the amount and function of estrogen in the body, cancer cell growth can be slowed or stopped. These medications are administered in oral pill form and are usually prescribed to be taken for approximately five years to prevent cancer recurrence. Common side effects of these medications include hot flashes, vaginal dryness, and muscle pain.

Nursing Care of the Patient with Breast Cancer

Because of the nature of cancer care, patients will often require an interprofessional team of providers to ensure the best possible outcome. The nurse plays a vital role on the team by creating a comfortable environment and providing necessary interventions.

Recognizing and Analyzing Cues

Common lesions may be found by the patient during a self-breast exam or by the provider during a physical examination. These nodules can be found anywhere within the breast but are often found in the upper outermost portion of the tissue. Their shape and characteristics may vary slightly, but they are usually immobile, hard, and nontender. The later signs of breast cancer include skin dimpling, nipple retraction, and changes in skin color and texture, likely due to stretching of the skin to accommodate growth of the tumor. Other late clinical manifestations associated with breast cancer are depicted in Figure 20.14.

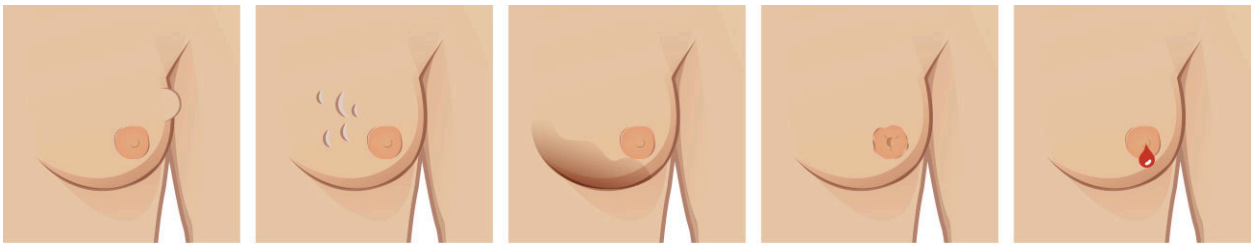


FIGURE 20.14 Late physical breast changes that may indicate the development of breast cancer include lumps, skin dimpling, changes in skin color or texture, change in nipple appearance, and clear or bloody nipple discharge. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Nursing care of the patient with breast cancer is complex and should be tailored to the specific type of treatment the patient are receiving. Important nursing interventions for each type of cancer treatment are described in Table 20.11. Regardless of the type of treatment initiated, it is important for nurses to provide supportive care, especially within the psychosocial realm. Receiving a cancer diagnosis can be scary and produce feelings of anxiety, so the nurse should provide a comfortable environment for the patient to explore their feelings. It is also important that nurses connect these patients to resources such as counseling or support groups to help them through their journey

with cancer and treatment.

Treatment for Breast Cancer	Nursing Considerations and Interventions
Surgical intervention (e.g., biopsy, mastectomy)	• Obtain informed consent for procedure. • Assist patient in scheduling and navigating preoperative appointments and postoperative follow-up care. • Help alleviate patients fears and anxiety before procedure. • Administer analgesic medications pre- and postoperatively as needed. • Promote positive body image and help patient cope with structural breast changes after surgery. • Monitor and treat potential complications such as **lymphedema** (swelling of the affected limb on the same side of the cancer), hematoma formation, or infection
Radiation therapy	• Educate patient regarding expected side effects and when to contact provider. • Help patient maintain skin integrity following treatment; avoid use of perfumed soaps and tight clothing on treated skin. • Educate patient regarding the importance of avoiding sun exposure on treated skin areas.
Chemotherapy	• Provide antiemetic medications as needed during and after treatment. • Promote positive body image, especially for patients experiencing hair loss. • Interventions to decrease pain associated with mouth sores (e.g., avoid spicy foods, use a soft-bristled toothbrush) • Educate patient about expected side effects and interventions that may improve them.
Hormone therapy	• Help patient manage side effects of medications (e.g., use of vaginal lubrication during sexual intercourse, wearing breathable clothing for comfort during hot flashes). • Educate patient about the importance of taking medications as prescribed.

TABLE 20.11 Selected Nursing Interventions for Different Types of Breast Cancer Treatments

Evaluation of Nursing Care of the Patient with Breast Cancer

Nurses, as part of the patient's care team, will be involved with the patient long after the initial treatment is complete. The nurse will be part of the patient's follow-up care, including the patient's physical and emotional needs.

Evaluating Outcomes

The optimal patient outcome after receiving treatment for breast cancer is the complete destruction and elimination of the cancer cells and a state of remission without cancer recurrence. Part of the follow-up process for patients who receive treatment for breast cancer involves close monitoring of breast tissue for the development of more tumors. These follow-ups will vary in frequency depending on provider preference and specific patient characteristics. Additionally, as part of the evaluation process, the nurse should assess how the patient is coping. Even after being treated effectively for breast cancer, there are still uncertainties about whether the cancer will come back, so it is important that patients are able to effectively cope with these unknowns. If the patient expresses concerns or difficulties with coping, the nurse can spend some time discussing these with the patient and finding resources such as support groups, which may help the patient improve their coping skills for the future.

CLINICAL SAFETY AND PROCEDURES (QSEN)

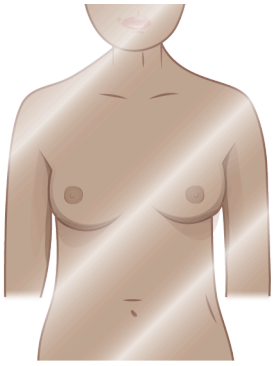
Patient-Centered Care: Breast Self-Examinations

Disclaimer: Always follow agency policy.

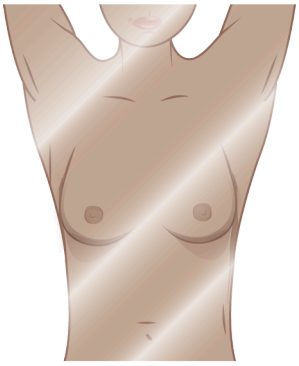
Definition: Recognize the patient or designee as the source of control and full partner in providing compassionate and coordinated care based on respect for the patient's preferences, values, and needs.

Breast self-exams are noninvasive, facilitate intimate familiarization of native breast tissue, and increase breast self-awareness. Guidelines from the American College of Obstetricians and Gynecologists and American Cancer Society recommend that individuals begin breast exams as early as age 25 years. Nurses can provide education on the correct methods for conducting a breast exam.

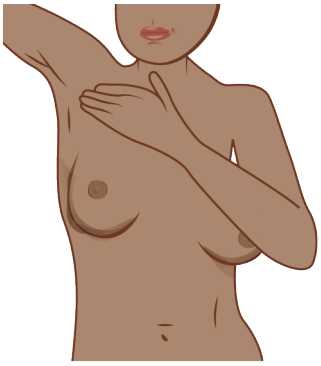
- Exams can be done in the shower, at least every month.
- The patient should be instructed to place hands on hips and observe for discoloration, rashes, and nipple inversion.
- Educate the patient that it is normal for one breast to be larger than the other.
- After inspection is complete, educate the patient to lay with the arm of breast being examined under the neck. With the other hand, use one of the two following methods: (1) Use the pads of the finger in a zig-zag or "lawn-mowing method" across the breast tissue; and (2) use a concentric motion starting around the nipple and palpate the tissue.
- Axillary assessment should also be conducted, noting any hard, nontender lymph nodes. The patient performing the breast self-exam should observe any fixed, nontender hard lumps.



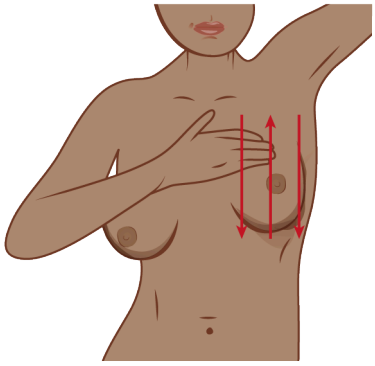
In front of the mirror



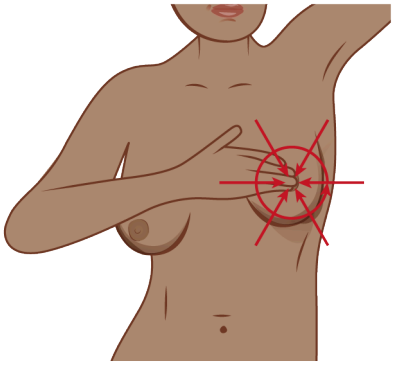
In front of the mirror



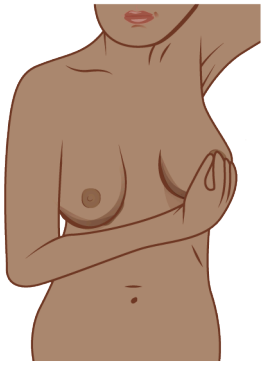
Examine the armpit



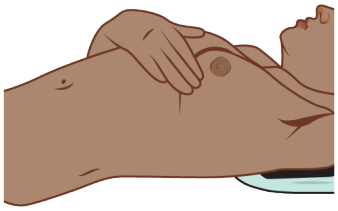
Up and down



Circles and wedges



Squeeze the nipple



In bed

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20.7 Renal Function and Chronic Kidney Disease

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations of acute tubular necrosis (ATN) and chronic kidney disease.
- Describe the diagnostics and laboratory values used to diagnose ATN and chronic kidney disease.
- Apply nursing concepts and plan associated nursing care of patients with ATN and chronic kidney disease.
- Evaluate the efficacy of nursing care of patients with ATN and chronic kidney disease.
- Describe the medical therapies that apply to the care of patients with ATN and chronic kidney disease.

The kidneys are arguably one of the most important body organs because they participate in many functions necessary for life. The major functions of the kidney include

- blood pressure control
- erythropoietin production for red blood cell regulation
- filtration of waste products and excretion as urine

- regulation of acid-base balance
- regulation of electrolytes
- regulation of water/fluid balance
- synthesis of vitamin D to its active form

Most individuals are born with two kidneys, which are located within the abdominal cavity. They are composed of several different components that are labeled in Figure 20.15. Each kidney has approximately one million nephrons (the functional unit of the kidneys), which assist in the formation of urine for excretion. Without optimal functioning of the kidneys, patients are unable to maintain blood pressure, fluid and electrolyte balance, and many other life-sustaining body system processes. This highlights the importance of providing effective treatment and care for disorders that result in dysfunction of the renal system. Two of the most common disorders that affect the kidneys are acute tubular necrosis (ATN) and chronic kidney disease (CKD), both of which are discussed in more detail in this section.

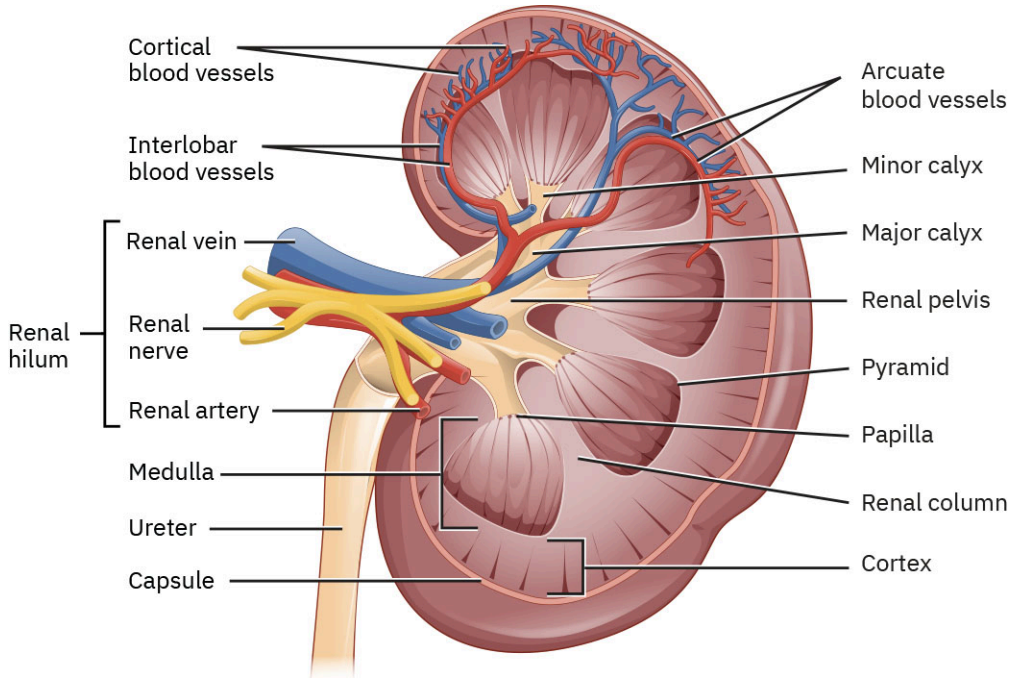

FIGURE 20.15 The kidneys participate in many functions necessary for life, including urine formation, blood pressure regulation, and fluid and electrolyte balance. (credit: *Anatomy and Physiology 2e*. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Patient Populations at Risk for Kidney Disease

One of the biggest risk factors for kidney disease is diabetes mellitus because this condition often results in **nephropathy**, or problems with the kidney vasculature. Other major risk factors for kidney disease are (American Kidney Fund, n.d.):

- African, American Indian, or Asian heritage
- diabetes mellitus
- family history of kidney disease
- glomerulonephritis
- hypertension
- increasing age
- medication use (e.g., nonsteroidal anti-inflammatory drugs, antibiotics)
- obesity
- polycystic kidney disease
- pyelonephritis
- smoking
- urinary tract obstruction (e.g., urinary tumors, enlarged prostate, kidney stones)

Pathophysiology of ATN

Acute tubular necrosis occurs when there is a lack of adequate oxygen and nutrients being delivered to the kidneys. Without adequate oxygen and perfusion, the kidneys can quickly become necrotic, resulting in kidney failure. Often, the cause of ATN is related to thrombosis, or clot formation, or a buildup of myoglobin that blocks blood flow to the kidneys. This condition is transient, but without prompt intervention and adequate treatment, it can become permanent, resulting in chronic kidney problems.

Clinical Manifestations of ATN

Recognizing and Analyzing Cues

Clinical manifestations of ATN are directly related to a lack of blood flow and perfusion to the kidneys, resulting in their suboptimal functioning. Common clinical manifestations of ATN are

- cardiac dysrhythmias
- confusion
- edema in the extremities
- electrolyte imbalances (e.g., hyperkalemia, elevated serum creatinine and blood urea nitrogen levels, decreased glomerular filtration rate)
- fatigue
- nausea/vomiting
- **oliguria** (urine output less than 30 mL/h)
- weight gain

Pathophysiology of CKD

The term **chronic kidney disease** is used to describe long-standing kidney dysfunction lasting longer than three months (Cleveland Clinic, 2020a). If left untreated, CKD can quickly turn into end-stage renal disease, which may require permanent dialysis or even a kidney transplant. Although the specific pathophysiologic mechanism of CKD is poorly understood, specific risk factors have been linked to its development. Patients with any of the risk factors listed in Table 20.12 are at a higher risk than the general population for developing CKD.

Clinical Manifestations of CKD

In many cases, the early stages of CKD are asymptomatic. Symptoms may not even become noticeable until the patient is in the later stages of the disorder that require complex intervention and medical care. Some of the clinical manifestations of CKD are like those seen with ATN, because both conditions result in kidney dysfunction and eventual failure. Clinical manifestations associated with CKD are the following:

- anorexia, nausea, and/or vomiting
- chest pain
- confusion
- edema and swelling of hands and feet
- fatigue
- hypertension
- muscle cramps
- oliguria
- shortness of breath (from fluid build-up in the lungs)

Assessment and Diagnostics

The diagnoses of both ATN and CKD are usually made on the basis of certain laboratory findings. Specific laboratory values that can indicate how well the kidneys are functioning include serum creatinine and blood urea nitrogen (BUN) level, and glomerular filtration rate (GFR). Serum creatinine is a byproduct of skeletal muscle metabolism and breakdown, and this value remains stable from person to person. If the kidneys are unable to filter and excrete creatinine effectively, it can build up in the blood and increased values may indicate kidney damage. Blood urea nitrogen is a byproduct of protein metabolism; elevations of this value may also indicate poor functioning of the kidneys and an inability to excrete the protein product in the urine. However, it is important to note that serum

creatinine tends to be a more specific indicator of renal dysfunction than BUN, because other conditions (e.g., dehydration, increased protein intake) can also increase BUN levels. The GFR represents how quickly the kidneys can filter the blood and excrete it as urine. With kidney dysfunction, GFR increases, indicating that it takes a lot longer for the kidneys to filter out and excrete waste products.

Medical Therapies and Related Care

The underlying principles for the treatment of kidney disorders are restoring optimal functioning and treating the underlying cause and associated symptoms. Because the kidneys play such an important role in the maintenance of fluid balance, treatment often revolves around interventions that help to restore optimal fluid balance. Most patients with kidney disorders will experience fluid overload because the kidneys are unable to filter out excess fluid effectively, resulting in manifestations such as edema and weight gain. These patients are often prescribed diuretic medications to remove the excess fluid from the body as urine. However, these medications are used cautiously because they may inadvertently cause worsening of the renal disease. It is important to closely monitor patients receiving diuretic therapy for electrolyte imbalances (e.g., hypokalemia), worsening renal failure, and hypotension, the latter two of which are common with the use of diuretics.

One of the most common electrolyte imbalances associated with kidney disease is hyperkalemia, or elevated potassium levels in the blood. Hyperkalemia occurs because the kidneys are unable to effectively excrete the potassium from the body, so it builds up in the blood. This is a significant issue because hyperkalemia can result in deadly ventricular dysrhythmias and, eventually, cardiac arrest, if left untreated. Often, the provider will order medications (e.g., sodium polystyrene [Kayexalate]), which work to pull out excess potassium, in turn excreted in the feces, bringing the electrolyte level back into normal range. If the potassium level is dangerously high, intravenous medications, including regular insulin, intravenous dextrose, and calcium can be administered to quickly cause an influx of potassium out of the vessels and into cells, restoring potassium balance much more quickly than with medications that cause potassium to be excreted in the feces. Another type of medication commonly used to treat patients with kidney disorders is phosphate binders (e.g., sevelamer [Renvela]). These medications bind with phosphate to prevent hyperphosphatemia that commonly occurs with kidney disorders.

For patients with more severe or end-stage kidney disease, **dialysis**, or the use of a dialyzer machine to filter the blood and remove toxins when kidney function is decreased, is often indicated. There are three main types of dialysis; they are described in Table 20.12. Though they all work by slightly different mechanisms, the goal of their use is to remove toxins and electrolytes that the kidneys are unable to excrete and to restore fluid volume to a normal level. Hemodialysis (HD) can be performed as an emergency procedure or as a long-term intervention for patients with CKD. For emergency situations such as life-threatening fluid overload or hyperkalemia, a temporary dialysis catheter can be placed in a central vein, allowing for immediate vascular access. Figure 20.16 shows a picture of a temporary dialysis catheter. For more permanent, long-term dialysis solutions, an **arteriovenous fistula** can be created. Arteriovenous (AV) fistulas are created through the surgical connection of an artery and a vein in the patient's arm and can be used to perform HD on a long-term basis. The downside to using an AV fistula is that they take several months to mature before they can be used, so a temporary dialysis catheter often must be used first until the fistula is ready. An illustration of an AV fistula is depicted in Figure 20.17.

Type	Description
Hemodialysis	Artificial kidney (hemodialyzer) machine is used to filter the blood and remove excess fluid and toxins. These treatments typically occur three times a week.
Peritoneal dialysis (PD)	Catheter is placed into peritoneal space in the abdomen. Dialysate fluid is administered through catheter into peritoneal space, where it remains in place for several hours to filter out toxins. Dialysate is then drained from the catheter into a drainage bag. The benefit of PD is it can occur while the patient sleeps in the comfort of their home.
Continuous renal replacement therapy	Similar mechanism to HD but filtration occurs continuously, allowing for slower removal of fluid and toxins. This type of dialysis is indicated for patients who are hemodynamically unstable and unable to tolerate large amounts of fluid and waste removal over a short time.

TABLE 20.12 Types of Dialysis

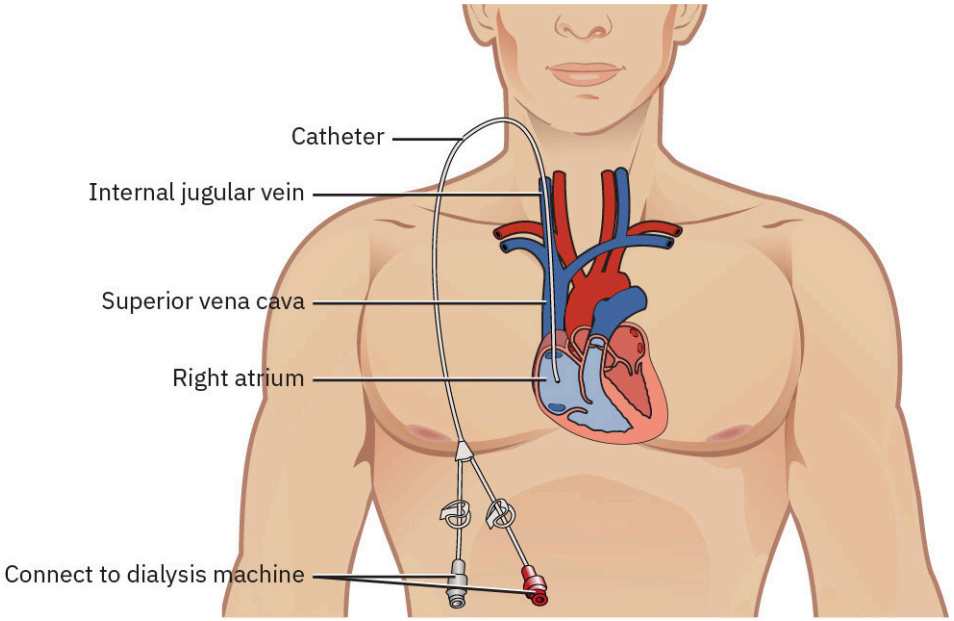

FIGURE 20.16 For emergency situations, a temporary dialysis catheter can be placed in a central vein. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

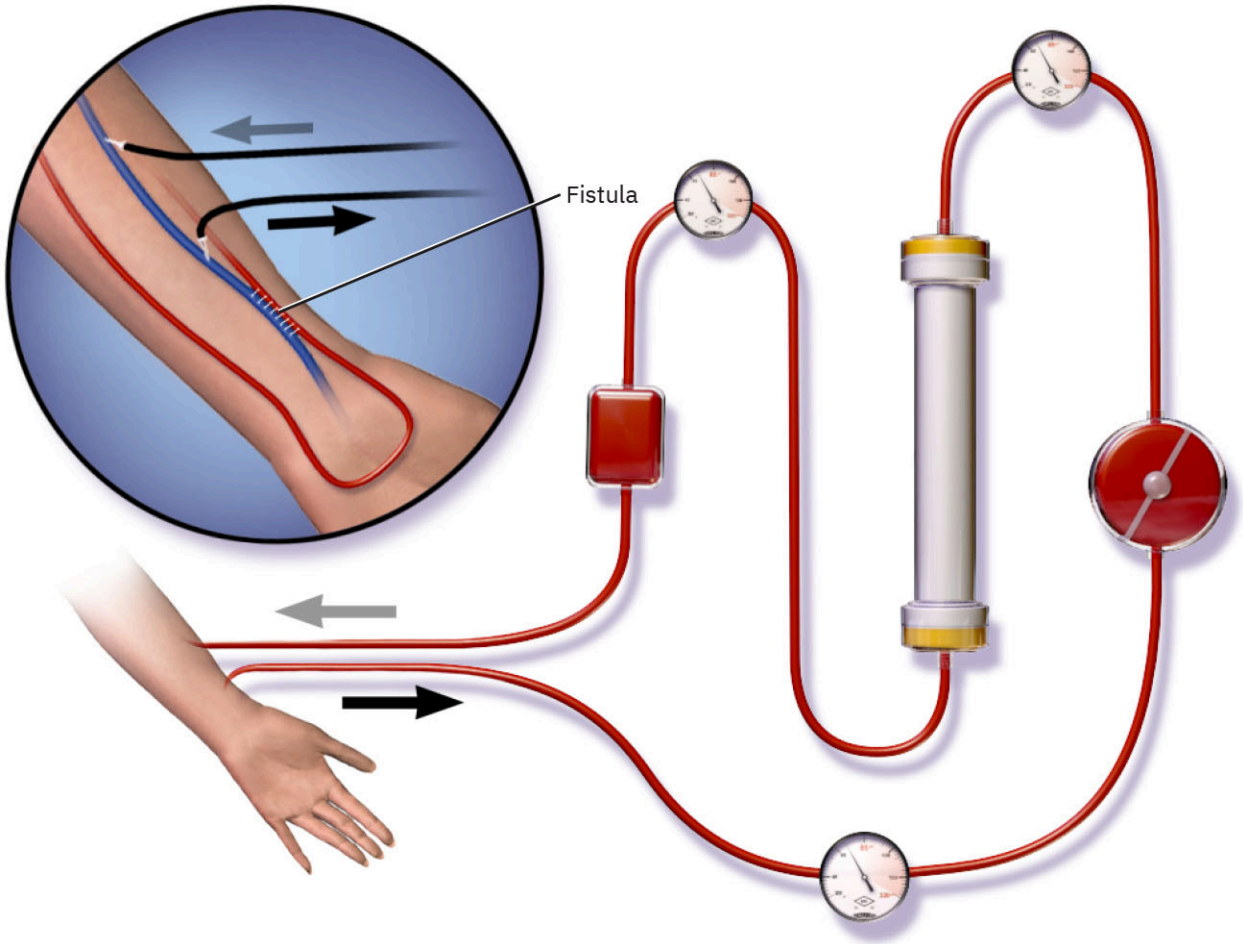

FIGURE 20.17 An AV fistula allows for long-term access to the circulatory system for HD. (credit: Blausen.com staff/WikiJournal of Medicine, CCBY 3.0)

Nursing Care of the Patient with ATN and CKD

While evaluating interventions and the effectiveness of treatment options, the nurse should also be constantly aware of the signs of complications of ATN or CKD. Complications can quickly lead to poor patient outcomes, and the nurse must be ready to address issues as they arise. The nurse should also be prepared to handle the patient's psychosocial and educational needs, and provide resources for the patient as needed.

Recognizing and Analyzing Cues

When caring for patients with kidney disorders, the nurse will assess for signs and symptoms indicating the kidney damage is progressing. One of the first signs may be a decreased urine output, highlighting the need for maintaining accurate intake and output documentation. Other signs to monitor for include alterations in laboratory values (e.g., elevated serum creatinine level or decreased GFR) and mental status changes, which are most likely related to electrolyte imbalances.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Caring for patients with kidney disorders is complex and involves a high level of attention to detail. The nurse must monitor the patient closely for signs and symptoms that indicate worsening kidney function. Without prompt intervention, kidney disorders can quickly become life-threatening, highlighting the importance of thorough assessments and attention to small changes in the patient's condition.

As part of the assessment process, the nurse will closely monitor fluid balance through accurate recording of intake and output as well as electrolyte balance with regular assessments of kidney values, including serum creatinine and BUN levels, and GFR. The nurse should monitor the patient closely for signs of fluid overload, such as edema, shortness of breath, or crackles in the lungs. In these situations, the nurse must act quickly, such as by elevating the head of the bed to alleviate the shortness of breath and improve the pulmonary congestion. The nurse will also alert

the provider so appropriate interventions may be started to restore optimal fluid balance and hemodynamics. Nurses caring for patients receiving dialysis must be alert to potential complications associated with this kind of treatment. Hypotension is one of the most common complications because dialysis often removes large amounts of fluid from the body at one time. With these quick fluid shifts, the patient may experience low blood pressure and associated symptoms such as lightheadedness or dizziness. For this reason, the nurse should consider withholding medications such as antihypertensives before dialysis treatment to prevent hypotension. The nurse should also monitor for cardiac dysrhythmias during and after dialysis that may result from the changes in electrolyte balance, so continuous telemetry monitoring is often indicated. Though most hospitals have specialized dialysis units and nurses, patients will often return to their initial room right after treatment, so all nurses need to be aware of these potential complications and be ready to intervene appropriately.

Evaluation of Nursing Care of the Patient with ATN and CKD

When evaluating care of a patient with ATN and CKD, the nurse must consider the effectiveness of any intervention and treatment options. The nurse should assess all aspects of the patient's well-being, including psychological and educational needs, as well as assessing for any signs of complications of ATN or CKD.

Evaluating Outcomes

The optimal patient outcome for patients with kidney disorders is restoration of kidney function to baseline level. With ATN, this is often possible if treatment is initiated early and complications do not occur. This would be indicated by normal serum creatinine and BUN levels, and GFR values, as well as a normal urine output. Patients with CKD have more advanced disease, so it is unlikely that their kidney function will return to baseline. With CKD, the goal would be to maintain as much function of the kidneys as possible, even if that means using therapies such as HD on a long-term basis. Other nursing goals include maintaining a baseline "dry" weight, reducing edema, and maintaining normal electrolyte balance. It is important for the nurse to evaluate how the patient is coping with their CKD, especially if they are receiving long-term HD. This disorder significantly affects everyday life, often requiring HD to be performed multiple times a week for several hours at a time. The nurse should provide these patients with the necessary social support and resources like support groups to help improve coping skills and life outlook.

READ THE ELECTRONIC HEALTH RECORD

Laboratory Profile of a Patient with Chronic Kidney Disease

Nurse's note: Patient arrived to ED at 0700 with complaints of nausea and vomiting and sudden weight gain. Patient reports a new onset of shortness of breath when walking.
0730 Vital signs and laboratory test results:
BP: 145/87 mm Hg
HR: 99
O_2: 92 percent
Laboratory test results: Serum creatinine (1.4 mg/dL), BUN (28 mg/dL), GFR (45 mL/min/1.73 m^2)
0930 Vital signs and laboratory test results:
BP: 155/92 mm Hg
HR: 110
O_2: 89 percent
Laboratory test results: Serum creatine (1.8 mg/dL), BUN (35 mg/dL), GFR (41 mL/min/1.73 m^2)

1. What condition does the nurse suspect and what interventions would the nurse anticipate?

Summary

20.1 Brief Review of Genitourinary and Reproductive Anatomy and Physiology

- The major organs of the male genitourinary system are the penis and testicles. Other structures in the genitourinary system are the bulbourethral glands and the prostate gland.
- Sperm production occurs in the testicles.
- The major organs of the female genitourinary system are the uterus and ovaries. Other structures are the vagina, urinary bladder, and urethra.
- Ovulation occurs when an egg is released from the ovary and generally occurs once a month.
- The menstrual cycle lasts approximately 28 days and is controlled by the release of follicle-stimulating hormone and luteinizing hormone.

20.2 Sexually Transmitted Infections

- STIs are transmitted through close sexual contact and are quite common worldwide. They can range from being completely asymptomatic to life-threatening, if not effectively treated. Other clinical manifestations include lesions, discharge, painful urination, or difficulty with conception.
- The diagnostics of STIs include urine analysis, culture, and sensitivity, and by visualization. Some patients may have delayed diagnosis because they are asymptomatic.
- Caring for patients with STIs is complex, and intervention and treatments will vary depending on the specific infection. Interventions center around counseling, education, and administering certain treatments.
- Nursing goals for the care of patients with STIs include thorough assessment and detection, early intervention, and effective treatment.
- Medical therapies can be pharmacological through antibiotics or antivirals, and surgical intervention may be required to remove lesions, if indicated.

20.3 Male-Specific Disorders of the Reproductive Tract

- Common disorders of the male reproductive system include testicular torsion, testicular cancer, and erectile dysfunction. These conditions surface from chronic comorbid disease, genetics, or acute injury.
- Erectile dysfunction is a condition in which the male individual cannot maintain a full erection of the penis for sexual intercourse. It is generally diagnosed based on the patient's subjective symptoms
- Testicular cancer is rare and is typically diagnosed in young men in their 20s and 30s. Signs and symptoms include a painless hard lump or sudden swelling in the testicle.
- Testicular torsion occurs when the spermatic cord, the supplier of blood to the testicles, becomes twisted. It is characterized by sudden severe pain in the testicles and scrotal swelling. It is a medical emergency.
- It is imperative that nurses and other health care professionals be able to recognize common symptoms, initiate appropriate interventions, and provide follow-up and education to ensure the best patient outcomes.
- Most male reproductive disorders are easily treated with medications or surgical procedures.
- The nurse needs to create an open environment for the patient while also focusing on proper diagnosis, intervention, and initiation of effective treatment options.

20.4 Disorders of the Prostate

- The prostate gland is an important part of the male reproductive system because it assists with the hydration and elimination of sperm for reproduction.
- The two main medical conditions that affect the prostate gland are benign prostatic hyperplasia (BPH) and prostate cancer. Both conditions can result in abnormal urinary elimination patterns and have a negative impact on mental and social health.
- Prostate cancer is diagnosed through digital rectal exams and a prostate-specific antigen blood test.
- BPH and prostate cancer are both quite common, especially in older men, but several treatment options exist, making them some of the most treatable conditions seen in the male population.
- Nursing care of patients with prostate disorders centers around improving urinary elimination patterns and providing psychosocial and educational support to the patient.

20.5 Female-Specific Disorders of the Reproductive Tract

- Disorders of the female reproductive system include PID, endometriosis, and uterine fibroids.
- Disorders of the female reproductive system can be difficult to diagnose because there are no specific diagnostic tests associated with any of the disorders. Diagnosis is typically symptom based.
- Nurses must manage all aspects of patient care, which can be complex and include the patient's physical, psychological, and educational needs. Nurses must also evaluate care and determine the effectiveness of treatments and interventions.
- Treatment options range from pain control with medications to eradication of the disorder with surgical procedures.
- These disorders can have a significant impact on female fertility and mental health, so it is important for nurses to provide these patients with supportive and empathetic care.

20.6 Disorders of the Breast

- Breast cancer remains a problematic disease affecting women, with higher incidence of mortality in the Black community. Risk factors include genetics, nulliparity, obesity, use of hormone replacement therapy, and excessive alcohol and nicotine use.
- The gold standard of diagnostics for breast cancer is the mammogram. Patients can perform self-breast exams to assess for presence of lumps.
- Nursing care of the patient with a breast disorder includes thorough history, scheduling mammograms, providing education about self-breast exam, and supporting the patient requiring surgical intervention, such as a mastectomy.
- Evaluation is tailored around monitoring the patient's response to therapy and goals of eradicating cancer. Nurses must also extend psychosocial support to the patient with breast cancer.
- Medical therapies include administration of chemotherapeutics, hormone therapy, and radiation. Surgical options may be a lumpectomy or a mastectomy.

20.7 Renal Function and Chronic Kidney Disease

- The kidneys play a vital role in many body functions, including fluid and electrolyte balance and blood pressure control. Kidney disease arises from damage to the nephron unit, impaired blood flow to the kidney, or outward flow from the urethra. Symptoms of kidney disease include fluid overload, oliguria, electrolyte disturbance, fatigue, and weight gain.
- Diagnosis of kidney disease encompasses noting the patient's subjective complaints while also monitoring BUN and creatinine levels, urine analysis, and results of certain diagnostic tests that can uncover kidney disease.
- Nurses caring for patients with kidney disease must assess for cues that further damage is occurring, through surveillance of laboratory tests and objective clinical findings. The responsibilities include monitoring hemodynamic stability, monitoring electrolytes, and specialty skills of dialysis when clinically appropriate.
- Evaluation of nursing care of patients with kidney disease includes monitoring improvement or worsening of renal studies, and normalization of fluid and hemodynamic status.
- Medical therapies vary in the treatment of kidney disease, from restoring perfusion to the renal unit through administration of fluids, treatment of hyperkalemia, to more invasive therapies such as dialysis.

Key Terms

arteriovenous fistula surgical joining of an artery and a vein in the arm to be used for performing hemodialysis on a long-term basis

chancre painless sore associated with a syphilis infection that develops where the organism entered the body

chronic kidney disease long-standing kidney dysfunction lasting longer than three months

continuous bladder irrigation (CBI) procedure in which a three-way urinary catheter is used to constantly irrigate the bladder and allow for adequate urinary drainage

cryptorchidism undescended testicles in an adult man

dialysis use of a dialyzer machine to filter the blood and remove toxins when kidney function is decreased

digital rectal exam (DRE) assessment conducted by a provider noting the size, shape, and regularity of a prostate

ectopic pregnancy pregnancy occurring somewhere in the reproductive tract other than the uterus (most often in a fallopian tube)
ejaculation release of sperm from the penis
endometriosis condition resulting in growth of uterine tissue in areas located outside of the uterus, resulting in severe pain and possible infertility
erectile dysfunction condition in which the male individual cannot maintain a full erection of the penis for sexual intercourse
genital vesicle painful, fluid-filled sac on the genitals
genitourinary system encompasses the organs of both the reproductive and urinary systems
hematuria blood in the urine
histology study of the microanatomy of cell and tissue types
infertility inability to conceive despite frequent and unprotected sexual intercourse for at least a year
lymphedema swelling that occurs to the affected limb from the same side of the breast cancer
menstruation process of a discharge of blood and other materials from the uterus through the vagina as part of the female menstrual cycle that lasts from puberty to menopause
nephropathy problems with kidney vasculature
nocturia increased urinary frequency experienced during nighttime hours
nulliparity having no children
oliguria decreased urine output (typically less than 30 mL/h)
orchiectomy surgical removal of the testicle(s)
ovulation release of an egg from one of the ovaries
pelvic inflammatory disease disease that surfaces in the pelvic unit after untreated STIs
prophylactic mastectomy complete removal of breast tissue prior to a cancer diagnosis
radiation proctitis inflammation of the rectum lining, which can result in diarrhea and rectal leakage
sexually transmitted infection (STI) infection that is transmitted through close sexual contact
spermatogenesis production of sperm in the testes
testicular torsion occurs when the spermatic cord, the supplier of blood to the testicles, becomes twisted
total mastectomy complete removal of breast tissue
urinary hesitancy difficulty starting urinary stream
uterine fibroid another name for uterine leiomyoma
uterine leiomyoma most common benign tumor affecting women

Assessments

Review Questions

1. What part of the male reproductive system is responsible for the production of male sex hormones?
   a. penis
   b. testes
   c. urethra
   d. epididymis

2. On approximately what day of the menstrual cycle does ovulation, or release of an egg from the ovary, occur?
   a. day 1
   b. day 7
   c. day 14
   d. day 28

3. The emergency department nurse received a handoff report on a patient newly diagnosed with syphilis. What is an example of an assessment finding the nurse would expect during the physical exam?
   a. cold sores around the mouth
   b. genital warts
   c. rash on the hands
   d. painful urination

4. What schedule is endorsed as the current guideline for screening for HPV?
   a. annually
   b. every 2 years
   c. every 3 years
   d. every 4 years

5. The nurse is caring for a patient in the urgent care clinic who was just diagnosed with HSV infection. What treatment would the nurse anticipate for the patient?
   a. antiviral medications
   b. intramuscular antibiotics
   c. cryotherapy
   d. colposcopy procedure

6. What finding would indicate to the nurse that treatment for HPV was effective?
   a. Rash on the hands is gone.
   b. Genital warts or blisters have cleared up.
   c. Patient is afebrile.
   d. Patient reports no pain with urination.

7. The nurse is caring for a patient recently diagnosed with testicular cancer. What component of the patient's medical history would the nurse note as a risk factor for this type of cancer?
   a. substance misuse
   b. HIV infection
   c. hypertension
   d. low levels of testosterone

8. What condition of the male reproductive system would the nurse identify as the most emergent?
   a. testicular cancer
   b. erectile dysfunction
   c. testicular torsion
   d. benign prostatic hyperplasia

9. What assessment finding would the nurse anticipate when caring for a patient diagnosed with testicular cancer?
   a. abdominal pain
   b. hard lump in the testicle
   c. nausea and vomiting
   d. decreased sex drive

10. The nurse is caring for a male patient with elevated levels of lactate dehydrogenase. What condition would the nurse suspect?
   a. testicular cancer
   b. erectile dysfunction
   c. testicular torsion
   d. testicular cyst

11. The nurse is caring for a patient with BPH who is prescribed tamsulosin (Flomax). What is an example of a statement the nurse would in the discharge teaching about this medication?
   a. "This medication may cause you to have issues maintaining an erection."
   b. "Be mindful of standing up too quickly while taking this medication."
   c. "A headache should be reported to your provider right away."
   d. "Nasal congestion is a common side effect of this medication."

12. What statement reflects the pathophysiologic cause of endometriosis?
   a. cancer of the endometrium
   b. abnormal uterine tissue growth
   c. benign tumor growths in the uterus
   d. infection that results in tissue scarring

13. What diagnostic tests would the nurse anticipate for a female patient diagnosed with PID? Select all that apply.
   a. pregnancy test
   b. positive gonorrhea swab
   c. a reduced hematocrit
   d. elevated white blood cell count
   e. history of an STI

14. What treatment would the nurse anticipate for a female patient diagnosed with PID?
   a. antibiotics
   b. oral contraceptive pills
   c. endometrial ablation
   d. analgesic medications

15. The nurse is providing education to a patient about the risks associated with developing breast cancer. What risk factor would the nurse include in the teaching?
   a. young age
   b. male sex
   c. early menopause
   d. having no children

16. What symptom is often the earliest physical sign of breast cancer?
   a. lump in breast
   b. skin dimpling
   c. skin color changes
   d. nipple discharge

17. What is an example of a statement that would indicate to the nurse the patient understands modifiable risk factors for breast cancer?
   a. “My mom didn’t have breast cancer, so I am okay.”
   b. “I will reduce my alcohol intake.”
   c. “My sister had breast cancer so I must have mammograms.”
   d. “I will take a daily aspirin.”

18. What is a risk factor for the development of kidney disease?
   a. diabetes insipidus
   b. young age
   c. White race
   d. pyelonephritis

19. What assessment finding would the nurse anticipate for a patient diagnosed with CKD?
   a. increased urination
   b. weight loss
   c. hypokalemia
   d. crackles in lungs

20. What laboratory trend would indicate chronic kidney disease?

a. increased glomerular filtration rate
b. decreased glomerular filtration rate
c. decreased blood urea nitrogen
d. increased sodium

21. What pharmacological therapy can the nurse anticipate for a patient with AKI and hyperkalemia?
a. rapid-acting insulin
b. regular insulin
c. Sevelamer
d. sodium bicarbonate

22. A patient with CKD has been undergoing peritoneal dialysis for the past month. What finding would indicate the patient is having a good response to treatment?
a. achieving a weight within 1 lb. of their dry weight
b. crackles in the lungs
c. 2+ lower extremity edema
d. creatinine 2.0 ng/mL

Check Your Understanding Questions

1. Describe typical medical therapies prescribed for STIs.

2. What treatment options are available to patients with erectile dysfunction? What are some key patient education points about each of the treatment options?

3. You are caring for a patient scheduled for a TURP. How would you explain this procedure to the patient so they understand what to expect?

4. In a review of the patient's blood test results during a routine wellness exam, the nurse notices the patient's PSA value is 2.2 ng/mL. What would the nurse anticipate for the patient?

5. What are some cues the nurse would anticipate for a menstrual disorder?

6. What statements made by the patient would cue the nurse the treatment was effective for management of painful periods?

7. The nurse is caring for a patient scheduled for a fine needle aspiration biopsy of the breast. How would you describe this procedure to the patient? How might you assess that the patient understands the information you provided?

8. What are the major functions of the kidneys and what can happen if these functions are affected by the development of kidney disease?

9. Which clinical assessment findings would indicate to the nurse the patient's renal failure is worsening?

Reflection Questions

1. You are caring for a patient who was assigned female at birth. The patient tells you that they identify as a man. What steps would you take to ensure you provide culturally sensitive and nonjudgmental care?

2. Being diagnosed with an STI can be frightening and cause severe anxiety. What are some effective communication strategies you could use that might help alleviate a patient's fears and anxiety when telling them they are positive for an STI?

3. How would a nurse provide education to a group of teenagers about the spread of STIs?

4. What are some communication strategies the nurse could use to promote a comfortable and safe environment when caring for patients with male reproductive system disorders?

5. What are some examples of how a nurse would evaluate the nursing care delivered to a patient who received teaching on performing a testicular self-exam?

6. A nurse preceptor is teaching a new graduate nurse about CBI. What are some things the nurse would want to evaluate for effective teaching?
7. A patient has called the clinical upset the genetic marker came back positive for *BRCA1* mutation. How would the nurse engage in therapeutic communication to support the patient?

What Should the Nurse Do?

Sarah, a 25-year-old female, presents to the clinic reporting symptoms of lower abdominal pain, dysuria, and vaginal discharge. She discloses a recent change in sexual partners and inconsistent condom use. Sarah's medical history indicates no known allergies, but she mentions a previous diagnosis of chlamydia treated six months ago. Current vital signs reveal a slightly elevated temperature of 99.8°F. Diagnostics include positive nucleic acid amplification test for *Chlamydia* and *N. gonorrhoeae*.

1. What specific verbal and nonverbal cues did Sarah provide during the initial assessment that indicated the possibility of a recurrent sexually transmitted infection?
2. In addition to antibiotic therapy, what educational interventions would you recommend to Sarah regarding safe sex practices, and how would you tailor these interventions to her individual needs?

Mark, a 45-year-old male, presents to the emergency department with a chief complaint of ED. He reports recent onset of difficulty achieving and maintaining an erection, causing distress in his intimate relationship. Mark has a history of hypertension and is currently taking antihypertensive medication. Vital signs reveal blood pressure within the normal range, but Mark appears anxious and visibly uncomfortable discussing his symptoms. He mentions occasional chest discomfort during exertion but has not sought medical attention for it.

3. Given Mark's history of hypertension and occasional chest discomfort, how would you further analyze these cardiovascular cues to understand their potential impact on his erectile function?
4. As a nurse, what specific actions would you take to facilitate further diagnostic evaluations for Mark's potential cardiovascular risks associated with ED?

David, a 60-year-old male, presents to the urology clinic with complaints of urinary frequency, urgency, and difficulty initiating a stream. He reports occasional nocturia and a sensation of incomplete emptying of the bladder. David's medical history includes hypertension and a family history of prostate cancer. Vital signs are within normal limits, but a DRE reveals an enlarged and firm prostate. A PSA test is ordered, and the result indicates a significantly elevated PSA level.

5. What specific cues in David's case initially prompted you to consider the possibility of a prostate disorder, and how did you differentiate these cues from common age-related urinary changes?
6. As a nurse, what specific actions would you take to ensure David's understanding of the diagnostic procedures and support him through the potential diagnosis of a prostate disorder?

Emily, a 35-year-old female, presents to the breast health clinic with a chief complaint of a palpable lump in her left breast. She reports discovering the lump during a routine self-breast examination. Emily has no prior history of breast issues, and her family history is negative for breast cancer. On further inquiry, Emily mentions occasional breast tenderness and notes changes in the appearance of her left nipple. Her vital signs are stable, and a physical examination reveals a firm, nonmobile mass in the upper outer quadrant of the left breast, with nipple retraction.

7. What specific cues in Emily's case initially prompted you to consider the possibility of a breast disorder, and how did you differentiate these cues from normal breast changes?
8. Given Emily's age, medical history, and symptoms, what potential risk factors for breast disorders should be considered in the analysis of her case?

Competency-Based Assessments

1. In what ways might an understanding of reproductive anatomy and physiology influence the nursing care of a patient undergoing fertility treatment?
2. How do the anatomy and physiology of the male and female reproductive systems intersect during fertilization and early pregnancy?
3. Identify three modifiable and three nonmodifiable risk factors for testicular cancer.
4. As a clinical nurse, develop a nursing care plan for a patient diagnosed with ED. Include three priority nursing

interventions.

5. Develop a nursing care plan for a patient with uterine fibroids. Include three priority nursing interventions.
6. As a nurse, how would you prioritize nursing interventions for a patient with concurrent endometriosis and fertility concerns, considering the potential impact on the patient's physical and emotional well-being?

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CHAPTER 21

Endocrine System and Endocrine System Disorders

FIGURE 21.1 The endocrine system, which includes the pituitary gland, ovaries, testes, thyroid, parathyroid, and adrenals, and their hormones coordinate and control growth, metabolism, temperature regulation, the stress response, reproduction, and many other functions. (credit: Airman 1st Class Rhett Isbell/Little Rock Air Force Base, Public Domain)

CHAPTER OUTLINE

INTRODUCTION The endocrine system is a complex network of cells, tissues, glands, and organs that can be intimidating to understand. While the organs of the endocrine system may be small (pituitary gland, ovaries, testes, thyroid, parathyroid, and adrenals), their contribution to homeostasis is huge. The endocrine system works behind the scenes to help regulate common body functions, and without a healthy endocrine system, problems that affect metabolism, puberty, energy, weight, stress, bone strength, and fertility can occur. This chapter provides an overview of the endocrine system and common endocrine disorders encountered in clinical care settings, and applies nursing concepts to plan nursing care for patients with endocrine disorders.

21.1 Review of Endocrine Anatomy and Physiology

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Explain the anatomy of the endocrine system
- Discuss common endocrine hormones and their functions
- Summarize the steps of a targeted endocrine system assessment

The endocrine system is responsible for regulating major biological processes in the body, such as digestion, metabolism, and the stress response, but is often overlooked. It is similar to the nervous system because it can send signals throughout the body, but instead of neurotransmitters, it releases hormones as the mode of communication. Disruptions to this communication process can cause major problems with the biologic functions of the body. As a nurse, it is important to have a basic understanding of the endocrine system in order to provide quality patient care.

Overview of the Endocrine System

The **endocrine system** consists of cells, tissues, and organs that secrete hormones as a primary or secondary function. Among the most important of these structures are the endocrine glands, including the pituitary, thyroid, parathyroid, adrenal, and pineal glands (Figure 21.2). The primary function of these ductless glands is to secrete their hormones directly into the surrounding fluid. The interstitial fluid and the blood vessels then transport the hormones throughout the body.

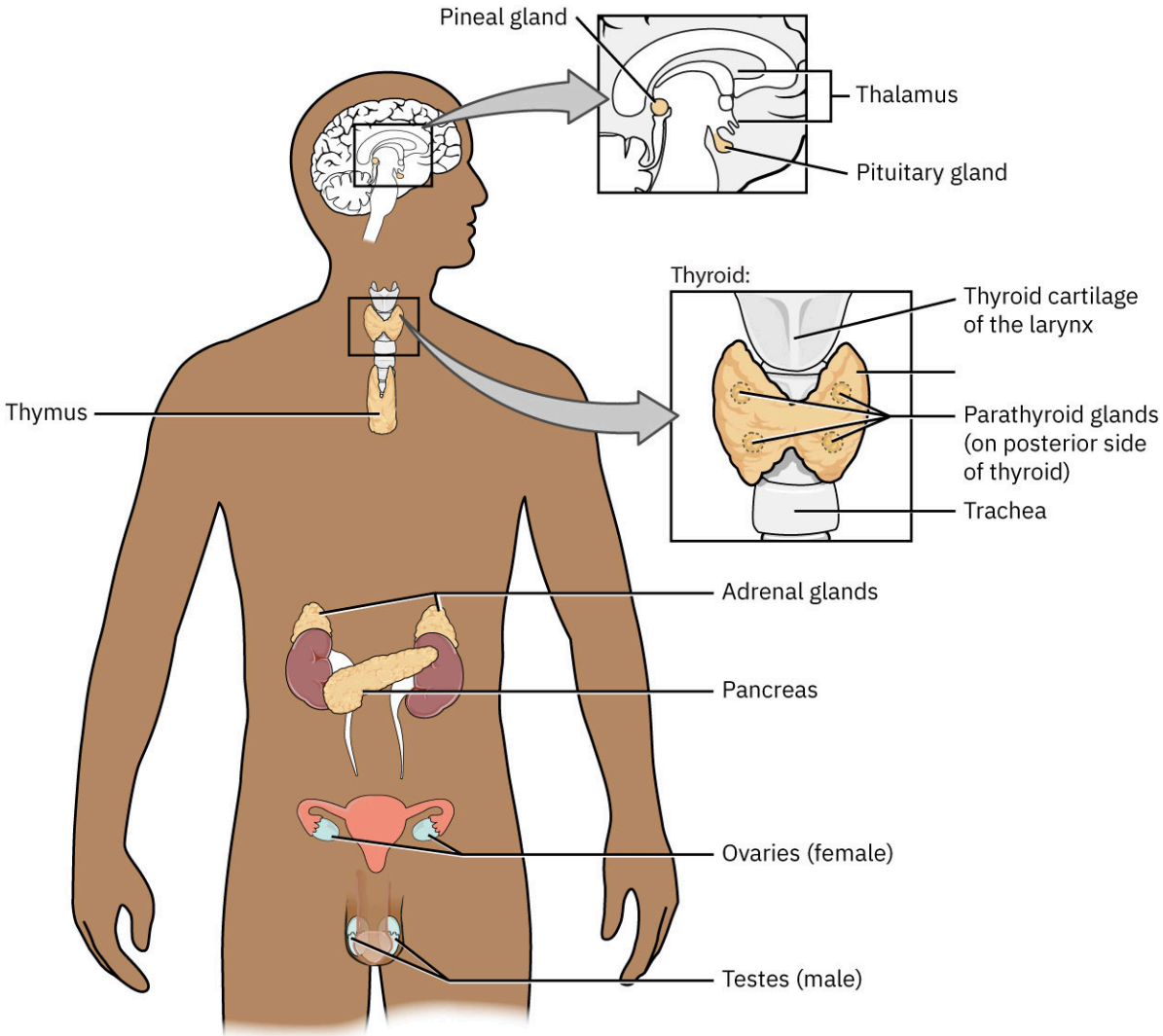

FIGURE 21.2 Endocrine glands and cells are located throughout the body and play an important role in homeostasis. (modification of work

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Some glands in the endocrine system have both endocrine and non-endocrine functions. For example, the pancreas contains cells that function in digestion as well as cells that secrete the hormones insulin and glucagon, which regulate blood glucose levels. The hypothalamus, thymus, heart, kidneys, stomach, small intestine, liver, skin, ovaries, and testes are other organs that contain cells with endocrine function. Adipose tissue (body fat) has long been known for producing hormones that help regulate various bodily functions. Recent research has expanded our understanding by revealing that bone tissue also has endocrine functions, meaning it can produce hormones that influence metabolism and other physiological processes (Newman, 2024).

The ductless endocrine glands are not to be confused with the body's **exocrine system**, whose glands release their secretions through tubes called ducts. Examples of exocrine glands include the sebaceous and sweat glands of the skin. The pancreas also has an exocrine function: most of its cells secrete pancreatic juice through the pancreatic and accessory ducts to the lumen of the small intestine.

Neural and Endocrine Signaling

The nervous system uses two types of intercellular communication—electrical and chemical signaling—either by the direct action of an electrical potential, or in the latter case, through the action of chemical neurotransmitters such as serotonin or norepinephrine. Neurotransmitters act locally and rapidly. When an electrical signal in the form of an action potential arrives at the synaptic terminal, they diffuse across the synaptic cleft (the gap between a sending neuron and a receiving neuron or muscle cell). Once the neurotransmitters interact (bind) with receptors on the receiving (post-synaptic) cell, the receptor stimulation is transduced into a response such as continued electrical signaling or modification of cellular response. The target cell responds within milliseconds of receiving the chemical "message;" this response then ceases very quickly once the neural signaling ends. In this way, neural communication enables body functions that involve quick, brief actions such as movement, sensation, and cognition.

In contrast, the endocrine system uses just one method of communication: chemical signaling. These signals are sent by the endocrine organs, which secrete chemicals—the hormones—into the extracellular fluid. Hormones are transported primarily via the bloodstream throughout the body, where they bind to receptors on target cells, inducing a characteristic response. As a result, this process, known as **endocrine signaling**, requires more time than neural signaling to prompt a response in target cells, though the precise amount of time varies with different hormones. For example, the hormones released when you are confronted with a dangerous or frightening situation, called the fight-or-flight response, occur by the release of adrenal hormones—epinephrine and norepinephrine—within seconds. In contrast, it may take up to 48 hours for target cells to respond to certain reproductive hormones.

In addition, endocrine signaling is typically less specific than neural signaling. The same hormone may play a role in a variety of different physiological processes depending on the target cells involved. For example, the hormone oxytocin promotes uterine contractions in people in labor. It is also important in breastfeeding and may be involved in the sexual response and in feelings of emotional attachment in humans.

In general, the nervous system involves quick responses to rapid changes in the external environment, and the endocrine system is usually slower acting—taking care of the internal environment of the body, maintaining homeostasis, and controlling reproduction. So how does the fight-or-flight response happen so quickly if hormones are usually slower acting? It is because the two systems are connected. It is the fast action of the nervous system in response to the danger in the environment that stimulates the **adrenal glands** to secrete their hormones. As a result, the nervous system can cause rapid endocrine responses to keep up with sudden changes in both the external and internal environments when necessary.

Hormones

A chemical substance called a **hormone** travels throughout the body in the bloodstream and affects the activity only of their target cells: that is, cells with receptors for that particular hormone. Once a hormone binds to a receptor, a chain of events is initiated that leads to the target cell's response. Hormones play a critical role in the regulation of physiological processes because of the target cell responses they regulate. These responses contribute to reproduction, growth and development of body tissues, metabolism, fluid and electrolyte balance, sleep, and many

other body functions. The major hormones of the human body and their effects are identified in (Table 21.1).

Endocrine Gland	Associated Hormones	Effect
Pituitary (anterior)	Growth hormone (GH)	Promotes growth of body tissues
	Prolactin (PRL)	Promotes milk production
	Thyroid-stimulating hormone (TSH)	Stimulates thyroid hormone release
	Adrenocorticotropic hormone (ACTH)	Stimulates hormone release by adrenal cortex
	Follicle-stimulating hormone (FSH)	Stimulates gamete production
	Luteinizing hormone (LH)	Stimulates androgen production by gonads
Pituitary (posterior)	Antidiuretic hormone (ADH)	Stimulates water reabsorption by kidneys
	Oxytocin	Stimulates uterine contractions during childbirth
Thyroid	Thyroxine (T4), triiodothyronine (T3)	Stimulate basal metabolic rate
	Calcitonin	Reduces calcium (Ca^{2+}) levels in the blood
Parathyroid	Parathyroid hormone (PTH)	Increases calcium (Ca^{2+}) levels in the blood
Adrenal (cortex)	Cortisol, corticosterone, cortisone	Increase blood glucose levels
Adrenal (medulla)	Epinephrine, norepinephrine	Stimulate fight-or-flight response
Pineal	Melatonin	Regulates sleep cycles
Pancreas	Insulin	Reduces blood glucose levels
	Glucagon	Increases blood glucose levels

TABLE 21.1 Endocrine Glands and Their Major Hormones

Endocrine Gland	Associated Hormones	Effect
Testes	Testosterone	Stimulates development of male sex characteristics including a deeper voice, increased muscle mass, development of body hair, and sperm production
Ovaries	Estrogen, progesterone	Stimulate development of female sex characteristics, including the development of adipose and breast tissue, and prepare the body for childbirth

TABLE 21.1 Endocrine Glands and Their Major Hormones

Hormones are divided into two major groups based on their chemical structure. Hormones derived from amino acids include amines, peptides, and proteins. Hormones derived from lipids include steroids. These chemical groups affect a hormone's distribution, the type of receptors it binds to, and other aspects of its function.

LINK TO LEARNING

Watch this video to gain further understanding about endocrine glands and their functions (https://openstax.org/r/77EndocrneGlnds) as an NCLEX review.

Pathways of Hormone Action

The message a hormone sends is received by a **hormone receptor**, a protein located either inside the cell or within the cell membrane. The receptor processes the message by initiating other signaling events or cellular mechanisms that result in the target cell's response. Hormone receptors recognize molecules with specific shapes and side groups and respond only to those hormones that are recognized. For example, cells contain insulin receptors and glucose channels. A cell's glucose channel will not open to accept glucose until insulin unlocks the insulin receptor, and only insulin will "fit" into the insulin receptor. The process is similar to using a specific key to unlock a door before opening it (Figure 21.3).

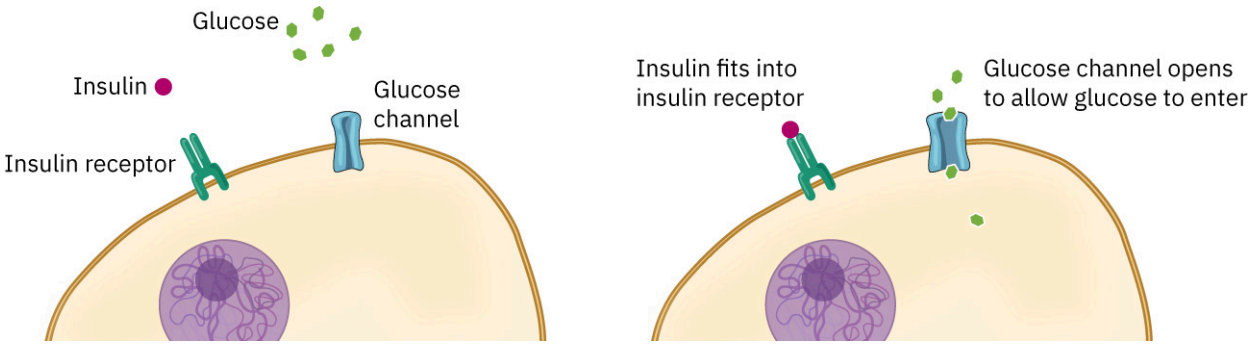

FIGURE 21.3 Insulin regulates the body's metabolism and is the "key" that "unlocks" a cell's glucose channel. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Once the target cell receives the hormone signal, it can respond in a variety of ways. The response may include the stimulation of protein synthesis, activation or deactivation of enzymes, alteration in the permeability of the cell membrane, altered rates of mitosis and cell growth, or stimulation of the secretion of products. A single hormone may be capable of inducing different responses in a given cell. Moreover, the same type of receptor may be located on cells in different body tissues and trigger somewhat different responses in each location. Thus, the response triggered by a hormone depends not only on the hormone but also on the target cell.

Regulation of Hormone Secretion

To prevent abnormal hormone levels and a potential disease state, hormone levels must be tightly controlled. The body maintains this control by balancing hormone production and degradation, or breakdown. Feedback loops govern the initiation and maintenance of most hormone secretion in response to various stimuli.

Role of Feedback Loops

A **positive feedback** loop is characterized by the release of additional hormone in response to an original hormone release. For example, the release of oxytocin during childbirth is a positive feedback loop. The initial release of oxytocin begins to signal the uterine muscles to contract, which pushes the fetus toward the cervix, causing it to stretch. This, in turn, signals the pituitary gland to release more oxytocin, causing labor contractions to intensify. The release of oxytocin decreases after the birth of the child.

The more common method of hormone regulation is the **negative feedback loop**. A negative feedback loop is characterized by the inhibition of further secretion of a hormone in response to adequate levels of that hormone. This allows blood levels of the hormone to be regulated within a narrow range. An example of a negative feedback loop is the release of glucocorticoid hormones from the adrenal glands, as directed by the hypothalamus and pituitary gland. As glucocorticoid concentrations in the blood rise, the hypothalamus and pituitary gland reduce their signaling to the adrenal glands, preventing additional glucocorticoid secretion (Figure 21.4).

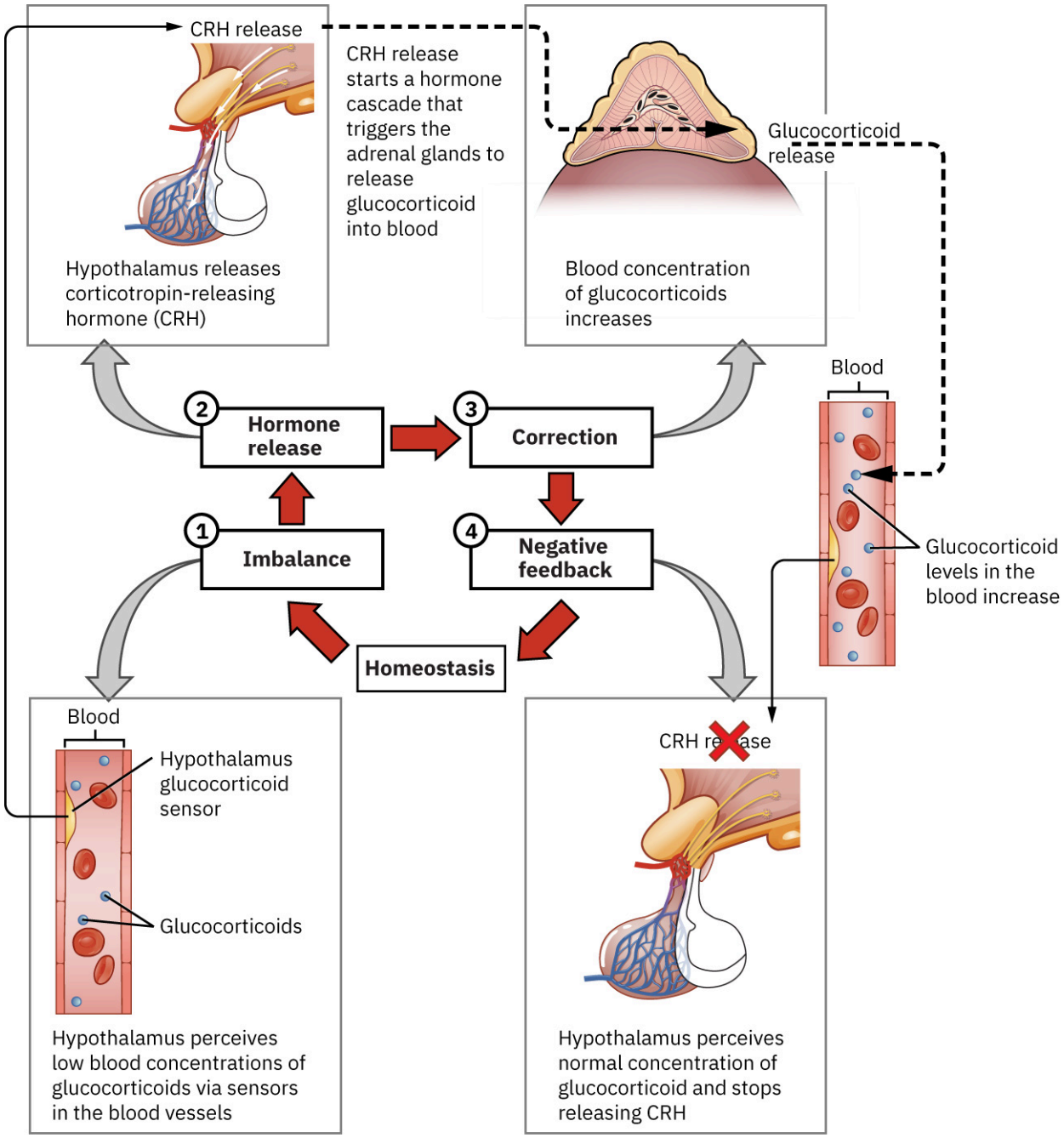

FIGURE 21.4 The release of adrenal glucocorticoids is stimulated by the release of hormones from the hypothalamus and pituitary gland.

This signaling is inhibited when glucocorticoid levels become elevated, a state that sends negative signals to the pituitary gland and hypothalamus. (modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Role of Endocrine Gland Stimuli

Reflexes triggered by both chemical and neural stimuli control endocrine activity. These reflexes may be simple, involving only one hormone response, or they may be more complex and involve many hormones, as is the case with the hypothalamic control of various anterior pituitary-controlled hormones.

Changes in blood levels of nonhormone chemicals, known as **humoral stimuli**, such as nutrients or ions, cause the release or inhibition of a hormone to, in turn, maintain homeostasis. For example, osmoreceptors in the hypothalamus detect changes in blood osmolarity (the concentration of solutes in the blood plasma). If blood osmolarity is too high, the blood is not diluted enough, so osmoreceptors signal the hypothalamus to release antidiuretic hormone (ADH). The hormone causes the kidneys to reabsorb more water and reduce the volume of urine produced. This reabsorption causes a reduction of the osmolarity of the blood, diluting the blood to the appropriate level. The regulation of blood glucose is another example. High levels of blood glucose cause the release of insulin from the pancreas, which increases glucose uptake by cells and liver storage of glucose as glycogen.

An endocrine gland may also secrete a hormone in response to the presence of another hormone produced by a different endocrine gland. Such hormonal stimuli often involve the hypothalamus, which produces releasing and inhibiting hormones that control the secretion of a variety of pituitary hormones.

In addition to these chemical signals, hormones can also be released in response to **neural stimuli**. A common example of neural stimuli is the activation of the fight-or-flight response by the sympathetic nervous system. When an individual perceives danger, sympathetic neurons signal the adrenal glands to secrete norepinephrine and epinephrine. The two hormones dilate blood vessels, increase the heart and respiratory rate, and suppress the digestive and immune systems. These responses boost the body's transport of oxygen to the brain and muscles, thereby improving the body's ability to fight the threat or flee from it.

Assessment of the Endocrine System

Clinical assessment of the endocrine system is a process that incorporates a patient history, physical examination, and diagnostic testing. The metabolic functions of endocrine glands can be monitored through the evaluation of the hormones they release.

Patient History

A patient history can provide targeted subjective data to the nurse and provider to evaluate the endocrine health of the patient. Table 21.2 lists questions that might be included in such a history.

Category	Focused Questions
Current health	What are your current goals for your health? Are there any other issues affecting your current health or the ability to complete your daily activities? If yes, tell me more. Are there any symptoms such as unexplained weight changes, fatigue, or changes in mood that concern you? If yes, please describe them in detail.
Medications	What are your current medications, including prescriptions, over-the-counter medications, vitamins, and herbal supplements, and why are you taking them? (Note: This is to establish the patient's understanding of their medications.) Do you take your medications as prescribed? (Note: If the response is "no" or "sometimes," follow up with an open-ended question such as, "Tell me more about the reasons for not taking the medications as prescribed.")

TABLE 21.2 Sample Focused Questions for Current and Past Health History

Category	Focused Questions
Allergies	Do you have any allergies to medications, food, latex, or other items? (Note: If yes, ask the patient to describe the allergic reaction.)
Childhood illnesses	Tell me about any significant childhood illnesses that you had. Do you recall what childhood vaccines you received? When did these illnesses occur? Were you hospitalized? Did you experience any complications?
Family health history	Tell me about the health of your blood relatives. Does anyone have diseases like cancer, thyroid problems, heart problems, diabetes, or respiratory problems? Have any of your blood relatives died? If so, do you know the cause of death? What age did they die?
Chronic illnesses	Tell me about any chronic illnesses you currently have or have experienced (such as cancer, cardiac or respiratory issues, diabetes, or arthritis). When were you diagnosed? Do you see a specialist for this chronic illness? If so, what is their name and location? How is this condition currently being treated? How has the chronic illness affected you? How do you cope with it? Have you experienced any complications or disability from this chronic illness? If so, tell me more.
Acute illnesses, surgeries, accidents, or injuries	Tell me about any acute illnesses or surgeries that you have experienced. Have you had any accidents or injuries? Did you experience any complications?
Reproductive health	For females: When was your last menstrual period? Have you ever been pregnant? Are you pregnant now, or is there any chance of being pregnant now? Tell me about your pregnancies. Were there any issues or complications? For females of age: At what age did you first experience symptoms of menopause? Perimenopause? For males: Have you ever experienced any testicular disorders? Impotence or sexual dysfunction?

TABLE 21.2 Sample Focused Questions for Current and Past Health History

Physical Examination

Endocrine conditions can be nonspecific and varied, and they can affect many body systems. Apart from thyroid disease, diabetes mellitus, and some reproductive disorders, they are also relatively uncommon. Table 21.3 lists possible medical diagnoses of common clinical features seen in endocrine conditions (Crafa et al., 2022).

Sign or Symptom	Possible Medical Diagnoses
Altered facial appearance	Cushing's syndrome, polycystic ovary syndrome (PCOS), acromegaly, hypothyroidism, dwarfism
Bone fragility	Hyperthyroidism, hypogonadism, Cushing's syndrome

TABLE 21.3 Common Clinical Features in Endocrine Conditions

Sign or Symptom	Possible Medical Diagnoses
Delayed puberty	Hypothyroidism, hypopituitarism, primary gonadal failure, polycystic ovary syndrome
Diffuse neck swelling	Hashimoto's thyroiditis, simple goiter, Graves' disease
Erectile dysfunction	Diabetes mellitus, primary or secondary hypogonadism, non-endocrine systemic disease
Excessive thirst	Conn's syndrome, diabetes mellitus or insipidus, hyperparathyroidism
Flushing	Carcinoid syndrome, hypogonadism, perimenopause, menopause
Hirsutism (excessive hair growth)	PCOS, Cushing's syndrome, congenital adrenal hyperplasia
Menstrual disturbance	Thyroid dysfunction, PCOS, hyperprolactinemia
Muscle weakness	Osteomalacia (soft bones), hyperthyroidism, hyperparathyroidism, Cushing's syndrome
Resistant hypertension	Renal artery stenosis, acromegaly, Cushing's syndrome, Conn's syndrome, phaeochromocytoma
Skin pigmentation changes (e.g., hyperpigmentation, bruising, pigmented spots)	Lentiginosis, primary adrenal insufficiency, Cushing's syndrome, Addison's disease, diabetes mellitus type I
Sweating	Acromegaly, hyperthyroidism, hypogonadism, phaeochromocytoma
Weight gain	Cushing's syndrome, hypothyroidism, PCOS
Weight loss	Adrenal insufficiency, hyperthyroidism, diabetes mellitus

TABLE 21.3 Common Clinical Features in Endocrine Conditions

LINK TO LEARNING

Watch this video to review common endocrine disorders (https://openstax.org/r/77EndcrnDisOrd) and their common clinical features.

When completing a physical assessment, inspect the patient's neck for asymmetry, redness, swelling, surgical scars, or masses by having the patient turn their head slowly from side to side. Ask the patient to take a sip of water, tilt their head back to elongate the neck, and swallow. Watch for any lumps or protrusions as the patient swallows (Alomari, n.d.). Movement of the neck should be uniform and symmetrical when swallowing.

Palpate the neck for symmetry, noting any masses. Standing behind the patient, find and palpate the thyroid gland, using a circular motion, and note any enlargement, asymmetry, or masses. Palpate for any tracheal deviation or cervical lymph nodes. Auscultate each lobe of the thyroid for any bruits.

LINK TO LEARNING

Click here to watch how to perform a full clinical examination of the thyroid gland (https://openstax.org/r/77ThyroidExam) from introduction through palpation of the thyroid.

Have the patient extend their arms, place their palms up, and assess for any minor tremors or sweaty palms. Check the patients' eyes to see if they bulge, a condition known as **exophthalmos** (Figure 21.5).

FIGURE 21.5 Exophthalmos is a clinical sign of an endocrine disorder. (credit: "Proptosis and lid retraction from Graves' Disease" by Jonathan Trobe, M.D., University of Michigan Kellogg Eye Center/Wikipedia, CC BY 3.0)

Diagnostic Testing

Diagnostic testing is targeted based on the findings of a history and physical exam. Serum hormone levels can assess under- or over-activity. Blood glucose and hemoglobin A1C (HbA1c) levels can determine diabetes mellitus. Urinalysis can evaluate for diabetes mellitus, urine electrolytes, and kidney damage. Imaging may be performed to visualize the physical appearance of different endocrine glands and organs and evaluate them for tumors. Fine needle biopsy may also be performed to assess any nodules for malignancies. Table 21.4 lists common diagnostic tests for endocrine assessment.

Diagnostic Test	Indication/Significance
Laboratory Testing	
Urinalysis	Glycosuria (excess glucose in the urine) or proteinuria may indicate diabetes mellitus and/or kidney disease
Blood glucose	High levels indicate diabetes mellitus
Serum calcium	High levels indicate hyperparathyroidism Low levels indicate hypoparathyroidism
Serum cortisol	Low levels indicate hypoadrenalism High levels indicate Cushing's disease
Gonadotrophins	High levels indicate primary hypogonadism
Imaging	
CT scan	View the adrenal glands and pancreas

TABLE 21.4 Targeted Diagnostic Testing in Endocrine Assessment

Diagnostic Test	Indication/Significance
MRI	View the pancreas and pituitary gland
Ultrasound	View the thyroid, parathyroid, testes, and ovaries
Positron emission tomography (PET) scan	Evaluate thyroid and neuroendocrine tumors
Radionuclide imaging	Uses an isotope to better assess endocrine function, circulation, and tumors
Invasive Procedures	
Inferior petrosal sinus sampling	Evaluate for a pituitary tumor by sampling adrenocorticotropic hormone (ACTH) from the veins that drain from the pituitary gland
Fine needle aspiration biopsy	Evaluate the cytology of a thyroid or adrenal nodule

TABLE 21.4 Targeted Diagnostic Testing in Endocrine Assessment

21.2 Diabetes Mellitus

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for diabetes mellitus
- Describe the diagnostics and laboratory values for diabetes mellitus
- Apply nursing concepts and plan associated nursing care for patients with diabetes mellitus
- Evaluate the efficacy of nursing care for diabetes mellitus
- Describe the medical therapies that apply to the care of patients with diabetes mellitus

Pathophysiology of Diabetes Mellitus

The endocrine function of the pancreas is to produce hormones that help to regulate blood sugar levels and appetite. The two main hormones produced by the pancreas are insulin and glucagon. Produced by beta cells in the pancreas, **insulin** helps cells absorb glucose for energy, lowering the body's blood sugar levels, and stimulates protein synthesis and the storage of free fatty acid in adipose tissue. Released by alpha cells of the pancreas when the body's blood glucose is too low, **glucagon** triggers the liver to release stored glucose to raise glucose levels.

Characterized by inappropriately levels of high blood glucose, **diabetes mellitus (DM)** is a disease caused by an imbalance of insulin and glucagon. The most common types of DM are **Type 1 diabetes mellitus (T1DM)**, **Type 2 diabetes mellitus (T2DM)**, and **gestational diabetes (GDM)** (ADA, 2024a). The pathologies of the different types of DM vary (Table 21.5) (Plows et al., 2018).

Type of Diabetes Mellitus	Pathology
Type 1 diabetes mellitus (T1DM)	• This autoimmune disease damages the beta cells of the pancreas so they do not produce insulin; thus, synthetic insulin must be administered by injection or infusion. • T1DM typically begins in childhood or adolescence.
Type 2 diabetes mellitus (T2DM)	• T2DM accounts for approximately 95 percent of all cases and is highly correlated with obesity and inactivity. • The cells of the body become resistant to the effects of insulin, so the pancreas increases its production of insulin. • Over time, the pancreas may no longer be able to produce insulin.
Gestational diabetes (GDM)	• GDM affects up to 14 percent of all pregnancies; it manifests as spontaneous hyperglycemia. • Beta cells in the pancreas become unable to compensate for the demands of pregnancy, causing a dysfunction in the production of insulin and a reduced insulin sensitivity resulting in high blood glucose levels. • Function usually returns to normal after pregnancy, but the condition can increase the risk of developing T2DM.

TABLE 21.5 Pathophysiology of Different Types of Diabetes Mellitus

Because of the imbalance of insulin and glucagon, patients with DM have a risk for **hyperglycemia** (high blood glucose levels), which can further impair beta cell function and insulin secretion (Dapra & Bhandari, 2023). Hyperglycemia can lead to an impaired metabolic state, causing increased urination, or **osmotic diuresis**, due to the excess glucose concentrations in the kidneys. Chronic hyperglycemia also causes excess fatty acids and pro-inflammatory cytokines, contributing to further insulin resistance and inappropriate glucagon production. The excess glucose also bonds to proteins and lipids, causing damage to blood vessels in the eyes, kidneys, and peripheral nerves. The damage can cause complications such as diabetic neuropathy, kidney disease, and peripheral neuropathy (Dapra & Bhandari, 2023).

Risk Factors

Known risk factors for T1DM are age or family history. A person is more likely to develop T1DM at a young age, or if they have a close family member with the disease. In some circumstances, research has shown it can also be caused by certain viral infections (Rajsfus et al., 2023). However, scientists do not fully understand the risk factors for T1DM since it is viewed as a complex autoimmune disease.

Risks for T2DM include being overweight, age 45 or older, or of American Indian, Black, Hispanic, Latinx, or Alaska Native descent (CDC, 2022b). Having a sedentary lifestyle, a personal history of GDM, or a family history of T2DM are also risk factors (CDC, 2022b).

GDM risk factors include being overweight, age 25 and older, or of American Indian, Black, Hispanic, Latinx, Native Hawaiian, Pacific Islander, or Alaska Native descent. Having a personal history of GDM or polycystic ovary syndrome or a family history of T2DM are also risk factors (CDC, 2024; Mayo Clinic, 2022).

Clinical Manifestations

Common symptoms associated with DM are polyuria, increased thirst, unplanned weight loss, increased hunger, blurry vision, tingling or numbness in hands or feet, decrease in energy, dry skin, increased infections, and slow wound healing (CDC, 2023). Patients may also experience symptoms of hypoglycemia, such as the following:

- Shakiness (tremors) or jitteriness
- Feeling nervous or anxious

- Sweating (diaphoresis), chills, and clamminess
- Irritability or mood swings
- Confusion
- Fast heartbeat (tachycardia)
- Dizziness or lightheadedness
- Hunger
- Nausea
- Color draining from the skin (pallor)
- Feeling sleepy
- Weakness, fatigue, or having no energy
- Blurred/impaired vision
- Tingling or numbness in the lips, tongue, or cheeks (paresthesia)
- Headaches
- Coordination problems (ataxia) or clumsiness
- Irregular heart rate (arrythmia)

Symptoms that indicate a medical emergency include seizures, inability to eat or drink, and loss of consciousness.

LINK TO LEARNING

Watch this video to learn more about the pathophysiology of hypoglycemia (https://openstax.org/r/77Hypoglycemia) and its etiology and classification.

Patients with T1DM may experience nausea, vomiting, and abdominal pain. Symptoms may not be present in patients with T2DM, since symptoms can take years to develop. GDM usually doesn't have any symptoms but is often diagnosed in the second or third trimester of pregnancy.

Complications

There are many complications associated with DM, regardless of what type a patient has. Most complications are microvascular (affect small blood vessels) or macrovascular (affect larger vasculature):

- Microvascular complications include diabetic retinopathy, blindness, and neuropathy.
- Macrovascular complications include nephropathy, cardiovascular disease, and myocardial infarction.
- Other complications include end-stage kidney disease, limb amputations, hypoglycemia, gastroparesis (delayed gastric emptying), and increased risk for certain types of cancer, such as pancreatic, liver, kidney, and gallbladder (Zhu & Qu, 2022).

Emergent complications of DM are **diabetic ketoacidosis (DKA)** and **hyperosmolar hyperglycemic state (HHS)**. DKA is an acute condition with a low mortality rate. HHS develops slowly, sometimes in weeks, but has a much higher mortality rate. Treatment occurs in the intensive care unit (ICU) and is the same in both cases. Table 21.6 provides additional information about DKA and HHS (Sapra & Bhandari, 2023).

	Diabetic Ketoacidosis (DKA)	Hyperosmolar Hyperglycemic State (HHS)
Pathophysiology	• Typically occurs in T1DM • Develops within 24 hours • Caused by sepsis, infection, stress, or missed insulin dose • Chronic lack of insulin causes the metabolism of lipids as energy, turning them into ketones • About 1% mortality rate	• More common in T2DM • Slow developing; within days to weeks • Caused by illness and infection • Chronic hyperglycemia leads to severe dehydration, weakness, and confusion • Up to 20% mortality rate
Symptoms	• Blood glucose above 250 mg/dL • Blood pH 7.3 or lower • Ketones in blood and urine • Increased anion gap (approximately >12 mEq/L) • Causes metabolic acidosis, diuresis, vomiting, acute kidney injury, dehydration, and electrolyte abnormalities	• Blood glucose higher than 600 mg/dL • Blood pH remains normal • No ketones in blood or urine • Normal anion gap (approximately 8-12 mEq/L) • Can cause seizures, coma, and organ failure
Treatment	• Intravenous insulin administration (titrated according to blood glucose and ketone levels) • Aggressive IV fluid hydration • Monitor and correct electrolyte imbalances, especially potassium • Evaluating for underlying cause	• Intravenous insulin administration • Aggressive IV fluid hydration • Monitor and correct electrolyte imbalances, especially potassium • Evaluating for underlying cause

TABLE 21.6 Diabetic Ketoacidosis and Hyperosmolar Hyperglycemic State

LINK TO LEARNING

This video provides a comparison of DKA and HHS (https://openstax.org/r/77DKAandHHS) as an effective NCLEX review.

Diagnostics and Laboratory Values

DM symptoms can vary according to type and severity. Accurate assessment is important to provide an accurate diagnosis and prevent complications. Diagnostic testing can provide information about disease type and severity. DM is diagnosed primarily through evaluation of fasting serum glucose levels, hemoglobin A1c levels, or oral glucose tolerance testing (OGTT). A patient can be diagnosed with DM with any one of the following results (ADA, 2024a):

- A fasting blood glucose level test result of 126 mg/dL or higher
- A glycosylated hemoglobin (A1c) level greater than or equal to 6.5%
  - A1C, used to assess long-term blood glucose levels over 3 months
- An OGTT value greater than or equal to 200 mg/dL during a 75-g OGTT
- Random blood glucose level of greater than or equal to 200 mg/dL in the presence of symptomatic hyperglycemia or a hyperglycemic crisis
- A urinalysis may be positive for glucose and ketones

An OGTT is performed in all pregnant patients between 24 to 28 weeks' gestation as a screening tool for GDM. The patient has their blood glucose level drawn, then drinks glucose and has another blood glucose level drawn at 1 hour, 2 hours, and/or 3 hours. The patient is diagnosed based on the results of the blood glucose levels.

REAL RN STORIES

Nurse: Mary, MSN
Years in Practice: Seven
Clinical Setting: Labor and delivery unit
Geographic Location: South New Jersey

One day, I was assisting the outpatient clinic with GDM testing, and I was assigned to prep a patient, Janine, for a glucose tolerance test. She had worked night shift, so she came in very tired but appropriately alert. She was a healthy 29-year-old patient, with a normal weight and measurements for a patient at 25 weeks' gestation. Janine didn't have a family history of GDM, but her mother and older brother both had T2DM. Since she was arriving after her overnight shift, we decided to perform a 2-step method glucose tolerance test. Her 1-hour result was 155 mh/dL, indicating that we'd have to do an overnight fast and second glucose tolerance test.

The next week, Janine had her repeat test and her glucose was 200 mg/dL after an hour, confirming that she had GDM. She was surprised and scared over the results. She said she was nervous about the health of her baby and didn't understand how she could possibly have GDM. I took the time to explain everything to her, including a nutritional plan to follow and instructions on how she could check her glucose levels at home. I also gave her information about support groups, as well as the phone number to the nurses' station if she had any questions. Janine was able to maintain healthy glucose levels through diet modification and the use of insulin throughout her pregnancy. Soon after delivery, her GDM resolved.

Nursing Care of the Patient with Diabetes Mellitus

While diabetes is a manageable condition, there is the potential for serious complications. Lifestyle changes, robust patient education, and timely intervention are key interventions to optimize outcomes.

Recognizing and Analyzing Cues

The nurse providing care to a patient with DM utilizes both objective and patient-reported data to optimize care. Subjective assessment findings may include a patient or family history of obesity, DM, unplanned weight loss, neuropathic pain, polyuria, or polydipsia. Possible physical findings may include decreased touch and temperature sensation, blurred vision, hypertension, **Kussmaul respirations** (rapid, deep breathing at a consistent pace), loss of deep tendon reflexes in ankles, weak dorsalis pedis and posterior tibialis pulses, dry skin, muscle atrophy, foot ulceration, obesity, candida infections, thick hyperpigmentation of the skin under creases or folds, and poor skin turgor.

LIFE-STAGE CONTEXT

Vision Loss in Older Patients

Visual acuity changes are a common cause of vision loss in older patients with DM. It is important to assess the visual acuity of older patients with DM while in the hospital setting, and to provide sufficient lighting for the patient to carry out activities and prevent falls. Reinforce to these patients at time of discharge the importance of regular eye exams by an optometrist (CDC, 2022a).

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Patients with DM should be continuously monitored for complications, such as signs of hypoglycemia and hyperglycemia. When a person is fighting illness, their body releases extra glucose into the bloodstream to combat disease. Extra insulin is then produced to balance the extra glucose. A patient with DM that is experiencing stress or an infection doesn't have the ability to provide that balance, so the nurse should plan to assess the blood glucose

levels more frequently. A nursing care plan for a patient with DM may include monitoring glucose levels, medication management, nutrition therapy, and thorough patient education. When educating your patient, consider covering the following topics:

- Fundamentals of DM: Explain the underlying mechanisms of DM, including what the condition is, the typical ranges for normal blood glucose levels, and the goals for target blood glucose levels.
- Treatment strategies: Provide guidance on prescribed treatments, such as how to correctly use insulin and oral antidiabetic medications. Also, discuss strategies for meal planning and techniques for monitoring blood glucose levels and urine ketones.
- Management of acute complications: Educate the patient on how to identify, address, and prevent acute complications, including both hypoglycemia and hyperglycemia.

The nurse should follow facility policy for safe insulin administration. Onset and peak times of insulin and sulfonylureas, in association with anticipated mealtimes, should always be considered to avoid hypoglycemia episodes. In the hospital setting, patients may be temporarily taken off oral agents and treated exclusively with insulin, since insulin can be easily adjusted to manage hyperglycemia. If a hypoglycemic episode occurs, the nurse should intervene quickly using the facility's established hypoglycemia protocol, and the event should be reported to the provider and in handoff or shift report. Symptomatic hyperglycemia should be immediately reported to the provider.

Evaluation of Nursing Care of the Patient with Diabetes Mellitus

Evaluating nursing care for patients with DM focuses on glucose monitoring and control. Accurately understanding the patient's understanding of the disease and willingness to participate in care can increase the nurse's ability to evaluate outcomes.

Evaluating Outcomes

The nurse should evaluate the outcome of the care provided with the patient and family. Sometimes interventions and timelines need to be adjusted to meet care goals. In caring for the patient with DM, questions that the nurse can ask themselves to evaluate care are:

- Did the patient's fluid volume status normalize to target ranges?
- Did the patient's electrolytes normalize to target ranges?
- Did the patient maintain adequate blood glucose levels?
- Did the patient experience a hypoglycemic/hyperglycemic episode?
- Did the patient seem engaged during education, and did they retain the information given?

Medical Therapies and Related Care

Treatment of DM is patient-specific and involves education and patient engagement, medication, lifestyle changes, and glucose monitoring (ADA, 2024b). Treatment is lifelong in order to prevent complications.

Patients with T1DM require insulin for treatment, while patients with T2DM may use insulin if other treatments are insufficient. The primary therapeutic effect of diabetes medications is to maintain serum blood glucose levels within the normal range and achieve an individualized target level of A1C, often set around 7 percent. However, patients should be aware of potential adverse and side effects associated with these treatments. Common side effects include hypoglycemia, characterized by abnormally low blood glucose levels, and hypokalemia, a deficiency of potassium in the blood. Additionally, specific medications, such as Afrezza, an inhaled insulin, can cause acute bronchospasm, especially in individuals with pre-existing respiratory conditions.

There are several different types of insulins that vary in terms of onset, peak, and duration (Table 21.7). It is critical for the nurse to be knowledgeable of these differences to help prevent episodes of hypoglycemia due to mismatched administration of insulin with food intake.

Class and Subclass	Prototypes and Generics	Onset/Peak/ Duration	Administration Considerations
Rapid-acting insulin	Insulin lispro (Humalog) Insulin aspart (Novolog) Inhaled insulin (Afreeza)	Onset: 15-30 minutes Peak effect: 1-3 hours Duration: 3-5 hours	• Administer within 15 minutes before a meal or immediately after a meal • Afrezza is contraindicated in patients with asthma or COPD
Short-acting insulin	Humulin R Novolin R	Onset: 30 minutes Peak effect: 3 hours Duration: 8 hours	• Administer 30 minutes before a meal
Intermediate-acting insulin	Humulin N Novolin N	Onset: 1-2 hours Peak effect: 6 hours (range 2.8-13 hours) Duration: up to 24 hours	• Administer once or twice daily • Only administer subcutaneously • Gently roll or invert vial/pen several times to re-suspend the insulin before administration
Combination: Intermediate-acting/Rapid-acting	Humalog Mix 50/50* Humalog Mix 75/25* Novolog Mix 70/30* *First number is % intermediate-acting insulin, second number is % rapid-acting	Onset: 15-30 minutes Peak effect: 1-5 hours Duration: 11-22 hours	• Administer twice daily, 15 minutes before a meal or immediately after a meal • Only administer subcutaneously • Gently roll or invert vial/pen several times to re-suspend the insulin before administration

TABLE 21.7 Types of Insulin

Class and Subclass	Prototypes and Generics	Onset/Peak/ Duration	Administration Considerations
Combination: Intermediate-acting/Short-acting	Humulin 70/30 Novolin 70/30	Onset: 30-90 minutes Peak effect: 1.5-6.5 hours Duration: 18-24 hours	• Administer twice daily, 30-45 minutes before a meal • Only administer subcutaneously • Gently roll or invert vial/pen several times to re-suspend the insulin before administration • Do not mix with other insulin
Long-acting insulin	Insulin glargine (Lantus) Insulin detemir (Levemir)	Onset: 3-4 hours Peak effect: none Duration: >24 hours	• Administer once daily (sometimes dose is split and administered twice daily) • Only administer subcutaneously • Do not mix with other insulin

TABLE 21.7 Types of Insulin

There are several different classes of oral antihyperglycemic drugs used in conjunction with a healthy diet and exercise for the management of T2DM. According to the American Diabetes Association, metformin is the preferred initial pharmacologic agent for the treatment of T2DM (ADA, 2024b). Three of the most-used antihyperglycemic classes and prototypes are sulfonylureas (glipizide), biguanide (metformin), and DPP-IV (sitagliptin). Administration considerations for each of these prototypes are described in Table 21.8.

Class	Prototype	Administration Considerations	Adverse/Side Effects
Sulfonylureas	Glipizide	Time with meals; peak plasma concentrations occur 1 to 3 hours after administration	Hypoglycemia; may be potentiated by nonsteroidal anti-inflammatory agents and other drugs that are highly protein-bound
Biguanide	Metformin	Contraindicated in renal and hepatic diseases Should be temporarily discontinued in patients undergoing radiologic studies involving intravascular administration of iodinated contrast materials	Stop immediately if signs of lactic acidosis or any condition associated with hypoxemia, dehydration, or sepsis occur Common adverse effects: diarrhea, nausea/vomiting, weakness, flatulence, indigestion, abdominal discomfort, and headache
DPP-IV inhibitor	Sitagliptin	Can be given with or without food	Hypoglycemia Report hypersensitivity reactions, blisters/erosions, headache, or symptoms of pancreatitis, heart failure, severe arthralgia, or upper-respiratory infection

TABLE 21.8 Oral Antihyperglycemics

Lifestyle changes play a crucial role in managing DM effectively and improving overall health. For individuals with DM, adopting a balanced diet rich in whole grains, lean proteins, and vegetables while reducing the intake of refined sugars and saturated fats can help control blood glucose levels and prevent complications. Regular physical activity, such as walking, cycling, or swimming, enhances insulin sensitivity and helps maintain a healthy weight. Additionally, managing stress through techniques like mindfulness or yoga can positively impact blood sugar levels. Monitoring blood glucose regularly and making informed adjustments to diet and exercise based on these readings further supports effective DM management. By integrating these lifestyle changes, individuals with DM can achieve better glycemic control and enhance their quality of life.

Oral antihyperglycemic medications have historically not been recommended during pregnancy because they cross the placenta and may pose risks to the developing fetus, potentially leading to harmful effects. Instead, insulin has traditionally been the preferred treatment for managing DM during pregnancy, as it does not cross the placenta and is considered safe for both the mother and the fetus. While some oral medications, like metformin, may be used cautiously in specific cases, insulin remains the standard choice to effectively control blood glucose levels and minimize risks to fetal development.

Regular screenings are crucial for preventing complications in DM management. Diabetic retinal exams should be performed annually to monitor for signs of diabetic retinopathy. Neurologic exams, including assessments for neuropathy, are typically recommended at least once a year. Urinalysis should be conducted periodically, often annually, to check for signs of nephropathy or urinary tract infections. Blood pressure should be monitored at each visit, with treatment adjustments made as needed to maintain control. Lipid levels are generally assessed annually to manage cardiovascular risk. Additionally, patients should conduct frequent self-inspections of their feet and have them checked regularly by a health-care professional, as often as every visit or at least every three to six months, to detect and address any sores or breakdowns promptly.

In addition to regular screenings and monitoring, comprehensive DM care includes several other essential standards. Routine vaccinations, such as those for influenza, pneumococcal disease, and hepatitis B, are crucial for preventing infections that could complicate DM management. Support for smoking cessation is also vital due to the increased risk of cardiovascular disease associated with smoking. Regular nutrition counseling helps individuals manage their diet effectively, while mental health support addresses psychological challenges related to DM. Additionally, monitoring kidney function through tests like serum creatinine and urine albumin-to-creatinine ratio helps in the early detection of diabetic nephropathy.

In DM management, the frequency of blood glucose monitoring varies depending on the type of DM and the treatment regimen. For individuals with T1DM, frequent monitoring is essential due to the need for precise insulin dosing. Typically, blood glucose should be checked multiple times a day, including before and after meals, before exercise, and at bedtime, to effectively manage insulin levels and prevent hypo- or hyperglycemia. For those with T2DM, the frequency of monitoring can vary based on the treatment approach. Patients who are on insulin therapy or other glucose-lowering medications may need to monitor their blood glucose levels several times a day, similar to T1DM patients. However, those managing their DM with oral medications alone or through lifestyle changes may only need to check their blood glucose levels once a day or a few times a week. The specific frequency should be tailored to each individual's treatment plan and glycemic control needs, as determined by their health-care provider.

It is crucial to reinforce to the patient the importance of keeping a detailed log of blood glucose results and to consistently check levels before meals and at bedtime. Regular monitoring and logging help provide valuable data for health-care providers, allowing for more accurate adjustments to treatment plans. This approach ensures better management of DM and contributes to improved overall health outcomes. Regular A1C testing, usually every three to six months, further helps assess long-term glucose control and informs any necessary changes in the monitoring routine.

21.3 Thyroid and Parathyroid Disorders

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for thyroid and parathyroid disorders
- Describe the diagnostics and laboratory values for thyroid and parathyroid disorders
- Apply nursing concepts and plan associated nursing care for patients with thyroid and parathyroid disorders
- Evaluate the efficacy of nursing care for thyroid and parathyroid disorders
- Describe the medical therapies that apply to the care of patients with thyroid and parathyroid disorders

Thyroid disorders arise when the thyroid gland secretes hormones in incorrect amounts, disrupting the processes that regulate metabolism of proteins, fats, and carbohydrates. This imbalance affects the body's energy utilization, oxygen consumption, and heat production. On the other hand, parathyroid disorders occur when the parathyroid glands produce abnormal levels of parathyroid hormone (PTH), which is essential for regulating calcium levels in the body. This module connects the function of the thyroid and parathyroid with common disorders caused by inappropriate function and discusses diagnostic testing, therapies, and nursing care of patients with thyroid or parathyroid disorders.

Pathophysiology of the Thyroid and Parathyroid

The **thyroid** is a gland in the neck, just below the larynx and in front of the trachea (Figure 21.6). It is a butterfly-shaped gland with two lobes that are connected by a band of tissue called the isthmus. It has a dark-red color due to its extensive vascular system. When the thyroid swells due to dysfunction, it can be felt under the skin of the neck.

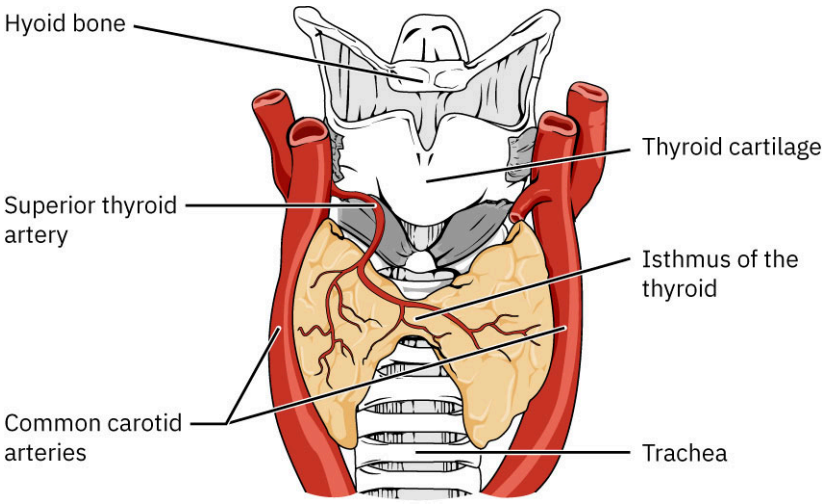

FIGURE 21.6 The thyroid, shown here in tan, is a butterfly-shaped gland that sits below the larynx and in front of the trachea. (modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

The thyroid gland is made up of many spherical thyroid follicles, which are lined with a simple cuboidal epithelium. These follicles contain a viscous fluid, called **colloid**, which stores the glycoprotein thyroglobulin, the precursor to the thyroid hormones. The follicles produce hormones that can be stored in the colloid or released into the surrounding capillary network for transport to the rest of the body via the circulatory system.

Thyroid follicle cells synthesize the hormone thyroxine, known as T4 because it contains four atoms of iodine, and triiodothyronine, known as T3 because it contains three atoms of iodine. Follicle cells are stimulated to release stored T3 and T4 by thyroid stimulating hormone (TSH), which is produced by the anterior pituitary. These thyroid hormones increase the rates of mitochondrial ATP production.

A third hormone, calcitonin, is produced by parafollicular cells of the thyroid either releasing or inhibiting hormones. Calcitonin release is not controlled by TSH; instead, it is released when calcium ion concentrations in the blood rise. Calcitonin functions to regulate calcium concentrations in body fluids. It acts in the bones to inhibit osteoclast

activity and in the kidneys to stimulate excretion of calcium. The combination of these two events lowers body fluid levels of calcium.

The **parathyroid** is a gland that is located on the posterior surface of the thyroid gland. Most people have four parathyroid glands; however, the number can vary from two to six. (Figure 21.7). Normally, there is a superior gland and an inferior gland associated with each of the thyroid's two lobes. Each parathyroid gland is covered by connective tissue and contains many secretory cells that are associated with a capillary network.

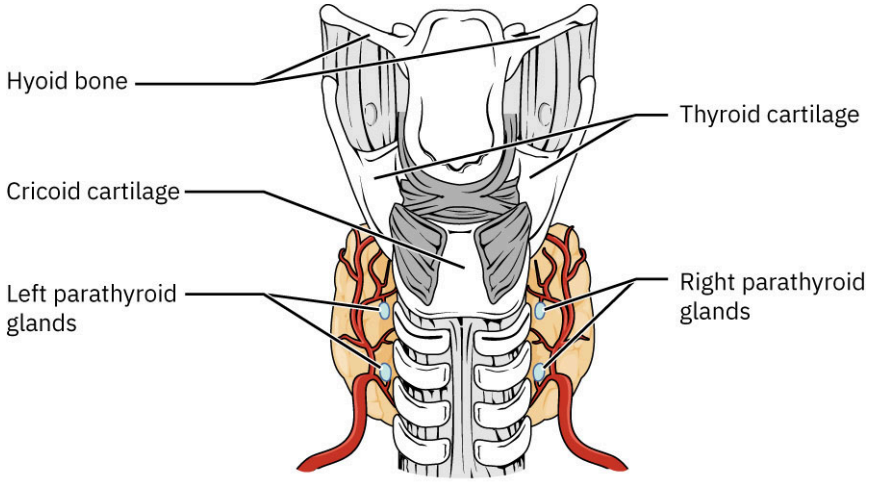

FIGURE 21.7 The parathyroid glands are located on the posterior of the thyroid gland. (modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

The parathyroid glands produce parathyroid hormone (PTH). PTH increases blood calcium concentrations when calcium ion levels fall below normal. PTH is produced by chief cells of the parathyroid. PTH and calcitonin work in opposition to one another to maintain homeostatic Ca^{2+} levels in body fluids. Another type of cell, oxyphil cells, exists in the parathyroid, but their function is not currently known.

Dietary Iodine

Dietary iodine is required for the synthesis of T3 and T4. But for much of the world's population, foods do not provide adequate levels of this mineral. The amount in crops varies according to the level in the soil in which the food was grown, as well as the irrigation and fertilizers used. Marine fish and shrimp tend to have high levels because they concentrate iodine from seawater, but many people in landlocked regions lack access to seafood. Thus, the primary source of dietary iodine in many countries is iodized salt. Fortification of salt with iodine began in the United States in 1924, and international efforts to iodize salt in the world's low-income nations continue today (Cavanaugh, 2024).

Dietary iodine deficiency can result in the impaired ability to synthesize T3 and T4, leading to a variety of severe disorders. Normally, the body controls T3 and T4 levels through a feedback loop. The hypothalamus releases thyrotropin-releasing hormone (TRH) which stimulates the pituitary gland to release TSH, which stimulates the thyroid to release T3 and T4. When T3 and T4 cannot be produced, the loop becomes broken and TSH is secreted in increasing amounts. As a result of this hyperstimulation, thyroglobulin accumulates in the thyroid gland follicles, increasing their deposits of colloid. The accumulation of colloid increases the overall size of the thyroid gland, causing a condition called a **goiter** (Figure 21.8). Iodine deficiency can also cause impaired growth and development, decreased fertility, and prenatal and infant death. Moreover, iodine deficiency is the primary cause of preventable intellectual disabilities worldwide.

FIGURE 21.8 A visible goiter on a person's neck is caused by an accumulation of colloid. (credit: "Goiter" by Jerry Kirkhart/Flickr, CC BY 2.0)

Hyperthyroidism

The overproduction of thyroid hormones, **hyperthyroidism** can lead to an increased metabolic rate and its effects: weight loss, excess heat production, sweating, and an increased heart rate. **Graves' disease** is the most common cause of hyperthyroidism. In Graves' disease, the hyperthyroid state results from an autoimmune reaction in which antibodies overstimulate the follicle cells of the thyroid gland. The person's eyes may bulge (exophthalmos) as antibodies produce inflammation in the soft tissues of the orbits. The person may also develop a goiter. Complications of Graves' disease include heart arrhythmias, heart failure, miscarriage, preterm birth, preeclampsia, maternal heart failure, osteoporosis, and thyroid storm.

Thyroid Storm

Also known as thyroid crisis or thyrotoxic crisis, **thyroid storm** is when the thyroid gland releases a large amount of thyroid hormone in a short period of time. It can be caused by sudden events such as infection, trauma, abrupt discontinuation of antithyroid medication, acute illness, stroke, or giving birth. Symptoms include:

- confusion/delirium
- fever
- nausea/vomiting/diarrhea
- agitation
- anxiety
- tachycardia
- shakiness
- jaundice
- loss of consciousness

Thyroid storm is a medical emergency and requires immediate care. Complications include blood clots, heart failure, seizures, delirium, and coma. If not promptly treated, death from heart failure, cardiac arrhythmias, or multiple organ failure can occur. Up to 30 percent of thyroid storm cases are fatal. Management involves providing antithyroid medications to decrease the creation and release of thyroid hormone and supportive care to treat the body systems affected. It is also important to treat the underlying cause of the thyroid storm (Cleveland Clinic, 2022b).

Hypothyroidism

Inflammation of the thyroid gland, known as **hypothyroidism**, is the more common cause of low blood levels of

thyroid hormones and is characterized by a low metabolic rate, weight gain, cold extremities, constipation, reduced libido, menstrual irregularities, and reduced mental activity. Females are more likely than men to develop hypothyroidism, and it occurs in approximately 5 out of 100 Americans over the age of 12 (NIDDK, 2021). The condition of **congenital hypothyroidism** is characterized by cognitive deficits, short stature, and sometimes deafness and muteness in children and adults born to mothers who were iodine-deficient during pregnancy.

Thyroid Cancer

Thyroid cancer affects approximately 44,000 Americans yearly, and most types have an overall 5-year survival rate of at least 90 percent (American Cancer Society, 2023). It is three times more common in females and 70 percent more common in White people than Black people (American Cancer Society, 2023). Risk factors for thyroid cancer include radiation exposure, low iodine diet, obesity, family history, and certain hereditary conditions. While thyroid cancer is a treatable cancer with a high survival rate, some patients develop hypothyroidism as a result from thyroidectomy or radiation treatment.

Hyperparathyroidism

Abnormally high activity of the parathyroid gland can cause **hyperparathyroidism**, a disorder caused by an overproduction of PTH, which results in excessive calcium reabsorption from bone. The two main causes of hyperparathyroidism are an abnormality or tumor on the parathyroid gland or a secondary condition, such as chronic kidney disease or vitamin D deficiency, that affects the function of the parathyroid gland. Hyperparathyroidism can significantly decrease bone density, leading to spontaneous fractures or deformities. As blood calcium levels rise, cell membrane permeability to sodium is decreased, reducing the responsiveness of the nervous system. At the same time, calcium deposits may collect in the body's tissues and organs, impairing their functioning.

Hypoparathyroidism

Abnormally low blood calcium levels may be caused by parathyroid hormone deficiency, also known as **hypoparathyroidism**, which may develop following injury or surgery involving the thyroid gland, certain autoimmune disorders, abnormal development of the parathyroid tissues, mutation of calcium-sensing receptors, or PTH resistance (Hans & Levine, 2022). Low blood calcium increases membrane permeability to sodium, resulting in muscle twitching, cramping, spasms, or convulsions. Severe deficits can paralyze muscles, including those involved in breathing, and can be fatal.

Clinical Manifestations of Thyroid and Parathyroid Disorders

The thyroid controls metabolism, heart rate, and body temperature. Clinical signs and symptoms of thyroid disorders typically involve either hyperactivity (hyperthyroidism) or hypoactivity (hypothyroidism) of the thyroid gland. Table 21.9 lists signs of symptoms of hyperthyroidism and hypothyroidism.

Hyperthyroidism	Hypothyroidism
• Nervousness/irritability • Fatigue/muscle weakness • Mood swings • Heat intolerance • Insomnia • Tremors • Tachycardia/irregular heart rhythm • Weight loss • Diarrhea • Goiter	• Depression • Fatigue • Dry skin • Dry, thinning hair • Cold intolerance • Puffy face • Joint/muscle pain • Bradycardia • Decreased sweating • Constipation • Heavy/irregular menstrual periods and fertility problems

TABLE 21.9 Signs and Symptoms of Hyperthyroidism and Hypothyroidism (George Washington University Hospital, 2024)

Clinical manifestations of parathyroid disease are unusual in the early stages. Signs and symptoms vary and are dependent on the type of disorder present. A patient with hyperparathyroidism may present with muscle weakness, fatigue, depression, chronic thirst, frequent urination, loss of appetite, abdominal pain, trouble concentrating, and

mild confusion. If hypercalcemia is present, the patient may have muscle spasms, bone/joint pain, drowsiness, confusion, cardiac arrhythmias, hypertension, osteoporosis, kidney stones, gastric ulcers, or pancreatitis. Patients with hypoparathyroidism may present with muscle cramps, spasms, or numbness or tingling in their toes, fingers, or lips.

LIFE-STAGE CONTEXT

Older Patients and Thyroid Disease

Patients over 60 years of age are more likely to develop hypothyroidism than younger adults, as TSH production increases with age. Thyroid dysfunction can also be more difficult to identify in older adults because symptoms, such as memory loss or cognitive function changes, are often attributed to advanced age. An extensive patient history is important to distinguish between normal age changes and thyroid dysfunction.

Diagnostics and Laboratory Values

An accurate assessment is important in the diagnosis of thyroid and parathyroid disorders. Diagnostic testing can further support diagnosis and provide information about the disease severity. Diagnostic testing for thyroid or parathyroid disorders includes bloodwork, imaging, and biopsy; the specific tests depend on what the subjective and objective data reveal. TSH, T3, T4, thyroglobulin, PTH, and calcitonin levels can help determine thyroid and parathyroid function. Calcium and other electrolyte levels may be checked to rule out imbalances. Imaging tests—such as ultrasound, radioiodine scan, chest X-ray, computed tomography (CT) scan, magnetic resonance imaging (MRI) scan, and positron emission tomography (PET) scan—can help to find suspicious areas that may be malignant, to see if a malignancy has spread, and to determine if a treatment is working. A fine needle aspiration biopsy of the thyroid may also be done to rule out cancer.

Nursing Care of the Patient with Thyroid Disorder

Care of the patient with a thyroid or parathyroid disorder involves educating the patient and family, following the plan of care, and monitoring for complications.

Recognizing Cues and Analyzing Cues

Begin a subjective assessment by asking the patient focused questions to determine if the patient is experiencing any symptoms or has a previous medical history of neck issues. Some questions to ask may include:

- Have you ever been diagnosed with a medical condition related to your neck, such as a thyroid or swallowing issue? Please describe.
- Are you currently taking any medications, herbs, or supplements for your thyroid?
- Have you ever had any radiation exposure? Please describe.
- Do you have a family history of thyroid problems? Please describe.
- Are you experiencing any joint/muscle pain, weakness, anxiety, insomnia, cold/heat intolerance, weight loss/gain, change in bowel habits, or mood swings? Please describe.

Utilize the information gathered from your subjective assessment to guide your physical assessment, as follows:

- Inspect the face and neck. The face should not be overly rounded, eyes should be normally set and not bulging, the trachea should be midline, and there should not be any noticeable enlargement of the thyroid gland.
- Note the patient's speech. They should be able to speak clearly with no slurring or garbled words.
- Assess the patient's skin, hair, and nails for dryness, brittleness, or thinness.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Prevention of complications, such as thyroid storm and myxedema coma, are a high priority during treatment. To monitor for thyroid storm, the nurse should monitor the patient for signs of hyperthermia, tachycardia, and hypertension; thyroid storm is a medical emergency that requires ICU level of care. Supplemental therapies include cooling blankets, telemetry, and pharmacological therapies (such as methimazole or PTU) to both treat hemodynamic instability and excessive production of thyroid (Pokhrel et al., 2022).

For patients with hypothyroidism, nursing management includes:

- Monitoring of the patient's weight, appetite, intake, and output
- Dietary consult and constipation management
- Providing skin moisturizer for dry skin
- Encouraging exercise
- Mental health consultation and support
- A bowel regimen to treat constipation
- Low-fat diet to prevent or manage hyperlipidemia

Severe cases of hypothyroidism, known as **myxedema coma**, require vigilant monitoring for hypothermia, bradycardia, and respiratory depression. Patients with myxedema coma also need continuous cardiac monitoring due to the risk of bradycardia. Medical management typically involves intravenous thyroid hormone replacement to quickly restore thyroid levels. Additionally, careful assessment of neurological status is crucial, as symptoms may include altered mental status, lethargy, and potential confusion. Similar to thyroid storm, patients with myxedema coma require ICU-level care to address these critical needs effectively. In chronic management of thyroid disorders, the nurse should be sure to report any symptoms of overtreatment to the provider. Older adults beginning thyroid replacement therapy should be educated to report any chest pain, as this could be an adverse effect. Routine blood work should be completed six to eight weeks after initiation of hormone adjustment therapy to evaluate the response.

Educate the patient and family about any diagnostic testing or procedures being completed, why they're being done, and what the results can mean. Teach about the therapies and treatments being done and why it's important for the patient to stick to prescribed regimens. For patients with hyperthyroidism, nursing management includes:

- Monitoring vital signs, cardiac rhythm, intake and output, and daily weights
- Teaching the patient relaxation techniques
- Providing oxygen as ordered and appropriate
- Providing a cooling blanket for fevers
- Utilization of eye lubricant to keep mucous membranes intact in the eyes
- High-calorie meals to meet metabolic demands.

Evaluation of Nursing Care for the Patient with Thyroid Disorder

Evaluating nursing care for patients with thyroid or parathyroid disorders centers around symptom assessment and management. The patient should be able to state the importance of therapy compliance, maintain a positive body image, and state what symptoms should be reported to the provider, such as changes in weight, energy levels, and mood, with specific attention to symptoms like rapid heartbeat or tremors in hyperthyroidism, and fatigue or weight gain in hypothyroidism.

Evaluating Outcomes

The primary outcome of disease management in thyroid disorders is symptom resolution and restoration of hormone levels to a normal range. The nurse evaluates the patient for symptom improvement throughout treatment. Laboratory values, such as TSH, T3, and T4 will be monitored to see if there is improvement in response to treatment. Vital signs, cardiac rhythm, fluid intake and output, and daily weight are monitored for fluctuations or abnormalities.

Medical Therapies and Related Care for the Patient with Thyroid Disorder

In hyperthyroidism, treatment depends on the underlying cause of the disease, the patient's overall health, and personal preference (Mathew et al., 2023). Treatment may include the following interventions:

- Anti-thyroid medications include methimazole and propylthiouracil. Initial therapy can last 12 to 18 months, then gradually taper off if symptoms resolve and bloodwork shows normal hormone production. It is essential to monitor patients for potential side effects, including agranulocytosis, a serious condition marked by a dangerously low white blood cell count. Regular blood work is necessary to detect this and other adverse effects early, ensuring timely intervention and adjustment of treatment if needed.
- Beta blockers may be prescribed for symptomatic treatment of palpitations, tachycardia, and tremor. Once

thyroid hormones are at a more normal level, beta blockers may no longer be needed.
- Radioiodine therapy (RAI) is an oral medication that may be used to shrink the thyroid gland and slow thyroid activity, either prior to surgery or as a standalone treatment, eventually making the thyroid gland underactive. Over time, patients may have to take thyroid hormone replacement therapy.
- Thyroidectomy (removal of part or all of the thyroid gland) may be performed in patients who cannot take anti-thyroid medications or RAI therapy. Patients who have a thyroidectomy need lifelong thyroid hormone replacement therapy. If parathyroid glands are removed during the procedure, the patient also has to take medications to regulate blood calcium levels.

Hypothyroidism is primarily treated with thyroid hormone replacement therapy, such as levothyroxine. Initial bloodwork to monitor thyroid hormone levels and taper levothyroxine dosing are completed every four to eight weeks until a target level is reached, then bloodwork is checked at six months, then yearly. In complex scenarios such as pregnancy, heart disease, congenital or pediatric hypothyroidism, or other endocrine disorders, an endocrinologist may be consulted. Other specialists in psychiatry, pediatrics, cardiology, or obstetrics/gynecology may also be involved (Patil et al., 2023).

Nursing Care of the Patient with Parathyroid Disorder

Similar to nursing care of a patient with thyroid disease, nursing care of the patient with parathyroid disease involves educating the patient and family, following the plan of care, and monitoring for complications.

Recognizing Cues and Analyzing Cues

The nurse utilizes subjective and objective data to optimize care in patients with parathyroid disorders. Subjective data may include weakness, depression or forgetfulness, anxiety, bone and joint pain, severe muscle cramps, abdominal pain, insomnia, increased thirst, loss of appetite, constipation, or tingling in the mouth, hands, or feet. Vital signs are evaluated with a focus on heart rhythm, blood pressure, and lung sounds. A positive Chvostek's sign (facial muscle twitching when the facial nerve is tapped) or Trousseau's sign (hand and wrist spasm when a blood pressure cuff is inflated) is an indicator of hypocalcemia.

LINK TO LEARNING

Hypocalcemia decreases the threshold for the activation of neurons, causing increased neuromuscular excitability, or tetany. Learn how to assess for indicators of hypocalcemia (https://openstax.org/r/77Hypocalcemia) called Chvostek's sign and Trousseau's sign.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

For patients being treated for hyperparathyroidism, targeted nursing care includes:

- Monitoring vital signs, calcium levels, intake, and output
- Obtaining baseline bloodwork, such as serum calcium, potassium, magnesium, and phosphate levels before treatment and as ordered
- Ensuring the patient receives information about all treatments for hyperparathyroidism
- Monitoring for bone pain, fractures, and gastrointestinal symptoms
- Providing emotional support and collaborate with psychology, as appropriate

Nurses should also monitor for signs and symptoms of **hungry bone syndrome**, a complication that occurs from prolonged hypocalcemia following surgical correction for hyperparathyroidism. This hypocalcemia is due to the sudden drop in PTH production and serum calcium being quickly incorporated into new bone. It is often accompanied by hypophosphatemia, hypomagnesemia, and elevated alkaline phosphatase (Pokhrel et al., 2022). Symptoms include:

- Seizures
- Paresthesia
- Arrhythmias
- Numbness
- Cardiomyopathy

- Laryngospasms

Treatment includes high levels of oral calcium and vitamin D supplementation, but intravenous calcium may be given in severe cases (Pokhrel et al., 2022).

For patients with hypoparathyroidism, targeted nursing care includes:

- Administering prescribed drugs, such as calcium
- Obtaining bloodwork as ordered, such as serum calcium and phosphorous levels
- Monitoring cardiac rhythm
- Instituting safety precautions and monitoring the patient for seizure activity
- Providing airway management by preparing for possible interventions like tracheostomy, oxygen administration, and suctioning if the patient develops severe respiratory issues or requires airway support

Evaluation of Nursing Care for the Patient with Parathyroid Disorder

The process of evaluating nursing care requires the nurse to evaluate each intervention, including how the patient responded, whether goals were met, and what could have been done differently to improve the patient's state. Goals of nursing care for a patient with a parathyroid disorder may include:

1. The patient will not experience signs and symptoms of calcium disorder.
2. The patient will collaborate with psychiatry to develop positive coping mechanisms.
3. The patient will express understanding of the disease process, treatment, and importance of follow-up care.
4. All goals should have a timeline, with a new goal made with the patient to direct the next portion of care.

Evaluating Outcomes

For a patient with a parathyroid disorder, one outcome should be the patient's serum calcium returning to normal levels. If not, the nurse should determine whether the patient followed the interventions that were chosen. Monitoring laboratory trends may reveal improvement in calcium levels, indicating that the treatment is working.

Medical Therapies and Related Care for the Patient with Parathyroid Disorder

A total or subtotal parathyroidectomy is the preferred treatment for hyperparathyroidism because it cures the underlying condition. Patients who undergo surgery are monitored routinely and often do well taking calcium and vitamin D supplementation. Patients who are unable or unwilling to undergo surgery must take medications to control hypercalcemia and low bone density. A calcium-sensing receptor drug, such as cinacalcet, may be prescribed to reduce circulating PTH levels and lower serum calcium levels. Bisphosphonates and rank ligand inhibitors (decrease osteoclast production to prevent bone breakdown and fractures) may also be prescribed to treat low bone density (Pokhrel et al., 2022).

Correction of calcium and electrolyte imbalance is the primary treatment for hypoparathyroidism. Patients are typically prescribed calcium and vitamin D supplementation, in addition to magnesium replacement, if appropriate. Recombinant human PTH may also be prescribed, along with adjunct therapy to help control hypocalcemia. If there is an underlying cause, such as a tumor, surgery may be necessary.

21.4 Pituitary Disorders

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for pituitary disorders
- Describe the diagnostics and laboratory values for pituitary disorders
- Apply nursing concepts and plan associated nursing care for patients with pituitary disorders
- Evaluate the efficacy of nursing care for pituitary disorders
- Describe the medical therapies that apply to the care of patients with pituitary disorders

The **pituitary gland** is a bean-sized organ suspended from the hypothalamus that produces, stores, and secretes hormones in response to hypothalamic stimulation. When the pituitary gland produces insufficient levels of hormones, disorders occur. This section explores common pituitary disorders, along with their treatments and nursing care of patients with these disorders.

Pathophysiology of Pituitary Disorders

The pituitary gland consists of two lobes that arise from distinct parts of embryonic tissue: the posterior pituitary lobe (neurohypophysis) is neural tissue, whereas the anterior pituitary lobe (also known as the adenohypophysis) is glandular tissue that develops from the primitive digestive tract (Figure 21.9). The posterior pituitary lobe is actually an extension of the neurons of the paraventricular and supraoptic nuclei of the hypothalamus.

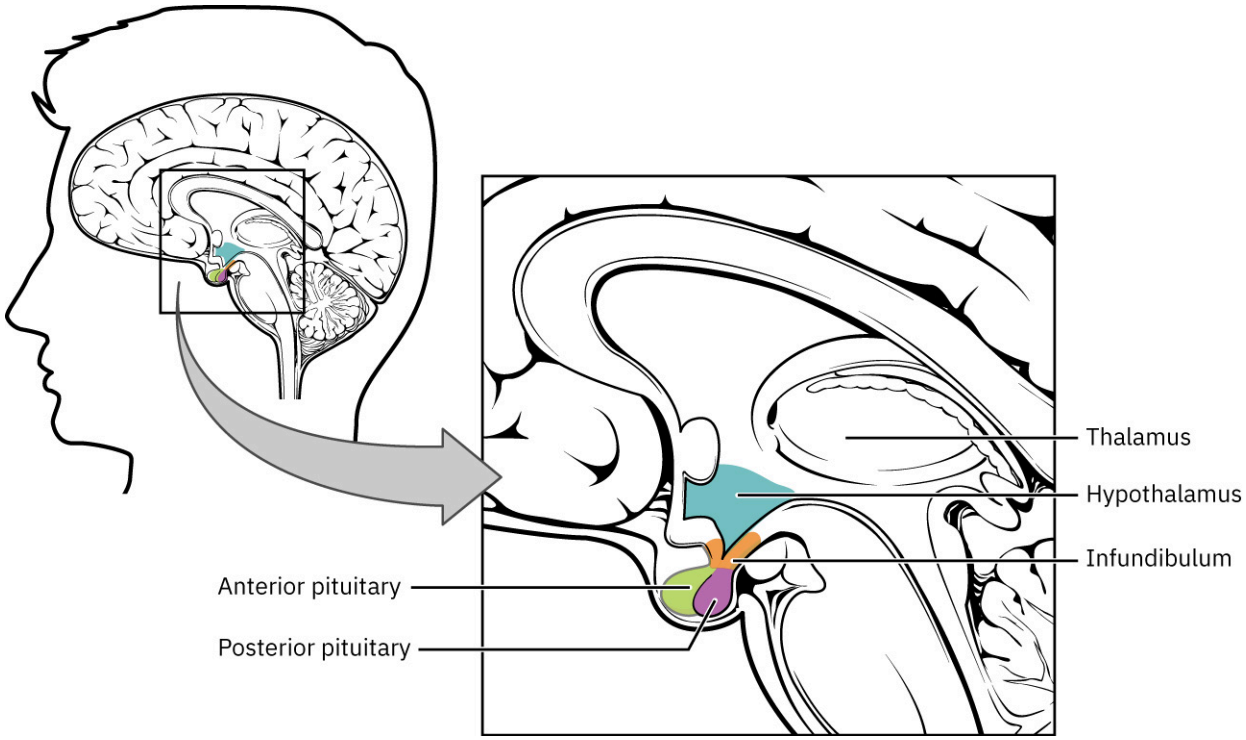

FIGURE 21.9 The pituitary gland is an extension of the hypothalamus. (modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

The cell bodies of these regions rest in the hypothalamus, but their axons descend as the hypothalamic–hypophyseal tract within the infundibulum and end in axon terminals that comprise the posterior pituitary lobe. This lobe does not produce hormones, but rather stores and secretes hormones produced by the hypothalamus (Table 21.10).

Pituitary Lobe	Associated Hormones	Effect
Anterior	Growth hormone	Promotes growth of body tissues
	Prolactin (PRL)	Promotes milk production from mammary glands
	Thyroid-stimulating hormone (TSH)	Stimulates thyroid hormone release from thyroid
	Adrenocorticotropic hormone (ACTH)	Stimulates hormone release by adrenal cortex
	Follicle-stimulating hormone (FSH)	Stimulates gamete production in gonads
	Luteinizing hormone (LH)	Stimulates androgen production by gonads
Posterior	Antidiuretic hormone (ADH)	Stimulates water reabsorption by kidneys
	Oxytocin	Stimulates uterine contractions during childbirth

TABLE 21.10 Pituitary Hormones

Any malfunction in the production or secretion of pituitary hormones can cause conditions of the pituitary gland. Common pituitary disorders include diabetes insipidus (DI) and syndrome of inappropriate antidiuretic hormone release (SIADH). Both disorders are related to inappropriate ADH activity within the body.

Diabetes Insipidus

Chronic underproduction of ADH or a mutation in the ADH receptor results in **diabetes insipidus (DI)**, also referred to as arginine vasopressin deficiency (AVP-D). If the posterior pituitary does not release enough ADH, water cannot be retained by the kidneys and is lost as urine. This causes increased thirst, but water taken in is lost again and must be continually consumed. If the condition is not severe, dehydration may not occur, but severe cases can lead to electrolyte imbalances due to dehydration (Buiser Schnur, 2021).

Clinical Manifestations

The main clinical manifestations of DI are extreme thirst (**polydipsia**) and the production of large amounts of urine (**polyuria**)—more than 3 liters in a 24-hour period. This occurs both day and night, making them distinguishing features of DI (Perkins, 2020). Other common signs and symptoms are dehydration, hypernatremia, fatigue, hypotension, tachycardia, dizziness, weakness, fatigue, and loss of consciousness. Patients with DI are also at risk for hypovolemic shock.

Diagnostics and Laboratory Values

Assessing for DI relies on a thorough patient history and assessment. Diagnostic testing can confirm a parathyroid disorder when signs and symptoms are present. Diagnosis of DI involves confirming polyuria, determining which type of DI is present, and figuring out the underlying cause (Perkins, 2020). A 24-hour urine sample will be collected to identify polyuria. Urine and blood osmolality will also be measured, showing a decreased urine osmolality and increased serum osmolality. Serum sodium levels will also be evaluated. Other assessments that may be completed include the fluid deprivation test and the hypertonic saline infusion test.

A **fluid deprivation test** involves restricting the patient's fluid intake while monitoring the patient's body weight and urine concentration. A positive test will show continued urine dilution and decreased urine osmolality.

Nursing Care of the Patient with Diabetes Insipidus

When caring for patients with DI, it is important to closely monitor intake and output, daily weights, vital signs, changes in level of consciousness, skin turgor, mucus membranes, and laboratory values. Accurate, strict intake and output is important to monitor the patient for dehydration. It is also important to monitor the patient at the same time each day, using the same scale if possible. Assessment of skin turgor and mucus membranes can also be quick indications of the patient's hydration status. Evaluation of laboratory values is also important to monitor for electrolyte imbalances and kidney dysfunction.

Recognizing Cues and Analyzing Cues

A patient constantly requesting water to drink and taking multiple trips to the bathroom is a cue for the nurse that the patient may have DI. It is important to utilize acute assessment skills along with targeted subjective questions to gather the appropriate data. When completing a subjective assessment, ask the patient targeted questions about their quality of life. Questions may include:

- Do you struggle with fatigue or feeling unwell?
- Are you having problems with irritability or concentration?
- How often do you urinate? Does it interfere with sleep?
- Have you had unplanned weight loss?

Obtain an accurate list of all medications the patient is currently taking, as some medications can cause polydipsia, polyuria, and hyponatremia. An objective assessment of a patient with DI may reveal tachycardia, hypotension, and dry skin and mucous membranes.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Additional cues, such as large volumes of clear urine, poor skin turgor, and dry mucus membranes, may further support a hypothesis that the patient has DI. The nurse should be sure to collaborate with the interdisciplinary team to identify and treat the underlying cause, implement appropriate interventions, re-evaluate therapies and plan of care, and include the patient and family in the plan of care.

When educating the patient and family, be sure to emphasize the following points:

- Importance of monitoring intake and output at home
- Daily weight checks at the same time and using the same scale
- Signs and symptoms of dehydration to report to the practitioner (e.g., dry skin and mucous membranes, persistent and intense thirst, reduced urine output or concentrated dark-colored urine, low blood pressure with associated dizziness or lightheadedness, a rapid heart rate)
- Benefits of wearing a medical alert bracelet stating the patient has DI

Evaluation of Nursing Care of the Patient with Diabetes Insipidus

The nurse should evaluate the outcomes of care with both the patient and their family. For patients with DI, positive outcomes would be intake, output, and electrolyte balance. If these outcomes are not met, the nurse should evaluate what could have been done differently. Was the patient engaged in during their treatment? How could the nurse modify care interventions to meet goals?

Evaluating Outcomes

Effective nursing care prevents complications of DI, provides the patient with education about the disease, and identifies signs and symptoms of dehydration or hypovolemic shock. Questions the nurse can ask to evaluate nursing care include:

- Did the patient maintain a balanced intake and output?
- Did the patient actively participate in monitoring their intake and output?
- Did the patient experience any electrolyte imbalances?
- Did communication remain open between the patient, nurse, and practitioner throughout care?

Medical Therapies and Related Care

Treatment strategies for DI include treating the underlying cause and ensuring the patient drinks enough fluids to maintain hydration. Desmopressin is typically administered to replace vasopressin in the body and act as an antidiuretic hormone to treat polyuria. If a tumor is present, the pituitary gland may be removed—a procedure called a **hypophysectomy**. Discontinuing nephrotoxic medications may return the kidneys to normal function. A thiazide diuretic may be prescribed in cases of low ADH production to reduce urine production (Perkins, 2020).

Syndrome of Inappropriate Antidiuretic Hormone Release

Unsuppressed or over-release of ADH results in **syndrome of inappropriate antidiuretic hormone release (SIADH)**. The excess ADH prevents the production of urine in the kidneys, impairs water secretion, and leads to excess water in the body (hypervolemia) and hyponatremia (Yasir & Mechanic, 2023). SIADH may be caused by certain cancers, central nervous system disturbances, certain medications, pulmonary disease, vascular diseases, and myocardial infarction. In some cases, SIADH can also be hereditary.

Clinical Manifestations

Clinical manifestations of SIADH are usually due to decreased extracellular fluid osmolality and hyponatremia. This causes cerebral edema. Early signs and symptoms of SIADH are malaise, nausea, and vomiting. As sodium levels continue to fall, lethargy, headache, obtundation, and seizures may occur, followed by coma and respiratory arrest if sodium levels fall below 120 mEq/L.

Diagnostics and Laboratory Values

A subjective assessment for SIADH involves asking the patient targeted questions about their quality of life. Diagnostic testing can further evaluate disease progression. Serum osmolality and serum sodium will both be low in patients with SIADH. Urine sodium levels will be elevated due to increased free water absorption in the renal collecting tubules. The state of having a normal volume of fluids in the body, or **euvolemia**, will be present.

Diagnostic testing should rule out underlying causes, such as hypothyroidism or adrenal insufficiency. Other tests—such as kidney and liver function testing, thyroid profile, fasting lipid profile, serum electrolytes, and serum cortisol levels—should also be evaluated. Patients with pulmonary symptoms or a history of smoking may have a CT scan or chest X-ray to rule out lung cancer (Yasir & Mechanic, 2023).

Nursing Care of the Patient with SIADH

Similar to DI care, the nurse should closely monitor intake and output, daily weights, vital signs, changes in level of consciousness, mental status, and laboratory values. It is also important to assess for Cheyne-Stokes respirations and to monitor the patient's weight at the same time each day, using the same scale if possible. Evaluation of laboratory values is also important to monitor for electrolyte imbalances and acute kidney injury.

Recognizing Cues and Analyzing Cues

When completing a subjective assessment, questions may include:

- Do you struggle with headaches, lethargy, dizziness, or confusion?
- Are you having GI problems, such as nausea and vomiting?
- Have you had unplanned weight gain?
- Are you having any chronic pain?
- Have you had any head trauma?

Obtain an accurate list of all medications or illicit drugs the patient is currently taking.

An objective assessment of a patient with suspected SIADH may reveal normal skin turgor, moist mucus membranes, and absence of edema. A detailed neurological assessment may show lethargy, speech difficulties, sluggish deep tendon reflexes, and tremor. A respiratory assessment may show **Cheyne-Stokes respirations** in severe cases. These are characterized by cyclical episodes of hyperventilation and apnea and are a sign of cardiac damage.

LINK TO LEARNING

Watch this video to hear the pattern of respiratory rhythm (https://openstax.org/r/77RespRhythm) of Cheyne-Stokes respirations.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Signs of fluid overload and heart failure are a high priority. The nurse will closely monitor the patient's cardiac output through blood pressure, heart rate, respiratory rate, and absence of chest pain. Intake and output, as well as daily weights, are also important to monitor fluid balance. Because of the excess water in the body, patients with SIADH are at risk for cerebral edema and seizures from low levels of sodium, so patient safety measures such as seizure precautions should be initiated. The nurse should ensure the proper administration of prescribed loop diuretics to aid in the elimination of excess water.

When educating the patient and family, be sure to include:

- The importance of monitoring intake and output at home
- Daily weight checks at the same time and using the same scale
- Signs and symptoms of hyponatremia to report to the practitioner

Evaluation of Nursing Care of the Patient with SIADH

Nursing interventions should always remain flexible in order to meet goals. Modifications to the nursing plan of care should be based upon the evaluation of the effectiveness of measures implemented to correct SIADH. A patient who isn't compliant with a fluid restriction, for example, may need re-education about its importance and goal adjustment to increase compliance.

Evaluating Outcomes

Effective nursing care prevents complications of SIADH, provides the patient with education about the disease, and identifies signs and symptoms of severe hyponatremia. A primary patient outcome related to SIADH management is to prevent further accumulation of excess water in the body. This can be evaluated through intake and output monitoring. Laboratory values can also show trending sodium and osmolality. Questions the nurse can ask to evaluate nursing care include:

- Did the patient maintain a balanced intake and output?
- Did the patient actively participate in monitoring their intake and output?

- Did the patient experience any signs or symptoms of hyponatremia?
- Was the patient compliant with fluid restrictions?
- Did communication remain open between the patient, nurse, and practitioner throughout care?

Medical Therapies and Related Care

Treatment for SIADH involves treating the underlying condition (such as pulmonary or CNS infection) and preventing any further decrease in sodium levels. For patients with mild symptoms of hyponatremia, an oral fluid restriction of less than 800 ml/day is initiated. If hyponatremia persists, oral or intravenous sodium chloride is given. Loop diuretics, such as furosemide, may be given to increase water excretion and decrease urine concentration.

Patients with severe symptoms, such as seizures and delirium, are given 100 mL IV boluses of hypertonic saline over three to four hours in addition to a water restriction. Serum sodium levels are closely monitored in between boluses to prevent rapid sodium increase. The brain is able to adjust to chronic hyponatremia and protect itself from severe brain swelling from the increase in water. When sodium levels raise too rapidly, the brain is unable to adjust and water is pulled from the nerve cells, causing dehydration damage to the brain that can be permanent.

Vasopressin receptor agonists, such as tolvaptan or conivaptan, may be prescribed for persistent SIADH. These medications prevent free water retention caused by ADH excess and help correct hyponatremia.

21.5 Adrenal Disorders

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for adrenal disorders
- Describe the diagnostics and laboratory values for adrenal disorders
- Apply nursing concepts and associated nursing care for patients with adrenal disorders
- Evaluate the efficacy of nursing care for adrenal disorders
- Describe the medical therapies that apply to the care of patients with adrenal disorders

Adrenal hormones (Table 21.11) are secreted by the cortex of the gland and released into the circulation via the left and right suprarenal veins. The adrenal cortex produces several key steroid hormones, including glucocorticoids like cortisol, which help regulate metabolism and the body's stress response; mineralocorticoids such as aldosterone, which are crucial for managing blood pressure and electrolyte balance; and androgens, which influence sexual development and function. Additionally, the adrenal medulla, the inner part of the adrenal gland, secretes catecholamines such as adrenaline and norepinephrine, which are critical for the body's fight-or-flight response.

Associated Hormone	Effect
Aldosterone	Increases blood sodium levels
Cortisol, corticosterone, cortisone	Increase blood glucose levels
Epinephrine, norepinephrine	Stimulate fight- or flight- response

TABLE 21.11 Hormones of the Adrenal Glands

One of the major functions of the adrenal gland is to respond to stress. Stress can be either physical or psychological or both. Physical stresses include exposing the body to injury, walking outside in cold and wet conditions without a coat on, and malnutrition. Psychological stresses include the perception of a physical threat, a fight with a loved one, and a bad day at school or work.

The body responds in different ways to short-term stress and long-term stress, following the pattern of General Adaptation Syndrome (GAS). Stage one of GAS is called the **alarm reaction**, also known as the fight-or-flight response. This short-term response is mediated by the hormones epinephrine and norepinephrine from the adrenal medulla via the sympathomedullary (SAM) pathway. Their function is to prepare the body for extreme physical exertion. Once this stress is relieved, the body quickly returns to normal.

If the stress is not soon relieved, however, the body adapts to the stress in the second stage of GAS, the **stage of**

resistance. If a person is starving, for example, the body may send signals to the gastrointestinal tract to maximize the absorption of nutrients from food.

If the stress continues for a longer term, the body enters the third stage of GAS, the **stage of exhaustion**. In this stage, individuals may begin to experience depression, the suppression of their immune response, severe fatigue, or even a fatal heart attack. These symptoms are mediated by the hormones of the adrenal cortex, especially cortisol, released as a result of signals from the hypothalamic-pituitary-adrenal (HPA) axis.

Adrenal hormones also have several non–stress-related functions, including the increase of blood sodium and glucose levels. Several disorders are caused by the dysregulation of the hormones produced by the adrenal glands. Two of the most common are Addison's disease and Cushing's syndrome.

Adrenal Insufficiency

An **adrenal insufficiency** is a primary insufficiency of the adrenal glands from complete or partial destruction of the adrenal cortex. This damage prevents the adrenal glands from producing adequate amounts of cortisol and aldosterone. The cortisol deficiency can result in low blood glucose levels, as it prevents the formation of glucose from molecules that aren't carbohydrates (gluconeogenesis), which is necessary for the body to maintain steady glucose levels. The aldosterone deficiency causes increased sodium loss from the kidneys, leading to hypotension and increased potassium reabsorption.

Causes of adrenal insufficiency include:

- Autoimmune disease and creation of antibodies that react against adrenal tissue (also known as Addison's disease)
- Infection (such as HIV, syphilis, tuberculosis, and histoplasmosis)
- Bilateral adrenalectomy
- Inherited disorders
- Trauma to the adrenal glands
- Malignant cancer that has spread to the endocrine system
- Certain medications that affect serum cortisol levels (such as ketoconazole, etomidate, or phenytoin)

LINK TO LEARNING

This video provides an overview of Addison's disease (https://openstax.org/r/77AddisonDis) as an effective NCLEX review

Clinical Manifestations

Patients with adrenal insufficiency may initially have symptoms such as fatigue, weight loss, generalized weakness, abdominal pain, nausea, vomiting, and dizziness. These symptoms tend to get progressively worse over time. As the disease progresses, hyperpigmentation of the skin (Figure 21.10) occurs in almost all patients (Munir et al., 2023). Female patients may also have decreased axillary and pubic hair.

FIGURE 21.10 This woman has hyper-pigmentation due to adrenal insufficiency. (credit: "F1: Facial and scar pigmentation" by Department of Diabetes and Endocrinology, Clinical Sciences Centre, University Hospital Aintree, Liverpool, CC BY 2.0)

Adrenal Crisis

An adrenal crisis is an acute, rapid onset of severe cortisol and aldosterone insufficiency, causing the patient to become critically ill and go into shock. It can be caused by abrupt discontinuation of steroid therapy or inadequate dosing of current steroid therapy in patients with adrenal insufficiency or by recent infection or trauma. Signs and symptoms include rapid, progressive onset of adrenal insufficiency symptoms such as nausea, vomiting, abdominal pain, hypotension, altered mental status, or obtundation. The crisis is initially treated by administering intravenous fluids, dextrose, and hydrocortisone, followed by diagnostic testing to discover and treat the underlying cause. Adrenal crisis is an emergency and should be reported to the provider immediately. Mortality is approximately 25 percent (Cleveland Clinic, 2022a).

Diagnostics and Laboratory Values

Diagnosis of adrenal insufficiency is confirmed by low serum cortisol and aldosterone levels, a blunt cortisol response with ACTH stimulation, and an elevated renin activity test. A morning serum cortisol level less than 3 mcg/dL will be present. Serum chemistry results may reveal hyponatremia, hypoglycemia, hypercalcemia, and hyperkalemia. Thyroid stimulating hormone (TSH) may also be elevated, secondary to low cortisol levels.

Other diagnostic testing may be completed to rule out alternative causes of the low hormone levels: for example, a chest X-ray to confirm tuberculosis, or abdominal CT scan to confirm adrenal tumor, mass, or calcification. A biopsy of the adrenal gland may be completed to confirm malignancy.

Nursing Care of the Patient with Adrenal Insufficiency

Nursing care of the patient with adrenal insufficiency involves maintaining nutrition and fluid balance, improving symptoms, and preventing complications, such as adrenal crisis. Careful monitoring, robust patient education, and timely intervention are key interventions to optimize outcomes.

Recognizing and Analyzing Cues

When completing a subjective assessment, ask the patient targeted questions, especially if the patient is experiencing a host of nonspecific symptoms (Munir et al., 2023). Specific questions related to adrenal insufficiency may include:

- Have you experienced fatigue and unexplained weight loss? Has it gotten worse over a period of time?
- Have you been experiencing a loss of appetite, nausea, or chronic abdominal pain?

An objective assessment may reveal generalized hyperpigmentation, especially at the elbows, palmar creases, lips, knuckles, posterior neck, nail beds, nipples, breast areola, and gingival mucosa (Munir et al., 2023). The patient may also have poor coordination, **vitiligo** (patches of skin without pigment), hypotension, and a weak, irregular pulse.

A slow progression of symptoms indicates a chronic adrenal disease, while a rapid progressive onset indicates an

acute, emergent condition. Nurses can analyze the degree of symptom burden incorporating all cues related to cardiovascular stability. Insufficient adrenal activity also predisposes patients to hypoglycemia; therefore, it is important for nurses to recognize symptomatic hypoglycemia such as weakness, tremors, confusion, diaphoresis, and in severe cases, seizures. Rapid identification of abnormal cues will guide clinical intervention if they become of an emergent nature.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Priorities of patient care include ensuring the patient follows treatment orders and monitoring the patient for adrenal crisis. Care of the patient with adrenal insufficiency includes prioritization of cardiovascular needs, monitoring of electrolyte imbalance, and close monitoring of glucose levels. Nurses should monitor hemodynamic stability with trending blood pressures, heart rate, and laboratory data. Serum sodium levels should be monitored since low levels of aldosterone can cause hyponatremia. Often, patients are placed on telemetry to identify any triggered dysrhythmias from electrolyte disturbance or hypovolemia. Any deviations of these physiological parameters can be catastrophic if this leads to adrenal crisis. An interdisciplinary, collaborative approach is mainstream when delivering care to the patient with adrenal complications. The care team may include a nutritionist to ensure the patient's diet includes sufficient sodium and potassium to maintain balance. If the patient has a decreased appetite, encourage frequent, small meals throughout the day to maintain a healthy caloric intake. For a patient experiencing fatigue, try to cluster care or activities so the patient has adequate periods of rest. Providing antiembolism stockings or a sequential compression device can prevent VTE in patients who are bedridden.

Patient teaching should include information about adrenal insufficiency, especially the importance of medication and treatment compliance. Avoidance of stress and healthy coping mechanisms to reduce stress and increase relaxation should also be discussed with the patient and family. Other teaching should include:

- Signs and symptoms to report to the provider, such as adrenal crisis
- Infection prevention measures, such as staying away from people who are sick
- Utilization of an alert bracelet stating the patient has adrenal insufficiency
- Technique for self-administering an emergency hydrocortisone injection in times of stress

Evaluating Nursing Care of the Patient with Adrenal Insufficiency

To evaluate the effectiveness of nursing actions, the nurse should review any goals created and see if they were achieved and by the set deadline. For example, if the patient was experiencing a decrease in appetite, were they still able to maintain a healthy caloric intake throughout the day? Re-assessment should compare current status to initial status. If the patient was not able to maintain a healthy caloric intake, inquire as to reasons for inability or barriers. Were the patient's food preferences taken into consideration? Were frequent, small meals offered to the patient throughout the day? If the goal is not met, the nursing care will need to be modified.

Evaluating Outcomes

Evaluating outcomes looks at the patient from a larger view. Questions the nurse can ask may include:

- Did the patient experience a decrease in the symptoms of adrenal insufficiency?
- Are the patient's cortisol levels, electrolytes, and vital signs within normal limits?
- Is the patient able to state the importance of following the treatment plan?

If these outcomes were not achieved, the plan will need to be re-evaluated and modified.

Medical Therapies and Related Care

Treatment of adrenal insufficiency involves repletion of low cortisone and aldosterone with synthetic versions of the hormones. Hormonal replacement is a lifelong therapy. A glucocorticoid, such as hydrocortisone or prednisone, will be prescribed to replace low levels of cortisone. For low aldosterone levels, fludrocortisone acetate, a mineralocorticoid, will be prescribed to help control sodium and potassium levels in the body. Medication dosages are determined by clinical response and return of electrolyte balance.

In situations of high stress, such as fever, infection, and pregnancy, an increase of glucocorticoid therapy will be required to compensate for a stress response. It is important for the patient to maintain all appointments with the endocrinologist and receive adequate patient education about the disease, treatment, and symptoms to report to the practitioner.

Cushing's Syndrome

Cushing's syndrome is a condition in which the body is exposed to too much circulating cortisol over a long period of time. The excess cortisol increases gluconeogenesis as well as creates insulin resistance. It also disrupts the Kreb's cycle and negatively affects the body's ability to metabolize glycogen and fats and synthesize proteins. This causes poor wound healing, osteoporosis, and poor immune function.

Cushing's syndrome is most commonly caused by long-term use or high doses of glucocorticoids (exogenous Cushing's syndrome) but can also be caused by excess production of cortisol by the adrenal glands (endogenous Cushing's syndrome). **Cushing's disease** is when the excess cortisol is produced because of a tumor or adenoma on the pituitary gland. The tumor causes the pituitary gland to produce an excess of ACTH, triggering the adrenals to produce excess cortisol. Cushing's disease is the cause of 80 percent of endogenous Cushing's syndrome (Chaudhry & Singh, 2023).

Clinical Manifestations

Clinical manifestations of Cushing's syndrome include weight gain, water retention, weakness, fatigue, headache, delayed wound healing, easy bruising, bone pain, loss of height, hirsutism (excess hair growth), impotence, decreased libido, menstrual irregularities, and frequent infections (Figure 21.11). Patients may also have depression, cognitive dysfunction, or peptic ulcer disease.

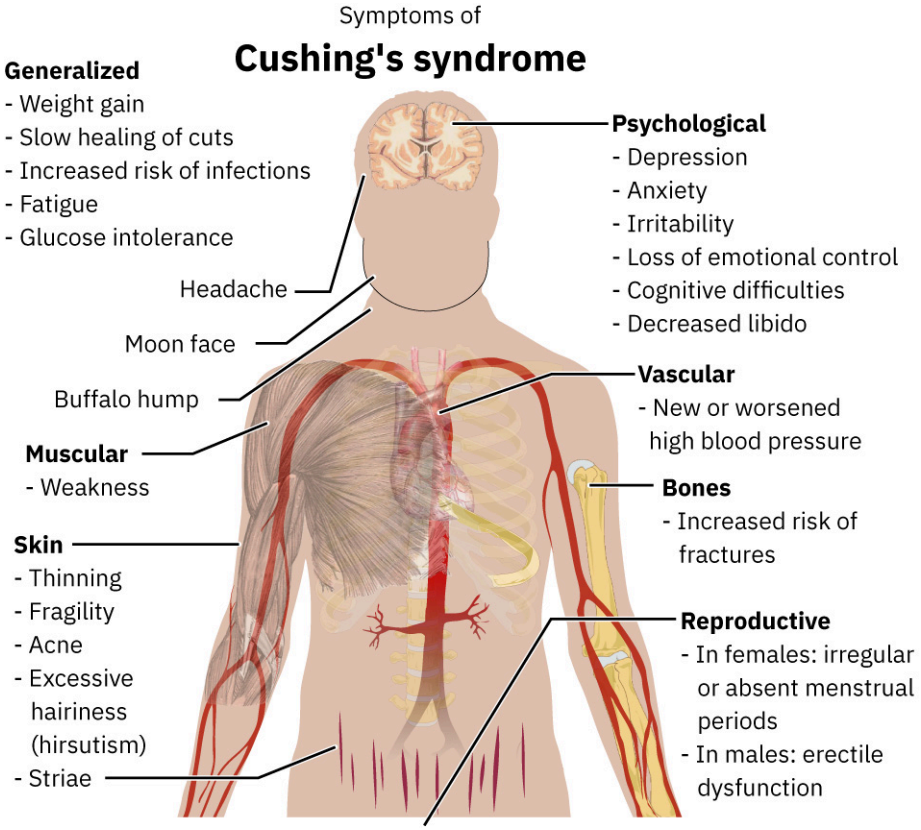

FIGURE 21.11 Cushing's syndrome affects many body systems. (credit: " Cushing's syndrome (vector image)" by Mikael Häggström/ Wikimedia Commons, CC0 1.0)

Diagnostics and Laboratory Values

Signs and symptoms of Cushing's syndrome may vary depending on the level of extra cortisol in the body (Belleza, 2023). An accurate assessment during initial diagnosis can prevent complications. Diagnostic testing can provide information about the underlying cause and severity of the disease.

A dexamethasone suppression test is done by giving the patient a low dose of dexamethasone at night, then collecting a serum cortisol level the next morning. A patient with Cushing's syndrome will not have the ability to suppress cortisol production, resulting in a high serum cortisol level. A 24-hour urine collection for free cortisol can detect overproduction of cortisol in the body. Serum electrolytes may show hypokalemia and hypocalcemia, and

fasting blood glucose levels may be elevated.

A CT scan or ultrasound of the kidneys may reveal an adrenal tumor. MRI of the brain may be done to evaluate for a pituitary tumor. X-rays may also be completed to evaluate for osteoporosis.

Nursing Care of the Patient with Cushing's Syndrome

Nursing care should be based on assessment data with the goal to reduce symptoms. For example, patients with Cushing's syndrome are more prone to pressure injuries and falls secondary to weakness, fatigue, and poor healing (Belleza, 2023). To decrease risk for pressure injury, the nurse should ensure the patient changes positions frequently while in bed. To protect skin integrity, the nurse can also frequently inspect the patient's skin and teach the patient how to care for their skin and avoid anything that can irritate or tear it. To prevent falls, institute fall precautions, provide assistance to the patient when ambulating, and ensure frequently used items are within the patient's reach.

Recognizing Cues and Analyzing Cues

Subjective questions during the initial nursing assessment to target symptoms of Cushing's syndrome may include:

- Have you had unexplained weight gain or water retention?
- Do you bruise easily?
- Have you been experiencing any bone pain, fatigue, or muscle weakness?
- Have you noticed any increase in hair growth on your face, chest, or abdomen?
- Have you noticed a decrease in libido or sexual dysfunction?
- Are your periods regular? (Female patients)

Be sure to obtain an accurate medication history. In some instances, Cushing's syndrome may be caused by certain medications, such as prednisone, used to treat other conditions. Physical findings may show fatty deposits around the face ("moon face") and between the shoulders ("buffalo hump"), hirsutism, thin extremities, muscle wasting, swollen ankles, purplish striae, skin atrophy, acne, and central obesity. Patients who have physical signs, such as moon face or a buffalo hump, may be experiencing body image issues. Listen to the patients' concerns and discuss how physical signs may fade with treatment (Vera, 2023). Talk to the patient about dietary changes they can make to decrease fluid retention, such as a low sodium diet.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Based upon the findings, the nurse may hypothesize Cushing's syndrome. The nurse will discuss the findings with the patient, then collaborate with the practitioner about a plan of care. Since the diagnostic priority is to evaluate cortisol production and discover the underlying cause, the nurse would expect to draw serum bloodwork and possibly prep the patient for imaging, such as X-ray, CT scan, or MRI.

Patients should be educated about the disease, testing, and treatment. Be sure to include:

- importance of monitoring daily weights and proper nutrition
- ways to prevent infection, such as avoiding large crowds, using proper hand hygiene, and keeping away from people who are sick
- injury prevention strategies
- stress reduction and relaxation techniques
- the importance of keeping all follow-up appointments
- wearing a medical alert bracelet stating the patient has Cushing's syndrome

In addition to improving symptoms, the nurse must monitor for complications. Similar to adrenal insufficiency, adrenal crisis can occur in Cushing's syndrome if glucocorticoid medications are abruptly stopped. The nurse should also monitor vital signs, electrolytes, daily weights, intake and output, and serum blood glucose for imbalances (Vera, 2023).

Evaluating Nursing Care of the Patient with Cushing's Syndrome

An improvement in symptoms and prevention of complications would indicate adequate nursing care. For instance, if the patient does not experience any falls or skin breakdown during treatment, nursing interventions were adequate for care. If the nurse notices a patient has an area of redness over a bony prominence, nursing care should be adjusted to prevent any further injury; the nurse may initiate a strict turn/repositioning schedule or request an

overlay mattress to further prevent pressure to that area.

Evaluating Outcomes

Any goals created during the nursing care process should be evaluated. Interventions are fluid and should be adjusted as appropriate during the care process. To support this process, the nurse may ask questions such as:

- Did the patient's skin remain free from injury?
- Did the patient's blood sugar achieve target norms?
- Did the patient remain free from infection?
- Did the patient's nutrition meet their ideal body weight?

Constant collaboration with the interdisciplinary team and open communication with the patient and family are also key to supporting nursing care goals.

Medical Therapies and Related Care

Treatment is dependent on the underlying cause. If Cushing's disease is exogenous, then the patient may be tapered off steroid therapy. The taper is done slowly, sometimes over months, to prevent adrenal crisis and give the adrenal glands a chance to return to normal function (Chaudhry & Singh, 2023). Mifepristone, a cortisol receptor blocker, may be prescribed to control blood glucose levels until adrenal function improves.

In endogenous cases caused by an adrenal tumor, surgery is the first therapy of choice for treatment. Patients are then closely monitored to evaluate if normal cortisol production is present. If the cause is a pituitary tumor, hypophysectomy surgery may be done; radiation therapy may also be performed. In some cases, if a tumor cannot be completely resected, a bilateral adrenalectomy may be performed; the patient will then require lifelong glucocorticoid and mineralocorticoid replacement therapy. Bisphosphonates may also be prescribed to prevent osteoporosis. Additional medications may be prescribed to control signs and symptoms, such as potassium supplements, diuretics, and antihypertensives.

Summary

21.1 Review of Endocrine Anatomy and Physiology

- The endocrine system consists of cells, tissues, and organs that secrete hormones critical to homeostasis.
- Endocrine glands are ductless glands that secrete hormones.
- Endocrine communication involves chemical signaling via the release of hormones into the extracellular fluid. From there, hormones diffuse into the bloodstream and may travel to distant body regions, where they elicit a response in target cells. Hormones are chemical substances that travel throughout the body in the bloodstream and affect the activity only of its target cells: that is, cells with receptors for that particular hormone.
- Hormones play a critical role in the regulation of physiological processes because of the target cell responses they regulate. Reflexes triggered by both chemical and neural stimuli control endocrine activity.
- Clinical assessment of the endocrine system is a process that incorporates a patient history, physical examination, and diagnostic testing.
- Endocrine conditions can be nonspecific and varied, and they can affect many body systems.
- Diagnostic testing is targeted based on the findings of a history and physical exam and can include laboratory testing, imaging, and invasive testing.

21.2 Diabetes Mellitus

- Diabetes mellitus (DM) is a disease characterized by inappropriately high blood glucose levels, caused by an imbalance of insulin and glucagon. There are three main types: Type 1 (T1DM), Type 2 (T2DM), and gestational diabetes (GDM).
- T1DM is an autoimmune disease that damages the beta cells of the pancreas so they do not produce insulin; thus, synthetic insulin must be administered by injection or infusion. Risk factors include age, family history, or history of viral infection.
- T2DM occurs when the cells of the body become resistant to the effects of insulin, causing the pancreas to increase its production of insulin. Risk factors include obesity, family history, and inactivity.
- Gestational diabetes (GDM) occurs when beta cells in the pancreas become unable to compensate for the demands of pregnancy, causing a dysfunction in the production of insulin and a reduced insulin sensitivity resulting in high blood glucose levels. Risk factors include obesity, family history, and polycystic ovary syndrome.
- Common symptoms associated with DM are polyuria, increased thirst, unplanned weight loss, increased hunger, blurry vision, tingling or numbness in hands or feet, decrease in energy, dry skin, increased infections, and slow wound healing.
- DM is diagnosed primarily through evaluation of fasting serum glucose levels, hemoglobin A1c levels, or oral glucose tolerance testing (OGTT).
- Patients with DM should be continuously monitored for complications, such as signs of hypoglycemia and hyperglycemia. When a patient with diabetes is experiencing stress or an infection, the nurse should plan to assess their blood glucose levels more frequently. Patients should also be thoroughly educated about their condition.
- Treatment of DM is patient-specific and involves education and patient engagement, medication, lifestyle changes, and glucose monitoring. Patients with T1DM are prescribed insulin. Patients with T2DM and GDM may be prescribed oral antihyperglycemics or insulin based on their individual blood glucose control needs and response to initial treatments.

21.3 Thyroid and Parathyroid Disorders

- Thyroid disorders occur when the thyroid gland releases inappropriate levels of hormones. This creates imbalance in the functions that regulate how the body metabolizes proteins, fats, and carbohydrates, as well as in how efficiently the body uses energy, consumes oxygen, and produces heat.
- Dietary iodine deficiency can result in the impaired ability to synthesize T3 and T4, leading to a variety of severe thyroid disorders.
- Common disorders of the thyroid include hyperthyroidism, hypothyroidism, and thyroid cancer. Because the thyroid controls metabolism, heart rate, and body temperature, clinical signs and symptoms of a thyroid

disorder usually involve hyper- or hypo-activity with these functions.

- Parathyroid disorders, such as hyperparathyroidism and hypoparathyroidism, develop when parathyroid glands release inappropriate levels of PTH hormone, which controls calcium levels in the body.
- Clinical manifestations of parathyroid disease are unusual in the early stages. Signs and symptoms vary and are dependent on the type of disorder present, but they usually mimic signs and symptoms of hypercalcemia and hypocalcemia.
- To determine whether a patient has a thyroid or parathyroid disorder, begin with a subjective assessment that asks focused questions to determine if the patient is experiencing any symptoms or has a previous medical history of neck issues. The information gathered from this subjective assessment can then guide a physical assessment.
- Diagnostic testing for thyroid or parathyroid disorders includes bloodwork, imaging, and biopsy. The type of testing depends on what the subjective and objective data reveal.
- Care of the patient with a thyroid or parathyroid disorder involves educating the patient and family, following the plan of care, and monitoring for complications.
- Medical therapies for a thyroid disorder include medications to correct inappropriate levels of thyroid hormone and thyroidectomy. Medical therapies for a parathyroid disorder include removal of the parathyroid and medications to correct electrolyte imbalances and bone density problems.

21.4 Pituitary Disorders

- The pituitary gland is a bean-sized organ suspended from the hypothalamus that produces, stores, and secretes hormones in response to hypothalamic stimulation.
- Chronic underproduction of antidiuretic hormone (ADH) or a mutation in the ADH receptor results in diabetes insipidus (DI). If the posterior pituitary does not release enough ADH, water cannot be retained by the kidneys and is lost as urine.
- The main clinical manifestations of DI are extreme thirst (polydipsia) and the production of large amounts of urine (polyuria).
- Diagnosis of DI involves confirming polyuria and figuring out the underlying cause. Common tests include a 24-hour urine collection, fluid deprivation test, and hypertonic saline infusion test.
- When caring for patients with DI, it is important to closely monitor intake and output, daily weights, vital signs, changes in level of consciousness, skin turgor, mucus membranes, and laboratory values.
- Treatment strategies for DI include treating the underlying cause and ensuring the patient drinks enough fluids to maintain hydration.
- Unsuppressed or over-release of ADH results in syndrome of inappropriate antidiuretic hormone release (SIADH). The excess ADH prevents the production of urine in the kidneys, impairs water secretion, and leads to hypervolemia and hyponatremia.
- Clinical manifestations of SIADH are usually due to decreased extracellular fluid osmolality and hyponatremia. This causes cerebral edema, and symptoms tend to be neurological.
- Diagnostic testing for SIADH should rule out underlying causes, such as hypothyroidism or adrenal insufficiency. Serum osmolality and serum sodium will both be low. Urine sodium levels will be elevated due to increased free water absorption in the renal collecting tubules.
- In patients with SIADH, it's important to closely monitor intake and output, daily weights, vital signs, changes in level of consciousness, mental status, and laboratory values. It is also important to assess for Cheyne-Stokes respirations.
- Treatment for SIADH involves treating the underlying condition (such as pulmonary or CNS infection) and preventing any further decrease in sodium levels.

21.5 Adrenal Disorders

- The adrenal glands are wedges of glandular and neuroendocrine tissue adhering to the top of the kidneys by a fibrous capsule. One of their major functions is to respond to stress. Adrenal hormones also have several non–stress-related functions, including the increase of blood sodium and glucose levels.
- Adrenal insufficiency is a primary insufficiency of the adrenal glands from complete or partial destruction of the adrenal cortex. This damage prevents the adrenal glands from producing adequate amounts of cortisol and aldosterone. It also causes low glucose levels, low sodium levels, and high potassium levels.

- Patients with adrenal insufficiency have progressive, nonspecific symptoms that include fatigue, weight loss, generalized weakness, abdominal pain, nausea, vomiting, and dizziness. Hyperpigmentation and vitiligo may be present.
- Diagnosis of adrenal insufficiency is confirmed by low serum cortisol and aldosterone levels, a blunt cortisol response with ACTH stimulation, and an elevated renin activity test.
- Treatment of adrenal insufficiency involves hormonal replacement, which is a lifelong therapy.
- Cushing's syndrome is a condition in which the body is exposed to too much circulating cortisol over a long period of time. The cause can be exogenous or endogenous.
- Clinical manifestations of Cushing's syndrome include weight gain, water retention, weakness, fatigue, headache, delayed wound healing, easy bruising, bone pain, loss of height, hirsutism (excess hair growth), impotence, decreased libido, menstrual irregularities, and frequent infections. Additional physical findings may show moon face, buffalo hump, hirsutism, thin extremities, muscle wasting, swollen ankles, purplish striae, skin atrophy, acne, and central obesity.
- A low-dose dexamethasone suppression test is done to confirm Cushing's syndrome. Imaging may also be completed to rule out cancer or pituitary involvement.
- Nursing care for patients with adrenal disorders is based on the assessment data, with the goals of reducing symptoms and preventing complications. Patient teaching should include information about the disease, testing, treatment, and signs and symptoms to report to the provider.
- Treatment for exogenous Cushing's disease includes a slow taper off steroid therapy. In endogenous cases, surgery or radiation therapy may be done. If a bilateral adrenalectomy is performed, the patient must be placed on lifelong hormone replacement therapy.

Key Terms

adrenal glands small, triangular-shaped endocrine glands located on top of each kidney that produce and release a variety of hormones that are essential for regulating several vital functions in the body

adrenal insufficiency insufficiency of the adrenal glands caused by complete or partial destruction of the adrenal cortex, which prevents the adrenal glands from producing adequate amounts of cortisol and aldosterone; also known as Addison's disease

alarm reaction first stage of GAS, in which a response to short-term stress is mediated by the hormones epinephrine and norepinephrine from the adrenal medulla via the SAM pathway; also called the fight-or-flight response

Cheyne-Stokes respirations respiration characterized by cyclical episodes of hyperventilation and apnea

colloid viscous fluid that stores the glycoprotein thyroglobulin, the precursor to the thyroid hormones

congenital hypothyroidism disorder characterized by cognitive deficits, short stature, and sometimes deafness and muteness in children and adults born to mothers who were iodine-deficient during pregnancy

Cushing's disease condition characterized by excess production of circulating cortisol; caused by a tumor or adenoma on the pituitary gland

Cushing's syndrome condition in which the body makes too much cortisol over a long period of time

diabetes insipidus (DI) disorder in which water cannot be retained by the kidneys and is lost as urine; caused by chronic underproduction of ADH or a mutation in the ADH receptor; also known as arginine vasopressin deficiency (AVP-D)

diabetes mellitus (DM) disease characterized by inappropriately high levels of blood glucose

diabetic ketoacidosis (DKA) serious complication of diabetes characterized by high blood glucose, ketone production, and metabolic acidosis due to insufficient insulin

endocrine signaling process by which hormones secreted into the extracellular fluid diffuse into the blood or lymph, enabling them to travel great distances throughout the body

endocrine system network of cells, tissues, and organs that secrete hormones as a primary or secondary function

euvolemia state of having a normal volume of fluids in the body

exocrine system network of glands that release their secretions through ducts

exophthalmos bulging eyes

fluid deprivation test assessment for diagnosing diabetes insipidus; involves restricting the patient's fluid intake while monitoring their body weight and urine concentration

gestational diabetes (GDM) beta cells in the pancreas become unable to compensate for the demands of

pregnancy, causing a dysfunction in the production of insulin and a reduced insulin sensitivity resulting in high blood glucose levels

glucagon hormone released when the body's blood glucose is too low, triggering the liver to release stored glucose to raise glucose levels

goiter enlarged thyroid gland

Graves' disease hyperthyroid state that results from an autoimmune reaction in which antibodies overstimulate the follicle cells of the thyroid gland

hormone chemical substance that travels throughout the body in the bloodstream and affects the activity only of its target cells

hormone receptor protein that receives and responds to messages from a particular type of hormone

humoral stimuli changes in blood levels of non-hormone chemicals, such as nutrients or ions, which cause the release or inhibition of a hormone to, in turn, maintain homeostasis

hungry bone syndrome complication that occurs from prolonged hypocalcemia following surgical correction for hyperparathyroidism

hyperglycemia high blood glucose levels

hyperosmolar hyperglycemic state (HHS) severe condition associated with extremely high blood glucose and increased plasma osmolality, but without significant ketone production or metabolic acidosis, commonly occurring in type 2 diabetes

hyperparathyroidism disorder caused by an overproduction of PTH, resulting in excessive calcium reabsorption from bone

hyperthyroidism overproduction of thyroid hormones, characterized by an increased metabolic rate and consequential weight loss, excess heat production, sweating, and increased heart rate

hypoparathyroidism disorder characterized by abnormally low blood calcium levels; may be caused by parathyroid hormone deficiency

hypophysectomy removal of the pituitary gland

hypothyroidism underproduction of thyroid hormones, characterized by a low metabolic rate, weight gain, cold extremities, constipation, reduced libido, menstrual irregularities, and reduced mental activity

insulin hormone that helps cells absorb glucose for energy and lowers the body's blood sugar levels

Kussmaul respirations rapid, deep breathing at a consistent pace

myxedema coma severe case of hypothyroidism that causes respiratory depression, hypothermia, and bradycardia

negative feedback loop process characterized by the inhibition of further secretion of a hormone in response to adequate levels of that hormone

neural stimuli release hormones in response to neural stimulation

osmotic diuresis increased urination caused by increased concentration of glucose in the kidneys

parathyroid gland located on the posterior surface of the thyroid gland

pituitary gland bean-sized organ suspended from the hypothalamus that produces, stores, and secretes hormones in response to hypothalamic stimulation

polydipsia extreme thirst

polyuria excessive urination volume

positive feedback loop process characterized by the release of additional hormones in response to an original hormone release

stage of exhaustion third stage of GAS, in which individuals may begin to experience depression, the suppression of their immune response, severe fatigue, or even a fatal heart attack

stage of resistance second stage of GAS, in which the individual's body tries to adapt to stress

syndrome of inappropriate antidiuretic hormone release (SIADH) disorder in which unsuppressed or over-release of ADH prevents the production of urine in the kidneys and impaired water secretion and leads to hypervolemia and hyponatremia

thyroid butterfly-shaped gland with two lobes that are connected by the isthmus

thyroid storm medical emergency caused when the thyroid gland releases a large amount of thyroid hormone in a short period of time

type 1 diabetes mellitus (T1DM) condition where autoimmune disease damages the beta cells of the pancreas so they do not produce insulin; thus, synthetic insulin must be administered by injection or infusion

type 2 diabetes mellitus (T2DM) condition where cells of the body become resistant to the effects of insulin, so the pancreas increases its production of insulin

vitiligo patches of skin without pigment

Assessments

Review Questions

1. Hormones travel throughout the body and affect the activity of what?
    a. blood osmolality
    b. target cells
    c. paracrine
    d. neural stimuli

2. What should the nurse do during a physical assessment of the thyroid?
    a. Push on the side of the neck to feel the thyroid.
    b. Ask the patient to tilt the head down while drinking water.
    c. Palpate the thyroid gland using a circular motion, while standing behind the patient.
    d. Assess the patient's arms and palms for tremors.

3. What is the function of the hormone glucagon?
    a. to increase blood sugar levels
    b. to decrease blood sugar levels
    c. to increase insulin levels
    d. to decrease insulin levels

4. What would be a symptom that the body was producing too much melatonin?
    a. increased agitation
    b. increased metabolism
    c. excessive sleepiness
    d. excessive hair production

5. The nurse is caring for a patient with T1DM. While developing a teaching plan about hypoglycemia as a complication of therapy, what sign or symptom should the nurse include?
    a. fruity breath
    b. increased thirst
    c. shakiness
    d. headache

6. The nurse is preparing to discharge a patient who is newly diagnosed with DM. The patient asks the nurse if they can eat a candy bar or cup of ice cream every time they feel shaky, hungry, or nauseated. How should the nurse respond?
    a. Yes, a candy bar or cup of ice cream is needed to treat the hypoglycemia.
    b. No, if your blood sugar reading is low, these snacks contain too much sugar; a few hard candies or a cup of skim milk would be better choices.
    c. Yes, you can eat the snack, but then have a meal as soon as possible.
    d. No, the snack will cause hyperglycemia; you should quickly eat a meal instead.

7. The nurse is reviewing a patient's fasting serum blood results. What result would indicate to the nurse that the patient may have diabetes?
    a. Potassium level of 4.2 mmol/L
    b. Hemoglobin level of 15 g/dl
    c. A1C level 6.1%
    d. Fasting glucose of 129 mg/dL

8. What behaviors are likely symptoms of hyperthyroidism?
   a. heat intolerance, slow heart rate, sleepiness
   b. fatigue, central obesity, cold intolerance
   c. irritability, mood swings, fatigue
   d. confusion, heat intolerance, slow movements

9. What should the nurse be sure to monitor for in order to prevent hungry bone syndrome?
   a. prolonged hypercalcemia
   b. dehydration
   c. prolonged hypocalcemia
   d. fluid overload

10. A patient with a history of hyperthyroidism is admitted to the hospital with thyroid storm. What should the nurse expect to be included in the plan of care?
   a. warming blankets
   b. antithyroid medications
   c. insulin
   d. diuretics

11. A nurse is caring for a patient with SIADH. What type of electrolyte imbalance would the nurse expect to find in this situation?
   a. hyponatremia
   b. hypocalcemia
   c. hyperkalemia
   d. hypermagnesemia

12. DI results from a chronic underproduction of ADH, which in turn does what to the body?
   a. increases glucagon production
   b. increases water retention
   c. decreases the amount of water retained
   d. causes hypernatremia

13. Cheyne-Stokes respirations are characterized by what?
   a. cyclical episodes of hyperventilation and apnea
   b. constant, rapid breathing
   c. long, slow, deep breaths
   d. shallow breathing

14. A patient diagnosed with adrenal insufficiency would be expected to have what laboratory value?
   a. low glucose
   b. elevated glucose
   c. elevated sodium
   d. low potassium

15. A nurse is teaching a patient about treatment for adrenal insufficiency. What should the nurse tell the patient about hormone therapy?
   a. Hormone therapy is a temporary measure.
   b. Hormone therapy does not have to be taken daily.
   c. Hormone therapy is a lifelong therapy.
   d. Hormone therapy is not an adequate treatment.

16. In some cases of Cushing's disease, a CT of the brain may be completed for what reason?
   a. to rule out dementia

b. to identify pituitary tumors
c. to identify frontal lobe tumors
d. to rule out temporal lobe damage

Check Your Understanding Questions

1. Why should a patient with DM be referred to an ophthalmologist?
2. When are the best times for a patient with DM to check their blood glucose levels?
3. Explain how a physical assessment can reveal signs of hypocalcemia.
4. What would you expect to see as part of the treatment plan for a patient being treated for DI?
5. What would be some signs and symptoms of rapid serum sodium correction and clinical assessment findings?
6. You are caring for a patient with Cushing's disease, and they are having body image disturbances. What can you do to help the patient properly cope with body changes?

Reflection Questions

1. Why is it important to complete a targeted subjective assessment on a patient with a suspected endocrine disorder?
2. In managing patients with SIADH, how might ethical considerations influence treatment decisions, especially when balancing fluid restriction and the risk of rapidly correcting sodium levels?

What Should the Nurse Do?

A 55-year-old patient has recently been diagnosed with T2DM and is being started on the sulfonylurea agent glipizide. The patient is very concerned about her new diagnosis and says she feels incompetent because she has no knowledge about DM.

1. What should the nurse include in the patient's education and support system?
2. How would the nurse evaluate the efficacy of the prescribed medication glipizide?

Ms. S.P. is a 44-year-old patient who noticed that she has gained weight and that her face and body are round, while her legs and arms have become thinner. A tentative diagnosis of Cushing's disease is made.

3. The nurse knows that Cushing's disease causes clinical manifestations. What routine assessments would the nurse make a priority in the plan of care?
4. The nurse notices that the patient seems depressed because she needs surgery and will not get out of bed to ambulate. What can the nurse do to prevent further complications?
5. Ms. S.P. is scheduled for discharge. What information does the nurse need in order to provide adequate patient teaching?

Competency-Based Assessments

1. Design a teaching tool that you would use to teach your newly diagnosed patient about the disease process of GDM. How would you check their understanding?
2. Develop a handout that you would use to help educate your patient about hypoparathyroidism.

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CHAPTER 22

Infection and Infectious Diseases

FIGURE 22.1 Two health-care professionals treat a patient with COVID-19. The COVID-19 pandemic has highlighted the need for preparedness and knowledge about effectively treating worldwide infections. (credit: "U.S. Navy Doctors, Nurses and Corpsmen Treat COVID Patients in the ICU Aboard USNS Comfort" by Navy Medicine / Flickr, Public Domain)

CHAPTER OUTLINE

INTRODUCTION Infections are one of leading causes of death and disability globally, with more than 7.7 million deaths in 2019 from bacterial pathogens alone (GBD 2019 Antimicrobial Resistance Collaborators, 2022). The total number of deaths that year from fatal infections was even higher, given that infections can also be caused by viruses, parasites, and fungi. During the COVID-19 pandemic, which started in 2019, we saw firsthand the destruction that widespread infections can cause both to human life and the economy. Additionally, we are starting to see the development of "superbugs" that are resistant to commonly prescribed antibiotics, making it even more difficult to effectively treat infections. Nurses are on the frontlines of these battles, which highlights the need for knowledge regarding the causes of and treatments for various infections.

22.1 Infectious Process

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the transmission of an infective antigen into the host
- Describe the key components of the immune system's response to infection
- Explain the important roles played by the lymphatic system in infection protection

Have you ever wondered how nurses can be exposed to patients with communicable diseases day after day but not become ill? Many factors affect the body's ability to defend against infection, and some individuals are at greater risk of developing an infection. When an infection does occur, early recognition is important to prevent it from spreading within the individual, as well as to others. Protecting people from developing an infection, as well as preventing the spread of infection, are major concerns for nurses. This section discusses the anatomy and physiology of the immune and lymphatic systems and their roles in fighting infection.

The **immune system** is the complex collection of cells and organs that destroy or neutralize pathogens that would otherwise cause disease or death. The immune system is associated with the lymphatic system to such a degree that the two are virtually indistinguishable. However, they are separate body systems with distinct components and functions. The **lymphatic system** is the system of vessels, cells, and organs that carry excess fluids to the bloodstream and filter pathogens from the blood. The swelling of lymph nodes during an infection and the transport of lymphocytes via the lymphatic vessels are but two examples of the many connections between these critical organ systems.

Infection

An **infectious disease** is caused by a **pathogen**—an agent such as a bacterium, virus, parasite, or fungus—that enters a human host, multiplies, and causes infection that can spread via direct or indirect transmission (CDC, 2022a). Two models—the epidemiologic triad and the chain of infection—are vital to understanding transmission of infectious diseases. The epidemiologic triad includes the host, agent, and environment, and describes the who, what, and where of the infectious process. The chain of infection builds on this triad; a disease is considered communicable or **contagious** (capable of spreading from one person to another) if the infected host has a portal of exit, a means of transmission, and a portal of entry into another susceptible host. Some infectious diseases can be spread by germs in the air, food, water, or soil and by vectors or by animals to humans. Although these diseases are still considered infectious, because they are caused by bacteria, viruses, parasites, or fungi, they are not considered communicable from person to person.

The agent's **pathogenicity** (the potential ability to cause disease in a susceptible host) depends on the agent's infectivity and its ability to invade the host, destroy host body cells, and produce toxins that result in the **virulence**, or severity, of the infectious disease. The human immune system has evolved over thousands of years to be able to control many pathogens, but the pathogens themselves have also evolved ways to evade the immune response. The first step in the immune response is for the body to recognize the presence of an **antigen**, or a molecule on the cell surface of a pathogen that is recognized as an invader by the immune system. However, pathogens mutate constantly, and some mutations change the chemical structure of an antigen sufficiently, so the immune response no longer recognizes it. This explains why a new strain of bacteria can evade the immune response of a body that has already been exposed to an older strain: the new strain is characterized by a structurally distinct antigen. This also explains why a new flu vaccine must be developed each year: each flu season, a new variant of the influenza virus, with a unique antigen, may have evolved.

The susceptibility of a host is a key component in the epidemiologic triad and chain of infection (CDC, 2022a). Susceptibility depends on many factors, such as age, sex, physical health, and immune status. Portals of entry and exit can include the skin, conjunctiva, respiratory tract, gastrointestinal (GI) tract, genital tract, and vertical transmission during the birthing process (CDC, 2022a). The environment is a component common to both the epidemiologic triad and the chain of infection. In this context, the environment refers to reservoirs of infectious agents, which may be humans, animals, plants, insects, water, and soil. The environment and any environmental changes can have a significant impact on the transmission of waterborne, foodborne, and vector-borne agents. Transmission of infectious agents includes airborne, direct contact, indirect contact, and droplet transmission. If an environment is favorable for the survival of an infectious agent and there is an opportunity for the host to be exposed to the agent, infection and disease will ensue. Thankfully, there are many pharmacologic treatments available for most infections, but, as you will see later in the chapter, in some cases, the established treatments are becoming ineffective, making it difficult to completely eradicate the pathogen.

LIFE-STAGE CONTEXT

Older Adults and Susceptibility to Infection

Older adults are at an increased risk for infections for many reasons. First, with aging, the effectiveness of the immune system decreases, making it harder for the body to fight off infections. Additionally, many older adults reside in facilities that put them in regular, close contact with a variety of people. This puts them at higher risk for developing infections that are passed from person to person. Although older adults are more susceptible to most infections, the most common ones seen in this population include pneumococcal disease and influenza, which are often acquired while receiving care for other conditions. Infections acquired in this manner are called nosocomial (health care–associated) infections (Cristina at al., 2021).

Functions of the Immune System

The immune system is a collection of barriers, cells, and soluble proteins that interact and communicate with each other in extraordinarily complex ways (CDC, 2022a). The modern model of immune function is organized into three phases based on the timing of their effects:

- A **barrier defense**, such as the skin and mucous membranes, acts instantaneously to prevent pathogenic invasion into body tissues.
- The rapid but nonspecific **innate immune response** consists of a variety of specialized cells and soluble factors, such as vascular endothelial growth factor or certain hormones, that can bind to receptors as part of the immune response.
- The slower but more specific and effective **adaptive immune response** involves many cell types and soluble factors. However, it is primarily controlled by white blood cells (WBCs) known as lymphocytes, which help control immune responses.

For the purpose of this chapter, we will focus on the respective functions of barrier defenses and WBCs.

LINK TO LEARNING

Review how the immune system works (https://openstax.org/r/77immune) with this video.

Barrier Defenses

Physical barriers are defense mechanisms that prevent pathogens from entering the body, destroy them after they enter, or flush them out before they can establish themselves as an infection. These barriers are among the body's most basic defense mechanisms. They are not themselves a response to infection, but they are continuously working to protect against a broad range of pathogens.

The different modes of barrier defenses are associated with the external surfaces of the body, where pathogens may try to enter. The primary barrier is the skin. The outer skin consists of a layer of cells that are too dry for bacteria to grow in; furthermore, these outer cells are continuously sloughed off, carrying with them bacteria and other pathogens. Skin secretions such as sweat physically wash microbes away; they also contain lipids and other chemicals that contribute to a toxic environment for pathogens—for example, by lowering pH, creating an acidic environment in which the pathogen can no longer survive. The acidic environment of the stomach, which is fatal to many pathogens, is also a barrier. Additionally, the mucus layers of the gastrointestinal tract, respiratory tract, reproductive tract, eyes, ears, and nose trap microbes and a wide range of debris and facilitate their removal.

Leukocytes

Another name for a WBC is a **leukocyte**. They are the primary cells of the immune system, tasked with fighting off pathogens to prevent infection (Tigner et al., 2022; University of Rochester Medical Center, 2024). There are several specific types of leukocytes, which are listed in Table 22.1.

Type of Leukocyte (normal percentage of all WBCs)	Description
Monocyte (2%–8%)	• Made in the bone marrow • Eventually becomes a macrophage (a cell that surrounds and kills microorganisms and ingests foreign materials) or a dendritic cell (a cell that presents antigens for recognition to lymphocytes)
Lymphocyte (20%–40%)	• A mature B or T cell that has not yet encountered an antigen for the first time • Develops a specific response to a specific antigen, making it the most effective type of cell to fight infection
Neutrophil (40%–60%)	• A phagocytic cell that is recruited from the bloodstream to the site of infection • A nonspecific part of the body's first line of defense, meaning it shows up regardless of what kind of pathogen is present
Basophil (0.5%–1%)	• The least common type, comprising less than 1 percent of the total WBC count • Mainly acts to intensify the inflammatory response
Eosinophil (1%–4%)	• Protects the body from allergies, parasitic infections, and some autoimmune diseases

TABLE 22.1 Types of Leukocytes

Functions of the Lymphatic System

A major function of the lymphatic system is to drain body fluids and return them to the bloodstream. These processes happen via a series of vessels, trunks, and ducts. The term **lymph** is used to describe interstitial fluid once it has entered the lymphatic system. When the lymphatic system is damaged in some way (e.g., blocked by cancer cells or destroyed by injury), protein-rich interstitial fluid accumulates in the tissue spaces. This inappropriate accumulation of fluid, or lymphedema, may lead to serious medical consequences, such as pain and limited mobility. The main organs and other components of the lymphatic system include the lymph nodes, spleen, bone marrow, and thymus (Figure 22.2).

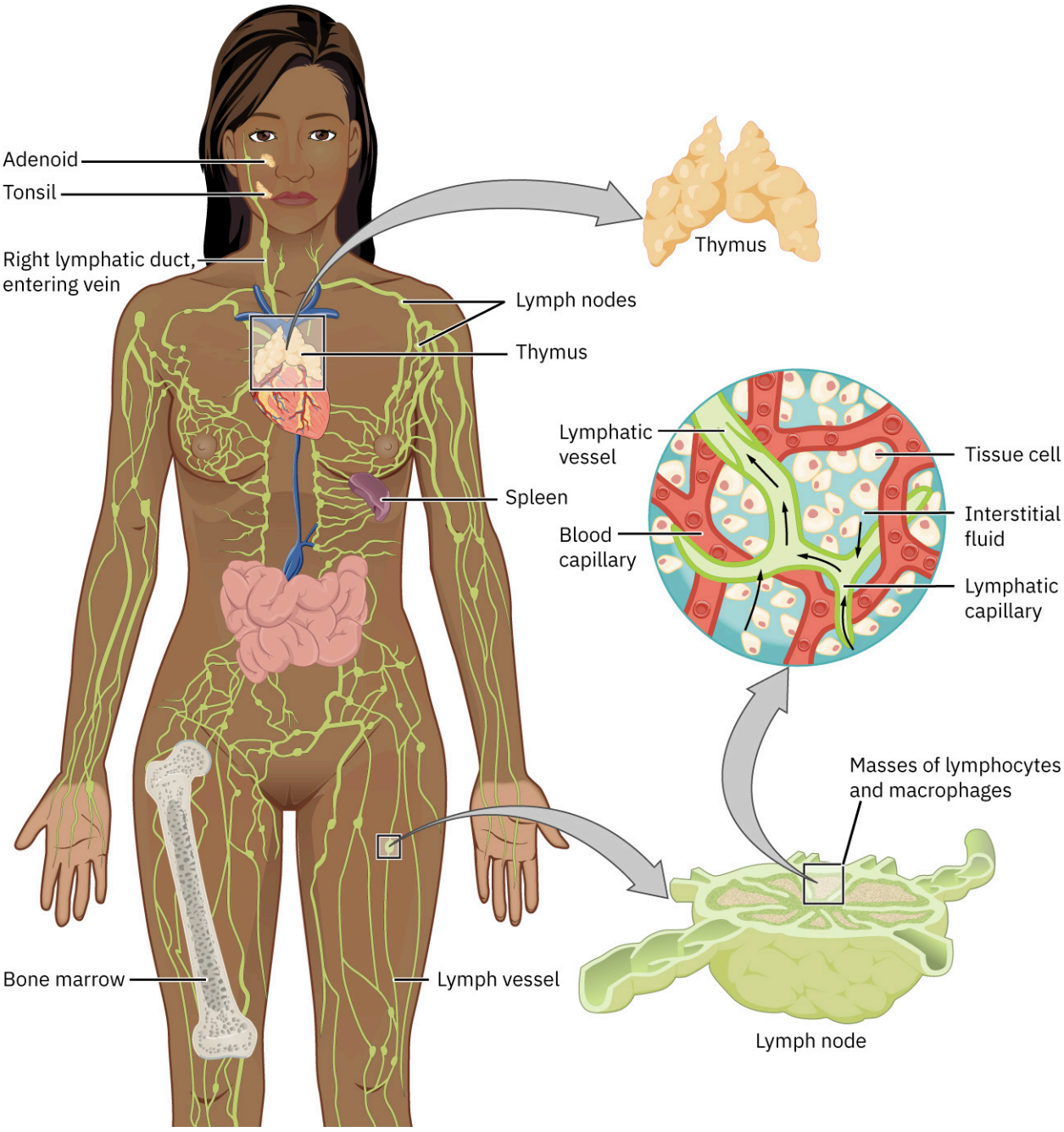

FIGURE 22.2 The lymphatic system is composed of organs, glands, and other structures that are connected via lymphatic vessels and ducts. (credit: modification of work from *Anatomy and Physiology 2e.* attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Lymph Nodes

A **lymph node** is a small, bean-shaped organ that removes debris and pathogens from the lymph; lymph nodes are sometimes referred to as the filters of the lymph (Figure 22.3). Any bacteria that infect the interstitial fluid are taken up by the lymphatic capillaries and transported to a regional lymph node. Dendritic cells and macrophages within the nodes internalize and kill many of the pathogens that pass through, thereby removing them from the body. (This is the reason swollen lymph nodes may be a symptom of an infection.) The lymph nodes are also the site of adaptive immune responses mediated by T cells, B cells, and accessory cells of the adaptive immune system.

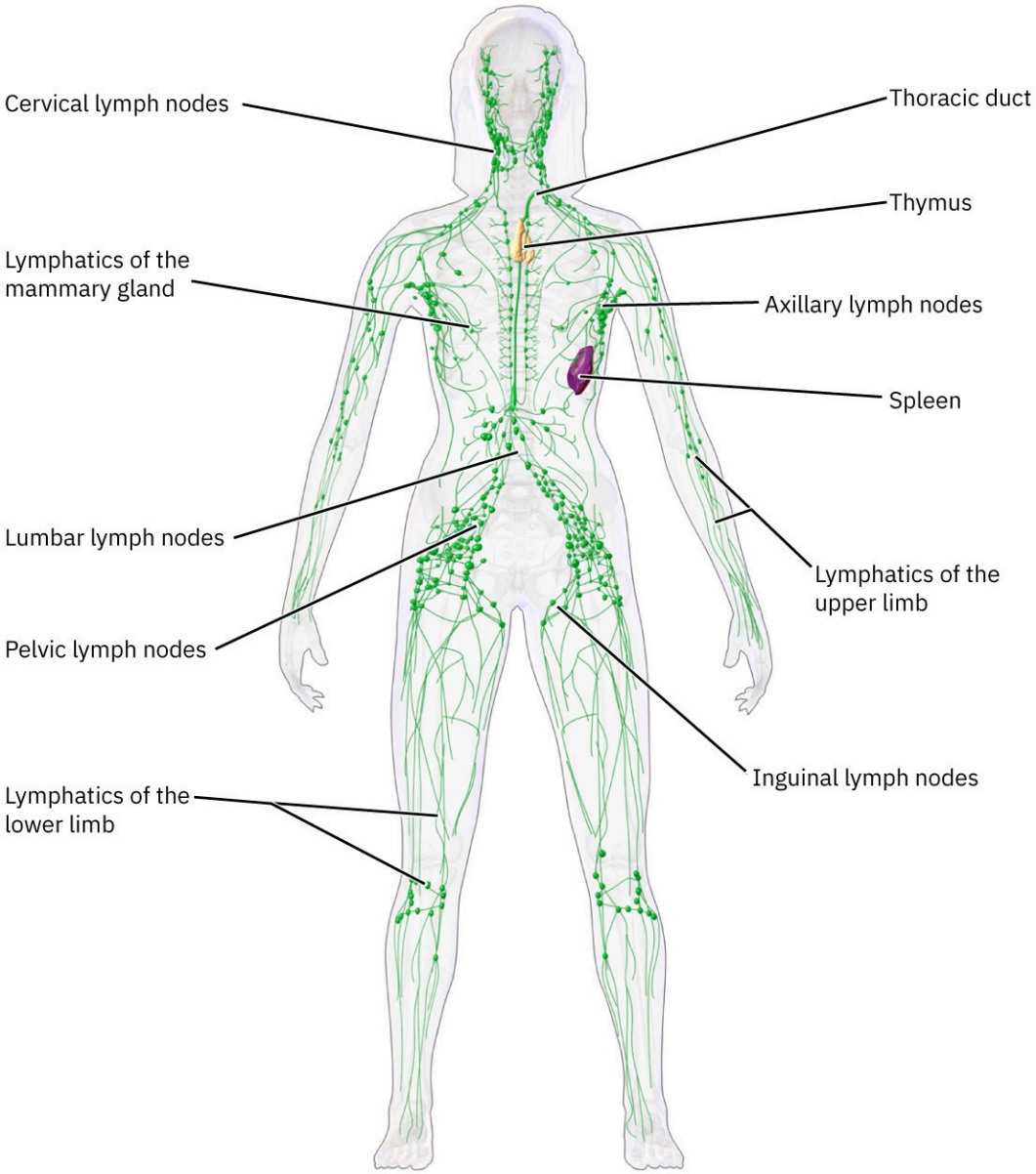

FIGURE 22.3 Lymph nodes are found throughout the body to help remove debris and pathogens from lymph. (credit: Blausen.com staff/ Wikimedia Commons, CC BY 3.0)

Spleen

The **spleen** is another important lymphoid organ (Figure 22.4). It is about 12 cm (5 in.) long and attached to the lateral border of the stomach. The spleen also is sometimes called the filter of the blood because of its extensive vascularization and the presence of macrophages and dendritic cells that remove microbes and other materials from the bloodstream. The spleen is also the location of immune responses to blood-borne pathogens. Because of its role in immune function, patients who have had their spleen surgically removed for medical reasons are at higher risk of infection.

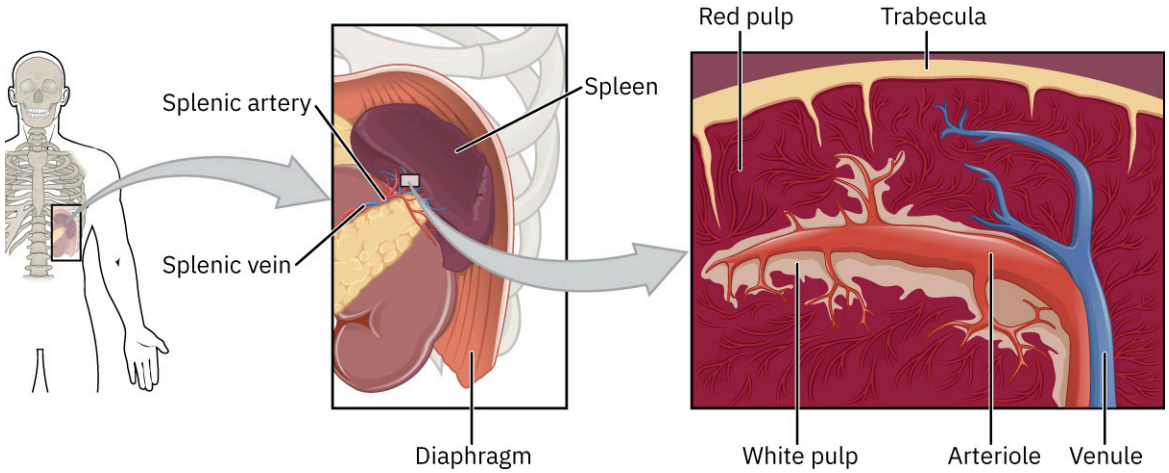

FIGURE 22.4 The spleen is located in the upper left quadrant of the abdomen, just under the diaphragm. The splenic artery carries blood to the spleen, and the splenic vein carries blood away from the spleen. (credit: modification of work from *Anatomy and Physiology 2e.* attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Bone Marrow

The soft, jelly-like tissue located inside bones is called **bone marrow** (Figure 22.5). Its main function is to produce blood cells and release them into the bloodstream once they are fully matured (Lucas, 2021). The importance of bone marrow cannot be overstated. It produces and matures red blood cells (including platelets) in addition to WBCs. Without optimal functioning of the bone marrow, the body would be unable to effectively fight infection or stop bleeding, problems that could very quickly result in a life-threatening condition such as hemorrhagic shock or sepsis (Lucas, 2021).

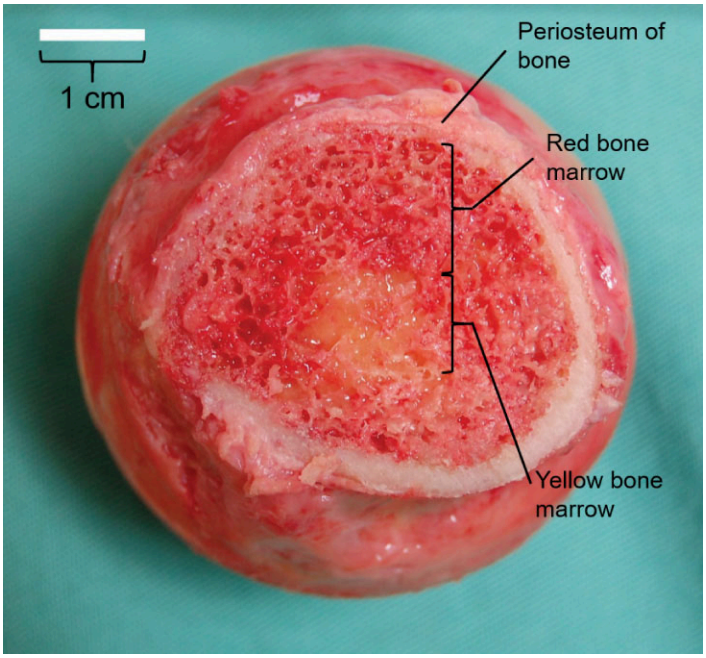

FIGURE 22.5 The bone marrow is a spongy material located inside the long bones and responsible for the production and maturation of blood cells. (credit: "Bone Marrow" by ASCCC OERI/Flickr, CC BY 2.0)

Thymus

The **thymus** is lymphatic organ whose main function is the production of a group of hormones that contribute to the development and differentiation of T lymphocytes, immune cells that contain specific receptors for antigens and play a large role in active immunity. The thymus is located in the chest cavity, between the lungs and behind the sternum (Figure 22.6).

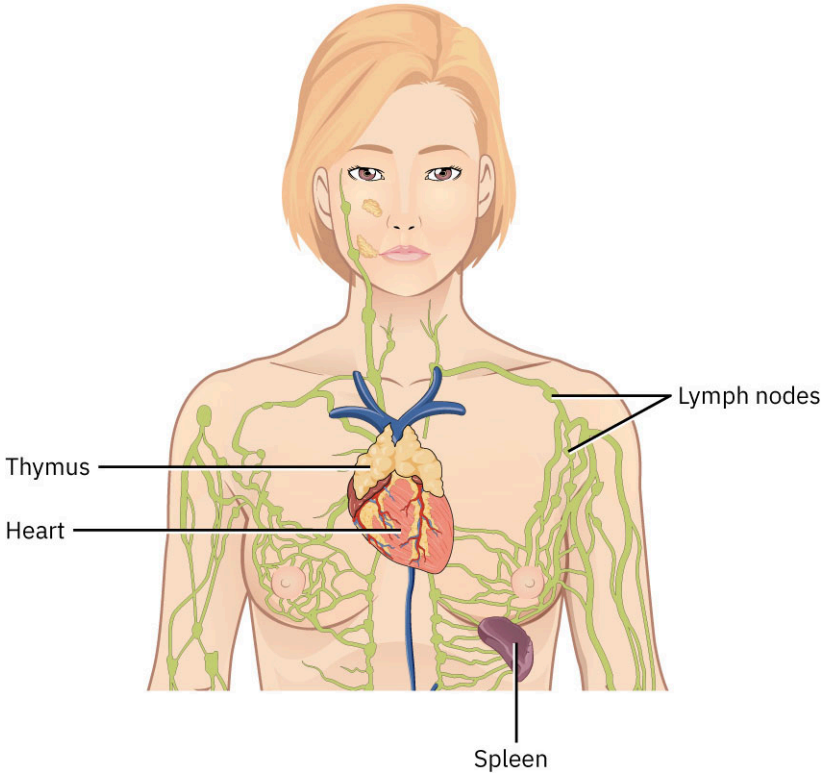

FIGURE 22.6 The thymus gland is located between the lungs, anterior to the sternum. (credit: modification of work from *Anatomy and Physiology 2e.* attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

22.2 Viral and Fungal Infections

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for viral and fungal infections
- Describe the diagnostics and laboratory values for viral and fungal infections
- Apply nursing interventions and associated therapies in the care of the patient with viral and fungal infections
- Apply nursing interventions and associated therapies in the care of the patient with viral and fungal infections

Before 2020, you may not have thought much about viruses, except perhaps when it came time to get your annual flu shot. However, that likely all changed with the onset of the COVID-19 pandemic. The pandemic has shed light on the profound impact of viral infections on society and redefined how the world will handle outbreaks in the future.

Infection with the **human immunodeficiency virus (HIV)**, a retrovirus characterized by the destruction of certain WBCs, was nearly 100 percent fatal in the 1980s. Over the past few decades, the development of antiviral drugs has transformed HIV infection into a chronic, manageable disease—provided those with the virus learn about their infection in time to start treatment and avoid passing it to others (HIV.gov, 2023).

The hepatitis viruses are another example of pathogenic viruses. The World Health Organization (2024) estimates that more than 300 million people worldwide are currently living with chronic hepatitis infection that is either undiagnosed or untreated.

Numerous fungi live on and within the human body, but they do not usually cause disease. When they do result in an infection, the areas most often affected are the skin and nails, but it can also spread to the mouth, throat, lungs, and urinary tract.

This section takes a closer look at nursing interventions and medical therapies for various viral and fungal infections. However, we start by examining the pathophysiology of viral infections in general.

Pathophysiology of Viral Infection

A **virus** consists of a piece of genetic code, such as DNA or RNA, protected by a coating of protein; some viruses also contain an outer envelope of lipids (Kramer, 2023). Regardless of their specific characteristics and how they are classified, viruses can profoundly affect, and even kill, the organisms they infect. Figure 22.7 illustrates one type of virus.

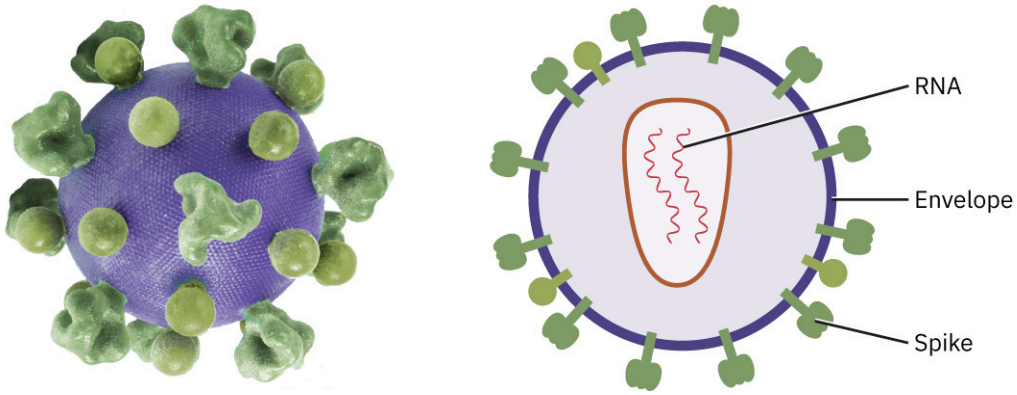

FIGURE 22.7 The virus illustrated here contains RNA, which can invade a host cell and cause infection. (credit (left): modification of "HIV Virus" by NIAID, CC BY 2.0. attribution (right): Copyright Rice University, OpenStax, under CC BY 4.0 license)

An individual whom a virus infects is called a **host**. Following the initial infection, the virus invades the host's cells, injects its genetic material, and uses the host cell's components to replicate and produce more viruses. The new viruses are then released into the body, creating a cycle of invasion, replication, and release that risks destroying the host's cells, threatening their health and, in some cases, life.

Viruses are often classified based on whether they contain DNA or RNA. Herpesvirus is an example of a DNA-containing virus, whereas SARS-CoV2 (which causes COVID-19) contains RNA. HIV is another type of virus containing RNA, but it is classified as a **retrovirus**, meaning that it is able to transcribe itself as permanent DNA inside the host cell. This ability makes retroviruses very difficult to treat. Viruses containing RNA are more likely to mutate, resulting in different strains. Medications and therapies that work on one strain may prove ineffective against a new strain with altered genetic material.

Although most viruses affect the upper airways, they can affect any body system. Humans can become infected by viruses by swallowing or inhaling them (via droplets), being stung or bitten by insects, or having sexual contact or intercourse. A mother can also transfer a virus to her fetus in utero or during birth. Viruses are difficult to treat because they are not responsive to antibiotics. Some antiviral medications are available, but they are not always effective; these are discussed in more detail later in this section.

Clinical Manifestations

Clinical manifestations will vary depending on the specific viral infection. Most viral infections cause vague general symptoms, including fatigue, muscle aches, and headache. Selected viruses and their associated clinical manifestations are listed in Table 22.2 (American Academy of Dermatology Association, n.d.; American Lung Association, 2023).

Virus	Clinical Manifestations
SARS-CoV-2 (COVID-19)	• Chills • Congestion or runny nose • Cough • Fatigue • Fever • Headache • Loss of taste or smell • Muscle aches • Nausea, vomiting, or diarrhea • Shortness of breath • Sore throat
Influenza	• Cough • Fatigue • Fever • Headache • Muscle aches • Sore throat
Respiratory syncytial virus (RSV)	• Cough • Headache • Runny nose • Sore throat
Viral meningitis	• Confusion • Fever • General rash • Headache • Nausea, vomiting • Photophobia (light sensitivity) • Stiff neck
Herpes simplex virus (HSV)	• Blisters (“cold sores”) around the mouth or lips, often with tingly or itchy skin around the mouth in the several days leading up to the outbreak • Chills • Fatigue • Fever • Muscle aches • Swollen lymph nodes
Rotavirus	• Loss of appetite • Signs of dehydration (e.g., poor skin turgor, dry mucous membranes, dizziness) • Vomiting and/or watery diarrhea lasting several days

TABLE 22.2 Clinical Manifestations for Specific Viral Infections

Assessment and Diagnostics

In many cases, viral infections can be diagnosed based on clinical manifestations alone. In other cases, blood tests and cultures may be used to determine the specific virus causing the infection. Laboratory tests are used often when

patients present with symptoms that could be indicative of multiple types of viruses. The most common example is when patients present with nonspecific symptoms such as a runny nose and fever. In this case, providers often order rapid influenza and COVID-19 tests to see if either of those infections is the cause of the symptoms, because they both present similarly.

Nursing Care of the Patient with COVID-19

COVID-19 is caused by a **coronavirus**, a type of virus characterized by a lipid envelope surrounded by proteins that jut out like spikes (Figure 22.7). Coronaviruses are often the cause of the relatively mild cluster of symptoms, including sore throat, congestion, and cough, known as the "common cold." The coronavirus that causes COVID-19 has proved especially dangerous partly because it is novel (i.e., new): our bodies had never encountered it, so they had not developed any immunity to it.

Providing nursing care for patients with COVID-19 has presented many challenges in the past few years since the onset of the pandemic (WHO, 2024b). Initially, nurses and other health-care professionals were unsure about how to care for these patients because there was not enough information available about the virus. Once there was more evidence and data collected about the virus, nursing care became more complex. However, this continuously changed as more data, trends, and treatments were discovered. COVID-19 had a significant mortality rate, requiring emotional and mental care to be provided to patients, families, and health-care staff alike (Mayo Clinic, 2023). Nurses remain on the frontlines of treating patients with COVID-19; therefore, it is critically important to be knowledgeable about the latest best practices in caring for these patients.

Recognizing and Analyzing Cues

It is imperative that nurses be able to recognize and analyze subtle changes in patients' conditions that may be indicative of the onset or progression of a COVID-19 infection. Early intervention for the infection reduces its mortality rate, so early detection is essential. Early signs include vague symptoms, such as the following (CDC, 2024c)

- congestion or runny nose
- fatigue
- fever
- headache
- muscle aches

If any of these symptoms are noted, the nurse should advocate for the patient to be tested for COVID-19 to rule out or confirm the diagnosis so treatment can be initiated quickly. Later signs and symptoms of COVID-19 include a loss of taste or smell, severe shortness of breath, cyanosis, and confusion. Emergent intervention is required once these symptoms are present, and the nurse must recognize the urgency of the situation and intervene appropriately (Administration for Strategic Preparedness & Response, n.d.).

Prioritizing Hypotheses, Generating Solutions, and Taking Action

If the patient presents with symptoms indicative of COVID-19 infection, the nurse will hypothesize that coronavirus is the cause and perform a rapid COVID-19 test. Results from rapid tests are obtained very quickly, thus the nurse can determine the next steps quickly. If the results are negative, the nurse should consider other potential causes of the symptoms and act accordingly. If the results are positive, the nurse begins to generate solutions and take actions, which include the following interventions:

- Monitoring vital signs: These can change quickly in patients with COVID-19, so the nurse should monitor them closely and frequently.
- Respiratory support: COVID-19 can cause severe lung damage, so providing respiratory support is essential. In mild cases, supplemental oxygen via nasal cannula may be sufficient, but many cases will require high-flow oxygen devices or intubation and mechanical ventilation.
- Positioning: Frequent repositioning of patients (ideally every 2 hours) helps facilitate lung expansion, which is crucial for treatment of COVID-19. The use of prone positioning also improves outcomes. Many units have specialized proning beds (Figure 35.11) for this purpose, but proning (placing patient in prone position) can also be done manually with assistance from other health-care staff.
- Infection control: Nurses caring for patients with COVID-19 must be vigilant about always wearing appropriate

personal protective equipment (PPE; e.g., gloves, gown, N95 mask). The patient should be placed on isolation precautions and visitors to the room should be limited to prevent the spread. During the pandemic, visitation regulations became stricter during the peak spread of COVID-19 and visitation was eventually not permitted.
- Psychosocial support: Offering emotional support, reassurance, and education to patients and their families is a huge aspect of nursing care for patients with COVID-19 infection. These patients are often isolated, making them anxious and afraid. The nurse should comfort them, address their concerns, and assist them to develop appropriate coping strategies while in the hospital.

Evaluation of Nursing Care for the Patient with COVID-19

Nurses play a vital role in evaluating outcomes to gauge the effectiveness of interventions. The nurse will closely monitor for changes in the patient's condition that indicate improvement or worsening of the infection.

Evaluating Outcomes

The nurse should evaluate assessment findings to determine if there has been any improvement in the patient's condition. Findings that would indicate improvement include:

- improved mobility and tolerance of activity
- increase in appetite
- negative COVID-19 test
- resolution of respiratory symptoms, as indicated by a decrease in supplemental oxygen needs and improved oxygen saturation
- stable vital signs

Medical Therapies and Related Care

For mild COVID-19 infections, specific treatment may not be required. Mild infections are usually self-limiting and improve with adequate hydration and rest. More severe cases, however, require pharmacologic intervention. With the onset of the pandemic, there was a rush to develop medications that were effective against COVID-19 infection. To date, three medications are available: nirmatrelvir/ritonavir (brand name: Paxlovid), molnupiravir (Lagevrio), and remdesivir (Veklury). Nirmatrelvir/ritonavir and molnupiravir are taken orally as pills, and remdesivir is given intravenously; remdesivir is used in more severe cases for patients who require hospitalization for symptoms. In hospitalized cases requiring supplemental oxygen, dexamethasone, a steroid, is often prescribed to reduce inflammation and improve breathing. In addition to developing medications, governments and private laboratories collaborated to develop vaccines that will prevent future outbreaks. As of early 2024, the Centers for Disease Control and Prevention (CDC, 2024f) recommends that all people over the age of 5 years get the COVID-19 vaccine and a booster. Experts also expect the COVID-19 vaccines will require annual updates to treat new and emerging strains of the virus, similar to the influenza vaccine that is recommended each year (Yale Medicine, 2023).

Some patients who did recover from COVID-19 continue to have symptoms and adverse effects for months after the infection. This is called **long COVID** or post-COVID syndrome and, in some cases, it has resulted in death (CDC, 2024e). The most common long-term symptoms following COVID-19 infection include fatigue, shortness of breath, and brain fog (Johns Hopkins Medicine, 2022). Interventions for the treatment of long COVID include:

- breathing exercises and respiratory therapy
- physical therapy
- steroid medications to reduce inflammation
- supplemental oxygen

REAL RN STORIES

Nurse: Hilary, BSN
Years in Practice: Six months
Clinical Setting: Intensive care unit
Geographic Location: Small, rural community hospital in Missouri

As I arrived for my shift, the weight of the ongoing pandemic hung heavily in the air. The halls echoed with the hustle and bustle of health-care workers, their faces obscured by masks and their eyes reflecting weariness. It was a scene that had become all too familiar in recent months. Having just graduated from nursing school 6 months ago, I never would have anticipated that my first real job as a nurse would involve so much uncertainty and so many patient deaths.

As I made my morning rounds, checking in on patients battling the virus, I couldn't shake my feelings of anxiety. Our supplies of masks, gowns, and gloves were dwindling, and administrators were unable to promise that we would get more any time soon. We had been storing our masks in brown paper sacks, wearing them for three shifts in a row. I was certain that my mask was no longer functioning effectively by the end of my third shift, but there really was no other choice. These patients needed us. We were the only people they got to interact with while in isolation, and we were the ones there holding their hand when they passed away.

Looking back on those challenging days, I am filled with gratitude for the resilience of the human spirit. Working as a frontline nurse, I may not have had enough PPE to keep me safe, but what I did have was an unwavering commitment to care for those in need, no matter the cost. And in the end, perhaps that was enough.

Nursing Care of the Patient with Influenza

Caring for patients with influenza, (more commonly called the “flu”) involves symptom management, infection control, and implementing interventions to alleviate discomfort, prevent complications, and promote recovery. Though the flu has been discussed less in recent years due to overshadowing by the COVID-19 pandemic, it is still a prevalent health concern that has led to death, and will continue to be studied in the coming years.

Recognizing and Analyzing Cues

Early detection and intervention for influenza infection is essential. Thus, the nurse is tasked with being able to recognize cues that indicate the presence of the virus. Early symptoms that may be indicative of influenza include:

- cough
- fatigue
- fever or chills
- headache
- muscle and body aches
- shortness of breath

Early symptoms of influenza are vague, making it difficult to make a definitive diagnosis based on clinical manifestations alone. The nurse must combine assessment findings with a thorough health history to recognize cues that would be consistent with influenza infection.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

If the patient presents with symptoms indicative of influenza, the nurse will first perform a rapid flu test. Likely, the nurse will also perform a rapid COVID-19 test at the same time, because both diseases present similar symptoms, at least initially. If the test is positive, the nurse begins to generate solutions and take actions, which include the following interventions:

- Symptom management: This includes administering antipyretics to decrease fever, analgesics for pain, and cough suppressants as needed.
- Respiratory support: The nurse should position the patient to facilitate breathing, apply supplemental oxygen as needed, and assist with coughing and deep breathing exercises. The nurse will monitor closely for changes such as worsening shortness of breath or dyspnea that would indicate the condition is not improving.
- Infection control: Nurses should perform adequate hand hygiene when caring for all patients, but especially patients with infections that are easily spread. The nurse should also educate all visitors about the importance of hand hygiene in preventing spread of the flu. Patients are placed on droplet precautions, and masks should be worn at all times to limit the spread of infection. Additionally, equipment and surfaces in the patient’s room should be cleaned and disinfected often.

Evaluation of Nursing Care for the Patient with Influenza

Nurses play a vital role in evaluating outcomes to gauge the effectiveness of interventions when caring for patients with influenza. The nurse will closely monitor for changes in the patient's condition that indicate improvement or worsening of the infection.

Evaluating Outcomes

The nurse should evaluate assessment findings to determine if there has been any improvement in the patient's condition. Findings that would indicate improvement include:

- adequate hydration (e.g., moist mucous membranes, adequate urine output)
- decreased fatigue
- improvement in body aches and headache
- improvement in respiratory status
- increased appetite
- resolution of fever

Medical Therapies and Related Care

Medical treatment for influenza involves a combination of medications and nonpharmacologic interventions. Most importantly, patients with the flu should be educated about the importance of rest and maintaining adequate hydration. In mild cases, this is usually enough to treat the infection, which will improve on its own over the course of days to weeks. In more severe cases, medications may be required. Oseltamivir (brand name, Tamiflu), zanamivir (Relenza), and peramivir (Rapivab) are the three antiviral medications currently available to treat influenza. It is important to note that these medications should be started within 48 hours of symptom onset for best results (CDC, 2024c). Beyond treatment, it also remains important to receive annual influenza vaccinations to decrease the risk of infection. These vaccines are altered each year to account for mutations in the virus, which is why it is important to educate patients about the need to get a vaccine every year.

Human Immunodeficiency Virus

In June 1981, the CDC, in Atlanta, Georgia, published a report of an unusual cluster of five patients in Los Angeles, California. All five were diagnosed with a rare pneumonia caused by a fungus called *Pneumocystis jirovecii* (formerly known as *P. carinii*). Why was this unusual? Although commonly found in the lungs of healthy individuals, this fungus is known to cause disease in individuals with suppressed or underdeveloped immune systems. The very young, whose immune systems have yet to mature, and older adults, whose immune systems have declined with age, are particularly susceptible. The five patients from Los Angeles, though, were between 29 and 36 years of age and should have been in the prime of their lives, immunologically speaking. What could be going on?

A few days later, eight similar cases were reported in New York City, also involving young patients, this time exhibiting a rare form of skin cancer known as Kaposi's sarcoma. This cancer of the cells that line the blood and lymphatic vessels had previously been observed as a relatively innocuous disease of older adults. The disease that doctors saw in 1981 was frighteningly more severe, with multiple, fast-growing lesions that spread to all parts of the body, including the trunk and face. Could the immune systems of these young patients have been compromised in some way? Indeed, when they were tested, they exhibited extremely low numbers of a specific type of WBC in their bloodstreams, indicating that they had somehow lost a major part of the immune system.

A new disease, called **acquired immunodeficiency syndrome (AIDS)**, was identified as caused by the previously unknown human immunodeficiency virus. Although AIDS was nearly 100 percent fatal in those early years, over the past few decades, the development of antiviral drugs has transformed HIV infection into a chronic, manageable disease—provided those with the virus learn about their infection in time to start treatment and avoid passing it to others (HIV.gov, 2023).

Pathophysiology of HIV

The underlying pathophysiology of HIV is complex because it is caused by a retrovirus (CDC, 2022c). A retrovirus is a virus that is composed of a strand of **ribonucleic acid (RNA)**, which can be turned into **deoxyribonucleic acid (DNA)** and inserted into a healthy cell permanently. HIV is dangerous mainly because it infects and destroys a specific type of WBC known as CD4. As you can see in Figure 22.8, the viral RNA strand inside of a cell infected with

HIV carries **reverse transcriptase**, which is an enzyme used to convert RNA into DNA. When an infected cell attaches to a healthy cell, it injects the enzyme into the cytoplasm of the healthy cell, where it creates strands of viral DNA. These strands are then inserted into the nucleus of the healthy cell, where they become permanently integrated into the cell's DNA. Once this happens, the newly infected cell produces more cells by using viral mRNA, all of which contain the new viral DNA. Cell replication can occur quickly, leading to an influx of infected immune cells. When this happens, the CD4 cells of the immune system can no longer function effectively, resulting in severe immunosuppression and eventually leading to the development of AIDS, the latest and most severe stage of HIV (HIV.gov, 2023a).

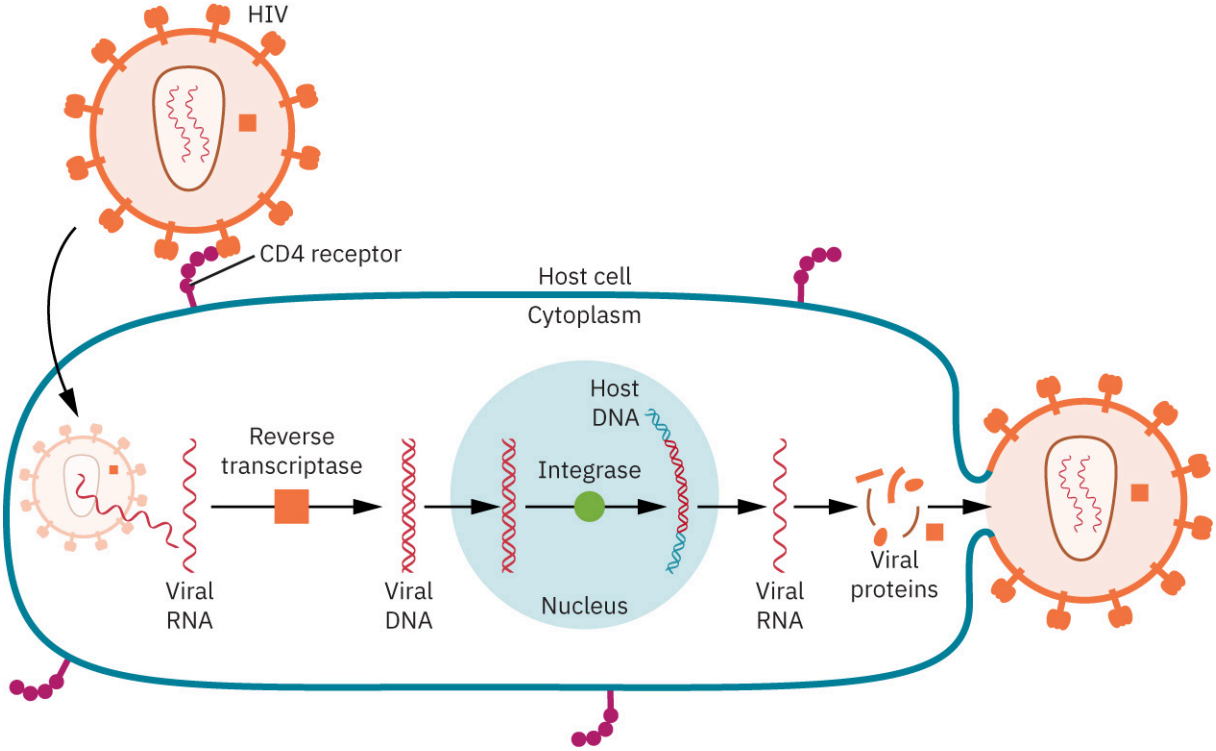

FIGURE 22.8 HIV's viral RNA is turned into DNA and integrated into a healthy host cell, which then replicates, leading to an influx of newly infected immune cells. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

LINK TO LEARNING

Watch a detailed animation of the pathophysiology of HIV and AIDS (https://openstax.org/r/77pathHIVAIDS) in this video.

Clinical Manifestations and Risk Factors

HIV is transmitted through semen, vaginal fluids, breast milk, and blood, and can be caught by having unprotected sex or sharing needles used to inject intravenous (IV) drugs; it can also be passed from an infected mother during childbirth or by breastfeeding (Justiz Vaillant, 2022). Flu-like symptoms sometimes emerge in the first 1 to 2 weeks after infection. This early period of rapid infection is known as the acute stage of HIV. The amount of virus circulating in the blood then drops to a low level. This is known as the chronic or latent stage of HIV: the person is infected but likely not carrying a large enough number of infected cells to show symptoms. This stage can last from a few months or years to decades, but eventually the immune system is overtaken by infected cells, resulting in end-stage HIV, also known as AIDS. The symptoms of AIDS include:

- diarrhea
- fever
- night sweats
- rashes
- severe weight loss (typically >10% of total body weight)

- swollen lymph nodes

In addition to these somewhat nonspecific clinical manifestations, AIDS is characterized by the development of opportunistic infections (Mayo Clinic, 2024). An **opportunistic infection** is caused by bacteria or other organisms in the body that would not typically cause an infection in a healthy individual. However, in someone with AIDS, these infections not only develop, they can also become life-threatening because the person's immune system is unable to eradicate the pathogen effectively. In some cases, patients with AIDS also develop certain cancers. Some of the common infections and cancers seen in patients with AIDS include:

- candidiasis (oral thrush)
- Kaposi's sarcoma (Figure 22.9)
- non-Hodgkin's lymphoma
- *Pneumocystis carinii* pneumonia (PCP)
- tuberculosis
- varicella-zoster virus

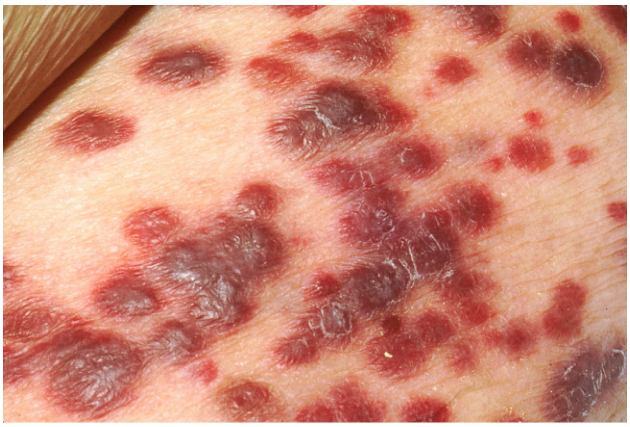

FIGURE 22.9 Kaposi's sarcoma is caused by cancer cells that manifest as nonpainful, red and purple lesions on the skin and mucous membranes. (credit: NIH: National Cancer Institute/Wikimedia Commons, Public Domain)

Assessment and Diagnostics

HIV can be difficult to detect and diagnose in the early stages because patients may be completely asymptomatic or have vague symptoms that resemble the flu. Although HIV diagnostic tests are usually fairly accurate, they cannot detect the virus immediately after infection. This highlights the need for community education about regular testing, especially for populations in which needle use for drugs or unsafe sexual practices are more common (CDC, 2022b). Table 22.3 lists the three main types of HIV tests.

Test	Description
Antibody tests	• They detect antibodies to HIV in the blood or saliva. • They can take up to 90 days after exposure to detect. • Blood tests can detect HIV sooner than an oral swab can.
Antigen/antibody tests	• They detect both antibodies to HIV and HIV antigens in the blood. • Tests of blood taken from a vein can detect HIV 18–45 days after exposure. • Tests of fingerstick blood samples can detect HIV 18–90 days after exposure.
Nucleic acid tests (NATs)	• They detect the actual virus in the blood. • They can detect HIV 10–33 days after exposure. • They are performed when exposure was recent or an individual shows early symptoms of HIV but received a negative antibody or antibody/antigen test.

TABLE 22.3 Types of HIV Tests (CDC, 2023)

Diagnostics and Laboratory Values

In addition to the diagnostic tests specific for HIV that were described in the previous section, there are several other laboratory values that are affected in patients with HIV. Because HIV is an immune disorder, the patient's WBC count will be abnormal (HIV.gov, 2023b). A normal WBC count is 5,000–10,000 cells/mm^3, whereas in patients with HIV, it is typically less than 3,000 cells/mm^3. The overall count is lower because the immune system is using up WBCs trying to fight off the virus. And because HIV specifically infects CD4 cells, their count will be exceptionally low. Consequently, CD4 count is one of the main laboratory tests used both to detect and monitor the progression of HIV. A normal CD4 count is 500–1,200 cells/mm^3, whereas in patients with HIV, it is less than 400 cells/mm^3. Once the CD4 cell count falls below 200 cells/mm^3, the patient is diagnosed with AIDS, the most advanced stage of HIV.

Another important laboratory value used to monitor the treatment and progression of HIV is the **viral load** test (CDC, 2022b). This blood test directly measures the amount of virus in the blood. A patient with high viral load has more virus in their body, indicating that treatment is not effective or the disease is progressing into more advanced stages. In contrast, an undetectable viral load indicates that treatment is effective and the patient cannot transmit the virus to others. However, it is important to note that an undetectable viral load does not mean the virus is not present in the blood. Rather, it is present in a sufficiently low amount that it cannot be detected or transmitted.

REAL RN STORIES

Nurse: Amelia, BSN
Years in Practice: Seven
Clinical Setting: Emergency department
Geographic Location: Inner city of a large metropolitan area in California

I was admitting Michael M., a 32-year-old male patient, who was being seen in the emergency department for unexplained sudden weight loss and a general feeling of illness. Michael reported that in addition to losing 10 pounds in the past month, he kept getting these "weird purple spotty rashes" on his arms and legs. He reported feeling more tired than usual and "not right."

Upon assessment, I noticed that he currently had purple pustules all over his arms and trunk. He was running a fever and looked generally unwell. While obtaining his medical and social history, he told me that he is a male having sex with another male. I began to worry that he has contracted HIV, because his sexual practices could put him at high risk. I asked him about using protection and he said that he uses condoms 90% of the time but not always. As soon as I asked about this, he said, "I have HIV, don't I? I know a lot of people who have it, and I knew it was just a matter of time for me." I reassured him that we don't know yet, but that I would relay this information to the treating clinician and get him tested immediately.

We did a rapid swab test and the results immediately came back positive for HIV. After testing his CD4 cell count, he was diagnosed with AIDS. He asked me, "How long have I been living with this?" and I didn't know how to respond at first. I ended up saying, "It's likely you have had it for awhile, but we can't be sure." Michael began to cry and asked me, "Could I have saved myself from AIDS if I had gotten treatment sooner?" I told him that we can never know for sure but the important thing is that he is getting care now. I said, "HIV treatments have come a long way in recent years, so there is hope that we can intervene and help you. We will do everything we can." The treating clinician then walked in and began to discuss the situation with him. The clinician recommended getting started on antiretroviral medications right away and taking medications to fight off the opportunistic infection Kaposi's sarcoma that Michael was currently infected with. Michael was agreeable to the plan but was distraught about the new diagnosis. I sat with him for an hour and just let him cry. Before leaving at the end of my shift, I provided him with the phone number of a support group for patients newly diagnosed with HIV and I gave him a hug and wished him well. I still think about Michael to this day and hope that he is still alive and well.

Nursing Care of the Patient with HIV

Nursing care of the patient with HIV requires knowledge of the disease, technical skills, and the ability to provide holistic care that is nonjudgmental. Patients with HIV are often scared and anxious about the diagnosis and disease

progression. Nurses not only provide medical care to these patients, they also provide emotional support and resources.

Recognizing and Analyzing Cues

Nurses should have a working knowledge of the signs and symptoms of HIV so cues can be recognized to aid with early diagnosis. This is difficult, however, because the presenting symptoms of HIV are usually vague (e.g., fever, rash, sore throat) and may be so mild that the patient does not even seek care. For patients who do seek care for presenting symptoms, the nurse must collect a thorough medical history, including assessing for risk factors for contracting HIV. If risk factors are noted, the nurse should advocate for the patient to be tested for HIV.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Patients with HIV often require a lot of nursing care, especially in the later stages of the disease. The nurse should conduct a full physical assessment and determine what symptoms are the priority. Per the CDC (2023), common nursing interventions for patients with HIV include

- alternating rest and activity periods for patients with severe fatigue
- checking laboratory values to monitor the progression of the disease and the effectiveness of treatment
- maintaining adequate nutritional status (e.g., offering high-calorie foods, administering enteral nutrition as needed)
- promoting skin integrity to prevent development of opportunistic infections
- providing regular oral care and other hygiene care to prevent infections
- providing the patient resources such as information about counseling or support groups
- relieving pain with pharmacologic and nonpharmacologic interventions

Evaluation of Nursing Care for the Patient with HIV

Patients with HIV are infected for life, so nurses will likely be continuously evaluating their health status. This is especially true in clinic settings where patients are cared for by the same provider for several years. It is important for the nurse to understand how to monitor the patient's condition and determine whether it is improving or requires a revised plan of care.

Evaluating Outcomes

First and foremost, the nurse should understand that monitoring the patient's viral load is the most accurate way to determine their health status and the effectiveness of medications. A viral load that begins to trend upward indicates that either the disease is progressing or the patient has not been taking medications as prescribed. This warrants further investigation and intervention by the nurse and care team. Outcomes that would indicate the patient's treatment is effective include a downward trending or undetectable viral load, as well as the absence of opportunistic infections, a healthy body weight, and patient demonstration of adequate coping skills.

CULTURAL CONTEXT

Providing Culturally Sensitive Care to the Patient with HIV

The Joint United Nations Program on HIV/AIDs aims to end the HIV epidemic by 2030. One of the key strategies for achieving this goal is nurse-led clinical programs. Such programs are run by nurses and involve providing home care for patients with HIV to ensure that patients adhere to antiretroviral treatments and receive adequate mental health support. Establishing trust, being nonjudgmental and compassionate, and listening have been pivotal for increasing antiviral compliance within the HIV population. Patients with HIV are at risk due to stigmatization, marginalization and having adequate access to care. Nurses have been an essential bridge connecting an at-risk population to treatment (Rouleau et al., 2019; Wood et al., 2018).

Medical Therapies and Related Care

Medical treatment of HIV focuses on decreasing viral load to slow progression of the disease, prevention and treatment of opportunistic infections, and symptom management. To decrease viral load, antiretroviral (ART) medications are used to block or slow viral replication. There are several different classes of ART medications, and most patients with HIV are prescribed at least two or three, each from a different drug class.

The various medication classes work on different parts of the HIV life cycle, so taking two different types increases the chance of slowing disease progression. It is important to note that many ART medications have unpleasant side effects, such as gastrointestinal upset or fatigue, so patients often skip medication doses or stop taking them altogether. This is dangerous not only to the patient's health but to others' because the virus is more likely to spread if it is not being controlled with medication.

When patients enter the later stages of HIV, they typically start developing frequent opportunistic infections. Patients with HIV should be counseled about the importance of maintaining good hygiene and avoiding crowds to limit their exposure to pathogens. Additionally, if they suspect they have an infection of any kind, it is important for them to seek care immediately; because their immune system is not functioning optimally, a "small" infection can quickly become life-threatening (Mayo Clinic, 2024).

Symptom management focuses on treating pain and depression, both of which are commonly seen in patients with HIV. These conditions are usually treated with pharmacologic interventions such as analgesics and antidepressants but may also be treated with nonpharmacologic options like counseling, meditation, and guided imagery. Additionally, patients with HIV often experience malnutrition and weight loss, so medical intervention may include use of appetite stimulants or administration of enteral feedings.

Hepatitis

A condition characterized by inflammation of the liver, **hepatitis** is often the result of a viral infection (WHO, 2019). There are several types, including hepatitis A, B, C, D, and E. Each of these types varies slightly regarding transmission and symptoms; types A, B, and C are the most common and, therefore, are the focus of this section. The World Health Organization (2024) estimates that more than 300 million people worldwide are currently living with chronic hepatitis that is either undiagnosed or untreated. The condition is a leading cause of **liver cirrhosis**, resulting in permanent scarring and fibrosis and in a significant number of deaths each year.

Pathophysiology of Hepatitis

Although the five hepatitis viruses differ, they can cause similar signs and symptoms because all have an affinity for a type of cell called a **hepatocyte** (liver cell) (). Hepatitis A can be contracted through ingestion, whereas types B and C are transmitted by parenteral contact (Table 22.4). It is possible for individuals to become long-term or chronic carriers of hepatitis viruses, which typically spread to the spleen, kidneys, and liver after entering the bloodstream. During viral replication, the virus infects hepatocytes. Inflammation occurs as the hepatocytes replicate and release more hepatitis virus.

Type	Transmission	Incubation Period	Prevention
Hepatitis A	Ingestion (e.g., fecal-oral route, contaminated food or water)	2–6 weeks	Vaccine is available and recommended for all children and high-risk groups (e.g., traveling to high risk area, food service workers, gay men, IV-drug users).
Hepatitis B	Parenteral, sexual contact	3–26 weeks	Vaccine is available and recommended for all children as part of standard vaccine schedule and boosters for adults, as needed, to maintain immunity.
Hepatitis C	Parenteral	2–33 weeks	No vaccine available. Prevention strategies include avoidance of using shared needles or razors and avoiding sexual contact with infected individuals.

TABLE 22.4 **Types of Hepatitis**

Hepatitis A

The hepatitis A virus is generally transmitted through the fecal-oral route, close personal contact, or exposure to contaminated water or food. Hepatitis A can develop after an incubation period of 15 to 50 days (the mean is 30 days) (CDC, 2024a). The infection is normally mild or even asymptomatic and usually self-limiting within weeks to

months. A more severe form, fulminant hepatitis, rarely occurs but has a high fatality rate of 70%–80% (CDC, 2024a). Vaccination is available and is recommended especially for children (between the ages of 1 and 2 years), those traveling to countries with higher risk, those with liver disease and certain other conditions, and drug users.

Hepatitis B

Hepatitis B has a mean incubation period of 120 days and is generally associated with exposure to infectious blood or body fluids such as semen or saliva (CDC, 2023a). Exposure to the virus can occur through skin puncture, across the placenta, or through mucosal contact, but it is not spread through casual contact such as hugging, hand holding, sneezing, or coughing, or even through breastfeeding or kissing (Tripathi & Mousa, 2023). Risk of infection is greatest for those who use IV drugs or who have sexual contact with an infected individual. Health-care workers are also at risk from needle sticks and other injuries when treating infected patients. The infection can become chronic and may progress to cirrhosis or liver failure; it is also associated with liver cancer. Vaccination is available and is recommended for children as part of the standard vaccination schedule (one dose at birth and the second by 18 months of age) and for adults at greater risk (e.g., those with certain diseases, IV-drug users, those who have sex with multiple partners). Health-care agencies are required to offer the hepatitis B vaccine to all workers who have occupational exposure to blood or other infectious materials.

Hepatitis C

Hepatitis C is often undiagnosed and, therefore, may be more widespread than is documented. It has a mean incubation period of 45 days and is transmitted through contact with infected blood (CDC, 2024b). Although some cases are asymptomatic or resolve spontaneously, 75% to 85% of infected individuals become chronic carriers (CDC, 2024b). Nearly all cases result from parenteral transmission, often associated with IV drug use or transfusions. The risk is greatest for individuals with a past or current history of IV drug use or who have had sexual contact with infected individuals.

LINK TO LEARNING

The CDC provides information about preventing needlestick injuries (https://openstax.org/r/77needleinjury) to limit the spread of hepatitis in health-care settings.

Clinical Manifestations

The clinical manifestations of each type of hepatitis vary slightly, as presented in Table 22.5. Figure 22.10 illustrates a characteristic symptom, jaundice.

Type of Hepatitis	Clinical Manifestations
Hepatitis A	• Usually asymptomatic • Vague symptoms when present (e.g., fatigue, loss of appetite, nausea)
Hepatitis B	• Abdominal pain • Clay-colored stools • Dark urine • Fatigue • Jaundice • Joint pain • Late-stage findings include confusion, coma, ascites, and GI bleeding • Loss of appetite • Nausea/vomiting
Hepatitis C	• Dark urine • Jaundice • Malaise • Nausea • Right upper-quadrant pain

TABLE 22.5 Clinical Manifestations of the Different Types of Hepatitis

FIGURE 22.10 Liver dysfunction caused by hepatitis may manifest as jaundice, a yellowing of the eyes and skin. (credit: Sheila J. Toro/ Wikimedia Commons, CC BY 4.0)

Assessment and Diagnostics

General laboratory testing for hepatitis begins with blood testing to examine liver function. When the liver is not functioning normally, the blood will contain elevated levels of alkaline phosphatase, alanine aminotransferase, aspartate aminotransferase, direct bilirubin, total bilirubin, serum albumin, serum total protein, and calculated globulin; the albumin to globulin (A/G) ratio will also be elevated. Some of these are included in a complete metabolic panel, which may first suggest a possible liver problem and indicate the need for more comprehensive testing. A hepatitis virus serological test panel can be used to detect antibodies for hepatitis viruses A, B, and C.

Nursing Care of the Patient with Hepatitis

Nursing care for patients with hepatitis will vary slightly depending on the specific type present, but care generally focuses on alleviating symptoms, preventing complications, and promoting recovery. Additionally, providing education is a major component of caring for patients with hepatitis to help prevent spread and complications (CDC,

2023a).

Recognizing and Analyzing Cues

Nurses play a vital role in recognizing and analyzing cues in patients with hepatitis to provide timely and effective care. First, nurses conduct thorough assessments, including obtaining a health history and performing a physical examination. The nurse will ascertain whether the patient is exhibiting signs and symptoms indicative of hepatitis, and if so, relay the information to the provider for further investigation. Second, the nurse will inquire about sexual practices and IV drug use to determine if the patient has any risk factors for the development of hepatitis. This should be done in a nonjudgmental manner to ensure truthfulness and allow the patient to feel comfortable talking about these sensitive subjects. Third, the nurse uses information obtained from laboratory tests to further investigate the patient's situation. Lastly, the nurse will recognize abnormalities in liver panel results and advocate for further testing, if indicated.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

After a diagnosis of hepatitis has been made, the nurse begins to generate solutions based on the type of hepatitis present. Significant nursing interventions are not likely required for hepatitis A, which is usually self-limiting. For patients with hepatitis B and C infections, some actions the nurse might take include

- administering prescribed antiviral medications
- alternating rest and activity periods to improve fatigue
- educating patients and families about hepatitis, including transmission routes, symptom management, and the importance of maintaining medication regimen and follow-up schedule, as well as vaccination education
- encouraging fluids to prevent dehydration
- providing emotional support and refer to counseling, as needed
- using proper hand hygiene, isolation precautions, and sharps (i.e., needle) safety strategies to prevent spread

Evaluation of Nursing Care for the Patient with Hepatitis

Evaluating nursing care provided to patients with hepatitis ensures that their needs are met and optimal health outcomes are being achieved. The nurse will monitor the patient over time to determine whether the current plan of care is effective or if it needs to be changed.

Evaluating Outcomes

To evaluate outcomes, the nurse will assess the patient's overall health status, monitor vital signs and laboratory values, and observe the patient's understanding of and compliance with their care plan. Assessment findings that would indicate the patient is improving include

- improved fatigue
- improvement in GI symptoms (e.g., nausea, vomiting)
- increased appetite
- normal skin tone (no jaundice)
- stable vital signs
- statements that demonstrate understanding of the disease and treatment plan

Medical Therapies and Related Care

For all types of hepatitis, supportive therapy including rest and fluids are indicated. Hepatitis A is typically self-limiting and does not require any specific treatment beyond supportive care. Hepatitis B may require specific treatment, especially if it is a chronic infection and/or the patient has a high viral load. If treatment is indicated, there are several antiviral medications that can be used, but it is important to note that there is no complete cure. For chronic cases of hepatitis C, treatment involves antiviral medications, such as sofosbuvir and daclatasvir. The goal of treatment with these medications is to completely rid the body of the virus, which can often be done by taking them for 12 weeks. In severe cases of hepatitis B or C that are refractive to treatment, a liver transplant may be necessary.

Fungal Infections

Fungal infections are caused by organisms that belong to the kingdom Fungi. A **fungus** is characterized by eukaryotic cells that contain cell walls and vacuoles but not chloroplasts and that typically grow as tubular, thread-like structures called hyphae. Fungi generally are immobile except for the spores they produce in their reproductive

stage, and they obtain energy by decomposing and then absorbing dead matter (Constantine et al., 2024). Although mushrooms may be the fungi with which we are most familiar, most fungal infections are caused by yeasts or molds.

Numerous fungi live on and within the human body, but they do not usually cause disease. When they do result in an infection, the areas most often affected are the skin and nails, but fungal infections can also spread to the mouth, throat, lungs, and urinary tract. One of the most common fungal infections is **oral thrush** (oral candidiasis), which the remainder of this section focuses on. It important to know that in patients who are immunocompromised, such as those with HIV or who are undergoing cancer treatment, fungal infections are more likely to be severe because the immune system is not functioning optimally (CDC, 2021).

Pathophysiology of Oral Thrush

Oral thrush most commonly affects young children, but it can affect all ages, especially in the presence of immunocompromise. It is caused by a fungus called *Candida albicans*, which is one of the fungi normally found in the mouth. Overgrowth of *C. albicans* leads to the clinical manifestations discussed in the next section.

Clinical Manifestations

The hallmark symptom of oral thrush is white, raised lesions in the mouth—most often on the tongue and cheeks (Figure 22.11). Other symptoms include (Cleveland Clinic, 2023a):

- difficulty or pain with swallowing
- dry mouth
- fever (if infection spreads)
- loss of taste
- mouth redness
- sore mouth and tongue

FIGURE 22.11 Oral thrush causes raised white lesions in the oral cavity. (credit: "Species identification of Candida isolates obtained from oral lesions of HIV infected patients" by V.P. Baradkar & S. Kumar/National Institutes of Health, CC BY 2.0)

Assessment and Diagnostics for Oral Thrush

Oral thrush can typically be diagnosed based on clinical manifestations alone. If the provider is unsure after visual inspection, a swab of the lesions can be done and sent to the laboratory for analysis. A swab is also recommended if medications have been started and are not working after several days. This might mean that the fungus is resistant to the medication, so a specific culture should be obtained to better tailor the medication regimen.

Diagnostics and Laboratory Values

For patients with oral thrush from an unknown cause, it is important to perform diagnostic tests for underlying

conditions such as HIV or lupus. Because oral thrush most often occurs with immunocompromise, the patient may have another underlying disorder. Additionally, blood samples can be taken to check for the presence of *Candida* in the bloodstream to aid in the diagnosis.

Nursing Care of the Patient with Oral Thrush

Oral thrush is mild and easily resolved in most cases, so it is most often treated in outpatient settings. However, some patients who are hospitalized for other problems may develop oral thrush secondary to an underlying issue, such as HIV or receiving cancer treatment, both of which suppress the immune system. Nursing care for the patient with oral thrush involves treatment of symptoms, promotion of good hygiene, and patient education. Appropriate hygiene includes brushing teeth at least twice a day, flossing at least once a day, and rinsing with warm saltwater.

Recognizing and Analyzing Cues

The nurse must be able to recognize the hallmark white lesions that occur with oral thrush and relay that information to the provider so timely intervention can be initiated. Additionally, the nurse should assess the patient for any significant symptoms or medical history that may indicate the cause of the fungal infection, such as a history of HIV or of corticosteroid use, both of which suppress the immune system, more easily allowing infection to occur.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

After determining that the patient is likely dealing with oral thrush, the nurse will begin planning care, which may include the following interventions:

- administer antifungal medications as ordered
- educate patient about importance of finishing antifungal medications as prescribed
- educate patient about oral hygiene
- encourage fluid intake to maintain hydration
- perform oral swab, if ordered by provider

Evaluation of Nursing Care for the Patient with Oral Thrush

The nurse evaluates the care provided to a patient with oral thrush through a combination of subjective and objective measures, including assessing symptoms, ensuring the patient adheres to prescribed medications, and monitoring for adverse effects.

Evaluating Outcomes

To evaluate the effectiveness of interventions, the nurse will first assess the patient's symptoms. Improvement in the oral lesions would indicate that medications and other interventions have been successful. If the lesions have not improved, a different medication may be required. The nurse should inquire about the patient's adherence to the medication regimen as well. Stopping antifungal medications too early can result in resistance of the fungus to medications, similar to what causes antibiotic resistance, as discussed in 22.3 Antibiotic Resistance. Lastly, the nurse should evaluate whether the patient is experiencing any adverse effects related to the medication or other interventions.

LIFE-STAGE CONTEXT

Dentures and Oral Thrush

Patients with dentures require extra attention to oral hygiene to prevent development of fungal infections. Management for these patients may include:

- Disinfecting dentures daily
- Removing dentures for at least 6 hours every night
- Soaking dentures in chlorhexidine and allowing to air dry
- Taking out dentures every time a topical antifungal medication is used

Medical Therapies and Related Care for Oral Thrush

The first-line therapy for mild, uncomplicated cases of oral thrush is topical antifungal medications such as nystatin, clotrimazole, or ketoconazole (Taylor, 2023). These are typically administered as a mouthwash, rinse, or lozenge.

For more severe cases, oral or IV antifungal medications may be required. In addition to pharmacologic intervention, the patient may also require dietary counseling. The patient should be educated about the importance of limiting sugar intake, because fungi tend to thrive in high-sugar environments, which may worsen the infection. It is also important to initiate treatment for the underlying cause of immunosuppression, which will decrease the risk of developing fungal infections in the future.

22.3 Antibiotic Resistance

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Describe the physiological mechanisms that contribute to antibiotic resistance
- Discuss the two most common diseases of antibiotic resistance encountered in clinical practice
- Define antibiotic stewardship
- Apply nursing interventions and associated therapies in the care of the patient with an antibiotic resistant infection

Imagine that you wake up one morning with a swollen, painful toe. You go to the clinic, where they swab your toe, diagnose a bacterial infection, and start you on an antibiotic. You take the antibiotic for the prescribed week but do not see any improvement in the infection. You go back to the clinic; after more tests, the provider determines the infection is caused by a microorganism that is not responsive to most medications, so you will have to be admitted to the hospital for administration of more potent IV antibiotics. If the infection does not improve while in the hospital, it could become life-threatening or even require invasive treatment such as amputation of the toe. What started as a simple toe infection has become potentially life-threatening because of **antibiotic resistance**. More and more, we are seeing bacterial infections that resist antibiotic treatment, highlighting the need for more education about the importance of adhering to prescribed medication regimens and other measures to prevent resistance from developing.

Pathophysiology of Antibiotic Resistance

There are several mechanisms by which bacteria can become resistant to antibiotics (CDC, 2022d). Some bacteria have outer membranes that antibiotics cannot penetrate. Others use pumps within their cell wall to remove the antibiotics after they enter the cell. Many bacteria also have their own internal enzymes that can be used to neutralize or destroy antibiotics. But the most significant driver of antibiotic resistance may be evolution. Bacteria can "remodel," meaning they can change their characteristics as they learn to evade antibiotic medications. Also, a typical dose of antibiotics does not kill every invading bacterium. Due to genetic variance, some bacteria are naturally able to withstand the drug; when these bacteria reproduce, they may pass this natural resistance to their offspring. As this process continues, subsequent generations become increasingly resistant; given enough time, a strain of the bacteria may develop that cannot be effectively treated by the antibiotic. This is why it is crucial that health-care providers maintain diligence in appropriate antibiotic prescribing. It is also important for individuals who are prescribed a course of antibiotics not to miss a dose or stop taking the medication before they complete all doses—doing so only ensures that more bacteria survive to pass on resistance to new generations.

Regardless of the specific cause or mechanism, more and more bacteria are developing resistance to the antibiotics our health-care system has come to rely on. Although new medications are becoming available, the process of researching and developing them takes years. During that time, countless generations of bacteria live, reproduce, and evolve better defenses.

Methicillin-Resistant *Staphylococcus Aureus*

A strain of bacteria that has become resistant to many antibiotics in recent years is called **methicillin-resistant *Staphylococcus aureus* (MRSA)**. MRSA infections are most commonly seen in patients who have been living in long-term care centers or have been admitted to the hospital for an extended time. MRSA typically occurs in wounds on the skin. Clinical manifestations include:

- fever
- purulent drainage
- red bumps and/or boils on the skin (Figure 22.12)
- warm skin

FIGURE 22.12 MRSA infection on the skin commonly manifests as a swollen red spot with purulent drainage. (credit: CDC/Public Health Image Library, Public Domain)

Though MRSA is usually confined to the skin, in some cases, it can spread deeper into the underlying tissues, bones, or organs, leading to severe systemic infection and sepsis if left untreated. Risk factors for the development of MRSA infection include (Mayo Clinic, 2022):

- HIV infection
- long-term hospitalization
- participation in contact sports
- residence in crowded environments (e.g., jail, dorms)
- residence in nursing home or long-term care facility
- treatment with invasive medical devices

Fortunately, there are still some combinations of antibiotics that can effectively treat MRSA, but, over time, these medications will likely become less effective.

Vancomycin-Resistant *Enterococcus*

A strain of enterococci bacteria that has become resistant to treatment with vancomycin, a common antibiotic, is called **vancomycin-resistant *Enterococcus* (VRE)**. Risk factors for infection with VRE include (Doganci et al., 2023):

- history of invasive surgical procedures or medical device placement
- long-term hospitalization
- previous use of vancomycin to treat an infection
- weak immune system (e.g., HIV, critically ill patients)

VRE can occur in many places in the body, but it is most commonly seen in the urinary tract, bloodstream, and wounds. It can be spread through contact with contaminated surfaces or from person to person, usually through contaminated hands. The best way to prevent the spread of VRE is through hand hygiene and frequent cleaning of surfaces; it is crucial to wear gloves if coming into contact with bodily fluids that may be contaminated with VRE. VRE can be treated with antibiotics other than vancomycin, but there are limited options available and, over time, the bacteria may become resistant to other antibiotics as well.

Antibiotic Stewardship

The term **antibiotic stewardship** refers to efforts to improve antibiotic prescribing strategies so infections are treated effectively without contributing to the development of antibiotic resistance. The CDC (2024) has developed a set of core elements that serve as guidelines for improving antibiotic use in practice. Some of the main takeaways from these guidelines include:

- ensuring patients take antibiotics as prescribed and finish the entire dose as ordered by the treating clinician
- not prescribing antibiotics for asymptomatic urinary tract infections
- prescribing the correct route, dose, and duration of antibiotic treatment regiments
- tailoring antibiotic therapy to specific organisms as opposed to immediately implementing broad-spectrum antibiotics

LINK TO LEARNING

For more detailed information about the CDC's guidelines, visit the Core Elements of Antibiotic Stewardship (https://openstax.org/r/77coreantibio) web page.

Medical Therapies for Antibiotic Resistance

Increases in antibiotic-resistant bacteria have highlighted an urgent need for research and development of new antibiotics. In recent years, several new antibiotics have become available, but pharmaceutical research is relatively slow to ensure safety of the medications in humans. For that reason, the development of new medications is not keeping pace with the development of antibiotic-resistant strains of bacteria. This highlights the need for strategies to improve the effectiveness of existing antibiotics. In many cases, this has involved changing the route of the antibiotic from oral to IV for quicker, more potent treatment. In other cases, this means altering the duration of therapy to eradicate the resistant bacteria more effectively. More examples to reduce antibiotic resistance include:

- Alternative antibiotics and combinations:
  - Broader-spectrum antibiotics: Use antibiotics with a broader spectrum of activity when appropriate, based on susceptibility testing.
  - Combination therapy: Use combination antibiotic therapy to enhance efficacy and prevent resistance development in cases where one antibiotic may help the other be more effective.
- Infection control measures:
  - Strict hygiene practices: Enhance infection control practices, including hand hygiene and environmental cleaning, to prevent the spread of resistant bacteria.
  - Isolation protocols: Use isolation techniques for patients with resistant infections to prevent transmission to others.
- Monitoring and surveillance:
  - Track resistance patterns: Monitor and track antibiotic resistance patterns in health-care settings to inform treatment decisions and policy adjustments.

Nursing Care to Avoid Antibiotic Resistance

One of the most important roles of the nurse in preventing antibiotic resistance is educating patients about taking their antibiotics as prescribed (National Institute of Allergy and Infectious Diseases, 2020). When patients stop a course of medication early, the bacteria are often not sufficiently treated. This allows any remaining bacteria to mutate and grow, contributing to their future resistance to antibiotic therapy. For this reason, nurses must emphasize the importance of finishing the entire course of antibiotics, even if the patient reports improved symptoms, and not sharing medications with others. Additionally, nurses can actively participate in antibiotic stewardship initiatives within their facility. This may simply mean adhering to best practices for using antibiotics and providing patient education, or it may involve active participation on a committee that is attempting to implement the initiatives on a specific unit or within the institution.

LIFE-STAGE CONTEXT

Older Adults and Antibiotics

Older adults are at a higher risk of infection because they have a less effective immune system, and they often benefit from antibiotic treatment (Soraci et al., 2023). However, older adults are also more likely to develop adverse drug events from using antibiotics because of polypharmacy (taking many other medications that may interact with the antibiotic), renal and liver dysfunction, and reduced adherence due to cognitive or functional issues. For this reason, antibiotics should be used with caution in this population, and patients prescribed antibiotics should be monitored closely for the duration of therapy.

22.4 Preventing Secondary Infections

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology of secondary infections and associated clinical manifestations
- Explain the common types of secondary infections encountered in the clinical setting
- Summarize important nursing interventions to prevent secondary infection
- Apply nursing concepts and plan associated nursing care for patients with *Clostridioides difficile* infection
- Describe the medical therapies that apply to the care of patients with *Clostridioides difficile* infection

A **secondary infection** arises after treatment of a different, primary infection (National Library of Medicine, 2023). Secondary infections (which are also called opportunistic infections) often result in a more complicated and prolonged recovery process. Most often, the pharmacologic treatment for the initial infection causes changes in the immune system that result in another infection. Two common examples of this include a person who develops a vaginal yeast infection after taking antibiotics for a bacterial infection and a person who develops bacterial pneumonia after being treated for a viral upper respiratory infection.

Clostridioides difficile Infection

One of the most common secondary infections is named for the bacterium ***Clostridioides difficile***, or *C. diff* for short (CDC, 2023b). This bacterium used to be called *Clostridium difficile*; however, it was reclassified in 2016 (Lawson et al., 2016). Normally located in the intestines, *C. diff* can cause inflammation of the colon (pseudomembranous colitis). This occurs most often after a patient takes antibiotics, which can alter the number of bacteria in the large intestine (Cleveland Clinic, 2023b). Other risk factors for the development of *C. diff* include:

- immunosuppression (e.g., HIV infection, cancer, organ transplant)
- older age (>65 years)
- previous *C. diff* infection
- recent hospitalization or residence in a long-term care facility

The hallmark clinical manifestation of *C. diff* infection is malodorous diarrhea (Mada et al., 2023). Additionally, patients may have fever, abdominal pain, and nausea.

Nursing Care of the Patient with *C. difficile* Infection

C. diff poses significant challenges in health-care settings, requiring diligent nursing care to manage symptoms, prevent transmission, and promote recovery. Nursing care for patients with *C. diff* encompasses a multifaceted approach, involving meticulous infection-control practices, symptom management, and targeted antibiotic therapy when warranted.

Recognizing and Analyzing Cues

Nurses play a key role in the initial detection of *C. diff*, especially in hospitalized patients. The nurse must be able to recognize subtle changes in the patient's condition that may be indicative of a *C. diff* infection. Specifically, the nurse should pay close attention to the patient's bowel movements, assessing for changes in consistency and signs of gradual development of diarrhea. If signs of *C. diff* are noted, the nurse should analyze the assessed cues by determining whether the patient has risk factors, such as recent antibiotic use, that increase the chance of developing *C. diff* infection.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

The nurse will recognize a recent history of antibiotic use as a major risk factor and hypothesize that the patient has developed a *C. diff* infection. Based on this information, the nurse prepares to initiate the following interventions:

- Stool sample collection: If *C. diff* is suspected, the nurse should send a stool sample to the laboratory for confirmation. While waiting for the results, the nurse should operate under the assumption that the patient has *C. diff* and use isolation precautions accordingly. If the sample comes back negative, isolation precautions can be discontinued.
- Ensure strict soap-and-water hand-hygiene regimens, not alcohol-based foams or gels, because the latter are ineffective at killing the organism. Handwashing should be completed before and after every patient encounter, not just the patient with *C. diff*. Nurses must thoroughly clean all surfaces objects with bleach

wipes.
- Implement isolation precautions: Patients with *C. diff* should be placed on contact precautions. Entering the patient's room requires gloves and a gown to prevent transmission to health-care personnel and other patients.
- Hydration and electrolyte management: Because patients with *C. diff* have a large amount of diarrhea, they are at increased risk of dehydration and electrolyte imbalances. The nurse should encourage oral fluids if tolerated and monitor the patient closely for signs that would indicate electrolyte imbalance.
- Symptom management: In some cases, the nurse may administer antidiarrheal or antiemetic medications, as ordered. For severe cases when the patient is immobile, a rectal tube may be ordered to contain the diarrhea and prevent skin breakdown.
- Educate patient and family: The nurse should educate the patient and family about measures to prevent the spread of *C. diff*. If the patient is prescribed antibiotics for *C. diff*, the nurse should educate the patient about the importance of finishing the course of medication to prevent antibiotic resistance.

Evaluation of Nursing Care for the Patient with *C. difficile* Infection

Evaluation of nursing care for the patient with *C. diff* involves assessing the patient's response to treatment, monitoring for resolution of symptoms, and preventing recurrence of infection. Examples include having the patient complete return demonstration of proper hand hygiene. Another way the nurse can evaluate the patient's and/or family's understanding and opportunity for more education is to have them explain why cleaning the home with bleach wipes is necessary.

Evaluating Outcomes

First, the nurse will assess the patient's response to treatment. If the patient has been prescribed a new antibiotic, the nurse should monitor for signs and symptoms that would indicate tolerance of the medication. If the patient reports GI distress or rash, the nurse should recognize those as potential signs of medication intolerance and alert the provider immediately. The nurse should monitor the patient's bowel movements closely, assessing for changes that would indicate the diarrhea is improving. After beginning treatment, the bowel movements should continue to become less liquid and more formed over the course of a few weeks. Lastly, the nurse should evaluate for potential risk factors for recurrence of infection. Specifically, the nurse should inquire about the patient's adherence to their antibiotic prescription to ensure the entire course was taken, which decreases their risk for developing a recurring infection.

Medical Therapies and Related Care for the Patient with *C. difficile* Infection

First and foremost, medical treatment for *C. diff* includes stopping the antibiotic that likely caused the infection. In many cases, the patient will develop *C. diff* a few days or weeks after finishing the antibiotics, so this is not possible. However, in cases where the patient is still taking an antibiotic that could have caused the infection, the antibiotic should be stopped immediately. The patient will then be prescribed different antibiotics for the *C. diff* itself: typically, metronidazole, vancomycin, or fidaxomicin. Mild cases can be treated with oral antibiotics, whereas more severe cases often require IV administration. For patients with recurring *C. diff* infections, colectomy or fecal transplant may be required. A **colectomy** is the removal of a portion of the colon, and a **fecal transplant** involves transferring medically processed stool from a healthy donor into the affected colon to restore healthy bacteria.

General Nursing Interventions for Preventing Secondary Infection

The priority intervention for preventing the development of secondary infections in general is the use of proper hand hygiene. Most secondary infections are transmitted through person-to-person contact, so washing the hands properly greatly reduces the risk of transmission. Additionally, nurses and other health-care personnel should always use gloves when caring for patients with secondary infections. This will help prevent hand contamination and subsequent transmission to other health-care workers or patients.

Although many secondary infections are related to pharmacologic interventions, some may develop secondary to placement of invasive tubes or lines. Critically ill patients often require intubation for mechanical ventilation, insertion of indwelling urinary catheters, or insertion of central lines. All these interventions involve placement of tubes in the body, increasing the risk for infection. For example, using mechanical ventilation greatly increases the risk of ventilator-associated pneumonia, and the use of urinary catheters and central lines increase the risk for catheter-associated urinary tract infection and central line–associated blood infection, respectively. Many hospitals

have started implementing committees that solely focus on the early discontinuation of these invasive tubes and lines. Extubating patients and removing indwelling lines as soon as possible greatly reduces the risk for developing secondary infections. This is significant because hospital-acquired secondary infections can negatively affect patient outcomes, increase length of hospitalization, and result in increased costs for the health-care institution.

Immunizations are another excellent strategy for prevention of secondary infections. For example, getting annual influenza and COVID-19 vaccines helps prevent initial infections that may require hospitalization, thus reducing the chance of developing a secondary infection. There are also several vaccines that prevent bacterial infections (e.g., meningococcal and pneumococcal infections). These reduce the chance of the patient requiring treatment with antibiotics, which, in turn, decreases the risk of developing secondary infections associated with antibiotic use, such as *C. diff*.

LINK TO LEARNING

Learn more about how to prevent secondary infections (https://openstax.org/r/77secondinfect) at this CDC webpage. The information focuses on opportunistic infections in the context of HIV, but many of the strategies are applicable to other kinds of secondary infection.

Summary

22.1 Infectious Process

- Infections are one of leading causes of death and disability globally. As we have learned from the COVID-19 pandemic, it is important to be prepared for outbreaks of infections.
- Nurses must remain knowledgeable about common infections, including how they spread and how best to treat them. Additionally, it is important for nurses to understand the underlying functions and mechanisms of the human immune system, so they may better care for patients with infections.
- The first step in the immune response is the body's recognition of an antigen. Infection results when a pathogen is able to evade the immune response.
- The immune response usually begins with the physical barriers that prevent pathogens from entering the body, destroy them after they enter, or flush them out before they can establish themselves as an infection. These barriers include the skin and mucus membranes.
- White blood cells, or leukocytes, are the primary cells of the immune system. They fight off pathogens to prevent infection. There are several specific types of leukocytes, including monocytes, lymphocytes, neutrophils, basophils, and eosinophils.
- The lymphatic system drains and filters various body fluids and returns them to the bloodstream. It includes organs such as lymph nodes, the spleen, and thymus, as well as bone marrow and a network of vessels and ducts.

22.2 Viral and Fungal Infections

- Viral infections are common and can be highly destructive, as evidenced by the 2020 COVID-19 pandemic. There are many kinds of viruses, but they all consist of a piece of DNA or RNA protected by a coating of protein. When a virus infects a host, it invades the host's cells, injects its genetic material, and uses the host's components to replicate and produce more viruses. This cycle risks destroying the host's cells and threatens their health and, in some cases, life.
- Humans can become infected by viruses by swallowing or inhaling them (via droplets), being stung or bitten by insects, or having sexual contact or intercourse; a mother can also transfer a virus to her fetus in utero or during birth. Most viral infections cause vague general symptoms including fatigue, muscle aches, and headache. Two of the most common viral infections today are COVID-19 (caused by the novel coronavirus) and influenza (caused by the influenza virus).
- Caring for patients with viral infections requires vigilant assessment skills, technical knowledge, and compassion. Nurses are on the frontlines of caring for these patients and must remain knowledgeable and informed about the most up-to-date clinical practices and interventions to provide care that ensures optimal patient outcomes. For serious infections, this may involve administering antiviral medications and providing respiratory support. When vaccines exist, it is also important for people to be vaccinated.
- Human immunodeficiency virus (HIV) was discovered in the 1980s. It is a retrovirus, meaning that infected cells can insert viral DNA into healthy host cells, permanently altering and infecting them.
- HIV targets specific cells of the immune system, particularly a type of WBC called CD4. As WBCs are destroyed, the immune system starts to fail. Eventually, the infected individual will no longer have a functioning immune system, putting them at risk for a variety of opportunistic infections and the development of acquired immunodeficiency syndrome (AIDS).
- HIV can be difficult to detect and diagnose in the early stages because patients may be completely asymptomatic or have vague symptoms that resemble the flu. In addition to several kinds of diagnostic tests, laboratory values such as viral load, total WBC count, and CD4 count, in particular, are key to diagnosing the disease and monitoring its progress.
- Nursing care for the patient with HIV or AIDS requires knowledge of the disease process, technical skills for monitoring viral load, and the ability to provide holistic, nonjudgmental care.
- Medical treatment for HIV is aimed at slowing the progression of the disease and controlling symptoms. Several classes of antiretroviral medications developed in recent decades have effectively turned HIV into a chronic, manageable condition rather than the death sentence it once was.
- Hepatitis is characterized by inflammation of the liver and often results from a viral infection. There are several types of hepatitis, each of which varies slightly regarding transmission and symptoms. Types A, B, and C are

the most common.

- Hepatitis A can be contracted through ingestion, whereas types B and C are transmitted by parenteral contact. Hepatitis C is often undiagnosed.
- Hepatitis A is usually asymptomatic or characterized by vague symptoms such as fatigue and nausea. Hepatitis C manifests as malaise, nausea, right upper-quadrant pain, dark urine, and jaundice. Hepatitis B has a wider range of clinical manifestations; late-stage findings include confusion, coma, ascites, and GI bleeding.
- General laboratory testing for hepatitis begins with blood testing to examine liver function. A hepatitis virus serological test panel can be used to detect antibodies to hepatitis viruses A, B, and C.
- Hepatitis remains a global health concern, highlighting the need for nurses to remain knowledgeable and prepared to care for patients with this kind of infection. Nurses must stay up to date with current research, advocate for vaccination, and promote safe practices to prevent disease transmission and limit complications.
- Collaboration with interdisciplinary teams, ongoing professional development, and a commitment to evidence-based practice are essential in nurses' efforts to mitigate the burden of hepatitis on individuals and communities worldwide.
- Fungal infections are caused by fungi. They are usually mild. However, in some cases, they can become life-threatening, especially in patients with underlying immunocompromise.
- One of the most common types of fungal infections is candidiasis, or oral thrush. Oral thrush causes white, patchy lesions in the mouth because of fungal overgrowth. It can be treated with topical antifungal medications or, in more severe cases, oral or IV antifungals.
- Nursing care for patients with oral thrush involves treatment of symptoms, promotion of adequate hygiene, and patient education.

22.3 Antibiotic Resistance

- There are several mechanisms by which bacteria can become resistant to antibiotics, including having impenetrable outer membranes, pumps that remove the medications, and the ability to remodel, or change in some way, so the medications are no longer effective.
- The two most common diseases of antibiotic resistance encountered in practice include infection by methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant *Enterococcus.*
- Antibiotic stewardship refers to efforts to improve antibiotic-prescribing strategies so that infections are treated effectively without contributing to the development of antibiotic resistance.
- One of the most important roles of the nurse in preventing antibiotic resistance is educating patients about taking their antibiotics as prescribed, because when patients stop a course of medication early, bacteria are often not sufficiently treated, which contributes to their increased risk of developing resistance to medications.

22.4 Preventing Secondary Infections

- A secondary infection arises after treatment of a different, primary infection, and often results in a more complicated and prolonged recovery process.
- One of the most common secondary infections is named for the bacterium *Clostridioides difficile* (*C. diff*).
- *C. diff* poses significant challenges in health-care settings, requiring diligent nursing care to manage symptoms, prevent transmission, and promote recovery.
- Nursing interventions for *C. diff* include stool sample collection, implementing isolation precautions, promoting hydration, managing electrolytes, and symptom management.
- Medical treatment for *C. diff* includes stopping the antibiotic that likely caused the infection and switching to a new antibiotic. In severe recurring cases, a colectomy or fecal transplant may be necessary.

Key Terms

acquired immunodeficiency syndrome (AIDS) latest and most severe stage of HIV, characterized by a low CD4 cell count and opportunistic infections

adaptive immune response relatively slow but very specific and effective immune response controlled by lymphocytes

antibiotic resistance increased ability of microorganisms to survive exposure to antibiotic medications

antibiotic stewardship efforts to improve antibiotic prescribing strategies to more effectively treat infections and

avoid the development of antibiotic resistance

antigen molecule on the cell surface of a pathogen that is recognized as an invader by the immune system

barrier defense skin, mucous membranes, and other components of the immune system that act instantaneously to prevent pathogenic invasion into body tissues

bone marrow spongy material located inside the long bones and responsible for the production and maturation of blood cells

Clostridioides difficile bacterium normally located in the intestines that can cause secondary inflammation of the colon, most often after taking antibiotics; also called *C. diff*

colectomy removal of a portion of the colon

contagious capable of spreading from one person to another

coronavirus type of virus characterized by a lipid envelope surrounded by proteins that jut out like spikes

deoxyribonucleic acid (DNA) self-replicating material that is present in all living organisms and the main constituent of chromosomes; the focus of genetics

fecal transplant transfer of medically processed stool from a healthy donor into a colon infected by *Clostridioides difficile* bacteria

fungus organism that belongs to the kingdom Fungi, characterized by eukaryotic cells that contain cell walls and vacuoles but not chloroplasts and that typically grow as tubular, thread-like structures called hyphae

hepatitis condition characterized by inflammation of the liver; often a secondary result of a viral infection

hepatocyte liver cell

host organism that has been infected by another organism or virus

human immunodeficiency virus (HIV) retrovirus characterized by the destruction of certain white blood cells, ultimately resulting in AIDS

immune system complex collection of cells and organs that destroy or neutralize pathogens that would otherwise cause disease or death

infectious disease caused by pathogenic microorganisms—agents such as bacteria, viruses, parasites, or fungi—that enter a human host, multiply, and cause infection that can spread via direct or indirect transmission

innate immune response rapid but relatively nonspecific immune response

leukocyte primary cell of the immune system that fight off pathogens to prevent infection; also called white blood cell

liver cirrhosis damage to the liver that results in permanent scarring and fibrosis

long COVID condition in which an individual has recovered from COVID-19 but continues to have symptoms and adverse effects for months after infection

lymph interstitial fluid once it has entered the lymphatic system

lymph node small, bean-shaped organs located along lymphatic vessels

lymphatic system system of vessels, cells, and organs that carries excess fluids to the bloodstream and filter pathogens from the blood

methicillin-resistant *Staphylococcus aureus* (MRSA) strain of *Staphylococcus* bacteria that has become resistant to many antibiotics

opportunistic infection infection that arises from pathogens that would not normally cause infection in a healthy individual but occur when the immune system is not functioning optimally

oral thrush infection caused by the fungus *Candida albicans*, which is found normally in the mouth but can become overgrown and pathological; also called oral candidiasis

pathogen agent such as a bacterium, virus, parasite, or fungus that enters a human host, multiplies, and causes infection

pathogenicity potential ability of a pathogen to cause disease in a susceptible host

retrovirus virus composed of a ribonucleic acid strand that can be turned into DNA and permanently inserted into a healthy cell

reverse transcriptase enzyme used to convert RNA into DNA

ribonucleic acid (RNA) nucleic acid that is present in all living cells and that carries instructions from DNA for controlling protein synthesis

secondary infection infection that arises after treatment for a different, primary infection; also called opportunistic infections

spleen secondary lymphoid organ that filters pathogens from the blood and removes damaged blood cells

thymus lymphatic organ whose main function is the production of a group of hormones that contribute to the development and differentiation of T lymphocytes

vancomycin-resistant *Enterococcus* (VRE) strain of enterococci bacteria that has become resistant to treatment with the antibiotic vancomycin

viral load amount of virus in the blood

virulence severity of an infectious disease

virus piece of genetic code, such as DNA or RNA, protected by a coating of protein and capable of self-directed movement and reproduction

Assessments

Review Questions

1. What is a common method pathogens use to evade the immune response?
    a. rapid multiplication in the bloodstream
    b. formation of antibodies
    c. continuous mutation
    d. direct attack on immune cells

2. What part of the immune system is nonspecific and acts quickly at the first sign of infection?
    a. leukocytes
    b. innate immune response
    c. adaptive immune response
    d. skin

3. What type of WBC is most involved in parasitic infections and allergies?
    a. monocyte
    b. lymphocyte
    c. eosinophil
    d. basophil

4. What acts as a barrier defense to protect the body from infection?
    a. hair follicles
    b. mucus membranes
    c. leukocytes
    d. bone marrow

5. What assessment finding would the nurse anticipate for a patient newly diagnosed with viral meningitis?
    a. constipation
    b. cough
    c. stiff neck
    d. sore throat

6. What is the most likely transmission route for hepatitis A?
    a. sexual contact
    b. hugging
    c. drinking contaminated water
    d. IV drug use

7. What laboratory value would be consistent with a diagnosis of HIV?
    a. WBC count of 5,400/uL
    b. CD4 cell count of 350 cells/mm^3
    c. red blood cell count of 5.0 cells/µL
    d. potassium level of 3.5 mEq/mL

8. The nurse is caring for a patient with oral thrush. What underlying condition should the nurse consider testing the patient for?
   a. COVID-19
   b. chronic obstructive pulmonary disease
   c. eczema
   d. lupus

9. What kind of patient would be at risk for developing a fungal infection?
   a. a patient with a history of prostate cancer
   b. a patient with HIV
   c. a patient with an indwelling urinary catheter
   d. a patient with a history of hypertension

10. How does HIV infect a cell?
   a. It injects its DNA into the cytoplasm.
   b. It injects its RNA into the nucleus.
   c. It injects its RNA into the cytoplasm, where it is converted to viral DNA.
   d. It injects its DNA into the nucleus, where it is converted to viral RNA.

11. What is an appropriate intervention for the nurse to perform when caring for a patient with oral thrush?
   a. monitoring vital signs every 30 minutes
   b. administering antibiotics as ordered
   c. encouraging fluid intake to maintain hydration
   d. providing a high-fat diet

12. What is the main rationale behind repositioning patients with lower respiratory infections every 2 hours?
   a. preventing skin breakdown
   b. minimizing virus transmission
   c. facilitating lung expansion
   d. increasing activity tolerance

13. What abnormal laboratory value would be consistent with a diagnosis of hepatitis B?
   a. decreased alkaline phosphatase level
   b. elevated alanine aminotransferase level
   c. elevated WBC count
   d. decreased direct bilirubin level

14. What is a likely treatment option for a patient newly diagnosed with HIV?
   a. a combination of antiretroviral medications
   b. surgery to remove the infected cells
   c. a course of antibiotics
   d. regular radiation and chemotherapy

15. What is the primary purpose of using personal protective equipment when providing care for patients with COVID-19?
   a. encouraging visitors to allow the patient to rest
   b. ensuring the patient remains in a clean environment
   c. providing privacy for the patient
   d. limiting spread of the virus to other patients and staff

16. What finding would indicate that interventions for treating a patient with HIV have been successful?
   a. CD4 cell count $<400/mm^3$
   b. negative for influenza

c. nondetectable viral load
d. WBC count of 14,000/mm^3

17. The nurse is caring for a patient who reports a history of IV drug use. What type of hepatitis is the patient most likely to have, given that information?
a. hepatitis A
b. hepatitis C
c. hepatitis D
d. hepatitis E

18. What assessment findings would indicate improvement in a patient's condition following interventions for COVID-19?
a. preference for prone positioning
b. increased oxygen requirements
c. decreased appetite and activity tolerance
d. stable vital signs

19. What is the role of pharmacologic interventions in treating COVID-19?
a. Paxlovid and Lagevrio are typically used for mild cases of COVID-19; Veklury is reserved for long-term management of symptoms.
b. Pharmacologic intervention is not necessary for mild cases of COVID-19, which usually resolve with rest and hydration.
c. All patients with COVID-19, regardless of severity, are prescribed Veklury intravenously as the first-line treatment.
d. The use of Paxlovid, Lagevrio, and Veklury is interchangeable and depends on patient preference.

20. What process contributes to bacteria becoming more resistant to antibiotics over time?
a. increased susceptibility to antibiotic effects
b. accelerated development of new antibiotics
c. enhanced communication between bacteria strains
d. adapting to evade or destroy antibiotics

21. What clinical manifestation is commonly associated with MRSA infection?
a. weight loss
b. new-onset cough
c. purulent drainage
d. frequent urination

22. What is a key principle emphasized in antibiotic stewardship guidelines developed by the CDC?
a. prescribing broad-spectrum antibiotics for all infections
b. administering antibiotics for all urinary tract infections
c. tailoring antibiotic therapy to specific organisms
d. allowing patients to stop antibiotic treatment when symptoms improve

23. The nurse is providing education about a newly prescribed antibiotic to a patient. What point about the prescription should the nurse emphasize in the teaching?
a. “You can stop taking your antibiotic when you feel better.”
b. “If your spouse develops the infection too, you can give them some of your medicine.”
c. “Keep any unused pills just in case you develop another infection later.”
d. “Make sure you take all the prescribed pills as directed.”

24. What is a key factor that increases the risk of adverse drug events from antibiotic use in older adults?
a. decreased susceptibility to infections

b. drug interactions due to polypharmacy
c. increased adherence to medication regimens
d. enhanced immune response to antibiotics

25. What is a factor that increases the risk for developing a *C.* diff infection?
a. consumption of probiotic-rich foods
b. regular exercise regimen
c. recent discharge from the hospital
d. history of seasonal allergies

26. What is an effective measure for preventing transmission of secondary infections in health-care settings?
a. routine use of antiviral medications
b. timely administration of broad-spectrum antibiotics
c. proper hand hygiene and glove use
d. placement of patients on airborne precautions

27. What is a priority nursing intervention when caring for a patient with suspected *C. diff* infection?
a. administering prophylactic antibiotics
b. encouraging bed rest to conserve energy
c. providing IV fluids for hydration
d. collecting a stool sample for laboratory testing

28. What is a primary consideration when implementing isolation precautions for a patient with *C. diff* infection?
a. wearing gloves and gown upon entering the patient's room
b. ensuring adequate ventilation in the patient's room
c. placing the patient in a negative-pressure isolation room
d. restricting all visitors from entering the patient's room

Check Your Understanding Questions

1. What are the main functions of the lymphatic system?
2. Identify the main parts of the lymphatic system and their respective roles in preventing or fighting infection.
3. For patients who present with vague symptoms, how can a viral infection be diagnosed?
4. What is the difference between HIV and AIDS?
5. What education should the nurse provide to a patient with dentures about preventing oral thrush?
6. Explain in your own words what an opportunistic infection is.
7. What are the main differences between how hepatitis A, B, and C are transmitted?
8. What is a primary method for preventing the spread of MRSA and VRE infections in the hospital setting?
9. What clinical manifestations should the nurse monitor for in a patient at risk for developing *C. diff* infection?

Reflection Questions

1. What do you think would happen if a patient's lymphatic system were not working optimally?
2. What do you think is the most difficult aspect of caring for patients with viral infections?
3. How would you stress the importance of getting a hepatitis vaccine to a patient who is wary of immunizations?
4. You are working with a student nurse who expresses concern about caring for a patient with HIV. The student nurse states, "I don't want to take care of this patient because I don't want to get infected." How would you respond?

5. How can nurses actively contribute to antibiotic stewardship efforts in health-care settings to promote appropriate antibiotic use and mitigate the development of antibiotic resistance?
6. What are some potential benefits that health-care institutions may experience when implementing strategies to prioritize the early discontinuation of invasive lines and tubes?

What Should the Nurse Do?

A 45-year-old male presents to the emergency department with symptoms of fever, cough, and dyspnea. He reports recent travel to an area with known cases of influenza. Upon examination, the patient's temperature is 102°F (38.9°C), respiratory rate is 24 breaths per minute, and oxygen saturation is 90% on room air. Auscultation reveals crackles in the lower lungs. The patient is tested for influenza and the result comes back positive.

1. Considering the patient's presentation and diagnosis of influenza infection, what factors may have contributed to his susceptibility to contracting the virus?
2. What are the highest priority nursing interventions at this time?
3. How might education and collaboration with other health-care professionals contribute to the management of this patient's care and the broader public health response to viral infections?

Competency-Based Assessments

1. Perform a literature search about a specific type of infection and determine how it uses mechanisms to evade the body's immune response.
2. Create an engaging handout for patients regarding the importance of obtaining annual influenza and COVID-19 vaccines.
3. Develop a patient brochure explaining risk factors and prevention strategies for the different types of hepatitis.
4. Develop a 15-minute in-service program for health-care staff about how to prevent secondary infections in the health-care setting.

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CHAPTER 23

Shock and Sepsis

FIGURE 23.1 Sepsis correlates with a high hospitalization rate and requires prompt intervention. (credit: Airman 1st Class Nathan Byrnes/U.S. Air Force, Public Domain)

CHAPTER OUTLINE

INTRODUCTION A nurse is caring for a patient who has been admitted to a medical-surgical unit for evaluation of weakness and shortness of breath. Upon admission to the unit, the patient manifested the following vital signs: oral temperature 98.6°F, pulse 88 and regular, respiratory rate 16, and blood pressure 120/82 mmHg. A chest x-ray, complete blood count (CBC), basic metabolic panel (BMP), and urinalysis have been obtained, with results pending.

The nurse reassesses the patient thirty minutes later and finds the patient to be disoriented to time, place, and person. Vital signs are as follows: oral temperature of 101.3°F, pulse of 118 and regular, respiratory rate of 22, and blood pressure of 88/60 mmHg. The nurse knows that such changes in vital signs are possible manifestations of shock, a life-threatening condition that causes cells and organs not to receive adequate perfusion. The nurse notifies the health-care provider, who prescribes interventions to restore homeostasis and prevent further complications.

Early identification of the development of shock and initiation of appropriate treatment is key to full patient recovery. By conducting prompt assessments and reporting concerning changes in vital signs, such as a drop in blood pressure and an increase in heart rate, nurses can have a significant positive impact on patient outcomes. In this chapter, you will learn how to prevent, recognize, and treat one of the most life-threatening conditions a patient

can encounter: shock.

23.1 Shock Overview

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Describe the pathophysiology and clinical manifestations associated with shock
- Discuss the stages of shock
- Identify the vital sign deviations associated with each stage of shock

To maintain a healthy state of equilibrium, or homeostasis, the cells and tissues in the body must receive adequate perfusion. When this does not happen, the body may go into a state of inadequate cellular perfusion known as **shock**. There are several different types of shock—including hypovolemic, septic, and neurogenic shock—all of which will be discussed in more detail throughout this chapter.

Pathophysiology of Shock

Physiologic alterations that occur with shock are the result of inadequate tissue perfusion. An adequate quantity and quality of blood—containing plasma, platelets, and red and white cells as well as essential substances such as sugars, oxygen, and hormones—are needed to support cell life. Normal perfusion requires coordinated efforts of the neurologic, cardiovascular, respiratory, and renal systems to maintain homeostasis. The ventricles of the heart must be strong enough to propel blood through the body. In addition, blood vessels must have adequate systemic vascular tone to support the flow of blood through the vascular system (see Figure 12.29); otherwise, blood flow can stagnate, causing blood to pool in the lower extremities (legs, ankles, feet). One of the key contributors to shock is vasodilation, which occurs as the body attempts to deliver more blood rich in oxygen, white blood cells, and platelets to the area of potential damage. Vasodilation creates a drop in blood pressure, and changes in vital signs reflect the body's attempt to compensate for decreasing pressure.

In the early stages of shock, the body compensates for decreased cell perfusion by activating the sympathetic nervous system to elicit the "fight or flight" response. This releases epinephrine, cortisol, and norepinephrine, resulting in the vasoconstriction of blood vessels, an increase in blood pressure and heart rate, and increased extracellular glucose to deliver energy to the cells. When these compensatory mechanisms are exhausted, circulatory failure and tissue hypoxia occur, ultimately leading to cell death and the destruction of vital organs.

Hemodynamic Monitoring

The study of the movement of the blood as it flows through cells, tissues, and organs is called **hemodynamics**. Knowledge of this field is needed to fully comprehend the pathophysiologic implications of shock. Hemodynamic monitoring of patients provides relevant data that help nurses assess tissue oxygenation, fluid balance, and the effectiveness of fluid and drug therapies. It also provides data on cardiac output (CO), which is the volume of blood the heart can pump to the vascular system in one minute; normal CO is 5 L/minute. A drop in cardiac output occurs with shock. Cardiac function is discussed in greater detail in Chapter 12 Cardiovascular System.

Hemodynamic monitoring can be performed via invasive or noninvasive methods.

- Examples of noninvasive hemodynamic monitoring include auscultation of the apical pulse and palpating the radial artery to obtain heart rate. Providers may use a sphygmomanometer, also known as a blood pressure cuff, to obtain blood pressure; they may also assess the patient's peripheral pulses, capillary refill time, skin, and warmth and check for the presence of edema.
- Invasive methods of hemodynamic monitoring devices allow for continuous measurements and are therefore more accurate than noninvasive monitoring devices. Invasive hemodynamic monitoring devices require the insertion of a catheter into the patient's vascular system. Examples include using a central venous catheter to measure:
  - **central venous pressure (CVP)**, a measure of the adequacy of blood volume within the vascular system; normal range is 8–12 mmHg
  - **mean arterial pressure (MAP)**, a measure of the average arterial pressure through one cardiac cycle; normally 70–100 mmHg
  - **cardiopulmonary pressure**, a measure of the pressure in the pulmonary artery, the lungs, or the right

atrium and ventricle of the heart, measured by a **pulmonary artery catheter** (a central arterial device used to measure cardiopulmonary pressure); normal cardiopulmonary pressure is 11-–20 mmHg, and elevated ranges result in pulmonary hypertension

These methods are discussed in greater detail in Chapter 35 Nursing Care of the Critically Ill Patient.

Blood pressure readings can be impacted by the stimulation of the sympathetic nervous system seen in shock. Consequently, MAP obtained from an arterial line is recommended for monitoring patients experiencing shock. This method has been found to best reflect the state of cell perfusion. Normal MAP readings are 70–100 mmHg. Inadequate cell perfusion is suggested if the MAP falls below 65 mmHg. Table 23.1 lists hemodynamic readings that indicate shock.

Hemodynamic Reading	Normal Range	Effect of Shock State
Cardiac output (CO)	5–6 L/minute	Decreased CO
Mean arterial pressure (MAP)	70–100 mmHg (The goal for critically ill patients is to keep MAP above 65 mmHg.)	Decreased MAP
Central venous pressure (CVP)	8–12 mmHg	Decreased CVP

TABLE 23.1 Hemodynamic Readings Indicative of Shock

Stages of Shock

Shock has four stages: the initial stage followed by the compensatory, progressive, and refractory stages. With progression to each stage of shock, cellular perfusion is further decreased, resulting in irreversible cell changes and death. Timely detection and intervention in the early stages of shock may prevent destruction of cells and organ systems.

Initial Stage

In the **initial stage** of shock, the body responds to hypotension with stimulation of the sympathetic nervous system (SNS) and the release of epinephrine and norepinephrine. Blood vessels constrict and the heart rate increases. Though overt clinical manifestations are not apparent in the initial stage, changes are taking place at the cellular level as cell metabolism converts from aerobic metabolism to anaerobic metabolism, producing an increase in lactic acid.

More subtle changes may also be detected in this stage. Decreased perfusion to the brain can result in agitation, and decreased flow to the kidneys can result in a slight decrease in urinary output. Blood pressure is usually normal or slightly elevated due to stimulation of the sympathetic nervous system.

Vital signs in the initial stage of shock include:

- normal to slightly elevated blood pressure
- normal to slightly elevated heart rate
- normal respiratory rate
- normal temperature

Compensatory Stage

If adequate cell perfusion is not restored, shock progresses to the **compensatory stage**. In this stage, there is a noticeable drop in blood pressure; the body responds by stimulating baroreceptors of the carotid and aortic bodies (Figure 23.2). These baroreceptors respond to changes in pressure or stretch in blood vessels within the aortic arch and carotid sinus. Decreased blood pressure causes decreased signal output from the baroreceptors, leading to disinhibition of the central sympathetic control sites and decreased parasympathetic activity with the final effect of an increase in blood pressure.

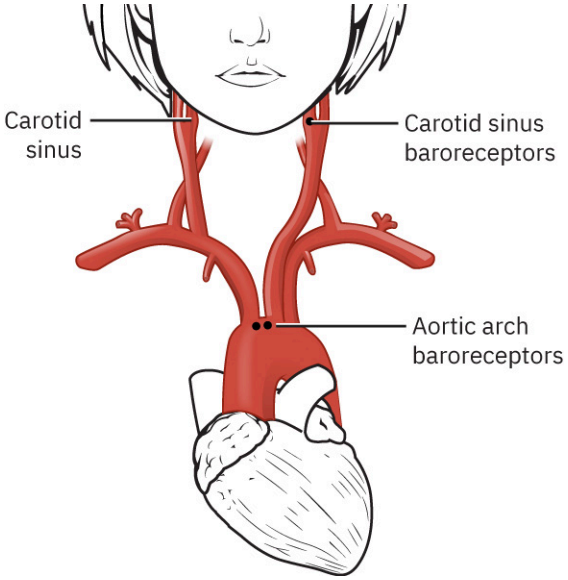

FIGURE 23.2 Carotid sinus baroreceptors and aortic arch baroreceptors respond to low blood pressure by decreasing parasympathetic activity, which increases vascular tone, heart rate, and blood pressure. (credit: modification of work from *Anatomy and Physiology 2e*. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

In the compensatory stage, norepinephrine and epinephrine are released in response to low blood pressure, resulting in constriction of blood vessels, increased heart rate, and increased cardiac output. Serum glucose elevates in the stress response. Blood flow is diverted to the vital organs—particularly the brain and heart—to preserve life. As a result, other body systems receive even less perfusion. The kidneys respond to decreased blood flow by releasing renin and activating the **renin-angiotensin-aldosterone system (RAAS)**, a critical regulator of blood volume, electrolyte balance, and blood vessel tone. As part of this system, the liver releases angiotensin and the lungs release angiotensin-converting enzyme (ACE). Renin and angiotensin combine to form angiotensin I, which combines with ACE to form angiotensin II. Angiotensin II then stimulates the adrenal gland to secrete aldosterone, which causes constriction of blood vessels and resorption of water and sodium in the kidney. The overall effect of RAAS is constriction of blood vessels and retention of fluid, increasing blood pressure.

LINK TO LEARNING

Review this web page for more information on the RAAS response (https://openstax.org/r/77RAAS) during the compensatory stage of shock.

During the compensatory stage, all body systems experience hypoxia, which initiates further disruption to each body system. Inadequate perfusion to the lungs causes disruption to the endothelial lining of the alveolar capillary membrane, increasing permeability. The result is fluid accumulation in the alveoli, leading to the development of pulmonary edema, respiratory failure, and possibly acute respiratory distress syndrome (ARDS), as shown in Figure 23.3.

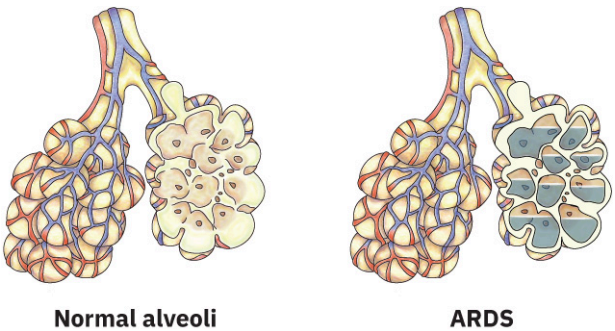

FIGURE 23.3 Shock can cause the development of acute respiratory distress syndrome (ARDS), as alveoli in the lungs fill with fluid. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Vital signs in the compensatory stage of shock include:

- low blood pressure
- high heart rate
- normal to slightly elevated respiratory rate
- normal temperature
- cool skin
- decreased urine output

If the cause of shock is identified and appropriate interventions are implemented, the situation is reversible with no permanent damage to cells and tissues. If the cause of shock is not corrected, the next stage of shock begins.

Progressive Stage

In the **progressive stage** of shock, profoundly decreased cellular perfusion results in a significant increase of capillary permeability, causing protein and fluid to leak out of the vascular system into the interstitial space. This massive shift of fluid further disrupts cell perfusion. To fully understand this process, it is helpful to review the three spaces where fluid exists in the body (Figure 23.4):

- The intracellular space consists of fluid in the cells.
- The intravascular space consists of fluid within the blood vessels.
- The interstitial space consists of fluid in the space between tissues.

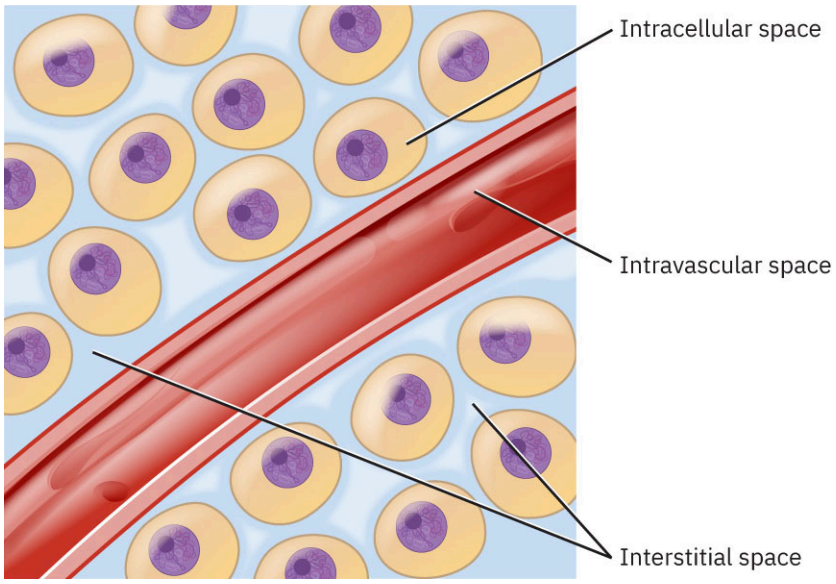

FIGURE 23.4 Fluids exist in three distinct spaces in the body. (credit: modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

A balance in these three spaces is needed for homeostasis. Loss of fluid or an overabundance of fluid in any of these spaces impairs cell function. In the progressive stage of shock, substantial capillary permeability results in dramatic shifts in fluid from the vascular space into the interstitial space, causing hypotension and electrolyte imbalance that further impair cell perfusion. All systems experience cellular hypoxia, resulting in the development of metabolic acidosis. The patient experiences pallor and cool clammy skin, as well as altered levels of consciousness because of poor perfusion to the brain. The hypoxic heart may develop irregular tachydysrhythmias, myocardial ischemia, or myocardial infarction. Complete deterioration of the cardiovascular system is possible. Additionally, the significant increase of capillary permeability results in fluid movement from the capillaries of the lung into the alveolar space, causing impaired diffusion of oxygen and carbon dioxide as well as pulmonary edema, bronchoconstriction, decreased lung capacity, tachypnea, increased crackles, increased work of breathing, respiratory acidosis, and ARDS.

Insufficient perfusion to the gastrointestinal system can result in disruption of the protective barrier of the stomach, resulting in ulceration, possible mitigation of bacteria from the gastrointestinal track, and inadequate absorption of nutrients. The renal system undergoes changes due to cellular hypoxia and further deteriorates if treatment

includes the use of nephrotoxic drugs. Urine output decreases to a rate of less than 30 mL/hour, and blood urea nitrogen (BUN) and creatinine (Cr) increase. Metabolic acidosis develops due to the buildup of waste products. Hypoperfusion of the liver results in the development of jaundice, elevated liver markers, decreased immune function, and impaired homeostasis. However, if treatment is initiated in a timely manner and the body responds, there is still a chance of recovery.

Changes by body system or organ in the progressive stage of shock are summarized in Table 23.2.

Body System	Effect
Heart	Irregular tachydysrhythmias Myocardial ischemia Myocardial infarction
Neurologic	Change in level of consciousness
Lungs	Increased alveolar capillary membrane permeability Fluid in alveolar space Impaired oxygen and carbon dioxide diffusion Respiratory acidosis Pulmonary edema Bronchoconstriction/decreased lung capacity Tachypnea Increased crackles Increased work of breathing ARDS
Gastrointestinal system	Gastric ulceration Mitigation of gastric bacteria Inadequate absorption of nutrients
Renal system	Urine output below 30mL/hour Increased BUN Increased creatinine Metabolic acidosis
Hepatic	Jaundice Elevated liver markers: ALP (alkaline phosphatase), ALT (alanine transaminase), AST (aspirate aminotransferase), GGT (gamma-glutamyl transferase) Decreased immune function Impaired homeostasis
Electrolytes	Imbalanced electrolytes
Vascular system	Significant third spacing and peripheral edema Significant vasodilation Hypotension
Skin	Pallor Cool, clammy

TABLE 23.2 Changes in Progressive Stage of Shock by Organ or Body System

Vital signs in the progressive stage of shock include:

- increased heart rate
- decreased blood pressure
- increased respiratory rate
- hypothermia
- cool skin and weak distal pulses
- decreased urine output

Refractory Stage

The **refractory stage** of shock is characterized by extreme dysfunction of cellular processes in multiple body systems. The significant increase in capillary permeability, anaerobic metabolism, lactic acid buildup, metabolic acidosis, tachycardia, and profound hypotension continues despite treatment. Cells, tissues, and organ systems shut down because of irreversible cell and organ damage, and recovery is unlikely.

Vital signs in the refractory stage of shock include mottled skin, characterized by a bluish-red lace pattern under the skin, caused by the pooling of deoxygenated blood. Other manifestations include:

- continued low blood pressure despite treatment
- increased tachycardia
- increased respiratory rate
- low to no urine output
- cool skin
- weak to absent peripheral pulses
- low temperature

Table 23.3 summarizes vital sign changes in each stage of shock.

Stage	Initial	Compensatory	Progressive	Refractory
Blood pressure	Normal	Low	Low	Low despite treatment
Heart rate	Normal	Elevated	Elevated	Elevated
Respiratory rate	Normal	Elevated	Elevated	Elevated
Urinary output	Normal	Low	Low	Low to zero
Temperature	Normal	Normal	Low	Low
Skin	Normal	Cool	Cool	Cool
Distal pulses	Normal	Normal	Weak	Weak to absent

TABLE 23.3 Clinical Manifestations of Shock Stages

Multiorgan Failure

Multiorgan dysfunction syndrome (MODS), or **multiorgan failure (MOF)**, results from prolonged cellular hypoperfusion. Figure 23.5 illustrates the organ systems that may be affected. It is most often a result of hypovolemic and septic shock. The prognosis for MOF/MODS is dependent upon the number of organs affected and the body's response to treatment. Older patients and patients with multiple comorbidities are at a higher risk for MOF/MODS.

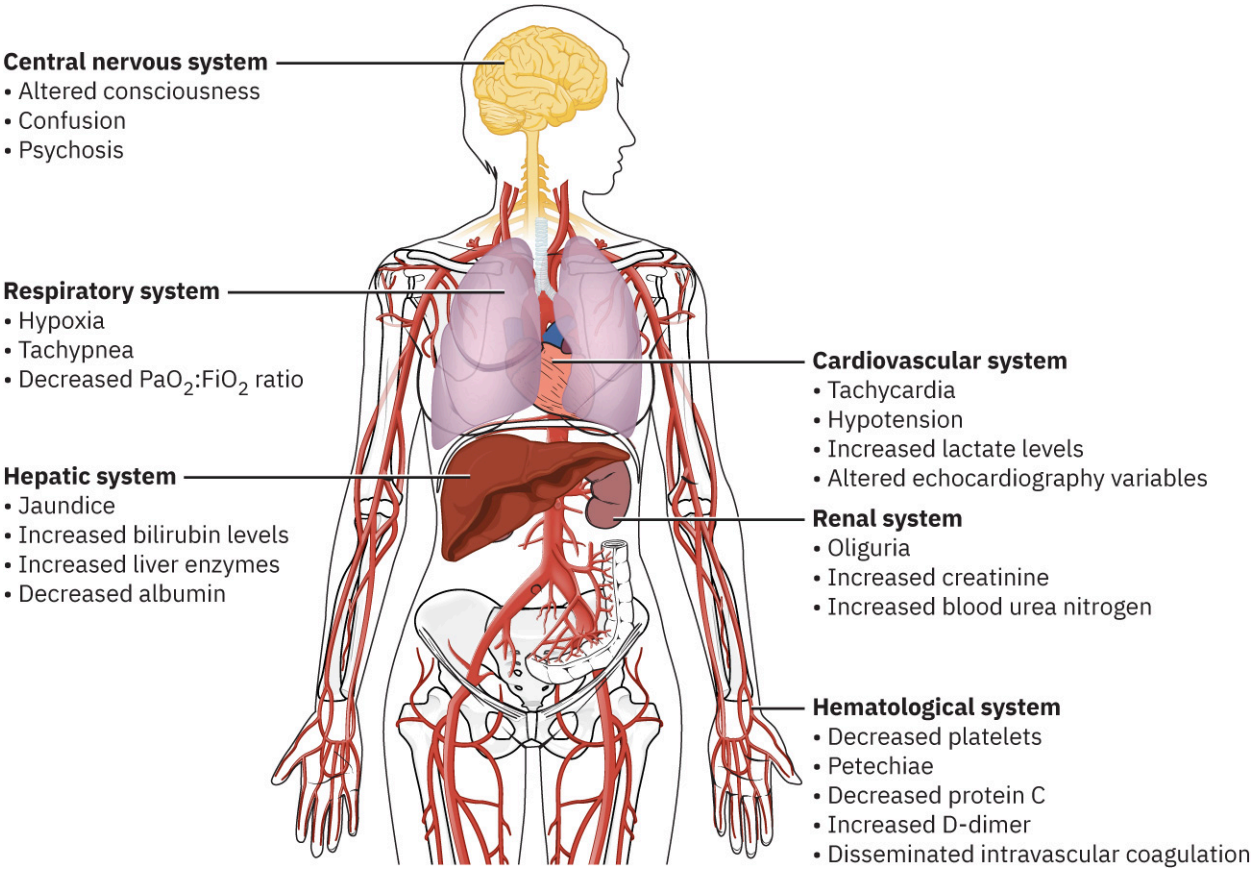

FIGURE 23.5 Multiorgan failure can manifest in many body systems. (credit: modification of work from *Anatomy and Physiology 2e*. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

A normal inflammatory response to decrease cell perfusion and cellular injury facilitates healing. Part of the normal inflammatory response includes the release of cytokines, which are protein substances that regulate the inflammatory response. MOF and MODS results when the inflammatory response extends beyond the area of injury throughout the body for a prolonged period of time. The development of MOF/MODS in sepsis has been linked to the release of cytokines. This causes an exaggerated inflammatory response throughout the body, leading to a cascade of events that can ultimately result in cell hypoxia, cell death, and organ failure.

LINK TO LEARNING

This video describes the types of shock (https://openstax.org/r/77shock) as an NCLEX review.

23.2 Hypovolemic Shock

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations of hypovolemic shock
- Describe the diagnostics and laboratory values for hypovolemic shock
- Apply nursing concepts and plan associated nursing care for patients with hypovolemic shock
- Evaluate the efficacy of nursing care for patients with hypovolemic shock
- Describe the medical therapies that apply to the care of patients with hypovolemic shock

The potentially life-threatening condition of hypovolemic shock results from a critical loss of volume in the intravascular space, which increases metabolic demand on the body. If the cause of volume loss is identified and appropriate treatment is initiated early, there is a chance of complete recovery (Taghavi, 2023). This module will review the specific pathophysiological causes of hypovolemic shock.

Pathophysiology of Hypovolemic Shock

There are two types of hypovolemic shock: absolute hypovolemia and relative hypovolemia. Commonly referred to as massive real fluid loss from the body, **absolute hypovolemia** is loss of blood that is visible. It is associated with:

- external hemorrhage
- internal hemorrhage
- gastrointestinal fluid loss from uncontrolled vomiting or diarrhea
- drainage from a fistula, an abnormal or surgically created passage between a hollow or tubular organ and the body surface
- hormonal abnormality not related to diabetes mellitus, such as diabetes insipidus, a pathologic process in which the body produces ineffective antidiuretic hormone, causing massive urinary output
- hyperglycemic induced diuresis
- diuresis

Commonly referred to as internal bleeding or third spacing of fluids rather than true loss of body fluids, **relative hypovolemia** is a volume adjustment within the body from the vascular space to the interstitial space, often called the third space. These episodes may be slow and incidental, but they can progress to hemorrhage depending on the mechanism of bleeding. Relative hypovolemia is associated with:

- bowel obstruction
- burn injury
- ascites, a condition in which fluid collects in the abdomen (Figure 23.6)
- long bone fracture
- ruptured spleen
- hemothorax, the accumulation of blood within the pleural space
- severe pancreatitis
- sepsis

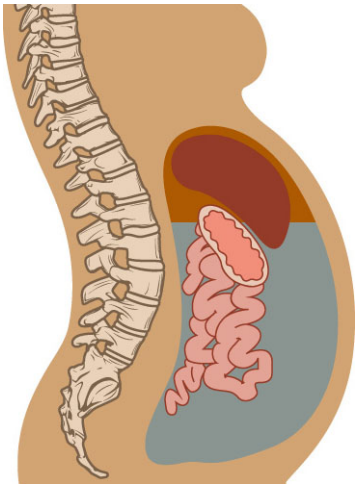

FIGURE 23.6 Ascites is a condition in which the abdominal cavity fills with fluid that shifts from the intravascular to the interstitial space, resulting in hypovolemia (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

In hypovolemic shock, lack of sufficient vascular volume causes decreased cell perfusion and hypoxia. To compensate, the sympathetic nervous system is activated to provide more blood flow to cells. Heart rate and contractility increase, as does the systemic tone of blood vessels. Blood pressure is normal to slightly elevated in the early phase of hypovolemic shock. When the body can no longer compensate, however, the patient develops hypotension and tachycardia with decrease of urinary output. The kidneys respond to decreased perfusion by retaining fluid to increase vascular volume.

The body is unable to maintain homeostasis in hypovolemic shock. In this state, the selective permeability of the cell membrane—key to maintaining optimal conditions for enzyme action and cell function, including aerobic metabolism—is lost due to hypoperfusion. Cellular metabolism converts to anaerobic metabolism because sufficient oxygen is not available at the cellular level. As a result, there is a buildup of lactic acid. In homeostasis, the liver is

able to maintain normal lactic acid levels of less than 2 mmol/L. A combination of anaerobic metabolism causing increased lactic acid and a hypoperfused liver unable to clear the substance from the body can lead to lactic acidosis.

Continued hypoperfusion of cells leads to the movement of blood to vital organs of the body, particularly the brain and heart. Other organ systems experience even greater hypoperfusion because of this. As the hypovolemic shock state progresses, acidosis does not respond to treatment, cardiac output is further decreased, cell perfusion further deteriorates, and a hypoxic state exists throughout the body. Cells and tissues die, and multiple organ failure develops. Risk factors for hypovolemic shock include recent surgery, major blood loss, open wounds, draining fistulas, diuretic use, hyperglycemia, hyperthermia, and uncontrolled vomiting or diarrhea.

Clinical Manifestations

Clinical manifestations of hypovolemic shock depend on the severity of the hypovolemia. One of the earliest manifestations is a change in mental status, most commonly anxiety caused by decreased perfusion to brain cells. Other classic manifestations of hypovolemic shock include increased heart rate, decreased blood pressure, increased respiratory rate, decreased urinary output, and cool clammy skin.

Patients experience tachycardia as their heart attempts to compensate and provide more blood flow to cells. Hypotension is the result of low vascular volume. Respiratory rate and depth increase to provide more oxygen to cells and rid the body of carbon dioxide as the cellular metabolism switches from aerobic to anaerobic. The kidneys respond to low vascular volume by retaining fluid, causing urine output to drop. The skin is cool due to the diversion of blood to the vital organs.

Assessments and Diagnostics

Symptoms of hypovolemic shock vary in severity based on the fluid volume lost. While some symptoms are sudden, others are progressive and can lead to cell death and organ destruction. Early identification and prompt treatment of hypovolemic shock can be accomplished through thorough, timely, and accurate nursing assessments.

An initial patient assessment of mental status followed by vital signs will provide the nurse with direction as to whether a more focused assessment of body systems is needed. Patients with hypovolemic shock are often confused or agitated because of the lack of blood flow to the brain. Vital signs often include decreased blood pressure, tachycardia, and tachypnea when compared with their baseline status. Orthostatic hypotension may also be present. This condition is characterized by a drop of at least 20 mmHg in systolic blood pressure and 10 mmHg in diastolic pressure within three minutes of standing up from a sitting or lying position. Patient safety is a priority when assessing orthostatic hypotension. The nurse should assist the patient in position changes, encourage the patient to gently rise to a standing position from a supine or sitting position, and encourage the patient to dangle on the side of the bed before standing.

Physical assessment may reveal classic manifestations of dehydration, including dry mucous membranes and a decrease in skin turgor. The patient may also complain of thirst and headaches. Peripheral pulses may be weak or absent and capillary refill time may be extended due to low vascular volume. It is also important to assess urine output because it is a good indicator of perfusion to the kidney. A rate of 30 mL of urine per hour is reflective of adequate kidney perfusion. The nurse should closely monitor output trending down. Lower urinary output values should be communicated to the health-care team, as adjustments to the plan of care may be necessary.

Table 23.4 reviews manifestations of early and advanced hypovolemic shock.

Type of Symptom	Early Hypovolemic Shock	Advanced Hypovolemic Shock
Blood pressure	Slightly low to normal or slightly elevated	Low blood pressure
Heart rate	Normal to slightly high	High heart rate
Respiratory rate	Normal to slightly high	High respiratory rate

TABLE 23.4 Manifestations of Hypovolemic Shock

Type of Symptom	Early Hypovolemic Shock	Advanced Hypovolemic Shock
Urine output	Normal to slightly low	Low (less than or equal to 30 mL/hour)
ABG	Normal with possible lower oxygen level	Evidence of hypoxia and metabolic acidosis
Capillary refill time	Normal to slightly long	Prolonged capillary refill time

TABLE 23.4 Manifestations of Hypovolemic Shock

Diagnostics and Laboratory Values

There is not one specific diagnostic or laboratory test to determine the presence of hypovolemic shock; however, low blood pressure is the best indicator, followed by low urinary output. A panel of blood work is drawn to serve as a baseline from which to plan appropriate care and evaluate the effectiveness of treatment. Additional diagnostic testing may include radiologic imaging, endoscopy, or exploratory surgery to identify and stop the source of volume loss.

Analysis of the complete blood count (CBC) in hemorrhagic shock may indicate low red blood cell (RBC) counts with a drop in hematocrit and hemoglobin. These values may also be low due to the dilutional effect of high-volume fluid resuscitation used to treat hypovolemic shock.

Impaired perfusion to the kidney results in an increase in the markers of renal function such as blood urea nitrogen (BUN) and creatinine (Cr). Creatinine is considered the more accurate indicator of kidney function, as BUN may be affected by muscle damage from trauma or surgery.

Activation of the sympathetic nervous system causes an increase in serum glucose. Poor perfusion to the liver may cause an increase in liver markers SGPT (serum glutamic-pyruvic transaminase) and SGOT (serum glutamic-oxaloacetic transaminase), also known as ALT (alanine transaminase) and ALP (alkaline phosphatase). Fluctuation of sodium levels occurs as the body is rehydrated. Potassium levels may increase as the nutrient is released from damaged cells. Lab findings may include lactic acidosis or metabolic acidosis due to the accumulation of waste products.

Table 23.5 reviews key findings of hypovolemic shock.

Test	Findings in Hypovolemic Shock	Rationale
Red blood cells (RBC)	High RBC hemoconcentration Low RBC hemodilution	Hemoconcentration due to loss of plasma Hemodilution due to fluid resuscitation
Hematocrit (Hct)	High hemoconcentration dehydration Low volume overload hemodilution	Hemoconcentration due to loss of plasma Hemodilution due to fluid resuscitation
Hemoglobin (Hgb)	High hemoconcentration dehydration Low volume overload hemodilution	Hemoconcentration due to loss of plasma Hemodilution due to fluid resuscitation
Blood urea nitrogen (BUN)	High	Hypoperfusion to kidney

TABLE 23.5 Findings of Hypovolemic Shock

Test	Findings in Hypovolemic Shock	Rationale
Creatinine (Cr)	High	Hypoperfusion to kidney
Liver markers	High	Damage to liver cells from hypoperfusion
Serum glucose	High	Stress response
Urine specific gravity	High urine specific gravity Low urine specific gravity	Dehydration from loss of fluids Fluid resuscitation
Sodium (Na) fluctuation	High Low	Fluctuations based on fluid status
Potassium (K)	High	As cell damage occurs, potassium migrates from inside to outside of the cell
Lactate	High	Anaerobic metabolism
Acid base status	High acidic	Accumulation of metabolic waste products

TABLE 23.5 Findings of Hypovolemic Shock

Nursing Care of the Patient with Hypovolemic Shock

Nursing care for patients with hypovolemic shock focuses on identifying the source of vascular fluid loss, stopping the fluid loss, restoring volume, and supporting all body systems as needed. If an overt hemorrhage is present, priorities of care include stopping the bleeding, which may be achieved by applying direct pressure or cold applications or elevating the site, as appropriate. In severe cases, patients may require cold saline flushed into indwelling tubes—for example, patients with presumed gastrointestinal bleeding may need a nasogastric tube. The patient may also require surgery to stop the loss of volume. Preoperative nursing interventions include providing information and emotional support for the patient and their family, ensuring that all preoperative data have been accumulated, and maintaining the patient's baseline hemodynamic status. The nurse may also need to adjust medications, schedule diagnostic tests, and complete a clinical handover and transfer of professional responsibility and accountability.

Other top nursing priorities include inserting and maintaining intravenous access devices to supply potential blood and blood products or other fluids. The type and extent of volume loss dictate the quantity and type of volume required. For example, if a patient is bleeding due to toxic effects of blood thinners, patients may require platelets or fresh frozen plasma for volume support. Some patients require the use of hemodynamic monitoring to evaluate the effectiveness of therapy.

Restoration of vascular volume is achieved by administering intravenous fluid—such as 0.9 percent normal saline or other isotonic solutions—at a rapid and high rate. This process is commonly referred to as **volume resuscitation**. These patients require frequent nursing assessments because they may not be able to tolerate rapidly administered, high-volume fluids. For example, a patient may have an underlying cardiac or renal disease that could worsen in response to fluid resuscitation. Volume resuscitation can increase the likelihood of these patients not being able to tolerate the increase of fluids, resulting in pulmonary edema. The nurse should make the provider aware of any change of respiratory status, including breath sounds to prevent the development or worsening of pulmonary edema. Hemodynamic monitoring is often needed to manage fluid resuscitation efforts.

The type and amount of solution used for volume resuscitation generally depend on the patient's fluid and electrolyte status, acid-base status, and organ function (Urden et al., 2022). Crystalloids and colloids are often used for volume replacement (Table 23.6). Crystalloids contain nonprotein substances, such as minerals, salts, and sugars, while colloids contain large molecules of proteins or starches, which help restore osmotic pressure and fluid

volume. Blood products are used when shock is caused by blood loss (Urden et al., 2022).

Intravenous Fluid	Crystalloids	Colloids
Contents	Nonproteins, minerals, salts, sugars	Large molecules or proteins or starches
Use	Maintenance of adequate fluid and electrolyte balance	Used as plasma substitutes for short-term replacement of fluid volume while the cause of the problem is being addressed
Example	Normal saline (0.9%) is a replacement solution used to increase plasma volume; it can be infused with any blood product. Ringer's lactate is a balanced salt solution containing sodium, chloride, calcium, potassium, and lactate.	Human-made (starches, dextran, or gelatins) or naturally occurring (albumin or fresh frozen plasma [FFP]) Bigger molecules stay in the blood longer before passing to other parts of the body.

TABLE 23.6 Crystalloids and Colloids

LINK TO LEARNING

Refer to this website for a review of crystalloids and colloids (https://openstax.org/r/77crystalcoll) to help nurses understand fluids and their use.

Patients experiencing hemorrhagic shock may require the administration of multiple units of blood. Nursing care should focus on safety practices for blood administration and assessment for potential complications, as the administration of multiple units of blood may cause the patient to experience several potentially dangerous conditions:

- The administration of cold or room-temperature blood can cause the core body temperature to drop, resulting in hypothermia. Blood-warming baths, warm saline, or radiant and microwave warmers are used at some institutions to warm blood and prevent hypothermia.
- Patients receiving blood transfusions are also at risk for **dilutional coagulopathy** if they do not receive sufficient clotting factors in the blood products they receive. It is important for the nurse to monitor the patient for bleeding and follow all appropriate precautions. It may be necessary to administer platelets or fresh frozen plasma.
- Citrate toxicity is another potential complication of blood transfusions. Citrate is used to keep banked blood from clotting. (Banked blood refers to units of blood products donated and available for a recipient in need.) It prevents the initiation of clotting cascade by binding to calcium. When the citrate in the transfused blood binds to calcium in the patient's system, **citrate toxicity** results. The result is hypocalcemia and hypomagnesemia. Manifestations include hypotension, arrhythmias, nervous system excitability, laryngospasm, and tetany.
- Finally, hemolysis is the destruction of red blood cells. It results from interactions of antibodies on the recipient's plasma with antigens on the donor's red blood cells. Manifestations include fever, flank pain, and red or brown urine.

Table 23.7 reviews nursing care practices for patients experiencing hypovolemic shock.

Steps for Nursing Care	Nursing Care Practices	Rationale
Assessment for hypovolemia	Trending of vital signs Dehydration assessment Hourly urine output Assessment orthostatic hypotension	Prevention of hypovolemic shock is the best treatment.
Identify source	Absolute hypovolemia Relative hypovolemia	Identifying and stopping the source of fluid loss can prevent the progression of hypovolemic shock.
Stop source	Prepare for surgery Prepare for procedures to correct intravascular volume loss	Identifying and stopping the source of fluid loss can prevent the progression of hypovolemic shock.
Intravenous access	Secure and maintain vascular access	Volume resuscitation and administration of blood and blood products can prevent the progression of hypovolemic shock.
Volume resuscitation	Frequent, accurate assessments to evaluate the patient's response to rapid high-volume, high-rate volume replacement	Complications of volume resuscitation may be prevented.
Blood transfusion and blood product administration	Follow all policies and procedures for blood and blood product infusion	Prevention of complications is key to patient recovery.
Hemodynamics	Accurate management of hemodynamic monitoring systems and accurate reporting of findings guide and evaluate the patient's response to care	Prevention of complications and evaluation of treatments are keys to decreasing morbidity and mortality.

TABLE 23.7 Nursing Care for Hypovolemic Shock

Recognizing Cues and Analyzing Cues

The nurse can recognize cues of hypovolemic shock through assessment and trending of vital signs. When determining the state of a patient's homeostasis, a series of vital signs is more representative than any one set. By recording accurate and frequent vital signs, the nurse may recognize a concerning trend. The nurse should report such a trend to the provider to prevent the full development of hypovolemic shock.

Vital signs associated with the development of hypovolemic shock include marked tachycardia over 100 beats per minute, decreased systolic blood pressure, narrowed pulse pressure, immeasurable diastolic pressure, marked decrease or no urinary output, depressed mental status, cold pale skin, cool clammy skin, delayed capillary refill time, anxiety, pallor, and increased respiratory rate. Furthermore, a change in mental status is often present. These changes—along with a history or evidence of volume loss, either absolute or relative—should cue the nurse to the potential diagnosis of hypovolemic shock.

In the early phases of hypovolemic shock, patients may complain of thirst or muscle cramps. As the condition progresses, so does the lack of perfusion to cells, causing hypoxia to cells with the conversion of aerobic to anaerobic metabolism and a buildup of waste products. All body systems may experience a decrease in perfusion during hypovolemia. The patient may experience chest pain, abdominal pain, ileus, change of mental status, dry mucous membranes, or decreased skin turgor.

Accurate and timely assessments are required to prevent long-term complications of hypovolemic shock—especially for patients experiencing excessive or prolonged diarrhea, severe burns, protracted or excessive vomiting, excessive sweating, bleeding from cuts or wounds, bleeding from traumatic accidents, internal bleeding from abdominal organs, or ectopic pregnancy. At-risk patients require frequent and accurate assessments for detection and initiation of treatment to be most effective.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Nursing care for hypovolemic shock requires a multisystem approach with input from a variety of health-care team members. The extent of volume loss can guide the level of care needed by the patient. All body systems must be supported, and any complications must be prevented. The patient and family need to be included in the development of the treatment plan, with appropriate education and emotional support provided by the nurse.

The goals of therapy include restoring intravascular circulating blood volume, preserving hemodynamic function, effecting the redistribution of circulating volume, addressing the underlying cause of fluid loss, and reversing the progression of inadequate tissue perfusion. These efforts are aimed at preventing organ damage. Priorities of care include the insertion of intravenous access devices, including central lines to restore circulating blood volume via volume resuscitation. Hemodynamic monitoring is often required to determine and evaluate the effectiveness of treatment. For the patient receiving volume resuscitation, frequent assessments should be completed in a timely and accurate manner. Any change in the patient's baseline status in general, with particular attention to the respiratory status, needs to be communicated to the provider to prevent complications of high-rate, high-volume resuscitation.

CLINICAL SAFETY AND PROCEDURES (QSEN)

Volume Resuscitation for the Patient with Hypovolemic Shock

The delivery of volume replacement for the patient with hypovolemic shock will depend on the trigger of volume loss. If volume loss is from increased elimination from diarrhea, sweat, vomiting, or high amounts of urine, the nurse will anticipate hanging crystalloid solution of 0.9 percent isotonic normal saline or lactated Ringer's solution. Hemodynamic monitoring with serial pulses, oxygen saturation, and blood pressures will gauge the patient's response to treatment. If the patient's fluid losses are from bleeding, other products such as packed red blood cells or plasma products may be considered.

Some patients may require surgery to preserve hemodynamic function. The nurse should complete all preoperative nursing interventions, including maintaining nothing-by-mouth status (NPO), ensuring completion of informed consent, determining blood type, and performing a type and cross match, as well as providing patient and family education and emotional support.

The nurse may assist with improving blood pressure by positioning the patient to increase venous return to the heart, thereby supplementing cardiac output. The preferred patient position is lying flat with the legs elevated about 12 inches. Unlike the Trendelenburg position, this position will not impair the patient's breathing ability. Some institutions recommend passive leg raises to improve the flow of blood back to the heart.

All organ systems should be supported to prevent damage. Mean arterial pressure (MAP) is often used to determine the effectiveness of organ perfusion; an acceptable minimum value is 65 mmHg or above for patients who have an arterial line. MAP levels must maintain a minimum of 65 mmHg for cells to receive the oxygen and nutrients needed to metabolize energy in amounts sufficient to sustain life Additionally, the patient should be kept warm, as a cold patient has a greater chance of developing acidosis.

Evaluation of Nursing Care for the Patient with Hypovolemic Shock

After treatment is initiated, it is important for the nurse to evaluate the patient's response to therapy and make appropriate modifications. The goal of treatment is for the patient to return to their baseline status.

An assessment of hemodynamics will be necessary to determine whether the patient has adequate cardiac output. If invasive hemodynamic measurement of cardiac output is not available, the following signs also indicate adequate cardiac output and normovolemia: a urine output of at least 30 mL/hour, the presence of peripheral pulses, systolic

blood pressure of 20 mmHg from baseline, a heart rate between 60 to 100 beats per minute, and a normal level of consciousness. Furthermore, decreased anxiety level is an important indicator of perfusion to the brain.

Medical Therapies and Related Care

The health-care team must work together in an organized manner to respond to the emergency of hypovolemic shock. The goals of treatment include identifying the source of volume loss, stopping the source of volume loss, and restoring appropriate volume. Standard treatment for volume replacement includes the insertion of large, 14- to 16-gauge intravenous catheters or the insertion of a central line for fluid administration. Fluids, blood, and blood products are administered based on the individual needs of the patient.

Identification and correction of the cause of intravascular volume loss is the first step in reversing hypovolemic shock. Some patients require the administration of medications to maintain hemodynamic stability. Medications that increase blood pressure are used to support patients in hypovolemic shock; these include epinephrine, norepinephrine, dopamine, and dobutamine. Epinephrine is the strongest vasoconstrictor of all vasopressors as it increases blood pressure, heart rate, and cardiac output. Norepinephrine increases arterial blood pressure through vasoconstriction and has little effect on heart rate. Dopamine and dobutamine are inotropes used to increase cardiac contractility.

23.3 Septic Shock

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for septic shock
- Describe the diagnostics and laboratory values for septic shock
- Apply nursing concepts and plan associated nursing care for patients with septic shock
- Evaluate the efficacy of nursing care for patients with septic shock
- Describe the medical therapies that apply to the care of patients with septic shock

The serious medical condition that results from an overreaction of the body to the presence of harmful microorganisms in the blood or other body tissues is called **sepsis**. According to the Centers for Disease Control and Prevention (CDC, 2024), at least 1.7 million adults in the United States develop sepsis each year, and nearly 270,000 die as a result. The number of annual sepsis cases in the United States has been increasing over the past several years. There are several likely factors contributing to this rise, including the increased awareness and tracking of cases and the rise of antibiotic-resistant bacteria. Additionally, people with chronic diseases are living longer and consequently are at higher risk of developing sepsis; organ transplants are also more common, and recipients are at higher risk for developing sepsis because of their suppressed immune system (CDC, 2024).

Rapid diagnosis and early treatment of sepsis are necessary to prevent cellular hypoxia, multi-organ failure, and death. For each hour that treatment is delayed, there is a 4 to 9 percent increase in mortality (Flanagan et al., 2020).

Pathophysiology of Septic Shock and Clinical Manifestations

Sepsis is a syndrome or set of symptoms or conditions caused by an overexaggerated inflammatory response to infection throughout the body. A normal inflammatory response includes the release of histamine, bradykinin, and prostaglandins at the site of the infection. These substances increase vasodilation and capillary permeability, causing vascular fluid to migrate to the interstitial space in efforts to deliver the formed elements of blood to the infected area and promote the restoration of homeostasis.

Sepsis is most associated with bacterial infections, usually gram-negative bacteria in nature, and is one of the most severe diseases for hospitalized patients (Virzì et al., 2022). Endotoxin is the major motivator of the inflammatory process. Endotoxins are the main component of the outer membrane of gram-negative bacteria. However, sepsis can also result from viral or fungal infections. In sepsis, the infecting organism or virus secretes endotoxins that significantly increase capillary permeability and elicit an exaggerated inflammatory response throughout the body. As a result, fluids shift from the intravascular and intercellular spaces to the interstitial space, causing profound hypotension and impaired cellular function. Lack of perfusion to cells results in the conversion of cell metabolism from aerobic to anaerobic metabolism, increasing lactate levels and causing metabolic acidosis. The overall result is profound hypotension, cell hypoxia, organ and tissue damage, and failure.

There are four stages of sepsis (CDC, 2024):

1. Systemic inflammatory response syndrome (SIRS) can occur when the body is exposed to a noxious stressor, such as infection. The aim of the response is to localize the endogenous or exogenous source of the stressor.
2. Sepsis is an overreaction of the immune system to infection.
3. In **severe sepsis**, manifestations of organ malfunction are present.
4. Finally, **septic shock** is a condition of low blood pressure despite adequate intravenous fluid administration. It causes decreased blood flow to cells, formation of blood clots in vessels, organ damage, organ failure, and, ultimately, death.

To compensate for hypotension in the first stage, the sympathetic nervous system is stimulated, causing tachycardia. This attempt to increase blood supply to the body further increases the oxygen needs of the heart and decreases cardiac output. Heart function is compromised in septic shock because endotoxins cause abnormal function of heart muscle cells and myocardial depression.

Patients with septic shock are at high risk for the development of disseminated intravascular coagulation (DIC), in which microclots develop inside blood vessels, using up the clotting factors. As a result, massive bleeding occurs throughout the body. The scattering of microclots throughout the body further decreases cell perfusion, resulting in cell hypoxia and dysfunction.

Cellular hypoperfusion stimulates the endocrine and central nervous systems to elicit a **hypermetabolic state** of accelerated metabolic activity that increases the body's energy to facilitate healing. The result is an increase in cellular demand for oxygen in an already compromised state. The overall result is maldistribution of blood volume, decreased perfusion to cells, and impaired cellular metabolism.

It is important for the nurse to identify patients with the following risk factors for the development of septic shock:

- pregnancy
- over sixty-five years of age
- substance abuse
- artificial joints
- heart valve surgery or replacement
- other surgeries
- acquired immune deficiency syndrome (AIDS)
- cancer
- diabetes mellitus (DM)
- leukemia
- immunosuppression
- chronic kidney disease (CKD)
- heart failure
- malnourishment

LIFE-STAGE CONTEXT

Older Adults and Sepsis

Sepsis disproportionately affects older adults with more than 60 percent of sepsis diagnoses attributed to adults aged sixty-five years and older (Rowe & McKoy, 2017). Older adults are at high risk for the development of septic shock because aging decreases the body's immune response. Decreased immune response can allow minor infections, such as urinary tract infections (UTIs), to quickly spread bacteria throughout the body. Additionally, many older adults have other factors, such as medical comorbidities, cognitive impairment, and functional status, which all impact outcomes. Change in mental status is often one of the first clinical manifestations of sepsis in the older adult. Therefore, any older adult who experiences a change of mental status change should be screened for sepsis.

Clinical Manifestations

Clinical manifestations vary from insidious to overt presentation based on the individual response of the body and

the stage of sepsis. Eventually, all organ systems are affected.

At the onset of septic shock, common manifestations include changes in mental status, high respiratory rate, tachycardia, and hypo- or hyperthermia. Common causes of sepsis are urinary or respiratory infections. If the source of the infection is the urinary system, the patient may complain of low energy levels or urinary retention with a continual urge to void. If the source of the infection is respiratory, the patient may complain of shortness of breath or present with a cough.

As sepsis progresses and brain cells experience decreased perfusion, the patient's mental status may progress from confusion and agitation all the way to coma. The patient may experience shortness of breath as the fluid shifts into the alveolar space, and renal hypoperfusion may cause a decrease in urinary output. Loss of vascular tone and other components of the infectious process result in variations in skin and body temperature. The patient may exhibit core temperature elevations as the infection progresses and an even greater increase in core temperature as the global inflammatory response ensues. Along with fever, the patient may experience shaking and chills. The skin may be warm and clammy or sweaty with cool, pale limbs.

The terms "warm shock" and "cold shock" are sometimes used to describe where the patient is in the progression of sepsis. In the early stages, usually within the first six to seventy-two hours of sepsis, the patient is often warm as the body responds to the inflammatory process. In this state of warm shock, cardiac output is increased, and systemic vascular resistance (SVR) is decreased.

LINK TO LEARNING

This video provides a detailed review of shock (https://openstax.org/r/77shock2) and compares cold and warm shock.

The dynamic precordium causes the patient to develop tachycardia, bounding peripheral pulses, and skin that is warm to the touch, with decreased capillary refill time. As the shock progresses, the patient deteriorates to the development of cold shock, which is a hypodynamic response of the body. At this point, cardiac output is decreased and SVR is increased. Skin may have purplish discoloration from poor perfusion to the cutaneous tissue. This change, called mottled skin, is a finding associated with septic shock. Some patients exhibit a "septic skin rash," or clusters of tiny blood spots that look like pinpricks of the skin.

Assessments and Diagnostics

Nursing assessment should begin with a general review of body systems and a thorough history. If evidence suggests the possibility of sepsis, the nurse should perform a sepsis screen.

Sepsis screens play a significant role in the treatment of sepsis, as early identification of sepsis and timely implementation of treatment have been found to decrease rates of organ failure and death. An example of a sepsis screening tool is the quick Sequential [Sepsis-related] Organ Failure Assessment (qSOFA) criteria. As shown in Figure 23.7, three criteria are assessed:

- systolic blood pressure < 100 mmHg
- altered mental status
- respiratory rate > 22 breaths/minute

Each criterion has a rating of one point. If the patient has a score of two or greater, they are suspected of having sepsis and treatment is initiated.

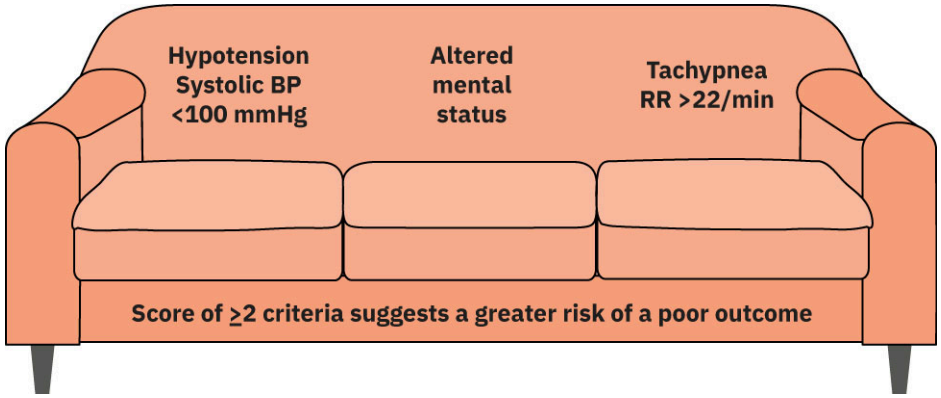

FIGURE 23.7 The qSOFA screening tool assigns one point to each of three criteria: hypotension, altered mental status, and tachypnea. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

LINK TO LEARNING

More information on rapid sepsis screening (https://openstax.org/r/77sepsisscreen) can be found on this website.

Diagnostics and Laboratory Values

A blood culture is the definitive test for sepsis. It usually takes one to three days to get the results. Consequently, some organizations incorporate the early use of a rapid sepsis screen, but the rapid results are not definitive. Most patients are treated with a broad-spectrum antibiotic if sepsis is suspected. Along with blood cultures, urine, sputum, or wound cultures are obtained to help determine the presence of infection. In some institutions, indwelling catheters such as vascular access devices and Foley catheters are removed and their tops are sent for culture and sensitivity.

Sputum culture helps providers evaluate the respiratory system. Other tools for this purpose include pulse oximetry, imaging studies of the lungs to diagnose pneumonia or other pulmonary infections, and arterial blood gas analysis to analyze the diffusion capacity of the lungs. Strep throat rapid antigen and throat culture as well as rapid influenza diagnostic tests may also be obtained.

A computerized tomography (CT) scan or magnetic resonance imaging (MRI) of the brain may be obtained if meningitis is suspected. Lumbar puncture, also called a spinal tap, may be performed to obtain cerebral spinal fluid (CSF). The provider may order a culture and sensitivity on the collected CSF to definitively diagnose meningitis.

Another test for sepsis is the presence of endotoxins. Under normal conditions, there should be no evidence of endotoxins in the blood. If gram-negative bacteria are present in the bloodstream, then endotoxins are released when the cell disintegrates. Testing for the presence of endotoxins is not a replacement for blood cultures, but it may assist in directing the immediate treatment of the patient.

Procalcitonin (PCY) levels are drawn for the patient with suspected sepsis. This substance is undetectable in patients without infection. Procalcitonin rises rapidly in response to proinflammatory stimuli, especially infection. It will not determine what type of bacteria is present, however. Another test, C-reactive protein (CRP), is sometimes obtained to assist in the diagnosis of sepsis. CRP is elevated with inflammation, which is very high in sepsis.

A complete blood count (CBC) is obtained to determine the baseline status of the patient as well as to plan and evaluate treatment. White blood cell (WBC) (leukocyte) results should be reviewed. A WBC count of 45,000 to 11,000 per microliter is considered normal. A count below 4,000 or greater than 12,000 per microliter is cause for concern. High leukocytes indicate the presence of infection, while low leukocytes indicate risk for infection.

Lactate levels are drawn to assess cellular perfusion. An elevation of lactate is indicative of cellular hypoxia. A lactate of less than 2 mmol/L is considered acceptable; however, a lactate level of greater than 4.0 mmol/L is associated with high mortality. Aggressive volume resuscitation is recommended for lactate levels of 4.0 mol/L (Lat et al., 2021).

Patients with septic shock often develop clotting abnormalities and disseminated intravascular coagulation (DIC).

Homeostasis is evaluated through analysis of prothrombin time (PT), partial thromboplastin time (PTT), and platelet count. High PT and PTT times indicate impaired clotting ability of the blood. Low platelet counts may be the result of platelet aggregation and the presence of microclots throughout the vascular system. **D-dimer** may be used as a marker of microcirculatory failure. It is the most-used fibrinogen-related marker for DIC diagnosis. Almost all patients admitted with sepsis have elevated D-dimer levels related to organ dysfunction and outcome.

Diagnostic tests for sepsis are summarized in Table 23.8.

Diagnostic Test	Normal Result	Sepsis Suspected
Blood culture	No infectious agent	Presence of infectious agent
Rapid Sepsis Screen qSOFA	Below 2	2 or higher
Endotoxin	Not present	Present
Procalcitonin	0	Greater than 2.0 µg/L
Lactate	Less than 2 mmol/L	Greater than 2 mmol/L
PT	10–13 seconds	High value
PTT	25–35 seconds	High value
Platelets	150,000 to 450,000	Low value
D-dimer	Less than 0.50	Greater than 0.50
Urinalysis	No infectious organisms	Infectious organisms detected
Sputum culture	No infectious organisms	Infectious organisms detected
Cerebral spinal fluid	No infectious organisms	Infectious organisms detected
Wound culture	No infectious organisms	Infectious organisms detected

TABLE 23.8 **Diagnostic Tests for Sepsis**

Nursing Care of the Patient with Septic Shock

Nurses should be acutely aware of subtle changes that may indicate the development of sepsis and notify the health-care team to plan and implement interventions to prevent the progression of sepsis. Due to the frequent changes in acuity, nurses must stay in regular contact with the provider once sepsis has been identified.

Recognizing Cues and Analyzing Cues

Any patient who suddenly develops hypotension, unresponsiveness, anuria, or fever is suspected of having sepsis. A sudden change in the level of consciousness is often an early manifestation of bladder infection, especially in older adults. An increase in respiratory rate is also associated with sepsis. As the body attempts to compensate for the buildup of lactic acid and metabolic acidosis, the respiratory rate increases to rid the body of carbon dioxide. As the patient decompensates, the respiratory rate will drop.

Early in the development of sepsis, blood pressure is slightly elevated from sympathetic nervous stimulation. As the shock progresses, blood pressure significantly drops. MAP is the best indicator of cell perfusion: a MAP > 65 mmHg indicates adequate blood pressure to help push life-sustaining nutrients into the cells and tissues.

When caring for patients with sepsis, nurses should also be aware of these cues:

- Hourly urine output of at least 30 mL per hour indicates adequate kidney perfusion. A drop in urine output to less than 30 mL/hour indicates poor renal perfusion.
- Lactate levels greater than 4 mmol/L indicate the need for volume resuscitation.
- Worsening manifestations of dehydration, such as decreased skin turgor and dry mucous membranes, indicate the need for fluid resuscitation.
- Assessment findings of weak to absent extremity pulses, change of skin temperature, and increased capillary refill time indicate hypoperfusion and the need for volume resuscitation.

It is imperative to recognize these cues of sepsis to prevent progression and serious complications such as respiratory failure, heart failure, kidney failure or injury, malfunction of the hematologic system, gangrene of fingers or toes, amputation of extremities, brain damage, and, ultimately, death. In the refractory stage of shock, the nurse is often present for discussions with the family to withdraw care because 30 percent of patients with severe sepsis do not survive.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Quality nursing care featuring attention to detail, close monitoring, and surveillance with prompt interventions can reduce morbidity and mortality. Any changes in the patient's status, including trends suggesting progression of the septic state, should be immediately reported for appropriate adjustment in treatment. Indications that the patient is deteriorating include an increase in respiratory rate, an elevated temperature with a quick drop, and a fast heart rate with hypotension.

Identifying and eradicating the infecting organism is essential to reversing the septic shock state. Immediate and timely administration of a first dose of broad-spectrum antibiotics is critical to the patient's prognosis. Culture and sensitivity are obtained prior to the administration of broad-spectrum antibiotics. When results are available, the antibiotic is often changed based on the identified organism. Some patients require surgical incisions and drainage of the infectious area.

When caring for the patient in sepsis, it is essential to stabilize the patient's hemodynamic status. Patients with sepsis may require massive volume resuscitation—usually between 6–10 L in the first twenty-four hours of treatment. Due to the massive input of fluid volume, an indwelling Foley catheter is often used to allow for accurate measurement of intake and output. Fluids are first administered to fill the vascular space, followed by a type of drug called a **vasopressor**, which supplies tone to the vascular system by inducing vasoconstriction and increasing blood pressure. The nurse must assess for complications of volume resuscitation such as pulmonary edema.

Patients with sepsis are at risk for developing complications to multiple organ systems; for example, poor perfusion to the lungs may cause the patient to develop ARDS. The ensuing respiratory failure may require the use of endotracheal intubation and mechanical ventilation to support the respiratory system.

There is an increase in metabolic response during the acute stage of sepsis, increasing the caloric needs of patients. Enteral nutrition may improve clinical outcomes, decrease the length of hospital stays, and reduce mortality in patients with sepsis. These feedings should be rich in protein and essential amino acids. Stress ulcer prophylaxis is also recommended.

Optimal outcomes for sepsis are influenced by regulated glycemic control. Sepsis can be associated with hyperglycemia, which can hinder the body's healing response. Hypoglycemia can also lead to a much higher mortality risk. Regulated glycemic control has been found to decrease morbidity and mortality in patients with sepsis. To stabilize and normalize serum glucose, the patient's blood glucose level should be monitored frequently and treated according to agency policy. A blood glucose level between 110 and 150 mg/dL has been associated with positive patient outcomes. Careful observation and assessment of the patient is vital, as patients with sepsis often experience variable glucose levels and insulin requirements, increasing the frequency of hypo and hyperglycemia.

Nurses should maintain urinary catheterization, calculating intake and output. Assessment of hourly urinary output is reflective of the patient's response to treatment and the status of renal perfusion. Hourly urinary output of less than 30 mL/hour should be reported to the health-care team; this reflects poor perfusion of the kidneys, which may lead to kidney failure.

Figure 23.8 illustrates equipment used to treat a patient with sepsis.

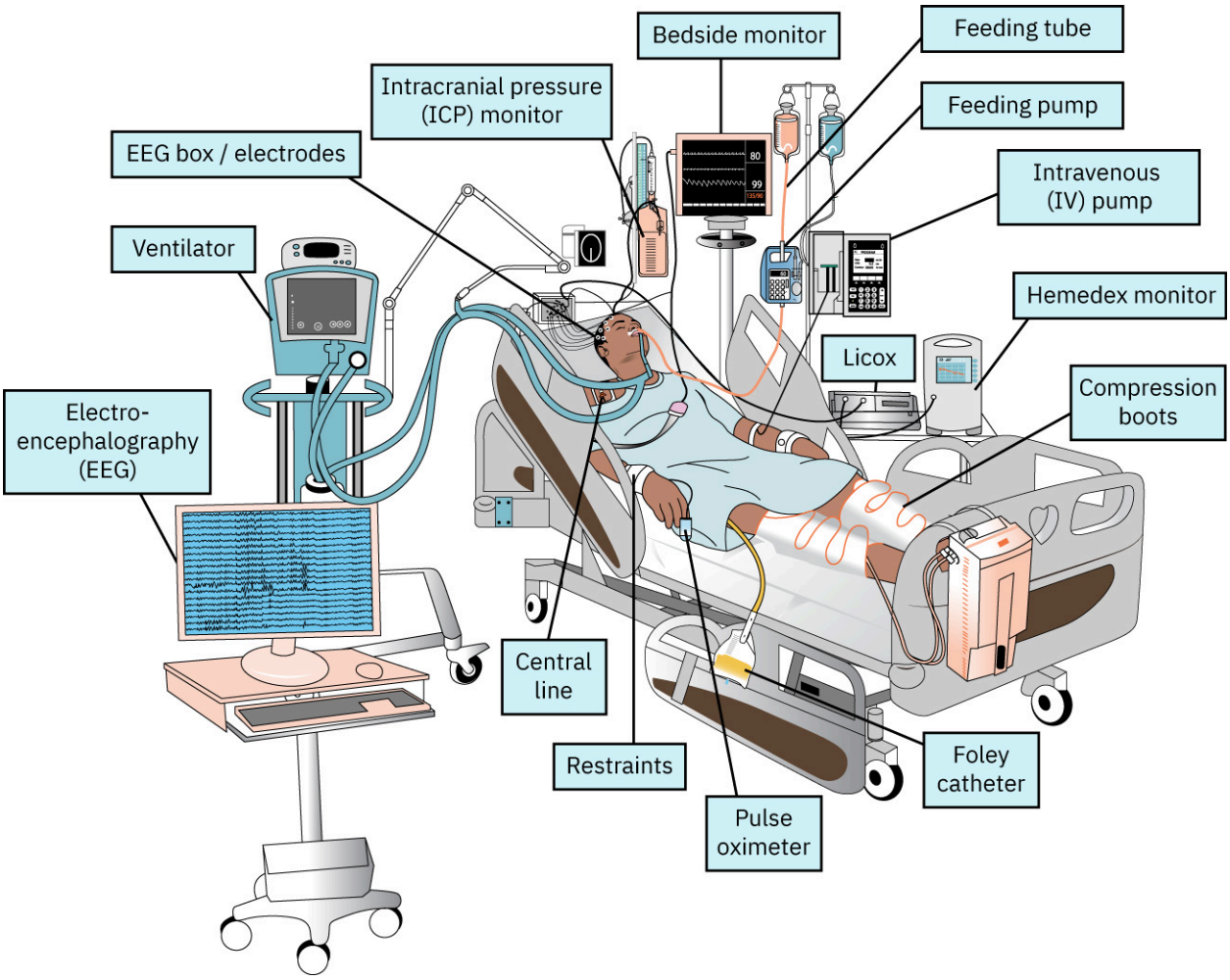

FIGURE 23.8 The treatment of sepsis often requires care for the patient in a critical care unit. (credit: modification of work from *Fundamentals of Nursing*. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

UNFOLDING CASE STUDY

COVID Complications: Part 3

Refer to COVID Complications: Part 2 for the second part of this patient's medical history.

Nursing Notes	02/23/24, 08:00 Continued low blood pressure despite treatment Increased tachycardia Increased respiratory rate Low to no urine output Cool skin Weak to absent peripheral pulses Low temperature Anuria Cold and clammy Ventricular dysrhythmias noted on monitor (increased K+ causes ventricular arrythmias) 02/23/24, 19:00 Family meeting held with the physician, nurse, and spiritual advisor. End of life was discussed with the family, including the health-care proxy. The family was in agreement to change the patient's advanced directive to a DNR and continue with comfort care. The family was offered an opportunity to seek spiritual counseling, according to their wishes.
Flow Chart	02/23/24, 08:00 BP, 74/48 HR, 120 RR, 24 Temp, 102.5 Hemodynamic values: Cardiac output, 3 L/min Mean arterial pressure, 50 mmHg Central venous pressure, 6 mmHg
Lab Results	02/23/24, 08:00 Na, 146 mEq/L K+, 5.8 mEq/L Cl, 80 mEq/L ABG: pH, 7.23 PCO_2, 60 mmHg PO_2, 65 mmHg HCO_3, 18 mEq/L BS, 180 mg/dL Lactic acid, 4.0 mmol/L
Provider's Orders	02/23/24, 11:00 Ringer's Lactate rate of 125 ml/hr Use insulin protocol for hyperglycemia Change norepinephrine to vasopressin IV drip Prothrombin time and partial thromboplastin time (PT and PTT), platelet count, and D-dimer 02/23/24, 18:00 Discuss end of life with the family.

TABLE 23.9 COVID Complications: Part 3

1. Choose the most important nursing action in caring for the septic patient.

    a. fluid replacement followed by vasopressors
    b. obtain a CXR

c. immediately insert a Swan-Ganz catheter
d. repeat ABG every hour
e. administer IV colloid fluids

2. What patient outcomes would most likely indicate the patient is in irreversible septic shock? Select all that apply.

a. anuria
b. respiratory acidosis
c. multiple organ dysfunction syndrome
d. metabolic alkalosis
e. lactic acid level of 4.5 mm/L

Evaluation of Nursing Care for the Patient with Septic Shock

Indicators of effective treatment plans for sepsis include maintenance of hemodynamic stability, treatment of the infection, and return to baseline status. The infection should show evidence of eradication based on clinical assessment and possibly repeat cultures. Some patients may need prolonged antimicrobial therapy beyond the course of their hospital stay. The patient should also demonstrate the ability to tolerate feedings and obtain adequate nutrition, leading to healthy weight gain and labs indicating nutritional adequacy.

Survivors of septic shock should be referred for counseling and provided with appropriate resources specific to their needs. Some complications of sepsis survivors include amputations and impaired lung and renal function. Other long-term effects of sepsis shock include fatigue, difficulty sleeping, decreased appetite, weakened immune system, anxiety, and depression.

LINK TO LEARNING

The Sepsis Alliance Institute (https://openstax.org/r/77SAI) has many valuable educational resources for patients with sepsis as well as their providers.

Evaluating Outcomes

Evaluation of outcomes includes determining the effectiveness of the current plan of care. Consistent monitoring of blood pressure and urinary output are key indicators of shock and recovery. Evaluation of lactate levels and electrolytes helps in determining the patient's recovery progress or continual decline. As the nurse continues to evaluate interventions, changes to the nursing care plan can be made as needed.

Medical Therapies and Related Care

Priorities of medical care for patients with sepsis include identification of the source of the infection, enhancing cell perfusion, and supporting body systems. Effective communication among health-care team members and timely implementation of protocol-based interventions for the early diagnosis and treatment of sepsis are key to patient survival. The Surviving Sepsis Campaign recommends the implementation of a one-hour bundle to obtain lactate, blood cultures, antibiotics, volume resuscitation, and possibly vasopressors within one hour of sepsis diagnosis (Lat et al., 2021).

LINK TO LEARNING

Read this article for more information about sepsis bundles (https://openstax.org/r/77sepbund) from the Indian Journal of Critical Care Medicine.

The profound hypotension seen in septic shock is the result of the massive shifting of fluid from the intravascular to the interstitial space. Fluid replacement followed by vasopressors are used to treat hypotension. After fluids are

administered, the first-line vasopressor recommended for use is norepinephrine. A target MAP of 65 mmHg is recommended. If MAP remains low to moderate with norepinephrine administration, vasopressin should be added to the treatment protocol. If blood pressure remains low, the provider will consider adding dobutamine or switching to epinephrine (Lat et al., 2021).

23.4 Neurogenic Shock

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for neurogenic shock
- Describe the diagnostics and laboratory values for neurogenic shock
- Apply nursing concepts and plan associated nursing care for patients with neurogenic shock
- Evaluate the efficacy of nursing care for patients with neurogenic shock
- Describe the medical therapies that apply to the care of patients with neurogenic shock

The distributive type of shock that results in hypotension (low blood pressure), often with bradycardia (slowed heart rate), caused by disruption of autonomic nervous system pathways is called **neurogenic shock**. It most commonly occurs in patients who sustain a spinal cord injury (SCI) to the cervical vertebrae or the thoracic vertebrae above T7. It is found in 19.3 percent of patients with cervical spinal cord injury and 7 percent of patients who have thoracic spinal cord injury (Sager et al., 2023) (Figure 23.9). Other causes of neurogenic shock include complications from spinal anesthesia, severe head trauma, and the use of opioids and benzodiazepines.

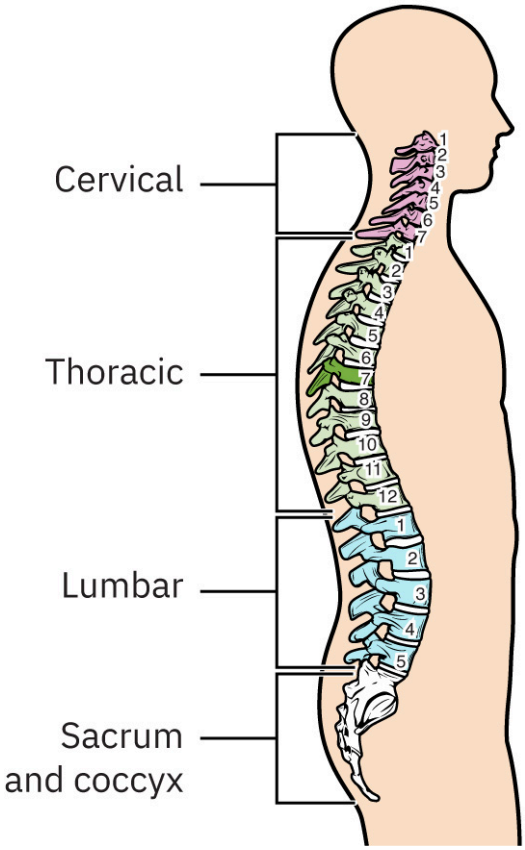

FIGURE 23.9 Injury to thoracic 7 vertebrae or above impacts the abdominal and intercostal muscles, which are essential for the expansion of the chest in the breathing process. (credit: modification of work from *Anatomy and Physiology 2e*. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Pathophysiology of Neurogenic Shock

To survive and thrive, cells and body tissues need a constant supply of oxygen and nutrients. In a state of homeostasis, the sympathetic nervous system ensures the cardiovascular system functions with adequate heart rate, cardiac output, and vascular tone to provide oxygen and nutrition to cells and body tissues. In neurogenic

shock, the sympathetic nervous system loses the ability to regulate the cardiovascular system, causing vasodilation and decreased perfusion to cells and, eventually, cellular and tissue hypoxia. Blood pressure is low because of vasodilation, not because of loss of circulating volume in the vascular system.

Neurogenic shock is a hemodynamic syndrome. When sympathetic nerve innervation is functioning properly, a drop in blood pressure is compensated for by an increase in heart rate. In this type of shock, however, sympathetic nerve innervation is lacking, and the body is not able to increase heart rate to compensate for low blood pressure caused by the dilation of vessels. Low blood pressure and low heart rate are hallmark findings in this type of shock. Additionally:

- Hypotension results from the loss of sympathetic vasomotor tone to the arteries and veins.
- Lack of sympathetic innervation to the heart results in unopposed stimulation of the vagus nerve (the main nerve of the parasympathetic nervous system), leading to bradycardia.
- Warm skin occurs initially but changes to become cool and clammy because of massive vasodilation.

Understand that **spinal shock** differs significantly from neurogenic shock. It is a transient neurologic syndrome of sensorimotor dysfunction, which can occur with injury to any part of the spinal cord. The patient experiences flaccidity and loss of reflexes in the area affected by the damage to the spinal cord. Table 23.10 contrasts these conditions.

Neurogenic Shock	Spinal Shock
Hemodynamic phenomena Loss of sympathetic stimulation Low blood pressure Low heart rate	Flaccid muscles Loss of reflexes Function may return

TABLE 23.10 Spinal Shock vs. Neurogenic Shock

It is important to realize the cause of hypotension in patients with this type of shock is lack of vascular tone, not vascular volume. Vasomotor tone plays a major role in the maintenance of blood pressure. In neurogenic shock, significant hypotension is present—usually below 70 mmHg—because the blood vessels lack vasomotor tone, limiting their ability to expand and constrict in response to perfusion changes, therefore causing hypoperfusion to the cells and organs. The hypotension of neurogenic shock is unresponsive to fluid resuscitation because sufficient volume is present already. Treatment of hypotension is therefore focused on increasing vasomotor tone and cardiac output.

Bradycardia is present in neurogenic shock because of unopposed vagus nerve stimulation (Figure 23.10). Decreased cardiac output also occurs. Treatment of bradycardia focuses on augmenting cardiac output and cardiac rate. Most patients require treatment with vasopressors and inotropes.

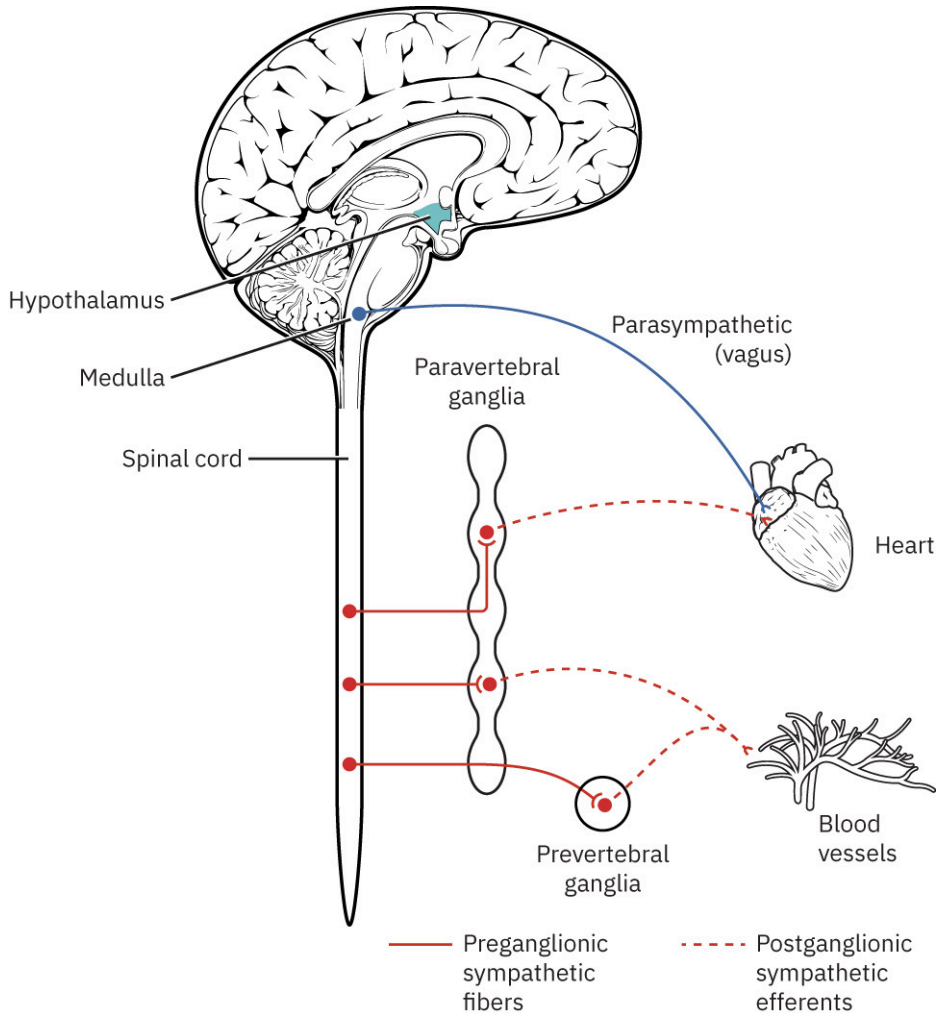

FIGURE 23.10 The image depicts the pathways of the parasympathetic nerves during neurogenic shock. Loss of sympathetic tone in neurogenic shock leads to unopposed parasympathetic response driven by the vagus nerve causing unstable blood pressure, heart rate, and temperature regulation. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Temperature regulation is altered during neurogenic shock. When sympathetic nerve stimulation is intact, the patient can maintain normal temperature by triggering their body to shiver or sweat to maintain optimal body temperature. Disruption of sympathetic stimulation results in the patient not being able to maintain normothermia. Patients in neurogenic shock may experience poikilothermia, also known as intrinsic thermoregulatory failure. The patient may go between experiences of hypothermia and hyperthermia because the body loses its ability to regulate dermal blood vessel contraction; dilation for temperature regulation is also lost due to a lack of sympathetic nerve intervention.

The massive vasodilation and decreased tissue perfusion caused by neurogenic shock affect all body systems, including the neurologic, renal, and gastrointestinal systems. Respiratory failure is also common in patients.

Clinical Manifestations

It is imperative for the nurse to assess the patient for the presence of the hallmark findings of neurogenic shock to enable the health-care team to make a rapid diagnosis and start an effective treatment. These hallmark findings include:

- low blood pressure
  - systolic less than 90 mmHg
  - diastolic less than 60 mmHg
- bradycardia
- heart rate less than 60 beats per minute
- warm skin

Other clinical manifestations of lack of vasomotor tone include absent jugular vein distention, reduced central venous pressure, altered mental status, and hypoactive bowel sounds.

Risk factors for the development of neurogenic shock include sports injuries, gunshot wounds to the spine, medications that affect the autonomic nervous system, and improper administration of anesthesia to the spinal cord.

Assessment and Diagnostics

Most patients who have neurogenic shock also have a spinal cord injury above the thoracic seven vertebrae. This creates a risk of impaired airway maintenance. The nurse should first assess that the patient has an effective airway and the ability to breathe.

The diagnosis of neurogenic shock is often a diagnosis of exclusion. When blood pressure and heart rate are low and fluids do not effectively raise blood pressure, neurogenic shock is suspected. The patient should undergo radiologic studies, including MRI, CT scan, and x-ray to assess for evidence of spinal cord injury. Routine blood work should be obtained to assess the baseline status of the patient.

Diagnostics and Laboratory Values

Patients with neurogenic shock have a variety of characteristic laboratory values, including low levels of red blood cells (RBC), hemoglobin (HGB), and hematocrit (HCT) because of the dilutional effects of volume resuscitation. Table 23.11 summarizes these findings.

Laboratory Test	Laboratory Finding	Cause
Red blood cells (RBC)	Low	Fluid resuscitation
Hemoglobin (HGB)	Low	Fluid resuscitation
Hematocrit (HCT)	Low	Fluid resuscitation
Blood urea nitrogen (BUN)	High	Decreased renal perfusion
Creatinine (Cr)	High	Decreased renal perfusion
Sodium (Na)	Vary	Volume resuscitation
Potassium (K)	High	Cell destruction
Arterial blood gas (ABG)	Abnormal findings	PH > 7.450 = early respiratory alkalosis PH < 7.350 = early metabolic acidosis
Lactic acid	Elevate	Cell death due to anaerobic metabolism
Liver markers	Elevate	Hypoperfusion to liver

TABLE 23.11 Laboratory Values Characteristic of Neurogenic Shock

Nursing Care of the Patient with Neurogenic Shock

It is important for the nurse to identify patients at risk for the development of neurogenic shock and to act in an efficient and immediate manner. Focused assessments and timely communication with the health-care team can prevent or limit long-term or fatal complications from neurogenic shock.

Prevention of neurogenic shock is the best treatment, so education plays a pivotal role in reducing risk. Because spinal cord injury is the most common cause of neurogenic shock, health-care professionals should teach the public about how to prevent spinal cord injuries: for example, by avoiding potentially dangerous activities such as diving

headfirst into a swimming pool and “heading” the ball in games such as soccer. The public should also be educated on the appropriate use of protective equipment such as seat belts and helmets.

Recognizing Cues and Analyzing Cues

The nurse can recognize cues of neurogenic shock by assessing vital signs and noting trends. Cues include low blood pressure, bradyarrhythmia, and peripheral vasodilation such as flushed warm skin that later becomes cold and clammy, and blue lips and fingertips. At-risk patients require frequent and accurate assessments to detect the onset of shock promptly and ensure treatments are most effective (Iovine et al., 2022).

- Any patient exhibiting low blood pressure and low heart rate should be suspected of having neurogenic shock.
- The level of the spinal cord from T7 to T12 helps control the abdominal muscles used for breathing and initiation of an effective cough. Therefore, any patient with a suspected spinal cord injury above T7 should be assessed for the presence of neurogenic shock. Injury of T7 to T12 also results in low lung volume, weak cough, and dyspnea. If the injury is above C3, the patient may need mechanical ventilation because impaired motor control of the respiratory muscles will result.

Nursing care of a patient with neurogenic shock in the emergent phase consists of following the ABCs of care:

- A = The patient’s airway should be assessed and maintained.
- B = The patient’s breathing status should be assessed and supplemented as needed, for example, with supplemental oxygen, endotracheal intubation, or mechanical ventilation.
- C = The patient’s circulatory status also needs to be assessed, as significant hypotension and bradycardia are often components of neurogenic shock.

The nurse should recognize these conditions and provide appropriate treatment to stabilize the patient’s hemodynamics. Figure 23.11 shows an example of a common precautionary measure to protect against neurogenic shock.

FIGURE 23.11 EMS will likely place a cervical collar on a patient with a suspected neck injury, such as this car crash victim. (credit: Szdavid/ Wikimedia Commons, CCBY 4.0)

It is important for the nurse to continually assess for volume overload when intravenous fluids are initially administered to the hypotensive patient. In addition to hemodynamic monitoring, the nurse should assess the lungs to determine the presence of adventitious breath sounds that indicate the development of pulmonary edema. It is imperative that the nurse recognize the cause of hypovolemia in patients is due to loss of blood vessel tone, not blood vessel volume.

Frequently, patients with neurogenic shock require endotracheal intubation and mechanical ventilation. The nurse should assess the patient’s response to suctioning. Insertion of a catheter into the endotracheal tube may trigger the vagus nerve, further dropping the heart rate. It is advisable to have atropine readily available for the treatment of bradycardia as needed. Some health-care providers recommend the use of pacemakers for patients with neurogenic shock who are experiencing significant bradycardia.

Hypothermia when present can be managed with a warming blanket. If the patient is hypothermic and hemodynamically unstable, slow rewarming is indicated. Studies have found that rapid rewarming may worsen the patient's unstable hemodynamic status due to further vasodilation.

The nurse should perform frequent assessments of all body systems to assess the patient's response to treatment. Along with a complete neurologic assessment, the nurse should assess for any change in the level of consciousness that might indicate decreased perfusion to the brain.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Caring for patients with neurogenic shock is complex and involves high attention to detail. The nurse must monitor the patient closely for signs and symptoms that indicate a decline in body systems. The nurse should assign patients experiencing neurogenic shock to a neurologic intensive care unit or spine center for close observation. Without prompt intervention, permanent, irreversible damage may result.

Meticulous skin care is essential. Patients with neurogenic shock are at high risk for developing pressure injuries because of poor perfusion to the skin and possible immobility related to spinal cord injury. Nursing care should also focus on preventing the development of aspiration pneumonia, foot drop, DVT, and other complications of immobility.

Some patients with spinal cord injury manifest changes in bowel and bladder function. Spinal cord injury may result in complete or partial loss of the patient's ability to control or manage excretions. The nurse should assess for urinary retention and bowel obstruction or constipation and provide appropriate care. Hourly and twenty-four-hour intake and output should be accurately assessed and documented.

Neurogenic shock also places patients at risk for the development of GI stress ulcers. The nurse needs to follow through with preventive measures to decrease the chance of gastrointestinal bleeding. Stress has also been found to increase the blood glucose level of patients. Results indicate that patients who have a blood glucose of less than 180 mg/dL experience less morbidity and mortality.

Evaluation of Nursing Care for the Patient with Neurogenic Shock

Successful management of neurogenic shock begins with early diagnosis and accurate identification of the cause. Appropriate treatments to limit low blood pressure and low heart rate have been found to decrease secondary injury to the spinal cord and restore adequate oxygenation to vital tissues, thus limiting cell damage. The effectiveness of treatment can be evaluated by the presence of baseline hemodynamic status of the patient. The optimal patient outcome for neurogenic shock is the resolution of the problem with no residual deficits.

Medical Therapies and Related Care

Medical therapies for patients with neurogenic shock focus on preventing secondary injury to the spinal cord, which starts with immobilizing the spine and completing imaging studies. The patient may require surgery for spine stabilization or decompression.

Other important therapies involve enhancing sympathetic tone to the blood vessels and heart to improve cellular and body tissue perfusion. Patients with neurogenic shock often have systolic blood pressure readings of less than 70 mmHg systolic. Treatment is geared to obtain a mean arterial pressure of 85 to 90 mmHg, as this is known to ensure adequate perfusion to cells and body tissues for patients in neurogenic shock. Hemodynamic stabilization starts with the administration of fluids followed by vasopressors. Fluid therapy is useful to compensate for the vasogenic dilation that occurs because of loss of sympathetic stimulation to the blood vessels; however, it does not result in acceptable profusion to cells and body tissues. Vasopressors are frequently required to obtain baseline hemodynamics. When administering fluids, it is imperative to assess the patient for the development of fluid overload, which often manifests as heart failure or pulmonary edema.

Pharmacotherapy for loss of vascular tone in neurogenic shock often includes the following:

- An **inotropic drug** (digoxin, dobutamine, milrinone) increases the force of cardiac contractions.
- Vasopressors (phenylephrine, norepinephrine, epinephrine, and vasopressin) constrict the blood vessels to increase blood pressure. The goal is to maintain mean arterial pressure between 85 to 90 mmHg.

Pharmacologic treatment of bradycardia in neurogenic shock includes:

- atropine, a positive chronotropic that blocks the effects of the vagus nerve on the heart
- glycopyrrolate, a positive chronotropic that blocks the enzyme that slows heart rate
- isoproterenol beta-1 and beta-2 adrenergic receptors, which reproduce a pure chronotropic effect
- Methylxanthines, which provide a positive chronotropic effect for refractory bradycardia

Summary

23.1 Shock Overview

- Shock is a state of inadequate cellular perfusion.
- Hemodynamic monitoring is the physical study of flowing blood and all solid structures where blood flows. It is useful in understanding the diagnosis and treatment of shock.
- During the initial stage of shock, clinical manifestations are not overtly apparent; however, changes occur at the cellular level.
- In the compensatory stage of shock, cell hypoperfusion causes a drop in blood pressure, tachycardia, cool skin, increased respiratory rate, and a decrease in urine output.
- In the progressive stage of shock, compensatory mechanisms fail and altered capillary permeability causes fluid to leak from the vascular system into the interstitial tissue.
- Vital signs in the progressive stage of shock include low blood pressure, increased heart rate, low urine output, increased respiratory rate, and cool skin with discoloration of peripheral extremities with weak distal pulses.
- In the refractory stage of shock, continued capillary permeability and cell hypoxia lead to cell death. Recovery is not likely from this stage of shock.
- Multiorgan failure (MOF), also referred to as multiorgan dysfunction syndrome (MODS), is a critical illness characterized by inflammation from a severe infection or simultaneous injuries to two or more organ systems.
- The direction of blood is forced to divert to the vital organs of the body, such as the heart, lungs, and brain.

23.2 Hypovolemic Shock

- An effective heart pump, sufficient blood volume, and appropriate sympathetic tone to blood vessels are needed to maintain adequate cell perfusion.
- Hypovolemic shock results when there is insufficient volume in blood vessels to maintain cell perfusion.
- Treatment of hypovolemic shock aims to identify and correct the source of volume loss.
- Absolute hypovolemia can result from overt bleeding, excessive vomiting or diarrhea, fistula drainage, diabetes insipidus, hyperglycemia, or diuresis.
- Relative hypovolemia results from fluid movement from cells and blood vessels into the interstitial space. Causes of this shift include bowel obstruction, burn injury, ascites, long bone fracture, hemothorax, severe pancreatitis, and sepsis.
- During hypovolemic shock, the body attempts to compensate for decreased vascular volume by increasing the sympathetic tone to blood vessels, increasing the sympathetic tone to the heart, increasing rate and contractility, and diverting blood to vital organs.
- Anaerobic metabolism, the accumulation of waste products, results from the hypoperfusion of cells.
- Manifestations of hypovolemic shock include increased heart rate, decreased blood pressure, increased respiratory rate, decreased urine output, and cool clammy skin.
- Treatment for hypovolemic shock focuses on identifying the source of volume loss, stopping the source of volume loss, and restoring appropriate volume. Some patients require the administration of medications to maintain hemodynamic stability.

23.3 Septic Shock

- Sepsis is a serious condition resulting from the body's overreaction to the presence of bacterial, fungal, or viral infection.
- Sepsis leads to an immediate inflammatory process throughout the body; severe sepsis results in organ malfunction, and septic shock is a cause of significant morbidity and mortality.
- MOF/MODS is a clinical syndrome characterized by the development of progressive and potentially reversible physiologic dysfunction in two or more organs or organ systems that is induced by a variety of acute insults, including sepsis.
- Early recognition and treatment of sepsis result in improved patient outcomes.
- Classic manifestations of septic shock include hypotension, tachycardia, tachypnea, low urine output, and mottled skin.
- The release of endotoxins from microorganisms causes vasodilation, maldistribution of blood flow, and

myocardial dysfunction.
- Patients require care provided in an intensive care environment.
- If profound hypotension is unresponsive to fluid therapy, vasopressors are needed.

23.4 Neurogenic Shock

- Neurogenic shock is a life-threatening medical condition caused by the sudden loss of sympathetic nerve stimulation, which is necessary to maintain normal muscle tone in the blood vessels. As a result, there is insufficient blood flow throughout the body, causing low blood pressure.
- Neurogenic shock is caused by the loss of vasomotor tone in the blood vessels, not by insufficient volume.
- Dilation of arteries and veins results in the pooling of blood and inadequate perfusion of cells and body tissues.
- The most common cause of neurogenic shock is spinal cord injury. Other causes include complications from spinal anesthesia and head trauma.
- Hallmark findings in neurogenic shock include hypotension, bradycardia, and initially warm, dry skin above the level of the injury.
- Fluid resuscitation is the first-line treatment to restore blood pressure; however, vasopressors are often needed to restore cell and tissue perfusion.
- Emergent nursing care for patients with neurogenic shock includes the ABCs, along with protecting the cervical spine and preventing secondary spinal cord injury.
- Continual assessments and interventions should be incorporated into care to prevent long-term complications.

Key Terms

absolute hypovolemia loss of blood that is visible
cardiopulmonary pressure normal range is 11–20 mmHg; elevated ranges result in pulmonary hypertension
central venous pressure (CVP) measure of the adequacy of blood volume within the vascular system; normal range is 8–12 mmHg
citrate toxicity condition caused by the accumulation of citrate, which binds to calcium in the body, causing hypocalcemia and hypomagnesemia
compensatory stage second stage of shock, characterized by a noticeable drop in blood pressure and causes stimulation of baroreceptors of the carotid and aortic bodies
D-dimer simple blood test that can help the health-care provider determine if a blood clotting condition is present
dilutional coagulopathy disruption of normal clotting mechanisms following the replacement of blood with fluids that do not contain adequate coagulation factors
hemodynamics study of blood flow and the relevant body structures
hypermetabolic state situation that occurs in response to injury and is characterized by increased blood pressure and heart rate, peripheral insulin resistance, and increased protein and lipid catabolism
initial stage first stage of shock, when the body responds to hypotension with stimulation of the sympathetic nervous system (SNS) and the release of epinephrine and norepinephrine
inotropic drug medication that increase cardiac contractility
mean arterial pressure (MAP) average arterial pressure through one cardiac cycle; normally 70–100 mmHg
multiorgan failure (MOF) failure of several organs at the same time, usually as the result of shock; also called multiple organ dysfunction syndrome (MODS)
neurogenic shock distributive type of shock resulting in hypotension (low blood pressure), often with bradycardia (slowed heart rate), caused by disruption of autonomic nervous system pathways
progressive stage third stage of shock, when profoundly decreased cellular perfusion results in a significant increase of capillary permeability, causing protein and fluid to leak out of the vascular system into the interstitial space
pulmonary artery catheter central venous catheter used to measure cardiopulmonary pressure
refractory stage final stage of shock, characterized by extreme dysfunction of cellular processes in multiple body systems
relative hypovolemia volume adjustment within the body from the vascular space to the interstitial space
renin-angiotensin-aldosterone system (RAAS) critical regulator of blood volume, electrolyte balance, and blood

vessel tone

sepsis overreaction of the immune system to infection

septic shock condition of low blood pressure (despite adequate intravenous fluid administration), decreased blood flow to cells, and formation of blood clots in vessels, leading to organ damage, organ failure, and, ultimately, death

severe sepsis sepsis that results in organ malfunction

shock state of inadequate cellular perfusion, leading to hypoxia and cell death

spinal shock altered physiologic state immediately after spinal cord injury, resulting in flaccid paralysis, anesthesia, absent bowel bladder control, and loss of reflex activity below the level of the injury; normal function may return if the spinal shock resolves

vasopressor member of a class of drugs that induces vasoconstriction and increase blood pressure

volume resuscitation administration of fluids to compensate for insufficient intravascular fluid volume

Assessments

Review Questions

1. Shock is a state of a decrease in what?
   a. heart rate
   b. urine output
   c. blood pressure
   d. cell perfusion

2. What is a hallmark finding in the progressive stage of shock?
   a. significant increase in capillary permeability
   b. activation of the sympathetic nervous system
   c. stimulation of the carotid and aortic baroreceptors
   d. arousal of the renin-angiotensin-aldosterone system (RAAS)

3. In what stage of shock are the aortic and carotid baroreceptors stimulated to regulate blood pressure?
   a. initial stage
   b. compensatory stage
   c. progressive stage
   d. refractory stage

4. What response occurs when the renin-angiotensin-aldosterone system (RAAS) is activated?
   a. Water is excreted from the kidneys.
   b. Sodium from the kidneys decreases.
   c. Blood vessels constrict.
   d. Heart rate increases.

5. What is a hallmark finding of the refractory stage of shock?
   a. low urine output
   b. low blood pressure despite treatment
   c. low respiratory rate
   d. low heart rate

6. A nurse reviews laboratory results for a patient who has had uncontrolled vomiting and diarrhea for the past thirty-six hours. What clinical manifestation is an indication that the patient may be experiencing hypovolemia?
   a. high urine specific gravity
   b. lactate level of 2 mmol/L
   c. potassium of 4.0 mEq/L
   d. urine output of 40 mL/hour

7. A patient who experienced a burn injury is receiving fluid resuscitation therapy. To prevent complications from fluid resuscitation, what is most important for the nurse to assess?
   a. breath sounds
   b. burn wound dressings
   c. pain level
   d. urine output

8. What is an example of a patient whom the nurse would identify as most at risk for the development of hypovolemic shock?
   a. an eighteen-year-old patient who sustained a neck injury while diving into a pool
   b. a forty-year-old type I diabetic with a blood sugar of 422
   c. a fifty-two-year-old patient who sustained an anterolateral myocardial infarction eight hours ago
   d. a seventy-two-year-old patient with a urinary tract infection

9. The nurse is caring for a patient who received multiple blood transfusions for treatment of hemorrhagic hypovolemic shock. The nurse is especially concerned about the patient developing citrate toxicity. To prevent this, the nurse should assess for low levels of what electrolyte?
   a. phosphate
   b. potassium
   c. sodium
   d. calcium

10. The nurse is part of the medical team caring for a patient in hypovolemic shock. The team assesses the patient and ensures that the airway, breathing, and circulation is stabilized. What next step should the team take?
   a. start epinephrine to increase the patient's heart rate
   b. start vasopressors to stabilize blood pressure
   c. start inotropes to increase the force of cardiac contraction
   d. identify the source of fluid loss

11. What laboratory finding is likely for patients who are experiencing hemoconcentration from the development of ascites?
   a. elevated hematocrit
   b. elevated BUN
   c. elevated potassium
   d. elevated lactate

12. A nurse receives orders from the provider for a post-op patient diagnosed with sepsis. What order should the nurse implement *first*?
   a. administer antibiotics
   b. change the surgical dressing
   c. insert a Foley catheter
   d. obtain a blood culture

13. A panel of blood work is drawn for a patient suspected of having septic shock. It is most important for the nurse to inform the provider of what result?
   a. lactate level: 4 mmol/L
   b. platelet count: 300,000 platelets per microliter of blood
   c. red blood cell count: 4.5 million
   d. white blood cell count: 9,000 per microliter

14. Laboratory results are reviewed by a nurse for a patient suspected of having sepsis. What value is most often associated with a diagnosis of sepsis?

a. negative endotoxin
b. high partial thromboplastin time (PTT)
c. low C-reactive protein
d. negative procalcitonin value

15. The nurse identifies what patient as being at highest risk for the development of septic shock?
a. a twenty-year-old with a closed fractured femur
b. a seventy-four-year-old who takes a diuretic for hypertension control
c. a fifty-two-year-old who had a cerebral vascular aneurysm repaired
d. a forty-year-old who had a total knee replacement

16. The nurse is caring for a patient in septic shock. What result would lead the nurse to conclude that the current treatment plan is effective?
a. urine output of 28 mL/hour
b. lactate level of 7 mmol/L
c. blood glucose of 118 mg/dL
d. mean arterial pressure of 60 mmHg

17. What is most accurate indicator of recovery from septic shock?
a. negative blood culture
b. urine output of 40 mL/hour
c. blood pressure of 118/78 mmHg
d. oral temperature of 37.2°C

18. What is a risk factor for the development of neurogenic shock?
a. myocardial infarction
b. pneumonia
c. severe burns to the chest
d. spinal cord injury

19. What drug is used in the treatment of bradycardia of neurogenic shock?
a. atropine
b. dobutamine
c. epinephrine
d. norepinephrine

20. When assessing a patient who sustained a spinal cord injury, what manifestation does the nurse identify as being most often associated with neurogenic shock?
a. bradycardia
b. hypotension
c. flaccid muscles and loss of reflex activity below the level of the injury
d. cool skin

Check Your Understanding Questions

1. What is the key contributor to the progression of shock?

2. In the early stages of shock, the body compensates for decreased cell perfusion by activating what system to elicit the “fight or flight” response?

3. In which stage of shock is blood pressure significantly low despite treatment?

4. What is the best noninvasive indicator of adequate perfusion to the kidney?

5. When a patient with hypovolemic shock is being treated with volume resuscitation, what should be the nurse’s priority concern?

6. A patient is experiencing an overreaction of the immune system. The nurse should identify the patient as being in what stage of sepsis?
7. Hypotension in neurogenic shock is primarily due to _____.
8. Patients experiencing neurogenic shock experience _____, also known as intrinsic thermoregulatory failure, which can lead to both hypothermia and hyperthermia.

Reflection Questions

1. Tissue perfusion and organ perfusion depend on mean arterial pressure (MAP), or the average pressure at which blood moves through the vasculature. Why must the MAP exceed 65 mmHg?
2. Shock progresses along a continuum and can be identified by stages. Why is it critical the nurse complete a thorough assessment and monitor the patient's signs and symptoms?
3. When administering multiple units of blood to a patient in hypovolemic shock caused by hemorrhagic bleeding from a bleeding gastric ulcer, what actions should the nurse take?
4. How can nurses evaluate the efficacy of care for patients with neurogenic shock?
5. Spinal cord injury is the number one cause of neurogenic shock. Data supports the benefits of fall prevention education for older adults. How might you incorporate fall prevention teaching into the care you provide for older patients?
6. The nurse is assessing a patient who sustained a spinal cord injury to thoracic vertebrae 5. The patient's vital signs are currently blood pressure 78/50 mmHg, heart rate 56 and regular, respiratory rate of 11 breaths per minute, and oral temperature of 36.8°C.

   Which medication should the nurse plan to administer first, and why?

7. After volume resuscitation, what medication should the nurse plan to administer next to achieve hemodynamic stabilization?

What Should the Nurse Do?

John, a thirty-five-year-old male, was involved in a motorcycle accident and sustained a spinal cord injury at the T4 level. Upon arrival at the emergency department, he presents with bradycardia, hypotension, and warm, dry skin below the level of injury. The health-care provider orders a series of diagnostics, including blood tests and imaging, to evaluate John's condition further. John's condition is confirmed as neurogenic shock. The health-care team initiates treatment protocols, and you are responsible for implementing the nursing care plan. After several hours of treatment, John's blood pressure has stabilized, and his heart rate has improved. However, he still exhibits signs of impaired perfusion. The physician orders norepinephrine and atropine to manage John's neurogenic shock.

1. What verbal and nonverbal cues should the nurse recognize that indicate John may be experiencing neurogenic shock?
2. What diagnostic tests and laboratory values should the nurse monitor to confirm the diagnosis of neurogenic shock, and how do these findings guide the next steps in care?
3. What specific nursing interventions should be prioritized for John to manage neurogenic shock, and how would these interventions be tailored to his injury?
4. How should the nurse evaluate the effectiveness of the interventions provided for John, and what indicators would suggest a need to adjust the care plan?
5. What should the nurse consider when administering norepinephrine and atropine, and how would the nurse explain the purpose and potential side effects of these therapies to John?

Competency-Based Assessments

A forty-five-year-old male is admitted to the emergency department following a motor vehicle accident. He has multiple lacerations and significant blood loss. Upon arrival, his vital signs are:

- Blood pressure: 85/55 mmHg
- Heart rate: 130 beats per minute

- Respiratory rate: 28 breaths per minute
- Skin is cold and clammy, and the patient is anxious.

1. Based on the patient's presentation, discuss the pathophysiology of hypovolemic shock and identify three risk factors and three clinical manifestations seen in this patient.
2. The same patient is undergoing diagnostics to confirm hypovolemic shock. The health-care team orders a complete blood count (CBC), blood chemistry, and arterial blood gases (ABGs). Describe the key diagnostic tests and expected laboratory findings for a patient in hypovolemic shock.
3. The patient's condition is deteriorating, and you are the nurse responsible for managing their care. Develop a nursing care plan for this patient, incorporating key nursing concepts for managing hypovolemic shock.

Jamal visits his grandmother once a week to take her grocery shopping. Today when Jamal arrives at her home, she does not answer the door. Jamal uses his key to let himself in and finds his grandmother lying on the bed. She is very confused and weak. Jamal calls 911 for assistance. She is transported to the local emergency department where you are the nurse assigned to care for the patient. Upon admission, the patient is disoriented to time, place, and person and manifests these vital signs:

- Blood pressure: 78/58 mmHg
- Heart rate: 122 beats per minute
- Respiratory rate: 26
- Temperature 39 °C

4. Using the scenario preceding, develop a plan of care identifying the patient's quick Sequential Organ Failure Assessment (qSOFA)?
5. Considering the progression for the preceding scenario, the provider orders a broad-spectrum antibiotic for the patient because sepsis is suspected. Prior to administering the antibiotic, the nurse validates that the patient has no allergies to the ordered medication. Develop a list of other steps the nurse must take prior to administering the antibiotic.
6. Early diagnosis and treatment of sepsis is key to patient survival. The nurse is aware of the recommended implementation of a one-hour bundle in the treatment of a patient who is suspected of having sepsis. Develop a presentation for your peers explaining what the one-hour bundle includes.

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CHAPTER 24

Management of Patients with Allergic Disorders

FIGURE 24.1 EpiPens are hypodermic devices that deliver a dose of epinephrine for emergency treatment of acute allergic reactions and to prevent or improve anaphylaxis. (credit: New Jersey National Guard/Flickr, Public Domain)

CHAPTER OUTLINE

INTRODUCTION The human body comes in contact with many potential intruders like allergens or pathogens that can pose a threat. The body is enabled with its own defenses to combat invaders and protect itself. However, in some instances the defenses are breached, causing an interruption in the body's enzyme systems that can destroy vital tissues.

The allergic system, also known as the immune system, is a complex network of cells, tissues, and organs that work together to defend the body against harmful substances and protect it from infections. Its primary function is to recognize and respond to foreign substances, known as allergens, in order to maintain the body's overall health and well-being. At times, it may overreact creating allergic disorders, which nurses must identify and know how to treat. This chapter will explore those allergic disorders and the medical and nursing treatment.

24.1 Allergic Response

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the role of immunoglobulins in the allergic process
- Differentiate the chemical mediators and their role in the allergic process
- Discuss the pathophysiology, risk factors, and clinical manifestations for hypersensitivity
- Describe the diagnostics and laboratory values in the patient experiencing hypersensitivity
- Apply nursing concepts and plan associated nursing care for patients experiencing hypersensitivity
- Evaluate the efficacy of nursing care for patients experiencing hypersensitivity
- Describe the medical therapies that apply to the care of patients experiencing hypersensitivity

Allergic responses are the ways the body responds to a pathogen or intruder. When it overreacts, it can develop into an allergic disorder that is an inappropriate or exaggerated response of the body's immune system to a substance that is usually harmless. The response may be due to contact by inhalation, contact, or ingestion of various allergens. Common allergic responses are to seasonal allergens like various trees, ragweed, or pollens; medications; perennial allergens like dust or molds; latex; animal dander; foods; household chemicals; fragrances; and insect stings or bites, as shown in Figure 24.2. Allergic responses vary among individuals; not every person will respond in the same way to an allergen.

FIGURE 24.2 An allergic reaction to a bee sting may cause painful swelling, as seen here. (credit: " Bee Sting Gone Bad" by OakleyOriginals/Flickr, CC BY 2.0)

Physiologic Overview of an Allergic Response

An **allergy** is an inappropriate or exaggerated response of the body's immune system to a foreign substance that is usually harmless, known as an allergen. An **allergen** is a type of antigen, triggering a series of events as the body attempts to terminate and eliminate the invaders. For example, lymphocytes in the body respond to the antigens by producing antibodies. An **antibody** is a protein substance that protects against antigens. Antibodies react with antigens in a number of ways and each antibody is specific to the type of antigen present.

During an allergic response, the immune system overreacts to harmless substances, known as allergens, triggering a cascade of physiological events. Allergens can enter the body through various routes, such as inhalation, ingestion, or direct contact with the skin. Table 24.1 provides a physiologic overview of an allergic response.

Physiological Event	Description
Activation of immune cells	The allergen is captured and processed by specialized cells called antigen-presenting cells (APCs), such as dendritic cells. APCs present fragments of the allergen, known as antigens, to T cells, which are a type of lymphocyte.
T cell activation	Upon encountering the allergen, specific T cells, known as helper T cells (Th cells), are activated. Th cells release chemical signals, such as cytokines, that stimulate other immune cells, including B cells and mast cells.
B cell activation and antibody production	Activated Th cells stimulate B cells to produce antibodies, specifically immunoglobulin E (IgE) antibodies. IgE antibodies are specialized to recognize and bind to the specific allergen.
Sensitization	The produced IgE antibodies attach to receptors on the surface of mast cells and basophils, which are types of immune cells found in tissues throughout the body. This process is known as **sensitization**.
Allergen re-exposure	If the sensitized individual is re-exposed to the same allergen, the allergen binds to the IgE antibodies on the surface of mast cells or basophils.
Release of chemical mediators	The cross-linking of allergen with IgE antibodies on mast cells or basophils triggers the release of chemical mediators, including histamines, leukotrienes, and prostaglandins. Histamine, in particular, plays a significant role in producing immediate allergic symptoms.
Immediate allergic response	The released chemical mediators cause various physiological effects. They cause blood vessels to dilate, leading to increased blood flow and leakage of fluid into tissues. This results in local swelling, redness, and heat. Histamine also stimulates the nerve endings, causing itching and pain. Increased mucus production can occur in the respiratory tract, leading to nasal congestion or wheezing.
Late-phase allergic response	In some cases, an additional response, known as the late-phase response, may occur several hours after the initial allergic reaction. It is characterized by the infiltration of immune cells, including eosinophils and other inflammatory cells, into the affected tissues. This leads to prolonged inflammation and persistent symptoms.
Systemic allergic response	In severe cases, an allergic response can become systemic, affecting the entire body. This can lead to a drop in blood pressure (anaphylaxis); difficulty breathing; swelling of the face, tongue, or throat; and can be life-threatening.

TABLE 24.1 The Allergic Response

It is important to note that allergic responses can vary in severity and presentation among individuals. The specific symptoms and intensity of the allergic response depend on factors such as the type of allergen, the route of exposure, the individual's immune system, and any pre-existing allergies or sensitivities. Understanding the physiologic overview of an allergic response helps health care professionals diagnose allergies, develop treatment plans, and provide appropriate interventions to manage allergic symptoms effectively.

Immunoglobins

When the body's immune system is first exposed to an allergen, lymphocytes and plasma cells produce immunoglobulins. An **immunoglobulin** is a protein capable of acting as an antibody. Immunoglobulins can be grouped into five classes: IgG, IgA, IgM, IgD, and IgE. They are commonly found in the tonsils, appendix, lymph

nodes, and **Peyer patches** (small groupings of lymphoid follicles) of the intestinal tract; they also circulate in lymph and blood.

The IgE immunoglobulins are involved in producing an **allergic disorder**, a common pathological condition due to IgE-dependent immunological reactions to an allergen. This particular class of immunoglobulin is found in the respiratory and intestinal mucosa. IgE molecules bind together to an allergen and trigger mast cells of the tissues or white blood cells in the bloodstream, called basophils, to release chemical mediators like histamine, kinins, serotonin, slow-reacting anaphylaxis substances, and the neutrophil factor that produces allergic skin reactions, hay fever, and asthma. IgE-mediated diseases have a genetic component. The genetic tendency to develop allergic diseases such as allergic rhinitis, asthma, and atopic dermatitis is called **atopy**. It refers to a hypersensitivity response to an allergen.

Role of B Cells

A **B cell** is a regulatory cell in the immune system; they are also called B lymphocytes. B cells are designed to produce one specific antibody. When there is an encounter with a specific antigen, the B cells stimulate the production of plasma cells, resulting in a flood of antibodies that terminate and eliminate the antigen.

Role of T Cells

A **T cell** is a cell that assists B cells; they are also called T lymphocytes. T cells secrete substances that direct cell defense activity, defeat target cells, and rouse macrophages that trigger an immune response by presenting antigens to the T cells. T cells then digest the antigens; they also aid in eliminating the remains of the invading cells and other debris.

Antigens

Examples of complete protein antigens include horse serum, pollen, and animal dander. Active communication between cells is necessary in allergic reactions in order for the physiologic process involved in an allergic response to be triggered (Abbas et al., 2023). When an allergen is engulfed through the gastrointestinal tract, skin, or respiratory tract, allergen sensitization occurs. Macrophages manage the antigen and allow it access to the proper cells. These cells develop into allergen-specific secreting plasma cells that produce and secrete antigen-specific antibodies.

Chemical Mediators

A **mast cell** of the skin and mucous membranes perform a key role in IgE-mediated immediate hypersensitivity. Mast cells are specialized types of white blood cells that are found throughout the body in tissues that line the skin, blood vessels, lymph vessels, nervous tissue, lungs, and intestines and act as security guards scanning for intruders. Once they are disrupted, the mast cell releases chemicals to activate the immune response to fight off the pathogen. IgE molecules bind together to an allergen and trigger mast cells to release chemical mediators like histamine, kinins, serotonin, slow-reacting anaphylaxis substances, and the neutrophil factor that produces allergic skin reactions, hay fever, and asthma. These physiologic events that result from immediate hypersensitivity may range from mild to life-threatening symptoms.

Primary Mediators

Primary mediators include histamine, eosinophil chemotactic factor, platelet activating factor, and prostaglandins. Histamine plays a key role in immune responses; it is usually the first chemical mediator to be released in both immune and inflammatory responses. This chemical mediator is produced and kept in high concentrations in body tissues exposed to environmental substances. Effects of histamine include erythema, pruritus, localized edema (wheals), contraction of bronchial smooth muscle (resulting in bronchospasms and wheezing), and enhanced secretion of mucosal and gastric cells (diarrhea), as the role of histamine is to create vasodilation, which promotes oxygen and white blood cells to the area of attack. The histamine's effects peak 5 to 10 minutes after antigen interaction. Histamine-1 receptors are found primarily on vascular smooth and bronchiolar muscle cells. Histamine-2 receptors are found primarily on gastric parietal cells.

The eosinophil chemotactic factor of anaphylaxis impacts the movement of granular leukocytes, particularly eosinophils, to allergen sites. An **eosinophil** is a leukocyte that protects the body from parasites, allergens, and other organisms. This chemical mediator is pre-formed in the mast cells and released from disrupted mast cells.

Platelet activating factor is chemically derived from arachidonic acid and is responsible for stimulating the platelet aggregation and leukocyte permeation in immediate hypersensitivity reactions. This chemical mediator causes bronchoconstriction, increased vascular permeability, and vasodilation.

A **prostaglandin**, or an unsaturated fatty acid with a wide range of biologic activity, produces smooth muscle contraction, increased capillary permeability, and vasodilation. This chemical mediator sensitizes pain receptors and increases pain from inflammation. Prostaglandins also prompt inflammation and boost the effects of mediators in inflammatory responses. Local indications include edema, heat, and erythema.

Secondary Mediators

Secondary mediators include leukotrienes, bradykinin, and serotonin. A **leukotriene** is a chemical mediator that initiates the inflammatory response. Indications of inflammation may be in part due to leukotrienes. Leukotrienes also cause smooth muscle contraction, bronchial constriction, smooth muscle contraction, mucus airway secretions, and wheal-and-flare skin reactions. In comparison to histamine, leukotrienes are 100 to 1,000 times more powerful in triggering bronchospasm. The chemical mediator **bradykinin** is a substance that stimulates nerve fibers and causes pain. It can cause vasodilation, hypotension, increased vascular permeability, and smooth muscle contraction (for example, of the bronchi). Edema results from increased capillary permeability. The chemical mediator **serotonin** acts as a forceful vasoconstrictor and bronchoconstrictor and is formed in platelets.

Hypersensitivity

An abnormal heightened response to any type of stimulus is called **hypersensitivity**. The reaction does not normally occur after the initial exposure to an allergen. The reaction follows subsequent exposure after sensitization, or the building up of antibodies in a person who is predisposed. Hypersensitivity reactions can be broken down into four classes; types I and IV are the most common. Types I, II, and III occur within 24 hours of exposure, whereas type IV reactions occur 1 to 3 days after allergen exposure.

Pathophysiology

Type I hypersensitivity, or anaphylactic response, is facilitated by IgE antibodies produced by the immune system in response to allergens like dust mites, animal dander, and pollens. These IgE antibodies attach to mast cells and basophils that release histamine granules, which cause inflammation. This type of reaction can be seen in allergic rhinitis, allergic dermatitis, bronchial asthma, food allergy, anaphylactic shock, and conjunctivitis (Vaillant et al., 2023).

Type II hypersensitivity involves cytotoxic-mediated responses against cell surface and extracellular matrix proteins. These reactions are facilitated by IgG and IgM antibodies. The immunoglobulins damage cells by phagocytosis or by triggering the complement system. This type of reaction can be seen in autoimmune hemolytic anemia, autoimmune neutropenia, and immune thrombocytopenia (Vaillant et al., 2023).

Type III hypersensitivity, or immunocomplex reactions, are also facilitated by IgG and IgM antibodies that react with soluble antigens to create antigen-antibody complexes. The complement system is triggered and issues chemotactic agents that attract neutrophils and cause tissue damage and inflammation, as seen in glomerulonephritis and vasculitis. This type of reaction can be seen in an Arthus reaction and serum sickness (Vaillant et al., 2023). An Arthus reaction refers to an acute, localized inflammatory response that typically occurs after vaccination. It is classified as a type III hypersensitivity reaction, which is when antigen-antibody clusters, also known as immune complexes, are formed due to an abnormal immune system response.

Type IV, or delayed-type, hypersensitivity is a reaction where tissue damage is the result of T cell–dependent macrophage activation and inflammation. The pathophysiology of this type of reaction depends on the underlying cause.

- Granulomatous type reactions occur when T cells are triggered by antigen-presenting cells that are not able to terminate engulfed antigens. Macrophages are recruited to the site and accumulate intracellularly, forming a granuloma. An example is sarcoidosis.
- Drug hypersensitivity occurs when various drug particles join T cell receptors.
- Contact hypersensitivities occur when haptens invade the skin with vicinity to the cells of the epidermis and dermis and trigger an inflammatory reaction. A **hapten** is an incomplete antigen. The dendritic and Langerhans cells play a key role in antigen presentation and sensitization of these haptens to CD4 and CD8 T

cells. The T cells exude cytokines and other enzymes to enlist other immune cells to the hapten exposure sites. Keratinocytes also help in recruiting immune cells by secreting cytokines like IL-8 (Marwa & Kondamudi, 2023).

Clinical Manifestations

Clinical manifestations of type I reactions include hypotension, bronchospasm, and, in critical cases, cardiovascular collapse. This type of reaction may also include asthma, allergic rhinitis, and systemic **anaphylaxis**, which is a potentially life-threatening type I hypersensitivity response resulting from the rapid release of IgE-mediated chemicals in an attempt to eliminate a triggering allergen.

Type II reactions are characterized by tissue damage. Immune thrombocytopenia may include petechiae or bleeding of the gums, bowel, urinary tract, or bowels. Autoimmune hemolytic anemia may be characterized by jaundice. Myasthenia gravis manifestations include diplopia, extreme muscular fatigue, deconjugate eye movements, difficulty swallowing, arm weakness, and bilateral ptosis. Another common type II reaction is Goodpasture syndrome, which is characterized by lung hemorrhage and nephritis. Type III reactions are characterized by edema, hemorrhage, vasculitis, and arthritis. Clinical manifestations of type IV contact dermatitis reactions include erythema, itching, vesicles, and bullae. Other manifestations are dependent on the cause. Drug reactions may include fever, rash, wheals, or multiorgan involvement. Granulomatous-type hypersensitivity is characterized by shortness of breath, weakness, weight loss, fever, dry cough, and chest pain (Marwa & Kondamudi, 2023).

Assessment

In order to effectively manage allergic and hypersensitivity disorders, a comprehensive allergy assessment and physical examination are needed to provide sufficient data. Any reaction to an allergen should be assessed and documented, including patient symptoms or discomfort, severity, treatments (if any), and response to interventions. Assessment will include obtaining symptoms of the eyes, ears, nose, throat, chest, and skin from the patient. The nurse will also want to ask the patient about factors that precede symptoms (like food, medication, or other exposure) or that exacerbate or alleviate the symptoms, as well as how often the symptoms occur.

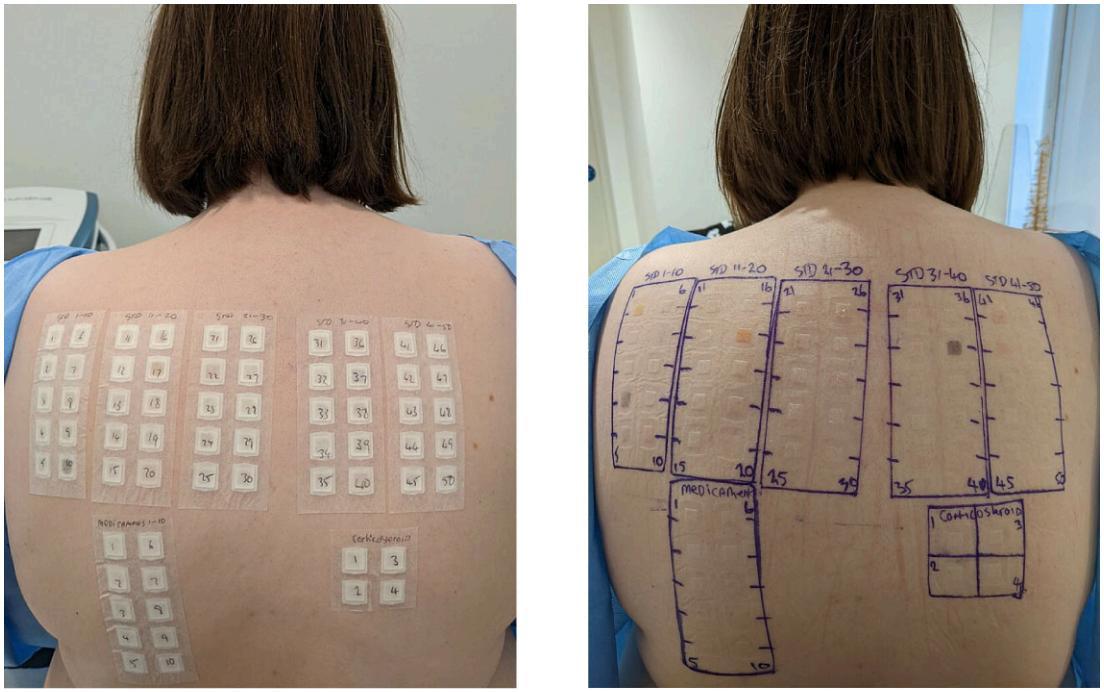
Diagnostics and Laboratory Values

Diagnostic tests for hypersensitivity include complete blood count (CBC) with differential, eosinophil count, total serum IgE, and skin tests. A complete blood count with differential frequently reveals white blood cells are elevated with infection or inflammation. Eosinophils are elevated in an allergic response and may be tested from either blood samples or smears of nasal secretions. High total serum IgE levels are indicative of an allergy disorder.

Other simple blood tests that are commonly used to detect a general state of inflammation include the C-reactive protein (CRP) and homocysteine level tests. These are commonly tested for in autoimmune conditions such as Hashimoto thyroiditis and even to detect cardiac risk for heart attacks. High levels of CRP or homocysteine have been shown to be correlated with early cardiac death.

Skin Tests

Skin tests may be performed as an intradermal injection or a superficial application of solutions at various sites (Figure 24.3). This is commonly done on a patient's back. Some allergy tests may have several solutions applied at different locations in one sitting. The solutions contain various antigens that represent an assortment of allergens known to cause reactions. Positive reactions are indicated by a wheal-and-flare reaction at the site. Depending on the severity of the reaction, some patients may also exhibit other symptoms like facial swelling or difficulty breathing.



(a) (b)

FIGURE 24.3 This patient is undergoing a skin test for allergies: (a) patches with a variety of allergens are applied to her back; (b) when the patches are removed, red marks indicate reactions to specific allergens. (credit a: modification of "Skin patch allergy test 01" by "Smirkybec"/Wikimedia Commons, CC BY 4.0; credit b: modification of "Skin patch allergy test 02" by "Smirkybec"/Wikimedia Commons, CC BY 4.0)

Skin test results should be combined with patient history, physical findings, and other lab tests like serum IgE, CBC with differential, and an eosinophil count in order for the physician to make a proper diagnosis. Not every person will react to a specific allergen. Precautions are necessary when performing skin tests. For example, avoid testing during times of bronchospasm, have emergency equipment available in the event of anaphylaxis, and perform scratch or prick tests before other methods in order to limit the risk of a systemic reaction. Other physical testing may include muscle testing, which is less invasive.

CLINICAL SAFETY AND PROCEDURES (QSEN)

QSEN Competency: Safety

Definition: "Minimizes risk of harm to patients and providers through both system effectiveness and individual performances" (Quality and Safety Education for Nurses, 2020, table 5).

Knowledge: The nurse will analyze basic safety principles, understand evidence-based practice standards, and reflect on unsafe nursing practices.

Skill: Demonstrate effective strategies to reduce the risk of harm. The nurse will:

- educate the patient (and guardian if patient is a minor) of the process and ensure consent has been obtained
- be aware of signs and symptoms related to allergic reactions
- be aware of signs and symptoms of anaphylaxis
- assess the patient is safe to proceed with testing; for example, ruling out current signs of bronchospasms or other signs of current allergic response
- remain with the patient
- have the appropriate equipment nearby in the event emergency intervention warranted
- perform scratch or prick tests before other methods in order to limit the risk of a systemic reaction

Attitude: The nurse will respect individual role in preventing errors by adhering to safe, evidence-based practice

standards.

(QSEN Institute, n.d.)

Nursing Care of Patients with Hypersensitivity

Nursing care for a patient with hypersensitivity will vary depending on the severity of the patient's reaction. In an acute care setting, if a patient is having a known or suspected reaction to a medication being administered intravenously, the medication must be immediately stopped. If the reaction is from a topical medication or solution, the patient's skin should be washed and patted dry. Removal of the offending trigger is key.

LINK TO LEARNING

Watch this video to learn more about the nursing procedure for monitoring patients receiving a blood transfusion (https://openstax.org/r/77BloodTransfus) for potential reactions.

Recognizing and Analyzing Cues

Per the Clinical Judgment Measurement Model, part of the nursing process includes recognizing and analyzing cues. When it comes to hypersensitivity reactions in an acute care setting, the nurse should assess for signs of dyspnea, anaphylaxis, rashes, fever, wheals or hives, erythema, flushing, pruritus, and edema. The nurse should also ask the patient if they are experiencing any difficulty breathing, any sudden changes in how they feel, or any other type of discomfort. The nurse should also be aware of when the symptoms started and when medication was given. The nurse should document the symptoms and onset after a medication has been administered. For patients reporting an allergy to a medication, the nurse must ask for onset, symptoms, and type of medication taken in order to assess if the patient is experiencing hypersensitivity or a side effect of the medication.

CLINICAL JUDGMENT MEASUREMENT MODEL

Recognize and Analyze Cues

Before they can recognize cues of an allergic reaction, nurses must make sure they have enough information about a patient's situation to correctly interpret the information and develop a plan of care. Suppose a patient claims to have an allergy to a certain medication. The nurse will need to assess further. For example, the nurse will need to ask what symptoms the patient experienced to determine if the patient's reaction was truly an immune response or a side effect of the medication. For example, a patient may report an allergy to hydrocodone by stating they experienced nausea after taking the medication. However, nausea is a common side effect of that medication; it is not necessarily a sign of an allergy. Only after considering all relevant information should the nurse move on to the next step of the Clinical Judgment Measurement Model: prioritizing a hypothesis and providing the appropriate education to the patient.

(National Council of State Boards of Nursing, n.d.)

Prioritizing Hypotheses, Generating Solutions, and Taking Action

If after analyzing cues the nurse determines the patient is having a reaction to a medication, the nurse must quickly prioritize interventions. Immediate interventions include discontinuing or removing the medication, managing the airway, administering oxygen as ordered, administering medications like epinephrine or diphenhydramine as ordered, and activating a rapid response in the event of anaphylaxis. The medication should also be documented as an allergy in the patient's chart, and the patient should be educated about the allergy, any related medications, and the need to report this medication at other health care facilities. For example, penicillin and amoxicillin are in the same drug category, so a patient who has an allergic reaction to one medication is likely to have a similar reaction to the other. If a patient was told they had a reaction to a medication as a child, but they are unsure of the reaction type, the nurse should err on the side of caution and document the medication as an allergy. Any interventions performed should also be documented.

Evaluation of Nursing Care for Patients with Hypersensitivity

Evaluation is an essential part of the nursing process. The nurse should compare observed outcomes against expected outcomes. This allows the nurse to evaluate for signs of improvement, decline, or no change in condition. The nurse would then use clinical judgment to assess whether the interventions were effective or if revised interventions are needed.

Evaluating Outcomes

Evaluating is not a one and done procedure; it is ongoing and multifactorial. The nurse should evaluate the effectiveness of every intervention. For example, if the patient experienced difficulty breathing, and the nursing intervention was to apply supplemental oxygen as ordered, the nurse should reassess the patient's respiratory status for improvement. The nurse should also assess whether any medications administered had the desired effect. For example, if diphenhydramine was given to aid in relieving pruritus, the nurse should ask the patient if itching has improved or gotten worse. The nurse should also watch for cues like scratching or grimacing. The nurse should document the evaluation of the interventions provided as well.

Medical Therapies and Related Care

As previously mentioned, standard interventions for an allergic reaction to a medication include immediately discontinuing the medication, assessing the airway, administering oxygen as ordered, and administering medications. The medication, along with the associated symptoms and their severity, should be documented as an allergy in the patient chart. The patient should be educated about the allergy, any related medications, and the need to report this medication at other health care facilities. Other related care would include finding alternative therapeutic medications that the patient can take to manage their health care needs.

Patients who are diagnosed with environmental allergies like pollen, various trees, plants, or grass may also be prescribed allergy injections to be given at regular intervals when those allergens are in season. Patients with allergies to insect stings or various food may also be prescribed an Epi-Pen (Figure 24.1) to keep with them in the event of an exposure to an allergen. The Epi-Pen injects a dose of epinephrine into the thigh; the medication then relaxes the muscles in the airway, stomach, intestines, and bladder. It is effective in reversing anaphylaxis that may present in allergic reactions. Some patients may be recommended to wear a medical alert bracelet to notify others of their allergies in the event of an emergency such as an extreme allergic reaction to peanuts, bee stings, or other allergens.

INTERDISCIPLINARY PLAN OF CARE

Interdisciplinary Plan of Care for Allergic Disorders

An interdisciplinary approach is important to take in response to any allergy. Various members of the health care team play key roles in maintaining patient safety and promoting optimal outcomes:

- Physician: oversee care of the allergy patient in collaboration with the interdisciplinary team
- Dietitian: evaluate nutritional status, assess food intake, advise on prevention, management, and treatment including elimination diets and long-term allergen intake
- Pharmacist: provide medication advice, check that correct medications are administered with proper technique
- Psychologist: provide in-depth psychological input and targeted interventions, apply coping strategies to support the patient and family
- Respiratory therapist: intervene when patient exhibits difficulty breathing or anaphylaxis, provide education

(Daniels et. al. 2021)

24.2 Allergic Rhinitis

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for allergic rhinitis
- Describe the diagnostics and laboratory values in the disease of allergic rhinitis
- Apply nursing concepts and plan associated nursing care for patients with allergic rhinitis
- Evaluate the efficacy of nursing care for patients with allergic rhinitis
- Describe the medical therapies that apply to the care of allergic rhinitis

The most common type of respiratory allergy is **allergic rhinitis**, which is a localized allergic reaction in the sinuses, like hay fever or seasonal allergic rhinitis. It affects about one in eight United States adults and is among the top eleven percent of reasons for primary care encounters (Rosenfeld et al., 2015). About one-third of patients diagnosed with allergic rhinitis have correlated sinusitis, asthma, and conjunctivitis.

Pathophysiology

When antigens are inhaled or ingested, sensitization is initiated. Nasal mucosae react to re-exposure, which results in an infiltration of inflammatory cells. The primary chemical mediator with this type of allergic reaction is histamine. Vasodilation and enhanced capillary permeability lead to tissue edema and congestion.

Early diagnosis and appropriate treatment are necessary to reduce complication and alleviate symptoms. Since allergic rhinitis is provoked by airborne molds or pollens, it is distinguished by the seasonal occurrences described in (Table 24.2).

Season	Common Allergens
Early spring	Tree pollen (elm, poplar, oak)
Early summer	Grass pollen (redtop, timothy)
Early fall	Weed pollen (ragweed)

TABLE 24.2 Allergic Rhinitis by Season

Attacks typically start and end about the same time each year. Airborne mold spores require warm, moist weather; they generally appear in early spring and become more pervasive during the summer. These spores then dwindle off and fade away by the first frost in areas that experience drastic variations in seasonal temperatures. Therefore, in areas that do not endure freezing temperatures, these allergens can continue throughout the year.

Clinical Manifestations

Allergic rhinitis symptoms are persistent and vary seasonally. Rhinitis occurs as the result of an IgE-mediated immunologic response from an allergen transmitted through the respiratory tract. The number of patients with the allergic type of rhinitis rises with age and often appears with other disorders like asthma or cystic fibrosis. Allergic rhinitis can be severe and impedes a person's sleep, leisure, educational or professional success, and overall quality of life. On average, affected patients miss 1 to 2 workdays a year due to chronic rhinitis (Rosenfeld et al., 2015).

The primary symptoms of allergic rhinitis are nasal congestion, sneezing, nose and throat itching, and abundant amounts of serous nasal drainage. Other symptoms may include itching, watery eyes, hyposomnia, headache, and post-nasal drip. Chronic cases can negatively impact quality of life by interfering with sleep, causing absences from school or work, and interfering with daily activities.

Assessment and Diagnostics

An allergic rhinitis diagnosis is dependent on the patient's history, clinical examination, and diagnostic test results. Any reaction should be assessed and documented and include patient symptoms or discomfort, severity, treatments (if any), and response to interventions. Some clinics may use an intake assessment form that the patient completes that may include symptoms of the eyes, ears, nose, throat, chest, and skin that may be associated with an allergen

exposure. If a form is not used by the facility, the nurse should ask questions and assess for symptoms that may be associated with allergic rhinitis.

Diagnostics and Laboratory Values

Diagnostic tests include peripheral blood counts, total serum IgE, serum-specific IgE, nasal smears, nasal provocation tests, and **epicutaneous** (on the skin) and intradermal (just below the skin) skin testing. Nasal provocation tests are testing methods that reconstruct the upper airway response to natural exposure of irritants or allergens. Allergic causes of rhinitis will have elevated IgE and eosinophil. as well as positive allergen testing reactions. However, false-negative and false-positive skin testing results can occur and should therefore not be used alone to make a diagnosis.

Nursing Care of Patients with Allergic Rhinitis

Nurses play an important role in managing care for those with allergic rhinitis. Nursing care for this disorder includes performing an assessment to recognize and analyze cues, prioritizing hypotheses, generating solutions, taking action, and evaluating care and outcomes. If any outcomes have been deemed nonsatisfactory, then the nurse must start over, repeating the step of recognizing and analyzing cues and then following subsequent steps until a satisfactory outcome is reached.

Recognizing and Analyzing Cues

As part of recognizing and analyzing cues, the nurse should complete an assessment that includes a physical examination. The exam's findings may reveal sneezing, itching eyes and nose, lacrimation, occasional headache, or thin, watery nasal discharge. The assessment should also describe the seasonal changes in symptoms, medication history, and nature of relevant antigens. The nurse should also obtain subjective data from the patient about how they felt prior to experiencing symptoms like difficulty breathing, wheezing, tingling sensations, pruritus, hoarseness, hives, rash, erythema, and edema. Finally, the nurse should assess any emotional distress the patient may be experiencing. Stress can exacerbate allergic symptoms by causing the body to release histamines, making symptoms worse. The nurse should also document the patient's personal and family history of allergies, if any.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

After documenting the findings from the examination and patient history, the nurse should verify orders received from the provider. Interventions may be aimed at improving breathing pattern, education, managing potential complications, and promoting home-based care. Nursing interventions for improving breathing pattern may include avoiding individuals with an upper respiratory infection and modifying the patient environment to reduce or prevent allergy symptoms. For example, the nurse should ensure the patient environment is free of fragrances, such as perfumes or certain lotions, that can cause an asthma attack. The nurse should also educate the patient on the importance of maintaining their medication or treatment regimen to minimize allergy symptoms, and on the risks of nonadherence to this regimen (e.g., allergy exacerbation). The nurse can help the patient identify barriers to adherence as well as alternative solutions to overcome these barriers.

The nurse must also ensure the patient and family understand that adherence in medications and treatments are essential. Any missed medication or appointments can interfere with dosage adjustments needed to reach a therapeutic range. This also includes educating the patients and families on medications for allergy maintenance, like leukotriene modifiers, versus rescue medications for allergy exacerbation or seasonal flares, like antihistamines. This is important to avoid building up a tolerance to the medications, so that the medication is effective when flareups or allergy exacerbations are evident.

Monitoring and managing potential complications are vital roles in nursing care. Patients with allergies are at risk for anaphylaxis or experiencing any difficulty breathing due to the reaction alone or medications. The nurse should monitor the patient's respiratory rate and pattern (for example, signs of labored breathing, wheezing, shortness of breath, increased respiratory rate) and assess for abnormal lung sounds or any difficulty breathing. The patient's pulse rate and rhythm should also be monitored. Emergency medications and equipment should be readily available in the event of anaphylaxis.

Discharge planning is always part of the nursing plan of care. The patient and family should be instructed on self-care at home, including correct usage of medications, adherence to treatment schedules, and the importance of minimizing exposure to allergens. The purpose, procedure, and schedule of any prescribed regimens from the

provider should be reinforced to ensure the patient and their family members understand. Any side effects from medications or treatments should also be explained to the patient and family as well as each medication's name, dosage, frequency, and actions.

Evaluation of Nursing Care for Patients with Allergic Rhinitis

Evaluation of applied interventions is an essential part of the nursing process. The nurse should compare observed outcomes against expected outcomes, to evaluate for signs of improvement, decline, or no change in the patient's condition. The nurse would then use clinical judgment to assess whether the interventions for allergic rhinitis were effective or if revised interventions are needed.

Evaluating Outcomes

The nurse will want to evaluate expected outcomes for patients with allergic rhinitis. For example, the nurse can determine that the patient's breathing pattern is adequate if lung sounds are clear on auscultation, respiratory rate and pattern are normal, and the patient denies any symptoms of respiratory distress. The nurse can determine that the patient understands their condition by having the patient verbalize or reiterate the teachings regarding diagnosis, medications, treatment, schedule, home care, and measures to avoid allergens. The patient should also be able to demonstrate how to properly administer their medications and to describe relevant signs and symptoms such as anaphylaxis, angioedema, difficulty swallowing, wheezing, difficulty breathing, peripheral tingling, and urticaria (hives).

Medical Therapies and Related Care

There are several options when it comes to managing allergic rhinitis. Avoidance therapy may be used in an attempt to minimize an individual's exposure to allergens. Pharmacologic therapy is also used and includes adrenergic agents, antihistamines, second-generation H1 receptor antagonists, mast cell stabilizers, corticosteroids, and leukotriene modifiers. Another option is immunotherapy to treat or manage allergic rhinitis.

Avoidance Therapy

Avoidance of triggers can be effective in decreasing symptoms of allergic rhinitis. Measures and environmental controls include:

- using air conditioners, humidifiers, dehumidifiers, and air cleaners
- removing dust-collecting items like knickknacks, books, soft toys, furnishings, carpets, and window coverings
- regularly washing bedding
- regularly cleaning the house (dusting, vacuuming, mopping)
- maintaining a pet-free home or bedroom
- using pillow and mattress covers that are resistant to dust mites
- maintaining a smoke-free environment
- changing clothes when returning from outdoors
- regularly showering to remove allergens from skin and air
- using a nasal irrigation device or saline spray to limit allergens in the nasal passages

High-efficiency particulate air purifiers and vacuum cleaner filters also aid in limiting the number of allergens in an environment. The use of multiple avoidance measures can greatly reduce the severity of symptoms. It is not possible to completely avoid allergen exposure, so other therapies (pharmacologic and immunotherapy) may be needed.

LINK TO LEARNING

The American College of Allergy, Asthma, & Immunology maintains a web page on avoiding environmental allergies (https://openstax.org/r/77EnvirAllergy) that describes measures individuals can take to minimize exposure to common environmental allergens.

Pharmacologic Therapy

There are several pharmacologic options for treating allergic rhinitis. One type is an **adrenergic agent**, which is a

vasoconstrictor of mucosal vessels that may be given orally or applied topically in the nasal or ophthalmic mucosal vessels; the topical route has fewer side effects, but prolonged use can lead to rebound congestion. Examples of adrenergic agents include Afrin (nasal), Alphagen P (ophthalmic), and Sudafed or pseudoephedrine (oral). Nasal decongestants are applied topically to relieve nasal congestion. This route activates the alpha-adrenergic receptor sites of the smooth muscle of the nasal mucosal blood vessels and reduces mucosal edema, fluid exudation, and local blood flow. Eyedrops may also be an effective treatment option to relieve symptoms of eye irritation such as itching, burning, dryness, or redness. Side effects may include dysrhythmias, palpitations, hypertension, irritability, tremor, central nervous system stimulation, and tachyphylaxis, which is the acceleration of hemodynamic status.

An **antihistamine** is classified as an H1 receptor antagonist, or blocker, and is used to manage mild allergy disorders. The H1 antagonists attach to H1 receptors and prevent histamine action at those sites. They do not prohibit mast cells from releasing histamine, and they have no effect on H2 receptors.

Oral antihistamines are readily absorbed and are the most effective when given at the initial onset of symptoms, as they can prevent new symptoms from arising. These medications are effective in certain patients with hay fever, urticaria, mild asthma, and vasomotor rhinitis. The side effects include drowsiness, dry mouth, agitation, anxiety, urinary retention, anorexia, blurred vision, nausea, and vomiting. Antihistamines are contraindicated in people who are nursing, newborns, pregnant people, children, older adults, and those who experience worsening conditions or symptoms.

Unlike the first-generation H1 receptor antagonists, such as Benadryl (diphenhydramine), the second-generation—or nonsedating—H1 receptor antagonists attach to peripheral rather than central nervous system H1 receptors. This leads to less sedation. Examples include Zyrtec (cetirizine), Claritin (loratadine), and Allegra (fexofenadine).

Antihistamines may be combined with a decongestant to decrease nasal congestion. Most are available over the counter, like cetirizine/pseudoephedrine (Zyrtec-D) and loratadine/pseudoephedrine (Claritin-D). Side effects may include increased blood pressure; therefore, long-term use should be avoided in those with hypertension.

Mast cell stabilizers are as effective as antihistamines but not as effective as intranasal corticosteroids. It may take a week before benefits are noticed. This type of medication is used prior to or at the initial onset of symptoms. Intranasal cromolyn sodium (NasalCrom) acts by stabilizing the mast cell membrane, which decreases histamine and other mediators release in the allergic response. It also prevents the action of macrophages, monocytes, eosinophils, and platelets involved in immune responses. This medication is not effective in nonallergic rhinitis. Side effects are usually mild and include local burning or stinging sensations and sneezing.

Intranasal corticosteroids may be used in more severe cases of allergic and perennial rhinitis that do not respond to decongestants, antihistamines, or intranasal cromolyn. The route of administration of this medication is by meter-spray devices. Examples of corticosteroids include triamcinolone (Nasacort), beclomethasone (Beconase, Qnasl), budesonide (Rhinocort), and flunisolide (AeroSpan).

Corticosteroids have anti-inflammatory properties and are effective in controlling or inhibiting allergic rhinitis major symptoms. (A topical decongestant may be needed to clear passages prior to intranasal corticosteroid administration if there are blockages.) These medications may take several days to two weeks to take full effect and should not be used for more than 30 days. Adverse effects include drying of the nasal mucosa as well as a burning or itching sensation from the meter-spray device. Corticosteroids can suppress the immune system and should therefore not be used in those with tuberculosis or untreated bacterial lung infections, as they can worsen the infection. This suppression of host defenses also increases the risk of infection in those who use corticosteroids.

Leukotriene modifiers affect the inflammatory cycle and are designed for long-term use. Patients may take these medications daily and may have a rescue medication to treat symptom exacerbation. Examples of leukotriene modifiers include montelukast (Singulair) or zafirlukast (Accolate). These medications work by blocking leukotriene production and action and preventing asthma symptoms.

Immunotherapy

The aim of immunotherapy is to desensitize an individual from allergies by treating IgE-mediated diseases by allergen extract injections. This allergy vaccine therapy involves gradually increasing the quantity of specific allergens to a patient until a therapeutic dose is reached. The therapeutic range is one that reduces the severity of

symptoms a patient experiences with natural exposure to allergens. Immunotherapy is used as an adjunct therapy with symptomatic pharmacologic therapy and may be utilized when avoidance is not an option. The goals of this therapy include decreasing circulating levels of IgE, raising the level of blocking antibody IgG, and decreasing mediator cell sensitivity.

A positive skin test, positive allergy history, and the inability to avoid an allergen is indicative that immunotherapy is needed. This therapy may take three to five years to alter the allergic disorder. It can prevent the development or progression of allergy symptoms and asthma and is therefore considered to be a potentially preventive measure. It is essential that the patient understand immunotherapy as well as the significance of persisting with the therapy until immunocompetence is reached.

The three methods of immunotherapy include subcutaneous immunotherapy (SIT), epicutaneous immunotherapy (EPIT), and sublingual immunotherapy (SLIT). Immunotherapy should not be started during pregnancy; if a pregnant patient was already undergoing this immunotherapy prior to becoming pregnant, the dosage should not increase throughout the pregnancy. If a patient does not have a reduction in symptoms within one to two years, does not develop an increased tolerance to confirmed allergens, and is unable to reduce medication use to decrease symptoms, therapeutic failure is apparent. Failure of this therapy may be due to misdiagnosis, insufficient allergen doses, insufficient environmental controls, or newly evolved allergies.

Subcutaneous Immunotherapy

The most common method is subcutaneous immunotherapy. This therapy involves serial injections of extracts of one or more antigens that may be warranted based on an individual's allergy testing results. The treatment begins with injections of a very small amount of these extracts and gradually increases until the maximum tolerated dose is reached. Patients must be monitored for at least thirty minutes after administration due to the possibility of severe reactions like anaphylaxis. In the event of large, localized swelling at the injection site, the subsequent dose should not be increased, as this may be a sign of a possible systemic reaction. Once the maintenance dose has been reached, booster injections are given at two-to-four-week intervals over several years until the maximum benefit is reached. This timeline may vary depending on when the disease course is altered for the individual. Immunotherapy patients are monitored by a physician to determine when this therapy can be discontinued (Persaud et al., 2023).

Epicutaneous Immunotherapy

Epicutaneous immunotherapy is the delivery of an allergen to the epidermis. There is less risk of a systemic reaction with this type of immunotherapy as the area has less vascularity.

Sublingual Immunotherapy

Sublingual immunotherapy has been reported to have had therapeutic effects in as little as 16 weeks of treatment (Jacobsen et al., 2012). This therapy includes a buildup phase followed by a treatment plan of three times per week where the patient ingests a liquid containing allergen extract or a rapidly dissolving tablet. While systemic effects are rare, they have been reported in some patients who also reported a systemic effect with subcutaneous immunotherapy. Side effects may include upset stomach, nausea, irritating, and minor swelling or irritation in the mouth.

24.3 Types of Dermatitis

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors and clinical manifestations of various types of dermatitis
- Describe the diagnostics and laboratory values in diagnosing various types of dermatitis
- Apply nursing concepts and plan associated nursing care for patients with varying presentations of dermatitis
- Evaluate the efficacy of nursing care for the patient with dermatitis
- Describe the medical therapies that apply to treating various presentations of dermatitis

Inflammation of the skin, or dermatitis, encompasses several types of skin conditions with the same inflammatory reaction pattern and manifestations. Depending on the type of dermatitis, the reaction may be caused by an overactive immune system, genetics, allergies, or irritating substances. This section focuses on three types of dermatitis related to allergic disorders: contact dermatitis, atopic dermatitis (eczema), and dermatitis

medicamentosa (drug reactions).

Contact Dermatitis

Contact dermatitis is a type IV delayed hypersensitivity caused by an exogenic substance. It may be acute or chronic, and there are four types: allergic, phototoxic, irritant, and photoallergic. Most cases are due to extreme exposure to irritants like soaps, solvents, or detergents. This skin sensitivity may develop over prolonged or short periods of exposure time, and clinical manifestations may take hours or weeks to show.

Pathophysiology

Contact dermatitis begins when an allergen contacts the skin. Once the allergen has entered the stratum corneum, it is obtained by Langerhans cells. The antigens then undergo processing by these cells and are visible on their surfaces. Subsequently, the Langerhans cells move toward local lymph nodes, where the antigens encounter neighboring T lymphocytes for destruction. These lymphocytes may then migrate within the blood and into the epidermis. This process is collectively known as the sensitization phase of contact dermatitis. The elicitation phase occurs after re-exposure takes place. A cytokine-induced proliferation process is triggered when Langerhans cells that include the relevant antigen correspond with the antigen-specific T lymphocytes for that antigen. This proliferation produces a localized, inflammatory response (Murphy et al., 2022).

Clinical Manifestations of Contact Dermatitis

Clinical manifestations of contact dermatitis include erythema, pruritus, burning, edema, and skin lesions like vesicles and papules. A **vesicle** is a thin-walled sac filled with fluid, and a papule is a solid or cystic raised spot on the skin. Following these symptoms, the affected skin usually thickens, hardens, and experiences scaling. Severe cases may also have **hemorrhagic bullae**, blood-filled blisters. Bacterial infections can develop when the person rubs or scratches the affected areas, allowing pathogens to invade the skin. Systemic symptoms are unusual unless the reaction is extensive.

Atopic Dermatitis

Atopic dermatitis—also called atopic eczema or atopic dermatitis/eczema syndrome (AEDS)—is a type I immediate hypersensitivity disorder characterized by inflammation and hyperreactivity of the skin. Atopic dermatitis is often associated with a process known as the **atopic march**, which frequently leads to asthma, food allergy, or allergic rhinitis (Figure 24.4). Atopic march is the typical progression of allergic disease that begin early in life (American Academy of Allergy Asthma & Immunology, n.d.).

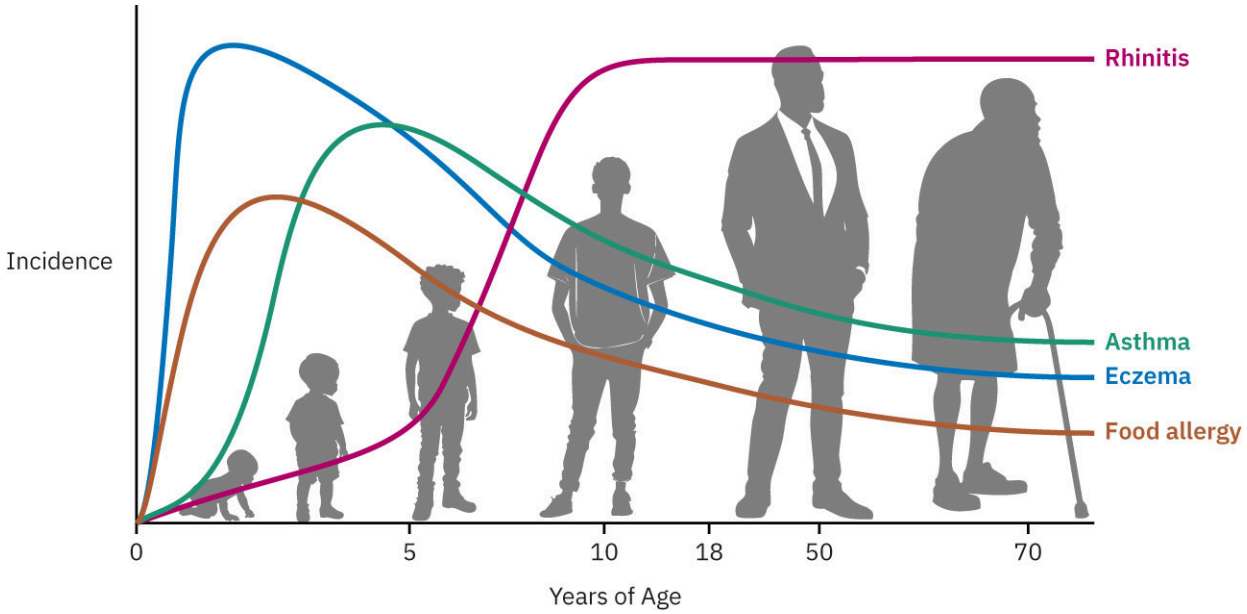


FIGURE 24.4 The atopic march is a sequence of allergic diseases that begins early in life. Eczema and food allergies peak at a young age and then diminish, while allergic rhinitis appears in later childhood and persists throughout adulthood. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Pathophysiology

Since this type of dermatitis belongs to the atopy family, there is a genetic tendency to develop allergic diseases associated with a heightened immune response, like asthma, eczema, and allergic rhinitis. The pathophysiology of this type of dermatitis is multifactorial and complex. The factors include alterations in cell-mediated immune responses, environmental factors, and IgE-mediated hypersensitivity. A key factor for atopic dermatitis is the presence of a loss-of-function mutation in the gene for the filaggrin protein. This can lead to severe atopic dermatitis due to a potential increase in trans-epidermal water loss, dehydration, and pH alterations. Those with eczema usually have a higher pH level than those that do not have eczema and can cause the skin barrier to not function as it should. Other genetic changes that may contribute to atopic dermatitis are an imbalance of Th2 to Th1 cytokines, which creates alterations in cell-mediated immune responses and can promote IgE-mediated hypersensitivity. Also, pH alterations lead to changes in enzyme activity which can trigger inflammation. In addition to loss-of-function mutations of filaggrin, harsh detergents, fragrances, and preservatives can alter pH levels of the skin (Kim et al., 2019).

Clinical Manifestations of Atopic Dermatitis

This type of eczema is characterized by itchy, chronic inflammation of the upper skin layers, as shown in Figure 24.5. In the acute phase, the rash may be red, oozing, and have crusted areas with occasional blisters present. The chronic phase may have dry, thickened areas. The rash may occur in one or more areas in adults and can spread to several areas on infants. The rash can vary in intensity, color, and location, but it is always itchy, which triggers scratching that ultimately makes the problem worse. Stress, irritation, and dry air can increase itchiness. Environmental triggers include harsh soaps, excessive bathing or hand washing, sweating, rough fabrics, wool, or *Staphylococcus aureus* present on the skin. Allergens like wheat, dairy, and eggs may also be a trigger for this reaction. Tears in the skin caused by scratching or rubbing can often lead to bacterial infections.

FIGURE 24.5 This person is using an ointment to treat their chronic eczema. (credit: "Applying steroid ointment to eczema – hand" by Kate Whitley/Welcome Collection, CC BY 4.0)

Dermatitis Medicamentosa (Drug Reactions)

Dermatitis medicamentosa is a type I hypersensitivity disorder resulting from drug reactions. Skin eruptions may not be evident until days after exposure to the antigen, but the reaction may also escalate quickly to anaphylaxis. Therefore, nurses should be sure to watch for adverse reactions when administering medications in order to provide emergent care immediately when warranted.

Pathophysiology

Dermatitis medicamentosa is a hypersensitivity manifestation of IgE-dependent (immunologic) or T cell–mediated (nonimmunologic) mechanisms initiated by topical, oral, or parenteral drug administration. Immunologic responses happen when specific antibodies or explicitly sensitized lymphocytes to a drug develop during the sensitization period, which can be up to 4 or 5 days after initial exposure.

Nonimmunologic responses may be caused by a variety of factors, including collective buildup of a drug; individual genetic predisposition; pharmacologic action of a drug; drug sensitization of the skin, producing a reaction with exposure to ultraviolet light; increased sensitivity to irritating topical solutions; and individual immune status (Knee & Sandberg-Cook, 2016).

Clinical Manifestations of Dermatitis Medicamentosa

With this disorder, skin eruptions may appear within minutes, hours, or days. The clinical manifestations are similar to the other types of dermatitis but may also include systemic symptoms like fever or difficulty breathing. Urticaria may also be present, as well as itching, burning sensations, and pain. A rash will not necessarily occur.

Assessment and Diagnostics

Dermatitis can be diagnosed by physical examination, exposure history, and patch testing. However, patch testing may not be indicated with drug reactions. The nursing assessment should include the patient's hobbies, occupation, exposure to irritants, and cosmetic use as well as the onset of symptoms. The physical examination should include the location and distribution of the lesions.

Diagnostics and Laboratory Values

Patch testing is indicated when the inflammation is not resolved with avoidance therapy. The patch test uses the Thin-layer Rapid Use Epicutaneous (T.R.U.E.) test. This test typically contains thirty-six allergens that are applied to the skin and then interpreted by a health care provider. Other patch testing options are available and may be applied using adhesive patches that contain small amounts of an allergen. The standard procedure for patch testing is to apply the patches to the skin on the back. The area is assessed for presence of edema, erythema, vesicles, crusts, and the size of the reaction in order to determine a positive or negative reaction. Patch testing is contraindicated with widespread, acute dermatitis. Other diagnostic testing may show elevated serum IgE and eosinophil levels.

Nursing Care of Patients with Dermatitis

Nurses play an important role in managing care for those with allergic dermatitis. Nursing care includes assessing the patient to recognize and analyze cues, prioritizing hypotheses, generating solutions, taking action, and evaluating care and outcomes. If any outcomes have been deemed nonsatisfactory, then the nurse must reassess. This process requires the nurse to start over with the Clinical Judgment Measurement Model with recognizing and analyzing cues and then following subsequent steps until a satisfactory outcome is reached.

Recognizing and Analyzing Cues

As part of recognizing and analyzing cues, the nurse should conduct a physical examination and complete the patient's personal and family history of allergies. Physical examination findings may reveal any of the clinical manifestations described previously. The nursing assessment should also include the patient's exposure risks in order to attempt to identify the irritant. The patient may be exposed to irritants at work, during leisure activities, or at home. Irritants may include chemical solvents, detergents, soaps, lotions, cosmetic products, or any other substance that may come in contact with the skin.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

After documenting findings from the examination and history, the nurse should verify orders received from the provider. Interventions may be aimed at improving symptoms, administering medications, educating the patient about avoidance therapy, and promoting home-based care. Nursing interventions for improving symptoms may include administering medications and eliminating identified or suspected irritants causing dermatitis. Medications may include topical corticosteroids for milder cases, oral antihistamines to relieve pruritus, system corticosteroids, topical hydrophilic creams or petrolatum to soothe the skin, and antibiotics for infection. Other interventions may include cool compresses or the application of aluminum acetate, which may be used to treat inflammation and itching. The nurse should also ensure the patient understands the importance of maintaining their medication or treatment regimen to improve and prevent symptoms. The nurse can help the patient identify barriers to adherence in order to help the patient identify alternative solutions. For example, a patient may not be able to avoid a certain chemical at their work; therefore, the nurse should help the patient identify ways to protect themselves, such as wearing personal protective equipment when handling the chemical. Discharge planning should include steps to educate the patient and family regarding self-care at home, including strategies for ensuring medications are used correctly, treatment schedules are adhered to, and exposure to irritants is minimized. The purpose, procedure, and

schedule of any prescribed regimens from the provider should be reinforced to ensure patients and family members all understand. The nurse should review the name, dosage, and frequency of all medications, as well as any side effects from medications or other treatments and actions to take in the event of side effects. Side effects may vary depending on the medication prescribed and have been covered previously in this chapter.

Other nursing interventions may be aimed at ensuring adequate coping with this diagnosis. Skin breakouts may be disturbing or embarrassing and have a negative impact on the patient's self-esteem. The nurse should ensure the patient understands the purpose of therapies aimed at treating dermatitis and measures that prevent the disorder from appearing. The nurse may also need to help the patient and family identify ways to incorporate care into their lifestyle.

REAL RN STORIES

Nurse: Rachel, BSN
Years in Practice: Ten
Clinical Setting: Family practice clinic
Geographic Location: The inner city of a large metropolitan area in Texas

A twelve-year-old girl was diagnosed with eczema at our family practice clinic. When I first walked in the room, she was quiet and withdrawn. When asking questions about when she first noticed her skin changes, she shrugged her shoulders and looked away. Her mom then stated that she had noticed her daughter went from bubbly and social to isolated and quiet. The mom expressed that felt she had been bullied at school. A part of our assessment with adolescents is to screen for depression. After I asked the screening questions, she admitted she had been having a hard time at school. She stated that kids made fun of her and said that her "rash" meant she was dirty, homeless, and poor.

I reinforced the education with her and reminded her about potential causes of dermatitis and that it is not a result of her status or being dirty. I let her know that while it is not curable, it is manageable. I asked her if she was okay with us coming up with a game plan together to manage her eczema. After she agreed, we went through a list of products she uses and identified lotions and soaps that are high in synthetic fragrances that can trigger dermatitis. We made a game plan together on how she can manage her eczema and strategized avoiding things that can trigger or worsen the eczema. We also discussed treatments that the doctor prescribed as well as managing stress as best she could, as stress is also a trigger. She looked at her mom and told her she would like to start counseling as well to learn coping skills. We also discussed exercises that aren't too strenuous to avoid worsening the eczema such as walking or swimming to help manage stress.

By the end of the conversation, she seemed hopeful and ready to take charge. I sent her home with a list of possible triggers and how to care for her eczema at home. I also provided her with a list of local counselors in the area that work with adolescents. She stated she was excited to get this managed and start wearing short sleeves to school again.

For patients with dermatitis medicamentosa, the known or suspected medication causing the reaction should immediately be discontinued. The patient should also be educated on the need to notify other providers and health-care facilities of the allergy and advised to wear a medical alert bracelet to alert providers in emergent situations when the patient is unable to speak. Since this reaction can have systemic symptoms, the nurse should be aware of the potential for anaphylaxis and have equipment readily available in case of emergency. The nurse should also monitor and treat systemic symptoms per provider orders.

Evaluation of Nursing Care for Patients with Dermatitis

Evaluation is an essential part of the nursing process. The nurse should compare observed outcomes against expected outcomes. This allows the nurse to evaluate for signs of improvement, decline, or no change in the patient's condition. The nurse should then use clinical judgment to assess whether the interventions were effective or if revised interventions are needed.

Evaluating Outcomes

The nurse will want to evaluate expected outcomes for patients with allergic dermatitis. The nurse can determine if symptoms have improved based on clinical examination as well as patient verbalization. The nurse can determine that the patient understands the education provided by having the patient verbalize or reiterate the teachings regarding diagnosis, medications, treatment, schedule, home care, and allergen avoidance measures. The patient should also be able to demonstrate how to properly administer their medications and to describe signs and symptoms to report, including anaphylaxis, angioedema, difficulty swallowing, wheezing, difficulty breathing, peripheral tingling, and urticaria.

Medical Therapies and Related Care

Medical therapies and related care should be individualized and may include identification and removal of irritants, avoidance therapy, phototherapy, aluminum acetate, cool compresses, systemic corticosteroids, topical corticosteroids, oral antihistamines like diphenhydramine, hydrophilic creams, petrolatum, antibiotics, and non-steroidal anti-inflammatory agents. Severely affected individuals may be prescribed immunosuppressants like cyclosporine or tacrolimus. Other therapies may include wearing cotton fabrics to decrease pruritus, bathing and washing with mild detergents, maintaining the room temperature from 68°F to 72°F, using humidifiers in winter, and avoiding irritants, animals, dusts, sprays, and perfumes. Patients can also manage their symptoms by keeping their skin hydrated through daily baths and using topical moisturizers that do not worsen or cause dermatitis. Patients with chronic eczema or psoriasis have also experienced relief from symptoms with ocean salt water (Peinemann et al., 2020).

24.4 Urticaria and Angioneurotic Edema

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for urticaria and angioneurotic edema
- Describe the diagnostics and laboratory values for urticaria and angioneurotic edema
- Apply nursing concepts and plan associated nursing care for patients with urticaria and angioneurotic edema
- Evaluate the efficacy of nursing care for patients with urticaria and angioneurotic edema
- Describe the medical therapies that apply to the care of urticaria and angioneurotic edema

Hives, or **urticaria**, is a type I hypersensitivity allergic reaction involving the skin. Angioedema, or **angioneurotic edema**, is a condition that is manifested by urticaria and dispersed swelling of the deeper skin layers. Urticaria may appear anywhere on the body, while angioedema typically occurs in the face, hands, feet, or throat. These conditions often occur together, but each can appear without the presence of the other.

Urticaria

Urticaria is a common allergic disorder. This reaction is usually the result of exposure to triggers like food, medications, insect stings, physical stimuli, latex, blood transfusions, bacterial or viral infections, pet dander, plants, and pollen. Urticaria can appear anywhere on the body, including the mucous membranes, gastrointestinal tract, and the larynx.

Pathophysiology

When mast cells and basophils in the epidermis release chemical mediators, urticaria develops due to swelling from capillary and venous vasodilation. Urticaria may be immune-mediated or nonimmune-mediated. With immune-mediated mast cell activation, urticaria is caused by type I hypersensitivity reactions when the IgE antibodies attach to high-affinity mast cell and basophil cell surface receptors. With autoimmune disorders, urticaria is caused by mast cell degranulation due to IgE receptor antibodies crosslinking with IgE receptors. Nonimmune-mediated reactions may be caused by medications and by physical or emotional stimuli that activate mast cells (Benedetti, 2021).

Cold urticaria is a subtype of urticaria triggered by exposure to cold. The cold can be from water, objects, or weather. The cold stimulates mast cells to release histamine, causing capillary and venous vasodilation that results in

urticaria. Cold urticaria is either acquired or familial atypical, an autosomal dominant condition inherited from one affected parent.

Clinical Manifestations

As shown in Figure 24.6, urticaria is characterized by edematous, red or pink wheals that vary in size from 2 to 4 mm. Pruritus and angioedema may also be present with this disorder. This condition may appear within minutes and can take three weeks or longer to resolve. If the condition lasts for more than six weeks, it is considered chronic. Bradycardia or tachycardia and tachypnea may also be present. Severe cases may include wheezing, fever, fatigue, dry mouth, abdominal pain, diarrhea, tremors, night sweats, and lymphadenopathy (Benedetti, 2021). Symptoms of cold urticaria include fever, conjunctiva infection, chills, headache, sweating, and arthralgia (joint pain).

FIGURE 24.6 Urticaria is characterized by red or pink wheals that may appear on a variety of body surfaces. (credit: modification of "Urticaria" by Andy Carter/Flickr, CC BY 2.0)

Assessment and Diagnostics

The nursing assessment for urticaria should include vital signs as well as a review of the relevant body systems to identify potential causes and determine the case's severity.

- A head examination should assess for any signs of angioedema, **malar rash** (erythematous flat or raised rash across the bridge of the nose and cheeks), enlarged thyroid, dry eyes, dry mouth, or **lymphadenopathy**, and the oropharynx should be assessed for signs of infection.
- An abdominal examination should assess for any enlargement or tenderness of the kidneys or spleen as well as any masses.
- A neurological examination should assess for signs of tremor, hyporeflexia, or hyperreflexia.
- A musculoskeletal examination should assess for inflamed or deformed joints.
- A skin examination should assess for urticaria, hyperpigmentation, jaundice, cutaneous ulceration, or small papules.
- Hives should be assessed for distribution, size, frequency, and duration.

Nurses should also assess for potential triggers like exposure to medications, detergents, new foods, or recent infections, and ask if the patient has experienced prior lesions or has any complaints of pruritus, angioedema, dyspnea, or **rhinorrhea** (runny nose) (Benedetti, 2021).

Diagnostics and Laboratory Values

Diagnosis of urticaria is generally done with examination and history. In the event of persistent wheals that are not healing, a skin biopsy may need to be done to rule out **urticarial vasculitis**, inflammation of the small vessels of the skin. Patients presenting with urticaria may be referred for allergy skin testing as well as laboratory tests like complete blood count, liver tests, blood chemistries, and thyroid-stimulating hormone. Thyroid-stimulating hormone levels assessed as chronic urticaria can be associated with thyroid disease. For more severe cases or those

with abnormal laboratory results, further testing to assess kidneys, liver, intestines, and thyroid may need to be done (Benedetti, 2021). Cold urticaria may be diagnosed by applying ice cubes to the skin on the forearm for 1 to 5 minutes. A positive result is when urticaria is present at the application site. Those with cold urticaria may develop leukocytosis, increased C-reactive protein levels, or raised erythrocyte sedimentation rate (ESR).

Nursing Care of Patients with Urticaria

Nurses play an important role in managing care for patients with urticaria. The care plan should include performing an assessment to recognize and analyze cues, prioritizing hypotheses, generating solutions, taking action, and evaluating care and outcomes. If any outcomes have been deemed nonsatisfactory, then the nurse must reassess using the Clinical Judgment Measurement Model and start over with recognizing and analyzing cues and then following subsequent steps until a satisfactory outcome is reached.

Recognizing and Analyzing Cues

Recognizing and analyzing cues requires the nurse to complete a physical examination and take both a personal and family history of allergies. Physical examination findings may reveal any of the clinical manifestations described previously. A nursing assessment should include the patient's exposure risks in order to attempt to identify the triggering allergen.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

After documenting examination and history findings, the nurse should verify orders that are received from the provider. Interventions may be aimed at improving symptoms, administering medications, patient education about avoidance therapy, and promoting home-based care. Nursing interventions for improving symptoms may include administering medications and eliminating identified or suspected triggers causing urticaria. Medications may include antihistamines and system corticosteroids. Other interventions may include avoiding heat, stress, tight clothes, NSAIDs, and alcohol, as those items can further aggravate the reaction. Patients with cold urticaria should be educated to avoid cold stimuli. The nurse should also educate the patient on the importance of maintaining their medication or treatment regimen to improve and prevent symptoms. Since anaphylaxis is a risk with any allergic reaction, the nurse must assess and be ready to intervene in the event of this type of emergency.

Discharge planning includes educating the patient and family on self-care at home and the importance of adhering to the treatment plan, correctly using medications, and minimizing exposure to triggering allergens and other substances that aggravate the reaction. The purpose, procedure, and schedule of any prescribed regimens from the provider should be reinforced to ensure patient or family understanding. Any side effects from medications or treatments should also be explained to the patient and family, as well as the name, dosage, and frequency of each medication and actions to take in the event of side effects. Patients with any type of urticaria should have an EpiPen, as hives can progress to anaphylaxis. The patient and family should be educated on proper use of an EpiPen or use of inhaled epinephrine and the need to call 911 for emergency treatment and monitoring following usage.

REAL RN STORIES

Nurse: Monique
Years in Practice: Five
Clinical Setting: Postsurgical unit
Geographic Location: Central Illinois

One day, I was asked to go help start a second IV line on a patient on a post-surgical floor. When I entered the room, I introduced myself to the patient, verified patient name and date of birth, and explained that I was there to help get the second IV line started. I noticed only the patient and his wife were in the room at this time. When I got closer to the patient, I noticed urticaria and erythema on his left arm. I remembered being told in report that the patient had just been started on a Cardizem infusion 15 minutes prior. I immediately stopped the Cardizem drip, paged the assigned nurse, and asked the patient if he is having any difficulty breathing or noticed any swelling in his airway. After the patient denied the symptoms, I asked if I could look at his skin under his shirt as well. I noticed urticaria and erythema on his trunk and arms. The patient then stated that he was beginning to itch as well. The assigned nurse entered the room with normal saline and diphenhydramine. The assigned nurse then administered the

medication, and the patient stated his itching was resolved. The provider also came in the room to speak to the patient about alternative medications needed to convert his heart rhythm out of atrial fibrillation. They agreed on a new plan of care. The patient and his wife were thankful I walked in when I did and noticed the reaction, as a potentially severe reaction was avoided.

Evaluation of Nursing Care for Patients with Urticaria

Evaluation is an essential part of the nursing process. The nurse should compare observed outcomes against expected outcomes. This allows the nurse to evaluate for signs of improvement, decline, or if unchanged. The nurse should then use their judgment to assess whether the interventions were effective or if other interventions are needed.

Evaluating Outcomes

The nurse will want to evaluate expected outcomes for patients with urticaria. The nurse can determine if symptoms have improved based on clinical examination as well as patient verbalization. The nurse can determine the patient's level of comprehension by having the patient verbalize or reiterate the teachings regarding diagnosis, medications, treatment, schedule, home care, and allergen avoidance measures. The patient should also be able to demonstrate how to properly administer their medications and be able to describe signs and symptoms like anaphylaxis, angioedema, difficulty swallowing, wheezing, difficulty breathing, peripheral tingling, and urticaria that is not resolving.

Medical Therapies and Related Care

Medical therapies include avoiding the use of NSAIDs, limiting the use of items that can further aggravate the reaction, and eliminating the known or suspected allergen that caused the reaction. NSAIDs should be avoided as they can not only cause urticaria but also worsen urticaria that is present. Antihistamines may be prescribed as they suppress the release of histamine and help relieve itching and swelling associated with urticaria. Systemic corticosteroids may be prescribed for more severe cases but are not designed for long-term use. Corticosteroids inhibit histamine release by stabilizing mast cell membranes and reduce inflammatory effects of histamine. Treatments for cold urticaria include warmth, bed rest, and corticosteroids for acute cases.

Angioneurotic Edema

Angioneurotic edema is also known as angioedema. As previously stated, it can occur alongside the presence of urticaria, alone, or as a component of anaphylaxis. This disorder involves swelling of the deeper skin layers and most commonly occurs in the face (eyelids, lips, tongue, cheeks), hands, feet, genitalia or throat. Angioedema can also occur in mucous membranes of the gastrointestinal tract, bronchi, and larynx. While not as common, the reaction can also be found on the back.

Pathophysiology

Angioedema is either histamine-mediated or bradykinin-mediated. Histamine-mediated angioedema is more common; it occurs due to mast cell and basophil activation. When there is re-exposure to the causative allergen, the mast cells and basophils release histamine. Histamine contributes to an increase in vascular permeability, resulting in swelling of the deeper skin layers or mucosa (Memo & Tiwari, 2023).

Bradykinin-mediated angioedema is either due to genetics, angiotensin-converting enzyme inhibitor-associated angioedema, or acquired C1-inhibitor deficiency. Vascular permeability is increased and results in edema. Hereditary angioedema is either secondary to angiopoietin-1, F12 gene, plasminogen, or an unknown gene mutation that contributes to abnormal accumulation of C1 inhibitor or bradykinin (Memo & Tiwari, 2023).

Clinical Manifestations

Angioedema is characterized by non-pitting swelling of the dermis and subcutaneous layers. The reaction may appear suddenly, within a few seconds or minutes, or slowly over one to two hours. If the reaction occurs slowly, the patient may experience itching and burning sensations prior to the onset of swelling. This reaction generally resolves within twenty-four hours. While it is rare, a recurrence can occur at three- to four-week intervals.

Assessment and Diagnostics

A physical examination is required to assess for swelling, severity, and any resulting complications like dyspnea or anaphylaxis. Airway management is the top priority with angioedema as airway obstruction can lead to hypoxia,

brain damage, and death. The nurse should assess the head, feet, hands, airway, and back. The nurse should also ask the patient or family about onset, duration, difficulty breathing, associated symptoms such as urticaria, and any possible triggers, such as a medication or food. The use of angiotensin-converting enzyme (ACE) inhibitors should also be assessed in the event the angioedema is a result of ACE inhibitor–associated angioedema.

Diagnostics and Laboratory Values

The patient's vital signs should be measured in order to obtain a baseline and identify any potential complications. If the cause of angioedema is not clear, C1 inhibitor levels may need to be assessed to check for acquired C1-inhibitor deficiency. C1 inhibitor is a serine protease inhibitor. Low levels can result in angioedema and laryngeal edema. Additionally, complement factor C4 levels can be drawn and assessed. Low levels of C4 proteins may indicate hereditary angioedema or acquired C1-inhibitor deficiency (Frank, 2024).

Nursing Care of Patients with Angioneurotic Edema

Nurses play an important role in managing care for those with angioedema. Nursing care includes conducting an assessment to recognize and analyze cues, prioritizing hypotheses, generating solutions, taking action, and evaluating care and outcomes. If any outcomes have been deemed nonsatisfactory, then the nurse must reassess by using the Clinical Judgment Measurement Model and start over with recognizing and analyzing cues and then following subsequent steps until a satisfactory outcome is reached.

Recognizing and Analyzing Cues

As part of recognizing and analyzing cues, the nurse should conduct a physical examination and take the patient's personal and family history of allergies. Physical examination findings may reveal any of the clinical manifestations described previously. An assessment should also include the patient's exposure risks in order to attempt to identify the triggering allergen.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

After documenting findings from the examination and history, the nurse should verify orders that are received from the provider. Interventions may be aimed at improving symptoms, administering medications, educating the patient about avoidance therapy, and promoting home-based care. Nursing interventions for improving symptoms may include administering medications and eliminating identified or suspected triggers causing angioedema. If the cause is unknown, any nonessential medications should be stopped. Medications may include epinephrine in extreme cases or those causing difficulty breathing. Antihistamines or corticosteroids may also be prescribed. The nurse should also educate the patient on the importance of maintaining their medication or treatment regimen to improve and prevent symptoms. Since anaphylaxis is a risk with any allergic reaction, the nurse must assess and be ready to intervene in the event of this type of emergency.

Discharge planning includes educating the patient and family on self-care at home and on the importance of adhering to the treatment plan, correctly using medications, and minimizing exposure to the causative allergen. The purpose, procedure, and schedule of any prescribed regimens from the provider should be reinforced to ensure patient or family understanding. Any side effects from medications or treatments should also be explained to the patient and family, as well as the name, dosage, and frequency of each medication and actions to take in the event of side effects.

Evaluation of Nursing Care for Patients with Angioneurotic Edema

Evaluation is an essential part of the nursing process. The nurse should compare observed outcomes against expected outcomes. This allows the nurse to evaluate for signs of improvement, decline, or no change. The nurse would then use their judgment to assess whether the interventions were effective or if other interventions are needed.

Evaluating Outcomes

The nurse will want to evaluate expected outcomes for patients with angioedema. The nurse can determine if symptoms have improved based on clinical examination as well as patient verbalization. The nurse can determine comprehension by having the patient verbalize or reiterate what they have learned regarding diagnosis, medications, treatment, schedule, home care, and allergen avoidance measures. The patient should also be able to demonstrate how to properly administer their medications and be able to describe signs and symptoms like anaphylaxis, difficulty swallowing, wheezing, difficulty breathing, peripheral tingling, and urticaria.

Medical Therapies and Related Care

Management of angioedema may include the use of epinephrine, antihistamines, or corticosteroids. Most reactions resolve on their own within two to four days. However, the patient should be monitored for airway obstruction; a tracheostomy may be a necessary intervention should this type of emergency happen. For ACE inhibitor–associated angioedema, fresh frozen plasma and C1 inhibitor concentrate may be given.

24.5 Allergy to Food

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors and clinical manifestations for food allergies
- Describe the diagnostics and laboratory values for patients experiencing food allergies
- Apply nursing concepts and plan associated nursing care for patients with food allergies
- Evaluate the efficacy of nursing care for patients with food allergies
- Describe the medical therapies that apply to the care of patients with food allergies

Food allergies are IgE-mediated type I hypersensitivity reactions. Over 170 foods have been reported to cause allergic reactions. The most common foods known to cause food allergies are peanuts, tree nuts, seafood (lobster, crab, shrimp, clams, fish), chocolate, berries, eggs, wheat, and milk. The most severe reactions are caused by peanuts and tree nuts. Because foods may be hidden within a recipe and not obvious to those with a food allergy, the basic act of eating can pose a huge risk of escalating to anaphylaxis. For this reason, equipment used to prepare food with a particular allergen is considered contaminated and should not be used by people with an allergy to that allergen. For example, a bakery that makes desserts with peanuts in a particular mixer should use a completely different mixer to make desserts that do not contain peanuts.

LIFE-STAGE CONTEXT

Children with Food Allergies

At least six million children in the United States have reported food allergies. Children with peanut or tree nut allergies are at particular risk of a severe, even life-threatening reaction. It is extremely important that parents and caregivers report their children's allergies to the school, daycare, camp, and any other organization where the children may eat with others. Some children are extremely sensitive and can experience breathing difficulties if they only have skin contact with the allergen. Other children like to share their food and may not think to ask if something they are offered is contaminated.

Pathophysiology

Once exposed, the allergen facilitates the production of allergen-specific IgE antibodies by plasma cells. The allergen-specific IgE binds itself to the surface of mast cells and basophils. This is the process known as sensitization, when antibodies are formed. Upon re-exposure to the allergen, the allergen cross-links IgE molecules on the surface of the mast cell or basophil membrane. The mast cells and basophils then release several chemical mediators initiating the inflammatory phase, which may include pruritus and smooth muscle contraction of the respiratory tract, gastrointestinal tract, and blood vessels. Leukotrienes and prostaglandins are also released. Leukotrienes can cause smooth muscle contraction, bronchial constriction, mucus airway secretions, and wheal-and-flare skin reactions. Prostaglandins produce smooth muscle contraction, increased capillary permeability, and vasodilation. This chemical mediator sensitizes pain receptors and increases pain from inflammation. Prostaglandins also elicit inflammation and boost the effects of mediators in inflammatory responses.

LINK TO LEARNING

The Institute of Agriculture and Natural Resources at the University of Nebraska–Lincoln maintains a Food Allergy webpage (https://openstax.org/r/77FoodAllergy) with information about many kinds of food allergies. There is also a video explaining how food allergies develop.

Clinical Manifestations

Clinical manifestations of food allergies range from mild to life threatening. Reactions can occur within minutes to hours after exposure. A wide range of allergy and gastrointestinal symptoms may include urticaria, wheezing, cough, angioedema, laryngeal edema, dermatitis, diarrhea, nausea, vomiting, abdominal pain, itching, swelling (lips, tongue, palate), and cramps. Anaphylaxis may also occur with food allergies.

Assessment and Diagnostics

A thorough allergy history, physical examination, and diagnostic tests are needed for a food allergy workup. Skin testing may also be done to aid in a diagnosis. The patient may also be advised to maintain a food diary that list foods consumed and any symptoms that follow, and even to eliminate certain foods from their diet in order to monitor the effects.

Diagnostics and Laboratory Values

Skin testing may be performed to assist in identifying food allergens, though false-positive or false-negative results are possible. Serum IgE levels may also be assessed. Elevated results indicate the IgE-mediated response, confirming the allergy. If a food cannot be identified as the cause, some providers may recommend the patient follow a nonallergenic food diet, which eliminates known food allergens.

Nursing Care of Patients with a Food Allergy

Nurses play an important role in managing care for those with food allergies. Nursing care includes conducting an assessment to recognize and analyze cues, prioritizing hypotheses, generating solutions, taking action, and evaluating care and outcomes. If any outcomes have been deemed nonsatisfactory, such as patient continues to complain of itchiness, then the nurse must start over by recognizing and analyzing cues and then following subsequent steps until a satisfactory outcome is reached.

Recognizing and Analyzing Cues

As part of recognizing and analyzing cues, the nurse should complete a physical examination and take the patient's personal and family history of allergies. Findings from the physical examination may reveal any of the clinical manifestations previously. An assessment should also include the patient's onset of symptoms after exposure to the suspected or known allergen.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

After documenting the findings from the patient's examination and history, the nurse should verify orders that may be received from the provider. Interventions may be aimed at improving symptoms, administering medications, and educating the patient about avoidance therapy and emergency measures should they be necessary. Nursing interventions for improving symptoms may include administering medications and eliminating identified or suspected triggers causing a reaction. Medications may include epinephrine in extreme cases or when patients have difficulty breathing. Antihistamines or corticosteroids may also be prescribed. Since anaphylaxis is a risk with any allergic reaction, the nurse must assess and be ready to intervene in the event of this type of emergency. The nurse should also educate the patient on a variety of topics: signs and symptoms that indicate a medical emergency; instructions on how to use an EpiPen and read ingredients and food labels; and the importance of reporting their allergy to other people, including health care providers and servers at restaurants, and of asking questions before eating food they did not prepare.

Evaluation of Nursing Care for Patient with a Food Allergy

Evaluation is an essential part of the nursing process. The nurse should compare observed outcomes against expected outcomes. This allows the nurse to evaluate for signs of improvement, decline, or no change. The nurse would then use their judgment to assess whether the interventions were effective or if other interventions are needed.

Evaluating Outcomes

The nurse will want to evaluate expected outcomes for patients with food allergies. The nurse can determine if symptoms have improved based on clinical examination as well as patient verbalization. The nurse can confirm comprehension by having the patient verbalize or reiterate what they have learned regarding diagnosis, symptoms, medications, and allergen avoidance measures. The patient should also be able to demonstrate how to properly

administer their medications and be able to describe signs and symptoms such as anaphylaxis, difficulty swallowing, wheezing, difficulty breathing, peripheral tingling, and urticaria.

Medical Therapies and Related Care

The primary management for food allergies includes eliminating the allergen from the diet. Medications may be prescribed for those who cannot eliminate exposure or those who do not benefit from avoidance therapy. Medications include antihistamines, adrenergic agents, H1 blockers, corticosteroids, and cromolyn sodium. All patients with food allergies should have an EpiPen. A medical alert bracelet should also be worn. Service animals can be trained to recognize allergens that pose a threat to their owner. Service animals can scan foods and other areas for the scent of an allergen and alert their owner of the potential threat. Service animals would not be used for those with known allergies to pet dander. It is important to note that those with allergies can develop an allergy to an animal, so this option should be used with caution (US Service Animals Blog, 2022).

24.6 Allergy to Latex

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for latex allergy
- Describe the diagnostics and laboratory values for patients with a latex allergy
- Apply nursing concepts and plan associated nursing care for patients with a latex allergy
- Evaluate the efficacy of nursing care for patients with a latex allergy
- Describe the medical therapies that apply to the care of patients with a latex allergy

The natural protein derived from the sap of the rubber tree, *Hevea brasiliensis*, is used to create **latex**. Latex allergies can cause allergic reactions including conjunctivitis, rhinitis, urticaria, asthma, contact dermatitis, and anaphylaxis. Since the introduction of latex-free and non-powdered latex gloves, the incidence of latex allergies has gradually decreased.

Latex gloves are made by converting liquid rubber into a stretchable solid form; the process uses more than 200 chemicals. The source of allergic reactions is thought to be from either the rubber proteins or the numerous chemicals used. Not all latex products have the capability to cause allergic reactions; it depends on the manufacturing method used to produce the products. Table 24.3 lists latex-free alternatives to the wide variety of home and hospital items that traditionally contain latex (Spina Bifida Association, 2009).

Category	Latex-Containing Items	Alternatives or Latex-Free Brands
Home Items	Balloons	Mylar balloons
	Condoms, diaphragms	Durex Avanti and Reality products, polyurethane products
	Diapers, incontinence pads	Always, Huggies
	Feminine hygiene products (pads, tampons)	Kimberly-Clark
	Wheelchair cushions	Sof Care or ROHO cushions
Hospital Items	Ace brown bandage	Ace white, cotton bandage
	Adhesive bandages, Telfa, Band-Aids	Cotton pads with plastic or silk tape, DuoDERM, 3M Active Strips
	Anesthesia equipment	Neoprene anesthesia equipment

TABLE 24.3 Items Containing Latex and Latex-Free Alternatives

Category	Latex-Containing Items	Alternatives or Latex-Free Brands
	Blood pressure tubing, cuff, bladder	Single-use nylon or vinyl cuffs, Clean Cuff, or use stockinette between equipment and patient clothing
	Catheters and catheter leg straps	Vinyl or all silicone IV catheters, Velcro straps for leg straps
	Crutch axillary pads, hand grips, tips	Cover silicone with tape or cloth
	EKG pads	Red Dot 3M EKG pads, Baxter
	Elastic compression stockings	Kendall SCD stockings (with stockinette)
	Enema kits that are prepackaged	Fleet Ready-to-Use, Therevac
	Gloves	Vinyl, neoprene, polymer, or Derma Prene gloves
	IV catheters	Deseret or Jelco IV catheters
	IV rubber injection ports	Cover Y-sites and ports and be careful not to puncture. Use 3 way stopcocks on plastic tubing.
	Levin tube	Salem sump tube
	Medication vials	Remove the rubber stopper
	Penrose drains	Zimmer Hemovac or Jackson-Pratt drains
	Pulse oximeters	Nonin oximeters
	Resuscitation bags	Puritan Bennett, Laerdal, and some Ambu
	Stethoscope tubing	Cover with latex-free stockinette; PVC tubing
	Suction tubing	Davol or Laerdal (PVC)
	Syringes	Abbott PCA Abboject or Terumo syringes
	Tapes	Micropore, Dermicel
	Theraband	Plastic tubing, new Theraband Exercisers
	Thermometer probes	Daitek covers
	Tourniquets	Avcor (X-Tourn) straps

TABLE 24.3 Items Containing Latex and Latex-Free Alternatives

Pathophysiology and Risk Factors

Latex allergy is a type I IgE-mediated immediate hypersensitivity due to the natural rubber proteins or other chemicals used in manufacturing. After sensitization, IgE antibodies stimulate mast cells and basophils to release histamine, prostaglandins, leukotrienes, and kinins that result in an immune response. Individuals at risk for latex allergies include patients with atopic allergies, patients with multiple surgeries, latex manufacturer workers, some health care workers, spina bifida patients, food handlers, automobile mechanics, hairdressers, and any individual in a profession that wears latex gloves. Those with latex allergies are at risk for developing an anaphylactic reaction. There have also been cross-reactions reported: some individuals with latex allergies are also allergic to bananas, avocados, kiwis, pineapples, mangoes, passionfruit, and chestnuts.

Latex exposure routes can be aerosol, parenteral, mucosal, percutaneous, or cutaneous, but allergic reactions are more likely to occur with parenteral or mucosal exposure. The most common reaction is from cutaneous contact by wearing latex gloves. The powder used in the latex gloves can also be a carrier of the rubber proteins; if the powder becomes airborne, it can lead to inhalation or settle on skin, clothing, or mucous membranes. Examples of mucosal exposure include catheters, airways, latex condoms, and nipples. Examples of parenteral exposure include hemodialysis equipment or intravenous lines.

Clinical Manifestations

There are various types of reactions to latex, including irritant contact dermatitis, allergic contact dermatitis, and latex allergy. Irritant contact dermatitis is not an allergic reaction. It is caused by skin damage due to irritation and the eventual loss of epidermoid skin. Causes include repetitive handwashing, extreme use of soaps, mechanical irritation like sweating or rubbing inside gloves, insufficient hand drying, exposure to chemicals used in the manufacturing process, and the alkaline pH of powdered gloves. Clinical manifestations may be acute (erythema, edema, burning, pruritus, or discomfort) or chronic (dry, thickened, and cracked skin).

Allergic contact dermatitis is usually the result of the chemicals used in the manufacturing process. The reaction is not life-threatening; it generally has a slow onset and occurs 18–24 hours after exposure and resolves within 3–4 days. Severe reactions may happen with re-exposure. Clinical manifestations include edema, erythema, pruritus, crusty thickened skin, blisters, and skin lesions.

Latex allergy can be due to inhalation or contact with the skin, mucosa, or internal tissues. Severe reactions are common with parenteral or mucosal exposure types. However, any individual with this type I hypersensitivity is at risk for anaphylaxis. Clinical manifestations can occur within minutes after exposure and may include localized edema, erythema, edema, pruritus, and systemic reactions such as anaphylaxis. Other clinical manifestations may include urticaria, rhinitis, flushing, laryngeal edema, bronchospasm, conjunctivitis, asthma, angioedema, extreme vasodilation, anaphylaxis, cardiovascular collapse, and even death.

Assessment and Diagnostics

Latex allergies are diagnosed by history and diagnostic test results. Laboratory tests may include serum-specific IgE, ELISA, EIA, or the level of Hevea latex–specific IgE antibodies. The preferred method for individuals with contact allergies is skin patch testing, which can detect sensitization to chemicals used in the manufacturing process. Only clinicians with expert experience with T.R.U.E. or other skin tests should perform this type of testing in the event of systemic or local allergic reactions.

Nursing Care of Patients with a Latex Allergy

Nurses play an important role in managing care for those with latex allergies. Nursing care includes completing a nursing assessment to recognize and analyze cues, prioritizing hypotheses, generating solutions, taking action, and evaluating care and outcomes. If any outcomes have been deemed nonsatisfactory, then the nurse must reassess using the Clinical Judgment Measurement Model and start over with recognizing and analyzing cues and then following subsequent steps until a satisfactory outcome is reached.

Recognizing and Analyzing Cues

As part of recognizing and analyzing cues, the nurse should conduct a physical examination and obtain the patient's personal and family history of allergies. Physical examination findings may reveal any of the clinical manifestations previously. An assessment should include the patient's onset of symptoms after exposure to the suspected or

known allergen. The nurse may use a latex allergy screening form with any new patient who may be exposed to latex.

LINK TO LEARNING

This link from Martin One Source provides a general assessment form (https://openstax.org/r/77LatexAllergy) that may be used to screen for a latex allergy.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

After documenting findings from the physical examination and patient history, the nurse should verify orders received from the provider. Interventions may be aimed at finding alternative, latex-free products for those with known or suspected latex allergies, as well as improving symptoms with reactions and educating patients about avoidance therapy and emergency measures.

Nurses working in surgery settings, emergency departments, or intensive care units should pay special attention to the possibility of patients with latex allergies. Review (Table 24.3) for alternatives to latex-containing items found within the hospital setting. Patients who have a reaction require interventions to improve symptoms, which vary depending on the reaction type. Any new latex reactions should be documented as a new allergy. Medications may include epinephrine in extreme cases or when patients have difficulty breathing. Antihistamines or corticosteroids may also be prescribed. Since anaphylaxis is a risk with any allergic reaction, the nurse must assess and be ready to intervene in the event of this type of emergency.

The nurse should educate the patient on signs and symptoms that warrant a medical emergency, instructions for using an EpiPen, and the need to report this allergy to other health care providers. The nurse should also advise the patient to be careful around foods that have been reported to be cross-linked with latex allergies, such as bananas, avocados, pineapples, and chestnuts. The nurse should identify items in the patient's home that may include latex and help identify alternatives.

Evaluation of Nursing Care for Patients with a Latex Allergy

Evaluation is an essential part of the nursing process. The nurse should compare observed outcomes against expected outcomes. This allows the nurse to evaluate for signs of improvement, decline, or if unchanged. The nurse would then use their judgment to assess whether the interventions were effective or if other interventions are needed.

Evaluating Outcomes

The nurse will want to evaluate expected outcomes for patients with latex allergies. The nurse can determine if symptoms have improved based on clinical examination as well as patient verbalization. The nurse can determine comprehension by having the patient verbalize or reiterate the teachings regarding diagnosis, symptoms, medications, and allergen avoidance measures. The patient should also be able to demonstrate how to properly administer their medications and be able to describe signs and symptoms to report like those of anaphylaxis, difficulty swallowing, wheezing, difficulty breathing, peripheral tingling, and urticaria.

Medical Therapies and Related Care

The primary management for latex allergies includes eliminating exposure. Patients with latex allergies should have a kit containing an EpiPen and antihistamines, and they should wear a medical alert bracelet. The patient should report this allergy to any health care facility where they are receiving care, local paramedic and ambulance companies, and their employer in the event of a job duty that may require exposure to latex. The patient can also get labels for their vehicle to alert paramedics or police about their allergy in the event of an emergency. The patient should also be encouraged to carry latex-free gloves with them. Those with type I latex hypersensitivity may not be able to continue their occupation if avoidance is not an option. Patients may also need to be referred to local support groups due to the significant changes that may take place with avoidance therapy or loss of occupation.

24.7 Anaphylaxis

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations for anaphylaxis
- Describe the diagnostics and laboratory values in the disease of anaphylaxis
- Apply nursing concepts and plan associated nursing care for patients with anaphylaxis
- Evaluate the efficacy of nursing care for patients with anaphylaxis
- Describe the medical therapies that apply to the care of anaphylaxis

Anaphylaxis generally occurs within minutes to hours of exposure and involves the integumentary, respiratory, cardiovascular, and gastrointestinal systems. The Allergy and Asthma Network (2023) reported that 1.5 to 5.1 percent of the American population has undergone anaphylaxis. It also found that medications are responsible for 34 percent of anaphylactic cases, food is responsible for around 31 percent, and insect stings for 20 percent. However, in infants, food is responsible for 73 percent of anaphylactic cases, while medications are responsible for only about 20 percent. The fatality rate of anaphylaxis in around 0.3 percent in the United States (Allergy and Asthma Network, 2023).

Pathophysiology

Anaphylaxis involves the rapid release of several chemical mediators from the degranulation of basophils and mast cells after subsequent exposure to a certain antigen. Common causes of anaphylaxis include foods, insect stings, latex, medications, and other pharmaceutical agents such as serums or skin testing antigens. IgE cross-linking and the resulting accumulation of high-affinity receptors induce the rapid release of stored chemical mediators. The inflammatory response is then facilitated by TNF-alpha (tumor necrosis factor) as a pre-formed and late-phase reactant (McLendon & Sternard, 2023).

The physiology of the released chemical mediators varies in the anaphylactic response. Histamine increases vasodilation and vascular permeability, resulting in reduced blood flow to the tissues. The body tries to compensate for this by increasing the heart rate and cardiac contraction. Prostaglandin D acts as a bronchoconstrictor that impacts both the cardiac and pulmonary vascular constriction. This prostaglandin also contributes to the reduction in blood flow to the tissues due to peripheral vasodilation. Leukotrienes contribute to vascular permeability and bronchoconstriction and induce alterations in the airway. Flushing, angioedema, urticaria, mucosal inflammation and edema, and hypotension may also be a result of the physiologic effects from these chemical mediators. The platelet-activating factors also function as a bronchoconstrictor and intensify vascular permeability (McLendon & Sternard, 2023).

Clinical Manifestations

Anaphylaxis reactions include multiple organ systems at once and may range from mild to moderate to severe. Generally, the faster the onset of symptoms, the more severe the reaction is. Subsequent reactions may not be as severe as the first. The severity is dependent on the degree of allergy and allergen dose exposure. Clinical manifestations of anaphylaxis are summarized in (Table 24.4).

Reaction	Clinical Manifestations
Mild	Peripheral tingling, warm sensations, and a sense of fullness in the throat and mouth. Periorbital swelling, sneezing, nasal congestion, pruritus, and tearing from the eyes may also occur. This category of symptoms typically begins within the first two hours after exposure.
Moderate	May include all of the mild symptoms, with the addition of anxiety and flushing. Some moderate reactions may be more severe and include edema of the airways or larynx, dyspnea, wheezing, cough, and bronchospasm. This category of symptoms also generally begins within the first two hours of exposure.
Severe	Also referred to as anaphylactic shock. This type of reaction has a rapid onset and includes any symptoms from the mild or moderate categories. Those symptoms rapidly progress to bronchospasm, severe dyspnea, edema of the larynx, cyanosis, and hypotension. Other symptoms include dysphagia, seizures, abdominal cramping, vomiting, and diarrhea may also occur. Untreated anaphylaxis can lead to respiratory arrest and coma.

TABLE 24.4 Anaphylaxis Reactions

Assessment

Assessment of anaphylaxis includes monitoring the patient for signs and symptoms of an anaphylactic reaction, as previously described. This assessment should include airway, breathing, circulation, level of consciousness, and exposure of the skin. Allergy testing may also be necessary to identify the allergen.

Diagnostics and Laboratory Values

Diagnostic tests to identify an allergen include skin tests, total serum IgE, complete blood count with differential, and eosinophil count. A blood test to check the amount of tryptase may also be used in the diagnosis of anaphylaxis. This enzyme is mainly found in mast cells and can be elevated up to three hours after an anaphylactic reaction. Plasma histamine levels and SC5b-9, a terminal compliment complex, may also be elevated after a severe reaction. Other diagnostics and laboratory values include vital signs, labs to assess the functionality of organs that may be impacted by the reaction, and x-rays or CT scans to assess those organs for damage or improvement.

Nursing Care of Patients with Anaphylaxis

Anaphylaxis is a life-threatening condition that occurs immediately after exposure to an allergen. Acute nursing care should be rapidly initiated to increase the patient's survival rate. Immediate treatment includes administration of any ordered medication, airway assessment and management, and circulation support.

Recognizing and Analyzing Cues

Per the Clinical Judgment Measurement Model, part of the nursing process includes recognizing and analyzing cues. When it comes to anaphylactic reactions in an acute care setting, the nurse must assess the patient for any signs and symptoms of anaphylaxis in order to quickly intervene. The nurse should assess airway, breathing, vital signs, signs of increasing edema, and respiratory distress. If the patient is able to speak, the nurse should also ask if they are experiencing any difficulty breathing, any sudden changes in how they feel, or any other type of discomfort. The nurse should also be aware of when the symptoms started and when exposure to the relevant medication, food, or other allergen happened, and document this information.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

If after analyzing cues the nurse determines the patient is in anaphylaxis, the nurse must promptly prioritize interventions. The nurse must notify the rapid response team or the provider per facility policy. Rapid interventions include intubation, emergency medication administration, intravenous line insertion, fluid administration, and oxygen administration, which may be necessary when the patient is experiencing cyanosis, wheezing, or dyspnea. Medications that may be administered during anaphylaxis include epinephrine, which should be injected as a 1:1,000 dilution subcutaneously in the thigh. A much lower concentration may be given continuously through intravenous solution following the initial subcutaneous injection. Epinephrine works quickly to improve breathing

and blood pressure by causing vasoconstriction. It also quickly reverses urticaria and reduces edema that may occur.

In addition to epinephrine, antihistamines and corticosteroids may be given. Other vasopressor agents, such as norepinephrine, dopamine, and vasopressin, and other volume expanders, such as lactated Ringer's and normal saline, may also be administered to maintain blood pressure and hemodynamic status. Patients with bronchospasms, asthma, or cardiopulmonary obstructive diseases may be given aminophylline and corticosteroids to improve airway patency and function. Other immediate interventions include discontinuing or removing the medication or other allergen. In the event of cardiac arrest, cardiopulmonary resuscitation (CPR) will need to be performed.

LINK TO LEARNING

Hamilton Health Sciences provides an excellent resource on how to use an EpiPen (https://openstax.org/r/77EpiPenUse) for patients at risk of anaphylaxis and their families. There is also a video demonstrating how to administer an EpiPen to oneself or others.

Evaluation of Nursing Care for Patients with Anaphylaxis

Evaluation is an essential part of the nursing process. The nurse should compare observed outcomes against expected outcomes. This allows the nurse to evaluate for signs of improvement, decline, or no change. The nurse would then use their judgment to assess whether the interventions were effective or if other interventions are needed. Documentation is required to include each intervention given and the patient's response.

Evaluating Outcomes

The nurse should evaluate the effectiveness of all interventions to determine if any other interventions are necessary. For example, if the patient experienced difficulty breathing, the nurse should reassess the patient's respiratory status for improvement. For example, the nurse will want to assess for improvements with wheezing or labored breathing. The nurse should check for improvements with the rate and oxygen saturation. The nurse should also assess whether any medications administered had the desired effect. If epinephrine was given, the nurse should reassess the patient's vital signs; for example, the patient should have an increase in blood pressure and heart rate.

Medical Therapies and Related Care

Patients who have experienced anaphylaxis and have received epinephrine should be taken to an emergency room if they are not already present in a hospital setting; once there, they should be monitored for four to eight hours for rebound or delayed reactions (Tupper & Visser, 2010). Patients with severe allergic reactions may be prescribed an EpiPen in the event of re-exposure to the allergen. Those individuals may also be advised to wear a medical alert bracelet.

Once the patient has recovered, the nurse should provide education to notify the patient of what happened and why they should notify their other health care facilities of the allergy. The patient and their family members should be taught how to use an immunotherapy and be able to demonstrate the proper administration. The patient and their family should also be aware of the need call 911 in order to receive care after anaphylaxis and be monitored for rebound or delayed reactions.

Summary

24.1 Allergic Response

- Allergic responses are inappropriate or exaggerated responses of the body's immune system to a substance that is usually harmless. The body has multiple defense mechanisms that recognize and eliminate antigens, or foreign proteins that invade the body.
- Hypersensitivity is an abnormal heightened response to any type of stimulus; it does not normally occur after the initial exposure to an allergen.
- Type I hypersensitivity, or anaphylactic response, is facilitated by IgE antibodies produced by the immune system in response to allergens like dust mites, animal dander, and pollens.
- Type II, or cytotoxic-mediated, responses against cell surface and extracellular matrix proteins are facilitated by IgG and IgM antibodies.
- Type III, or immunocomplex, reactions are also facilitated by IgG and IgM antibodies that react with soluble antigens to create antigen-antibody complexes.
- Type IV, or delayed-type, hypersensitivity is a reaction where tissue damage is the result of T cell–dependent macrophage activation and inflammation.

24.2 Allergic Rhinitis

- The most common type of respiratory allergy is allergic rhinitis.
- The symptoms of allergic rhinitis are nasal congestion, sneezing, nose and throat itching, abundant amounts of serous nasal drainage, itching, watery eyes, hyposomnia, headache, and post-nasal drip.
- An allergic rhinitis diagnosis is dependent on the patient's history, as well as a clinical examination and diagnostic test results.
- There are several options when it comes to managing allergic rhinitis.
- Avoidance therapy may be used to minimize an individual's exposure to allergens and thereby decrease symptoms.
- Pharmacologic therapy is also used; medications include adrenergic agents, antihistamines, second-generation H1 receptor antagonists, mast cell stabilizers, corticosteroids, and leukotriene modifiers.
- Another option to treat or manage allergic rhinitis is immunotherapy, which includes subcutaneous immunotherapy (SIT), epicutaneous immunotherapy (EPIT), and sublingual immunotherapy (SLIT).

24.3 Types of Dermatitis

- Dermatitis, or inflammation of the skin, encompasses several types of skin conditions with the same inflammatory reaction pattern and manifestations.
- The three types of dermatitis related to allergic disorders are contact dermatitis, atopic dermatitis (eczema), and dermatitis medicamentosa (drug reactions).
- Contact dermatitis is a type IV delayed hypersensitivity that may be caused by extreme exposure to irritants like soaps, solvents, and detergents.
- Atopic dermatitis, also called atopic eczema, is a type I immediate hypersensitivity disorder. Atopic dermatitis may be caused by food allergens and environmental triggers.
- Dermatitis medicamentosa is a type I hypersensitivity disorder resulting from drug reactions.
- Dermatitis can be diagnosed by physical examination, exposure history, and patch testing (except for widespread reactions and drug reactions).
- Medical therapies and related care should be individualized and may include identification and removal of irritants, avoidance therapy, phototherapy, aluminum acetate, cool compresses, systemic corticosteroids, topical corticosteroids, oral antihistamines like diphenhydramine, hydrophilic creams, petrolatum, antibiotics, and nonsteroidal anti-inflammatory agents.
- Severely affected individuals may be prescribed immunosuppressants.
- Other measures include wearing cotton fabrics to decrease pruritus, bathing and washing with mild detergents, moisturizing after bathing, maintaining the room temperature from 68°F to 72°F (20°C to 22.2°C), using humidifiers in winter, and avoiding irritants, animals, dusts, sprays, and perfumes.

24.4 Urticaria and Angioneurotic Edema

- Urticaria is a type I hypersensitivity allergic reaction involving the skin.
- Angioneurotic edema is a condition that is depicted by urticaria and dispersed swelling of the deeper skin layers.
- Urticaria may appear anywhere on the body, while angioedema typically occurs on the face, hands, feet, or throat.
- These conditions often occur together but can appear without the presence of the other.
- These conditions may be the result of exposures to allergens like food, medications, insect stings, physical stimuli, latex, blood transfusions, bacterial or viral infections, pet dander, plants, and pollen.
- Urticaria is characterized by edematous red or pink wheals that vary in size from 2–4 mm. Pruritus and angioedema may also be present with this disorder.
- The assessment should include vital signs as well as a review of the systems to identify potential causes or a severe case.
- Interventions may be aimed at improving symptoms, administering medications, educating the patient about avoidance therapy, avoiding aggravating factors, and promoting home-based care. Nursing interventions for improving symptoms may include administering medications and eliminating identified or suspected triggers. Medications may include antihistamines and system corticosteroids.
- Angioedema involves swelling of the deeper skin layers; it most commonly occurs in the face (eyelids, lips, tongue, cheeks), hands, feet, genitalia, or throat.
- Angioedema can also occur in mucous membranes of the gastrointestinal tract, bronchi, and larynx.
- Angioedema is either histamine-mediated or bradykinin-mediated and is characterized by non-pitting swelling of the dermis and subcutaneous layers.
- Interventions may be aimed at improving symptoms, administering medications, educating the patient about avoidance therapy, and promoting home-based care. Medications may include epinephrine in extreme cases or those causing difficulty breathing. Most cases resolve on their own within two to four days. Antihistamines or corticosteroids may also be prescribed.

24.5 Allergy to Food

- Food allergies are IgE-mediated type I hypersensitivity reactions.
- The most common foods known to cause food allergies are peanuts, tree nuts, seafood, chocolate, berries, eggs, wheat, and milk.
- Reactions may include smooth muscle contraction, bronchial constriction, mucus airway secretions, wheal-and-flare skin reactions, increased capillary permeability, and vasodilation.
- Symptoms of food allergies range from mild to life-threatening and include a variety of allergy and gastrointestinal problems.
- All patients with food allergies should have an EpiPen and a medical alert bracelet.

24.6 Allergy to Latex

- Latex is a natural rubber protein derived from the sap of the rubber tree.
- There are various types of reactions to latex, including irritant contact dermatitis, allergic contact dermatitis, and latex allergy, which is a type I IgE-mediated immediate hypersensitivity due to the natural rubber proteins.
- Latex allergies can cause a variety of reactions including erythema; edema; burning; pruritus; dry, thickened, and cracked skin; blisters; skin lesions; urticaria; rhinitis; flushing; laryngeal edema; bronchospasm; conjunctivitis; asthma; angioedema; extreme vasodilation; anaphylaxis; cardiovascular collapse; and even death.
- Those in settings where patients have a risk of exposure should assess the patient for latex allergies and may use a screening tool to aid in identifying if there is a risk. If there is a risk, the nurse should identify latex-free alternatives.
- Other interventions may be aimed at improving symptoms caused by reactions and educating at-risk individuals about avoidance therapy, emergency measures, and foods reported to be cross-linked with latex allergies.
- Primary management is avoiding exposure.

- Patients with latex allergy should have a medical alert bracelet and a kit containing antihistamines and EpiPen.
- The patient should also report this allergy to emergency services and health care facilities and may be advised to put a warning label on their vehicle.
- Patients may also need to seek new employment or be referred to support groups.

24.7 Anaphylaxis

- Anaphylaxis is a potentially life-threatening, type I hypersensitivity response resulting from the rapid release of IgE-mediated chemicals in an attempt to eliminate a triggering allergen.
- Anaphylaxis generally occurs withing minutes to hours of exposure and involves the integumentary, respiratory, cardiovascular, and gastrointestinal systems.
- Common causes of anaphylaxis include foods, insect stings, latex, medications, and other pharmaceutical agents like serums or skin-testing antigens.
- Clinical manifestations include bronchoconstriction, increased vascular permeability, flushing, angioedema, urticaria, mucosal inflammation and edema, and hypotension.
- Anaphylaxis reactions include multiple organ systems at once and may range from mild to moderate to severe.
- Mild reactions include peripheral tingling, warm sensations, and a sense of fullness in the throat and mouth. Periorbital swelling, sneezing, nasal congestion, pruritus, and tearing from the eyes may also occur.
- Moderate reactions include any of the mild symptoms, with the addition of anxiety and flushing. Some moderate reactions may be more severe and include edema of the airways or larynx, dyspnea, wheezing, cough, and bronchospasm.
- Severe reactions are referred to as anaphylactic shock. They have a quick onset and include any symptoms from the mild or moderate categories. Those symptoms rapidly progress to bronchospasm, severe dyspnea, edema of the larynx, cyanosis, and hypotension. Other symptoms like dysphagia, seizures, abdominal cramping, vomiting, and diarrhea may also occur.
- Assessment for anaphylaxis should include airway, breathing, circulation, level of consciousness, and exposure of the skin.
- When it comes to anaphylaxis reactions in an acute care setting, the nurse must assess the patient for any signs and symptoms of anaphylaxis in order to quickly intervene. The nurse should assess airway, breathing, vital signs, signs of increasing edema, and respiratory distress.
- Interventions include intubation, emergency medication administration, intravenous line insertion, fluid administration, and oxygen administration. CPR may be warranted in the event of cardiac arrest. Antihistamines and corticosteroids may also be given in adjunction with epinephrine.
- Patients who have experienced anaphylaxis and received epinephrine should be taken to an emergency room, if not already present in a hospital setting, as they should be monitored for rebound or delayed reactions.

Key Terms

adrenergic agent pharmacological agent that acts as a mucosal vessel vasoconstrictor
allergen foreign substance that is usually harmless
allergic disorder common pathological condition due to IgE-dependent immunological reactions to an allergen
allergic rhinitis localized allergic reaction in the sinuses
allergy inappropriate or exaggerated responses of the immune system to a foreign substance that is usually harmless
anaphylaxis potentially life-threatening, type I hypersensitivity response resulting from the rapid release of IgE-mediated chemicals in an attempt to eliminate a triggering allergen
angioneurotic edema condition that is characterized by urticaria and diffuse swelling of the deeper skin layers
antibody protein substance that protects against antigens
antihistamine H1 receptor antagonist
Arthus reaction acute, localized inflammatory response that typically occurs after vaccination
atopic march typical progression of allergic disease that begins early in life
atopy genetic tendency to develop allergic diseases
B cell regulatory cell in the immune system; also called B lymphocyte
bradykinin chemical mediator that stimulates nerve fibers and causes pain
eosinophil leukocyte that protects the body from parasites, allergens, and other organisms

epicutaneous on the skin
haptens incomplete antigens
hemorrhagic bullae blood-filled blisters
hypersensitivity abnormal heightened response to any type of stimulus
immunoglobulin protein capable of acting as an antibody
latex substance made from natural protein derived from the sap of the rubber tree
leukotriene chemical mediator that initiates the inflammatory response
malar rash butterfly rash
mast cell specialized type of white blood cells that are found throughout the body
papule solid or cystic raised spot on the skin
Peyer patches small groupings of lymphoid follicles in the small intestine
prostaglandin unsaturated fatty acid with a wide range of biologic activity
rhinorrhea runny nose
sensitization process in the allergic response where IgE antibodies attach to receptors on the surface of immune cells after an allergen has been introduced
serotonin chemical mediator that acts as a forceful vasoconstrictor and bronchoconstrictor and is formed in platelets
T cell cell that assists B cells in the immune response; also called T lymphocyte
urticaria type I hypersensitivity allergic reaction involving the skin and characterized by wheals
urticarial vasculitis inflammation of the small vessels of the skin
vesicle thin-walled sac filled with fluid

Assessments

Review Questions

1. What immunoglobulin is involved in allergic disorders?
    a. IgA
    b. IgD
    c. IgE
    d. IgM

2. What seasons are associated with allergic rhinitis? Select all that apply.
    a. Spring
    b. Summer
    c. Fall
    d. Winter

3. A patient is undergoing subcutaneous immunotherapy. If the patient exhibits localized swelling at the injection site, what conclusion should the nurse draw?
    a. This is an expected finding.
    b. This could be a sign of a possible systemic reaction.
    c. The next dose should be increased to aid in the patient reaching a therapeutic level.
    d. The injection site should be rubbed to get the swelling to go down.

4. What kind of hypersensitivity is atopic dermatitis?
    a. Type I
    b. Type II
    c. Type III
    d. Type IV

5. A nurse has provided education to a patient newly diagnosed with atopic dermatitis. What is an example of a statement by the patient that demonstrates to the nurse the patient understands the teaching?
    a. “Atopy means the reaction is on the outer area of the skin.”

b. "Atopy means there is a genetic tendency to develop allergic diseases."
c. "Atopy means the inflammation is improving."
d. "Atopy means the reaction only occurs due to contact with an allergen."

6. A nurse is caring for a patient who is experiencing angioedema. What does the nurse know is the highest priority?
a. monitoring blood pressure and heart rate
b. managing the airway and ensuring patency
c. assessing possible triggers
d. performing tests to identify the trigger

7. An experienced nurse provides education to a new nurse at an allergy and asthma clinic. What is an example of a statement by the patient that demonstrates to the experienced nurse that they understand the teaching?
a. "Urticaria is always accompanied by angioneurotic edema."
b. "Urticaria always occurs without the presence of angioneurotic edema."
c. "Angioneurotic edema only results due to urticaria."
d. "Urticaria and angioneurotic edema may occur with the other or alone."

8. A patient states they do not understand why a food they ate previously did not cause an allergic reaction but now it does. What is an example of a response the nurse should give?
a. "You did have a reaction following your first exposure, but you must not have recognized it."
b. "Your body formed antibodies during the first exposure, so the subsequent exposure resulted in an immune response."
c. "This is probably a one-time occurrence, so you can eat the food again without risk."
d. "Your symptoms were probably caused by a stomach virus rather than a food allergy."

9. A patient with a peanut allergy asks why the nurse recommends reading food labels. What is an example of a statement that demonstrates an appropriate explanation by the nurse?
a. "Some foods that you may not expect, like certain salad dressings, contain peanuts as one of the ingredients."
b. "If a patient is allergic to peanuts, then they are probably allergic to all the common food allergens like wheat, dairy, and shellfish."
c. "Some foods may be manufactured in a facility that also makes foods with peanuts in it."
d. "Foods that contain tree nuts may pose a similar reaction as peanuts."

10. What foods have been reported to have cross-reactions for those with latex allergies? Select all that apply.
a. Melons
b. Bananas
c. Avocados
d. Kiwis
e. Strawberries

11. What is an example of a vasopressor agent that may be given during anaphylaxis?
a. Normal saline
b. Dopamine
c. Aminophylline
d. Prednisone

12. A nurse has administered epinephrine to a patient in anaphylactic shock. What is an indicator to the nurse that the epinephrine is having a therapeutic response?
a. dilates the patient's airways
b. blocks histamine effects
c. increases blood pressure and heart rate

d. prevents anaphylaxis from occurring with subsequent exposures to the antigen

Check Your Understanding Questions

1. Describe the steps a nurse would take in the event of a patient experiencing an allergic response.
2. Describe how avoidance therapy may be used to manage allergic rhinitis.
3. Describe the diagnostic testing completed for allergic rhinitis.
4. Describe the pathophysiology of dermatitis medicamentosa.
5. What are techniques the nurse can use to evaluate the efficiency of provided nursing education?
6. Describe the pathophysiology of latex allergies.

Reflection Questions

1. What information should a nurse include when educating a patient or their family about a diagnosis of a new allergy disorder?
2. The nurse is caring for a patient on a medical-surgical floor, the patient is started on IV penicillin as ordered by the provider. The patient calls the nurse into the room after 20 minutes due to the presence of severe urticaria and pruritus. What should the nurse do first?
3. What information should a nurse include when educating a patient or their family about a new diagnosis of allergic rhinitis?
4. What clinical manifestations can occur with food allergies?
5. What testing may be performed with assessing for latex allergies?
6. Diagnostic tests to identify an allergen include skin tests, total serum IgE, complete blood count with differential, and eosinophil count. A blood test to check the amount of what enzyme may also be used in the diagnosis of anaphylaxis?

What Should the Nurse Do?

Ms. Stein, a 32-year-old female, presents at a local drop-in medical facility with a chief complaint of recurrent episodes of sneezing, nasal congestion, and itchy eyes for the past six months. She reports a medical history of seasonal allergies but notes an escalation in symptoms despite over-the-counter antihistamine use. Vital signs reveal a blood pressure of 120/80 mm Hg, heart rate of 78 beats per minute, respiratory rate of 16 breaths per minute, and a temperature of 98.6°F. During the assessment, Ms. Stein describes her symptoms worsening during spring and fall seasons. Her family history includes a maternal aunt with a history of severe allergies.

1. What key symptoms reported by Ms. Stein suggest the possibility of hypersensitivity, and how do they align with the objective related to the role of immunoglobulins in the allergic process?
2. What nursing interventions can be generated to address Ms. Stein's immediate symptoms, and how do they align with the application of nursing concepts in hypersensitivity care?

Mr. Pratt, a 45-year-old male, has presented to the dermatology clinic with a complaint of persistent, pruritic rash on his hands and forearms for the past month. He reports a history of occasional eczema flare-ups during the winter months but notes that the current episode is more severe and does not respond to over-the-counter creams. Mr. Pratt's vital signs are stable, with a blood pressure of 122/78 mm Hg, heart rate of 82 beats per minute, respiratory rate of 16 breaths per minute, and a temperature of 98.9°F. Physical examination reveals erythematous, scaly lesions with occasional vesicles on the dorsal aspects of both hands. He denies any recent exposure to new substances or known allergens.

3. Considering Mr. Pratt's medical history and the localized nature of his rash, what factors contribute to the analysis of potential triggers and the differentiation of various types of dermatitis.
4. What nursing interventions can be generated to address Mr. Pratt's immediate symptoms, and how do these interventions align with the application of nursing concepts in dermatitis care?
5. Based on the prioritized hypotheses, what specific actions should you as a nurse take to confirm the

diagnosis, and how do these actions correlate with the description of diagnostics and laboratory values in dermatitis?

6. A patient exhibits urticaria after taking penicillin for an infection. What should the nurse do?

Alex, a 10-year-old male, is brought to the emergency department by his mother due to a severe allergic reaction after consuming a peanut-containing snack. Alex presents with facial swelling, urticaria, and difficulty breathing. His mother reports that he has a known history of peanut allergy diagnosed in early childhood. Vital signs indicate a blood pressure of 110/70 mm Hg, heart rate of 120 beats per minute, respiratory rate of 24 breaths per minute, and oxygen saturation of 92%. Alex has no previous history of anaphylaxis, and he has not taken any medication or used an epinephrine auto-injector prior to arrival.

7. Given the urgency of the situation, what are the priority hypotheses for the nurse to consider in managing Alex's anaphylactic reaction, and how do they guide immediate nursing actions?
8. What nursing interventions can be generated to address the immediate needs of Alex, and how do they align with the application of nursing concepts in managing acute food allergies?
9. Based on the prioritized hypotheses, what specific actions should the nurse take to stabilize Alex and initiate ongoing care, and how do these actions correlate with the description of diagnostics and laboratory values for food allergies?
10. A nurse is setting up the operating room for a patient with a known latex allergy. What should the nurse do?
11. The nurse is caring for a patient on an intensive care unit. The patient has critically low hemoglobin and hematocrit levels. The nurse has begun administering a blood transfusion as ordered by the provider. The patient begins to exhibit wheezing and shortness of breath. What should the nurse do?

Competency-Based Assessments

1. Role play the appropriate procedure for performing skin testing on a patient.
2. Summarize the education a nurse would provide to a patient on managing dermatitis at home.
3. Prepare a 10-minute presentation on the clinical manifestations of urticaria.
4. Create a bullet point list of educational content for a patient recently diagnosed with food allergies.
5. Summarize education a nurse may need to provide to a patient recently diagnosed with latex allergies.
6. Prepare a 10-minute presentation on the pathophysiology of anaphylaxis.

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CHAPTER 25

Preoperative Care

FIGURE 25.1 Surgical handoff, a crucial aspect in perioperative nursing, is generally performed with the patient, preoperative nurse, intraoperative nurse, and an anesthesia provider. This process ensures patient safety by verifying name, date of birth, surgery being performed and site, allergies, and any potential limb alerts. (credit: Airman 1st Class Kyle Johnson, U.S. Air Force/Joint Base Elmendorf-Richardson, Public Domain)

CHAPTER OUTLINE

INTRODUCTION Perioperative means the time around surgery. It is used to encompass the time between going to the facility, having the procedure, and then returning home afterward. This chapter will discuss the first of three phases included in perioperative nursing. There are multiple pathways a patient may take before ending up in the operating room. As health care has evolved through the years, one major advancement is the more streamlined, less invasiveness of surgery. Many procedures are now performed in outpatient settings, such as surgical clinics, allowing for a quicker return home and less downtime for the patient. Some common surgical procedures are planned, such as elective cosmetic procedures, while other surgeries are emergent and unplanned, such as for life-threatening conditions or injury. There is often overlap when it comes to the provided care between the phases of preoperative nursing, which will be discussed further in this chapter. In order to provide safe, quality, and competent patient care, the nurse must thoroughly understand the different phases of preoperative care.

25.1 Preadmission Assessment and Education

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Identify important aspects of preadmission care
- Discuss education and planning for patients scheduled for an operation

The first of the three phases included in perioperative nursing is the preoperative phase. The **preoperative phase** starts when the decision is made to proceed with a surgery or procedure and ends when the patient arrives in the operating room. Many hospitals or surgery centers have a presurgical services department to facilitate preadmission testing. The preadmission assessment and interview provide the nurse and anesthesia provider the opportunity to ensure the patient is safe to continue with the procedure or surgery. Based on the patient's health history, the nurse may identify any potential risks, as well as any further testing that may be needed as outlined by the anesthesia provider or surgical protocol. Preadmission testing also identifies any risks or interventions that may need to be addressed prior to the procedure. At this time, the nurse will also need to obtain information pertinent to the procedure, such as consent forms (as appropriate).

The preoperative phase is a crucial phase to ensure patient safety throughout the surgical process. This phase requires the nurse to utilize clear and concise communication, strong teamwork, and flawless patient assessment skills to promote the patient's best achievable outcomes and avoid errors or adverse events. The preoperative nurse should ensure the correct site and surgery are verbalized by the patient in their own words, as well as documented correctly both in the patient's chart and the surgical consent. The surgeon is responsible for marking the correct limb or surgical site. The actual marking must be verified by both the preoperative and intraoperative nurse. Omitting these crucial steps could result in surgery being performed on the wrong site. Information that the preoperative nurse obtains will be communicated to the intraoperative nurse during patient handoff (see Chapter 26 Intraoperative Care).

Preadmission Care

Preadmission care the nurse provides will vary depending on the route the patient takes to the operating room (OR). In the case of a planned procedure, there will be a scheduled appointment 7-10 days, or even up to a month, beforehand. At this time, the nurse will gather information, which includes the patient's demographics, health history, and any diagnostic and laboratory testing. This can be done via phone or in person depending on facility protocol. For example, a patient having a total joint replacement may need to come in person to the facility because the preadmission testing is extensive, as it includes several laboratory tests, an ECG, chest X-ray, and special preoperative instructions. Whereas a patient having a less invasive procedure, like a colonoscopy, is able to complete the preadmission screening over the phone.

When a patient is already in the facility (for example, admitted as an inpatient, in the ER, or in observation), the preoperative nurse is responsible for doing the interviewing and assessment at the patient's bedside. The nurse will also need to ensure that any necessary diagnostic tests have been completed, and teaching is provided prior to the procedure.

Assessment and Testing

The timing of the nurse's assessment and any preop testing may be days to weeks before a planned surgery, or day-of in the case of a more emergent surgery. The tasks are the same, whether it is happening far in advance or just hours before the procedure takes place.

The nurse should have the patient state in their own words the type of surgery they are having. This is the first safety check to see if the orders sent match the patient's description of what needs to be completed, especially when it comes to ensuring the correct site for the surgery to be performed.

A nurse's assessment needs to cover a great deal of information, including:

- Demographics (e.g., address, date of birth)
- Allergies
- Height, weight
- Current medications

- Health history
- Social history (including smoking, alcohol, and recreational drug use)
- Surgical history (including any potential problems with anesthesia—e.g., trouble waking up after surgery, nausea, vomiting, or malignant hyperthermia)
- Pertinent family history (such as diabetes, hypertension, or previous problems with anesthesia)
- History of falls
- Presence of any metal or implants in the body
- Use of corrective devices
- Advanced directive (if patient has one)

The nurse uses current, past, and family health histories obtained during the assessment to identify risks or the need for alternative medications due to an allergy. Height and weight are used to determine a person's body mass index (BMI) to decide if a transfer device or specialty bed will be needed.

Special precautions may be implemented for patients who report previous complications with anesthesia. If a patient reports having a previous lumpectomy or mastectomy, or has an AV fistula or graft in place, the nurse should assess for any restrictions with blood pressure or IV placements in either limb. If there are contraindications, the nurse will need to create a limb alert per facility protocol. Examples of a limb alert include a colored band to communicate to other care team members that the identified extremity cannot be used for blood draws or IV placement.

By gathering this information, the nurse can help confirm preventive steps are taken to ensure the patient's safety. Preadmission assessments can determine if anesthesia medications need to be adjusted from normal dosages, or if the patient may require longer monitoring in the post-anesthesia care unit (PACU) for potential reactions. The anesthesia provider may adjust the medications given during surgery for patients with a history of postoperative nausea and vomiting or trouble waking up from anesthesia, or for patients identified as those who use alcohol daily. The nurse will assess a baseline pain level acceptable to the patient, so the postoperative nurses can take that into consideration when planning a mutual, patient-centered care plan for pain management after surgery.

Preoperative tests ordered may vary, depending on the provider's orders and the nurse's assessment. Some surgeons request their own testing or simply ask the facility to follow their anesthesia protocol. Anesthesia protocols typically include:

- ECG for patients that have a cardiac history or above a certain age
- Pregnancy test for women of childbearing age
- Basic metabolic panel for those with diabetes and those with hypertension
- Fasting blood glucose for patients with diabetes the morning of surgery
- Chest X-rays for those who complain of chest pain or shortness of breath that is new or worsening
- Cardiologist clearance may be required for patients with a history of cardiac conditions or any identified dysrhythmia

Again, it's important to note that the timeline for testing may depend on the path the patient takes to the OR. If the procedure is planned, some testing may be performed prior to the date either at the patient's primary care provider or at an outpatient facility. While the patient may have some flexibility, the testing needs to be done in time for the anesthesia team or surgeon to view the results before surgery. In emergent cases or when the patient is are already admitted to a facility, testing will be done in hospital on the day of the procedure.

Education and Planning

Preoperative education includes what to expect on the day of surgery, like arrival time versus surgical start time, explaining the need for necessary tasks prior to the surgical start time. The nurse may start by helping the patient visualize what they can expect the day of their procedure. The nurse might explain that once the patient checks in at the designated area on the day of surgery, the preoperative nurse will escort them back to a preoperative room to change clothes, sign consents, place an IV, administer medications, and perform any preparation to the surgical site, such as a surgical scrub or wipe down with antimicrobial solutions.

The patient should be educated to remain **NPO**, which means to take nothing by mouth, after midnight the night before surgery. The nurse will teach that this includes not smoking, not swallowing water or toothpaste, and not

using gum or hard candies the morning of surgery. Anything eliciting extra saliva or gastric juice production will need to be avoided. The patient will need to know which medications should not be taken, and which medications can be taken. For example, a patient with diabetes may be instructed to take only half a dose of insulin the night before surgery and to take diabetic medications or insulin the morning of surgery as normally prescribed. If there are any medications the patient should take the morning of surgery, the nurse will instruct the patient to take medications with a very small sip of water. The nurse must make sure that the patient understands that it's not only prescribed medications that may need to be stopped or changed—over-the-counter medications and supplements should also be discussed. Some common over-the-counter medications like aspirin and certain herbal remedies can thin the blood, while others may interact with medications given during or after surgery. For example, a surgeon may request that a patient stop using aspirin for up to 10 days prior to the procedure to reduce the risk of bleeding, though it will depend on the reason for aspirin therapy. (Plümer et al., 2017) If the patient reports having sleep apnea, the preoperative nurse will advise the patient to bring their sleep apnea machine with them, as it will be incorporated into their plan of care.

The nurse will also need to assess the patient's psychological state, as this can impact their readiness to learn and receive preoperative education. For example, a patient who has never had a medical procedure before may be anxious and scared. Or a patient who is in a great deal of pain will likely be distracted and unable to focus. Until the patient's pain is controlled and they are in a more relaxed state, they will not be able to fully understand the information that the nurse is providing to them about their care. The nurse should determine the readiness of the patient and provide appropriate nursing interventions to each patient scenario. Patients who are cognitively or developmentally impaired will need a guardian present for education.

REAL RN STORIES

Nurse: Joseph
Years in Practice: Eleven
Clinical Setting: Outpatient surgical center
Geographic Location: Northeastern US

Joseph has been an RN for over a decade and knows the importance of talking to patients before surgery. This is not just to get key information about their health, but to make sure the patient fully understands what to expect before and after the procedure. Here, Joseph describes a thoughtful conversation with a patient, which resulted in discovering a key detail that could have had negative effects on their surgical outcomes had it remain unidentified.

It was a really busy day; I had a huge list of patients who needed to be called for preadmission assessment and interviews. I was already late because I had run into some construction on the way to work, causing a delay. The first few calls I made, I caught myself feeling rushed and tense. I was "checking off the boxes" but didn't feel like I was doing everything I could to make sure the patients had a chance to ask questions and teach-back to me what I had just educated them on. The teach-back method helps me confirm the patient understands the information I'm giving them.

The next patient I called after my reflection was a 35-year-old female named Kelly, who was planned for a cholecystectomy. Kelly was in a great mood, personable and wanted to tell me about her little daughter, who I could hear playing in the background. I tried to keep Kelly focused on the conversation, because we had a lot of information to go over.

When we got to her medications, she said she wasn't prescribed anything. I asked about over-the-counter or a supplement medication, and she said, "Well…no." I sensed a little hesitation in her response. I thought, maybe she wasn't sure about something being a supplement. I glanced at the clock and realized that the conversation was already running over the standard call time. I knew that I needed to wrap up the call, but something in my gut feeling was giving me pause. So, I circled back to the supplements and asked her more specifically if she took anything like homeopathic remedies, or was there something she took for stress, or to help her sleep? At that point, Kelly said, "Well, yeah, I take valerian root to help me sleep and, wow, does it really help!"

I was so glad that I asked, because valerian root can actually interfere with anesthesia. I explained this to Kelly, and

made sure she understood, she will need to stop taking it before her surgery. She still had a couple of weeks before her surgery, and her surgeon would be fine if she wanted to take it for a few more days to lower her dose before stopping rather than just going "cold turkey." Luckily, she didn't think it would be a big deal and said she'd just finished a bottle, so she'd just wait until after her surgery to open the new one.

Other instructions include showering with either an antibacterial soap or surgical soap per facility protocol. The patient is educated on what clothes to wear the day of surgery to accommodate the type of surgery performed. For example, loose fitting pants that will fit around a cast, boot, or immobilizer. The patient should also be instructed not to wear contact lenses, nail polish, makeup, or jewelry. The patient should be instructed to bring their own bag for personal items on the day of surgery. Also, they should be provided with information on visitor policies, and if they will need to have someone drive them home after surgery. Some facilities may require the person driving the patient home to be on campus prior to the surgery starting, as well as remaining there until the patient is ready to discharge.

At this point, advance directives are also discussed. An **advance directive** is a document that allows a patient to convey, in writing, their wishes for care if they are unable to advocate for themselves due to a medical condition. If a patient does not have an advance directive, they may be given information about the documents to help them decide if this planning is something they would like to complete before surgery. The nurse may advise patients about talking to the health information department or checking the facility's website for forms or templates that help patients create their advance directives. Patients who have an advance directive may be asked to bring it with them to their surgery so that the facility can have it on file in the event the patient is not able to make decisions for themselves.

The general recovery process for the facility can be explained prior to surgery, but most of the time, postoperative instructions are not available until after the surgeon has performed the procedure. For example, patients undergoing foot surgery may be told in the office that they will be weight-bearing as tolerated after surgery. However, if the surgery was more extensive than the surgeon originally thought, the surgeon may decide that the patient will need to be non-weight bearing. For this reason, postoperative instructions are generally given after the surgery to ensure consistency and avoid confusion. Postoperative instructions are printed and verbalized with family or a responsible adult present.

Patients who will stay overnight after surgery should be informed of this, as well as what things they may need to bring with them. Some facilities request medications either be left at home or brought into the facility in their original bottles. Patients should also be educated on approximately when they will be discharged, and that the provider will come to assess them to determine if the patient is ready to discharge.

25.2 Preoperative Nursing Priorities

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Identify documentation priorities for the preoperative nurse
- Discuss aspects of the preoperative assessment
- Analyze the preoperative physical assessment
- Explain other preoperative patient care responsibilities

Preoperative nurses have several responsibilities and priorities. They are responsible for assessing not only the physical state of a patient but also the psychological and social states. The preoperative nurse prepares patients for surgery by educating the patient on any preparation to be done at home, educating on the surgical process, and prepping the patient on the day of surgery. The appropriate nursing interventions should be implemented per facility protocol or as ordered.

Documentation

In nursing, documentation is a crucial component of the nursing process. The preadmission assessments and testing performed in the preoperative phase prior to the surgery allow for a baseline to be recorded. This baseline allows members of the health-care team caring for a patient intraoperatively or postoperatively to determine the presence of any abnormalities or unexpected versus expected findings with the type of surgery performed or medications received from anesthesia. Any intervention or education provided is also documented to communicate

that the patient has been provided with information they need to understand and make informed decisions about their care.

Verifying Consent

Informed consent is very important in the surgical setting, as the patient should not be coerced into a surgery, nor should they go into a procedure without all the information. The preoperative nurse verifies that the surgeon has given the patient all of the details regarding the procedure; that the patient understands its risks, complications, and benefits; and the patient consents to the procedure. An informed consent requires a witness signature. The preoperative nurse may witness the patient's or guardian's signature. It is the responsibility of the surgeon to provide the information needed for informed consent to the patient, as well as alternative therapies; the risk of disability or disfigurement; the removal of body parts (if necessary); what to expect postoperatively; and address any questions the patient may have. Consent must be signed prior to the patient receiving anesthesia or any medications that can alter the decision-making capacity of the patient. The nurse should also be aware of the standard requirements for what is listed on the surgical consents, which may vary by state. Obtaining consent also gives the nurse the opportunity to have the patient verbalize the surgery in their own words, which ensures patient safety and minimizes the risk of adverse events like wrong-site surgery.

Persons under age 18 may not sign their own consent unless they are an emancipated minor and have the appropriate documentation presented to the facility. Adults over age 18 who have certain neurological or cognitive impairment may be deemed incompetent and cannot sign their own consents because they lack the capacity to understand what they are signing. Instead, they will need someone with medical power of attorney to sign on their behalf. Individuals that do not understand or speak English as their native language will require a medically trained interpreter to aid with obtaining consent. The materials should be provided in their spoken language, if available. Interpreters cannot be family, friends, or other staff. To follow compliance guidelines, each medical facility has a trained medical interpreter available 24/7 via a hotline, or some facilities have one present on location. Alternative forms may be needed to ensure patient understanding, such as forms using large print if the patient has visual impairments, or a medically trained sign language interpreter for a deaf patient. The preoperative nurse must verify patient understanding in order to verify consent.

LINK TO LEARNING

The Joint Commission explains informed consent, barriers, and safety actions (https://openstax.org/r/77InformConsent) to consider. Informed consent is more than just getting the patient to sign a consent form; informed consent is the conversation a patient has with a provider that gives them enough information to decide about their care. Verifying informed consent ensures that the patient understands the risks, benefits, alternatives, and the surgery itself.

Nursing Documentation

Nursing documentation should include the patient's neurological status, confirming whether the patient is cognitively capable of giving an informed consent, including if an interpreter was used. The interpreter's ID and name should be documented on the consent form and in the chart. Documentation includes using the patient's own words to describe the surgery to be performed. Other documentation includes components of the preoperative assessment. The following list displays examples.

- Recent fluid and nutrition intake
- Current medications and when the last doses were taken for each
- Current infections that could impact healing
- Recent drug or alcohol use
- Overall mental affect or psychological state

The physical assessment findings should also be documented as further discussed in the 25.3 Preoperative Nursing Care Plan. The presence of any immobilization devices, dressings, assistive devices, corrective devices, hardware, or implants should be documented. Any nursing interventions provided in the preoperative setting should be documented, along with the patient's response to the interventions. For example, if iodine was used to prep the

patient's leg, the preoperative nurse will document if any reaction was noted.

Additional documentation includes any provided surgical preparation. This may include clipping hair from the skin or administration of a laxative regimen as a bowel preparation. The nurse will need to document whether the preparation was completed by the health-care provider or the patient, the type of prep that was used, when it was completed, and whether the patient experienced any reactions.

Education provided to the patient should also be documented. The type of education provided and how the education was performed (e.g., over the phone, in person, verbally, written, return demonstration) during preadmission should be documented in the patient chart, as well as any additional education provided in the preoperative setting. An evaluation of the patient's understanding should be included in the documentation.

When the time comes for the intraoperative nurse (discussed in Chapter 26 Intraoperative Care) to take the patient to the operating room, the preoperative nurse should perform and document a patient handoff (see 1.2 Intercollaborative Care for more information on ISBAR during a handoff). The handoff report includes verifying the patient demographics, completed consent, surgery being performed, allergies, history and physical from the surgeon within 30 days, abnormal labs, and the marking from the surgeon verifying the surgical site. Handoff report should also be performed with the patient present as an additional safety check. Documentation should include the information discussed in handoff, the date and time, who was involved in the handoff, how the patient is being transported to the OR, and who is part of the transportation to the operating room.

Preoperative Assessment

The goals of a preoperative assessment are to:

- address the state of the patient prior to the procedure
- identify any risks that can contribute to postoperative complications or delay recovery
- establish a baseline for future comparisons to assess any unexpected or expected findings after the procedure is performed.

Any risks identified allow for a plan of action to be created in order to avoid potential complications. For example, if a patient states that they have a history of postoperative nausea and vomiting, then the anesthesia protocol may allow a scopolamine patch to be ordered unless otherwise contraindicated. If the patch is contraindicated, the anesthesia provider may adjust the type of medications given in order to decrease the likelihood of postoperative nausea and vomiting.

UNFOLDING CASE STUDY

Care of the Surgical Patient: Part 1

The nurse is performing a preoperative assessment on a 45-year-old female who presents to the preoperative check at 06:00 for a 09:00 surgery for a left partial knee replacement. The patient is accompanied by her husband. The patient has left knee discomfort on admission and has been taking ibuprofen for her knee pain. She stopped taking the ibuprofen 7 days ago per her provider's orders. The patient is slightly anxious but expresses, "I can't believe I have done this to myself," "I don't have the stamina and mobility I used to have and miss running so much," and "I am so depressed." Patient is quiet and appears withdrawn at times.

PMH	**3/12/24, 0600** Patient has a history of playing high school and college sports as a track and field athlete. Patient had a left knee meniscus tear with arthroscopic repair 15 years ago and a patellofemoral arthroscopy repair 5 years ago. Patient had one miscarriage 12 years ago. Patient works full time as a grade schoolteacher. They do not have children. Patient states that she experienced a severe adverse reaction of post-op nausea and vomiting (PONV). **Family History** Father is living, has a history of a heart attack and tobacco use. Mother alive with osteoarthritis. One brother, healthy **Social History** Patient lives at home with husband. Never smoked and states she drinks only drinks 1-2 drinks/week. Patient stays physically active with a recliner air bike and walks as tolerated 5 times/week. The patient went to counseling after her second surgery 5 years ago but does not currently see a counselor. **Current Medication** Ibuprofen 800 mg every 6 hours (max dose 3200 mg/24 hr) No known allergies
Nursing Notes	**Triage Assessment, 3/12/24, 0600** The patient is alert and oriented. The patient's skin is warm and dry, easy respirations, no dyspnea noted. She arrived via wheelchair but does not use an assistive device. **3/12/24, 0630** **Physical Examination** HEENT: Pupils equal and reactive to light, mucus membranes dry, no thyroid enlargement. Lymphatic: lymphatic nodes were not swollen or enlarged Respiratory: 16, easy, good depth, no SOB noted. Lungs clear all lung fields on auscultation. Cardiovascular: NSR noted on monitor Abdomen: soft, denies pain, abdomen distended, bowel sounds present all four quadrants Musculoskeletal: Moves all extremities well with the exception of existing pain limiting the full flexion and extension of the left leg related to knee injury. Skin: Warm and dry Mental assessment**:** Patient admits to increased anxiety and depression. The patient has been NPO as of 10 pm last night. Document full assessment in the patient's EMR/chart.
Flow Chart	**Assessment, 3/12/24, 0600** Blood pressure: 110/70 Heart rate: 78 Respiratory Rate: 16 Temperature: 98.0 Oxygen Saturation: 99% room air Weight: 130 lbs Height: 5 ft 9 in Pain: 6/10

Lab Results	**Preop, 3/5/24** WBC, 8.0 × 10^3 cells/mm^3 Platelet count, 200,000 Partial thromboplastin (PTT), 30 sec Prothrombin time (PT), 11 sec Hgb, 12 g/dl Hct, 41 % INR, 1.0 BUN, 14 mg/dl Creatinine, 0.09 mg/dl Fasting glucose, 84 mg/dl Na, 138 mEq/L K+, 3.8 mEq/L Cl, 100 mEq/L Liver function tests: ALT, 25 U/L AST, 19 U/L GGT, 20 U/L Total protein, 70 g/dL Total bilirubin, 11 mg/dL eGFR, 90 Rapid PCR-Covid test, negative Pulse oximetry, 99% RA **Preop, 3/12/24** WBC, 8.0 × 10^3 cells/mm^3 Platelet count, 200,000 per microliter Partial thromboplastin (PTT), 30 sec Prothrombin time (PT), 11 sec Hgb, 12 g/dl Hct, 41% INR, 1.0 BUN, 14 mg/dl Creatinine, .09 mg/dl Fasting BS, 84 mg/dl Na, 138 mEq/L K+, 3.8 mEq/L Cl, 100 mEq/L Liver function tests ALT, 25 U/L AST, 19 U/L GGT, 20 U/L Total protein, 70 g/dL Total bilirubin, 11 mg/dL eGFR, 90 Rapid PCR-Covid test, negative Pulse oximetry, 99% RA

Diagnostic Tests/ Imaging Results	**Preop** Left knee X-ray: "repair of left knee meniscal tear with scar tissue formation, multipartite patellae as well as gross patella alta or baja," post-surgical arthroscopy surgeries. CXR: normal ECG: normal, regular sinus rhythm
Provider's Orders	**Preop, 3/5/24** Left knee x-ray, anteroposterior, lateral and axial views CXR ECG CBC with differential Electrolytes Liver function studies Coagulation profile eGFR Covid test Hold ibuprofen for 7 days preoperative Consent obtained from provider for partial left knee replacement **Preop, 3/12/24, 0600** Repeat electrolytes preop now Anesthesia provider to start IV Prep left knee for partial left knee replacement per standard preoperative orthopedic orders Confirm patient surgical consent has been obtained and patient understands what the surgeon will do during her surgery. The nurse will explain that once under anesthesia, the surgeon will inspect the left knee joint. The surgeon will make an incision at the front of the knee and explore the three compartments of the knee to verify that the cartilage damage is, in fact, limited to one compartment (unilateral), which is required for a partial knee replacement and that your ligaments are intact. If the surgeon feels that the knee is unsuitable for a partial knee replacement, the surgeon may instead perform a total knee replacement. Repeat labs in am if patient stays overnight: CBC with differential, Hgb, Hct, electrolytes, BS.

1. After assessing the patient, the nurse determines the most important patient's presentation complaint is due to [Option 1] resulting in the primary symptom of [Option 2]. Match the most likely options for the information missing from the statement by selecting from the lists of options provided.

Option 1	Option 2
Panic attack	Increased fever
Medication side effects	Pain
Educating the patient	Possible infection
Left knee injury, preop	Respiratory rate 30
Abnormal WBC	Irritability

2. Once the nurse has reviewed the relevant patient information, which assessment finding(s) are most consistent with the associated disease process?

Assessment Finding	Left knee injury repair	Depression	Anxiety
Pain in the left knee			

Lack of education for surgery			
Grieving loss of prior activity and exercise tolerance			
Emotional support from her husband			
Withdrawn			

Nutrition and Fluids

Adequate nutrition is key to aiding a body in the healing process and opposing infection or other complications. Assessing the nutritional status of a patient allows the preoperative nurse to identify any potential factors that can affect the patient's surgery and recovery process, such as malnutrition, metabolic disorders, obesity, unexpected weight loss, nutrient deficiencies, and medication effects on nutrition. Any nutrient deficiencies noted need to be addressed prior to surgery, as optimal protein is needed to aid in tissue and wound healing. Height and weight should be taken again to confirm the body mass index (BMI) of the patient, as they may have gained or lost weight (or height for pediatric patients who are still growing). Weight is needed for accurate dosage calculation for anesthesia medications.

Monitoring the fluid status of a patient is also essential because hypovolemia, dehydration, and electrolyte imbalances (see Chapter 10 Fluid, Electrolyte, and Acid-Base Imbalances) can contribute to complications in older adults or those with other chronic health conditions or comorbidities. Patients undergoing bowel preparation are at risk for dehydration and chemical imbalances due to the depletion of fluids and electrolytes and fasting. Any identified fluid or electrolyte imbalances should be corrected prior to surgery. For example, a patient may need to have IV fluids administered prior to surgery, and some surgeons may allow a patient to continue to have water or Gatorade up to two hours prior to surgery. The nurse will need to follow the Enhanced Recovery After Surgery (ERSA) protocol per facility guidelines (Sung & Yuk, 2020).

Medications

Obtaining a patient's medication history allows the preoperative nurse to identify any potential interactions or risks with any medications that may be administered during surgery. For example, patients taking blood thinners are at an increased bleeding risk associated with surgery, so these medications may need to be discontinued prior to surgery.

The patient's medication history should include any prescribed medications, herbal supplements, vitamins, and over-the-counter medications. Some medications may be taken the day of surgery, while others may need to be discontinued for a recommended period of time to avoid risks of bleeding or interactions with anesthesia. Any medication that poses a risk should be outlined by the facility and anesthesia protocol, as well as instructions to provide to the patient with regards to stopping the medication. Some medications may require a clearance from the prescribing provider to stop. For example, a cardiac patient may be on aspirin or another blood thinner. The cardiologist (or prescribing physician) should clear the patient for surgery, giving approval for the patient to stop the medication and specifying how many days the patient should remain off the medication. Table 25.1 provides examples of common medications and treatments that are contraindicated before surgery because they increase the risk of bleeding (Sung & Yuk, 2020).

Type of Medication	Examples
Anticoagulants	Warfarin, coumadin, heparin
Antiplatelet medications	Dipyridamole
Antibiotics	Flagyl, doxycycline

TABLE 25.1 Medications Contraindicated before Surgery

Type of Medication	Examples
Antipsychotics	Thioridazine, thorazine
Corticosteroids	Hydrocortisone, prednisone
Herbal supplements	Gingko biloba, ginseng, St. John's wort
Hormonal contraceptives or hormone replacement therapy	Oral birth control pills, estrogen creams/patches
Nonsteroidal anti-inflammatory medications	Aspirin, ibuprofen, naproxen
Tricyclic antidepressants	Anafranil, clomipramine, Elavil

TABLE 25.1 Medications Contraindicated before Surgery

Many patients leave out the use of vitamins or herbal supplements during the medication assessment, so it is imperative the preoperative nurse specifically ask about their use. Common herbal supplements include garlic, ginger, St. John's wort, echinacea, ginseng, ginkgo biloba, valerian root, and licorice extract. Many of these supplements can cause interactions with anesthesia or increase a patient's risk of bleeding, so it is imperative that the preadmission testing nurse assess the patient's use, as they may require discontinuation of one to two weeks prior to surgery.

Immune System

The function of the immune system is an important component to assess to determine if the patient has any allergies that may cause complications during or after surgery (e.g., medications, latex), as well as checking for the presence of an active infection. Infections may postpone a surgery and are usually detected by a urinalysis or obtaining a white blood cell count. Any allergies identified may alter the course of routine medications given during the surgical course. Allergies must be documented in the patient's electronic medical record or paper chart, and a wrist band noting the allergy should be placed on the patient on a limb that does not interfere with the surgery. Allergies to medications, latex, foods, blood transfusions, and contrast should be assessed and identified, as well as the signs and symptoms associated with the reaction.

A special consideration with the immune system is if the patient is on or undergoing immunosuppressive drugs or therapies like corticosteroids, chemotherapy, radiation therapy, or if the patient has any immune system deficiencies. Examples of disorders that impact the immune system include HIV, AIDS, and leukemia. When the vital signs are obtained, any mild symptoms or temperature elevations must be reviewed in order to determine if surgery is a safe option for the patient at that time.

Alcohol and Drug Use

The use of alcohol and illicit drugs can greatly affect the anesthesia process. This can be a sensitive subject for patients to discuss, and they may not be honest. It is essential that the preoperative nurse ask direct questions about alcohol use in a nonjudgmental, caring, and patient manner. Those who consume larger amounts of alcohol respond differently to anesthesia and may require stronger medications or higher amounts of anesthesia. Any patient reporting daily drinking should be reported to anesthesia in order to determine if a change in the plan of care is warranted. Excessive alcohol use often leads to malnutrition and metabolic imbalances that can pose risks with surgery. Research has shown that patients who use substances, including alcohol and tobacco, have a higher risk of poor surgery outcomes, readmission, and reoperation. (Fernandez et al., 2022). Complications can include increased bleeding, cardiac events, vomiting, aspiration, sepsis, medication interactions, delayed recovery, stroke, and death.

Illicit or illegal drugs may increase the sedative effects of anesthesia and can lead to respiratory failure. Some drugs may also be associated with cardiac risks or other interactions when mixed with anesthesia. If a person presents for surgery under the influence or suspected under the influence of illicit or illegal drugs, the surgery will be cancelled to avoid complications or injury. In the event of emergency surgery, special precautions are implemented for those under the influence, such as using a local, regional, or spinal block. A nasogastric tube is inserted before general

anesthesia in emergency cases to prevent vomiting and aspiration.

The use of alcohol and drugs can weaken a person's immune system, which can deter healing, as well as increase the chances of postoperative complications. If the patient is admitted to the facility (inpatient) after surgery, they could experience symptoms of withdrawal from a substance, or **detoxification**. This situation will require special monitoring in the postsurgical unit. Signs of withdrawal from suddenly stopping alcohol include seizures, delirium, or death. A Clinical Institute Withdrawal Assessment (CIWA) scale should be used for patients experiencing detoxification (Canver et al., 2024).

LINK TO LEARNING

Review the Clinical Institute Withdrawal Assessment of Alcohol Scale – Revised (https://openstax.org/r/77Withdrawal) from the *British Journal of Addiction*, which is used for assessing a patient's withdrawal status.

Psychosocial Status

Surgery may trigger many emotions for some patients. Some people may experience fear or anxiety due to the unknown. Some may be anxious over the lack of control they have over the situation. Other people may be expecting the worst outcome, and the anticipation of pain is too much to handle. The nurse can relieve these symptoms by providing education related to each step of the procedure.

The preoperative nurse should assess the patient's psychosocial state prior to surgery by asking questions and observing the patient's behavior. Some patients may cry, be withdrawn, bite fingernails, talk excessively, avoid eye contact, or exhibit other types of behavior typical of someone experiencing anxiety. The nurse should remain empathetic, address concerns the patient may have, or ensure the patient has a support person nearby, when allowed. Some patients may be more relaxed when their loved one waits with them in their room before their surgery; some might prefer not to have family or a friend with them.

CULTURAL CONTEXT

Spiritual Surgical Care

Patient-centered care is culturally competent and spiritually aware care. The preoperative nurse should inquire about and honor any spiritual or cultural beliefs the patient has. If these beliefs are unable to be honored due to possible harm, the nurse should provide an explanation and offer an alternative, if possible. For example, a patient may request that a clergy come visit the patient before surgery.

A nurse who is culturally competent understands that in some cultures, it is more polite to avoid eye contact. When the nurse understands the cultural practice, they knowe that not making eye contact is not a sign of anxiety or fear in the patient but a sign of respect. Another example of cultural competence is in some Thai cultures, the top of the head is considered sacred. In this case, the nurse would allow the patient to put their own surgical cap on to avoid offending the patient by touching their head.

Preoperative Physical Assessment

An adequate preoperative physical assessment includes the assessing of all the systems of the body for optimal functioning. The baseline assessment data that are collected ensures the patient is stable for surgery and allows the postoperative nurse to compare their data to the baseline. Any abnormalities or unexpected findings in the preoperative physical assessment should be investigated further prior to surgery. If those findings are found postoperatively, the postoperative nurse will have a protocol to follow to investigate further.

Respiratory

The respiratory system is assessed prior to surgery and includes breathing pattern, respiratory rate, breath sounds, work of breathing, and oxygen saturation. Elective surgeries may be postponed for patients who have poor or weak vitals, or present with a respiratory infection. Patient history is also obtained to identify patients with respiratory disorders as well as those with any recent changes in their respiratory status. A chest X-ray may be ordered prior to

surgery depending on the type of surgery or if the patient has had new or worsening respiratory symptoms.

Patients who smoke should be educated to stop smoking 30 days prior to surgery to aid wound healing and reduce pulmonary complications. Those who smoke are at higher risk for delayed wound healing, surgical site infection, pneumonia, and venous thromboembolism (Fernandez et al., 2022). Smoking cessation education and materials should be provided to the patient.

When needed, patients will be educated about the use of an **incentive spirometer** or tool used for breathing exercises to promote lung function postsurgery. This education is important to be performed prior to the administration of any anesthesia medications, so that the patient is able to fully inhale and exhale in order to set the appropriate goals. This is important to the patient's ability to fully inflate the lungs when breathing after surgery to prevent pneumonia or atelectasis.

LINK TO LEARNING

Watch this video to learn how a patient can use an incentive spirometer (https://openstax.org/r/77Spirometer) to fully inflate the lungs, taking slow, deep breaths.

Cardiovascular

Assessment of the cardiovascular system prior to surgery includes obtaining baseline blood pressure and heart rate; assessing capillary refill time; obtaining peripheral or radial pulses (as appropriate); and obtaining the patient's history and verifying medications. An ECG may also be performed prior to surgery. Surgery may be postponed for patients with uncontrolled dysrhythmias or uncontrolled heart rate until the condition is resolved or the patient has been cleared by a cardiologist.

Renal and Hepatic

The kidneys and liver metabolize and filter out wastes, toxins, and medications. It is essential to ensure that the renal and hepatic systems function optimally before, during, and after surgery, as these systems are integral to the clearance of medication (including anesthesia) and waste from the body. The following blood tests may be ordered to assess their functionality: liver function tests (ALT, AST, GGT, total protein, bilirubin, LDH), CMP, PT/INR, eGFR, BUN, and creatinine. A urinalysis may also be performed to check for color, cloudiness, odor, the presence of acid, albumin, bacteria, glucose, or specific gravity for urine concentration.

Patients with poor liver function are at higher risk for surgical mortality due to the inability to effectively metabolize anesthesia medications. Elective or non-emergent surgeries may be postponed, allowing time for interventions that will increase liver function. Surgery may be contraindicated in those with acute renal insufficiency, oliguria, anuria, or acute nephritis. However, exceptions include life-saving surgeries, procedures aimed at improving renal function, or surgeries to provide dialysis access.

Endocrine

Endocrine disorders that impact surgery include diabetes, thyroid disorders, and Addison's disease. Poorly controlled diabetes and hyperglycemia increase the risk of slowed surgical site healing and infection. The patient's blood glucose should be monitored preoperatively, intraoperatively, and postoperatively. Facility protocols should be implemented if the fasting blood glucose is too high or low. Patients with hyperthyroidism are at risk for thyrotoxicosis, while patients with hypothyroidism are at risk for respiratory failure. Patients should be educated on the importance of continuing with their thyroid medications prior to surgery to ensure their thyroid levels remain controlled. Patients taking corticosteroids are at risk for surgical complications. Corticosteroids can have a negative impact on adrenal function. The use of corticosteroids within the last year should be reported to the anesthesia provider or surgeon as soon as possible. The patient will need to be monitored for signs of adrenal insufficiency. Close monitoring is also paramount for patients with Addison's disease, in which an adrenal crisis may be triggered by fasting, the stress of surgery, or medications.

Preoperative Patient Care

Patient care in the preoperative setting may include skin preparation, bowel preparation, and education. Some preparation may be performed at home by the patient or by the preoperative or intraoperative nurse on the day of

surgery. Skin preparation and bowel preparation should be followed per surgeon order or per facility protocol if there is no surgeon specification.

Skin Preparation

Skin preparation is essential to prevent infection. Some surgeons may request the patient's hair be clipped if the hair interferes with the procedure or the surgeon's field of vision. For example, if the surgeon is using a microscope, hair can interfere with the surgeon's ability to see. Patients should be educated to not shave at home to reduce risk of skin injury or infection. If hair removal is necessary, the nurse will perform it prior to the procedure. Other skin care may include the patient's use of a surgical or antibacterial soap prior to coming to the facility. The preoperative nurse may also use a type of skin preparation such as iodine or chlorhexidine gluconate the day of surgery.

An important component of skin preparation is for the surgeon to mark the site where surgery is to be performed prior to surgery. The surgery site should be verified by the preoperative and intraoperative team as part of a safety handoff prior to the patient transferring to the operating room.

Bowel Preparation

Bowel preparation is only warranted for procedures where the patient is undergoing an abdominal or pelvic procedure. Laxatives or enemas may be prescribed for the patient to perform at home or by the preoperative nurse if the patient is admitted prior to surgery. Complete bowel elimination allows the surgeon to see inside the intestines clearly and reduces the potential for infection from fecal matter, if an accidental perforation happens during surgery.

REAL RN STORIES

Nurse: Cory
Years in Practice: Six
Clinical Setting: Surgery center
Geographic Location: Utah

Cory is a nurse at a surgery center. Here, Cory recalls an occasion early in his nursing career when he thought his actions were compassionate toward a patient who needed to complete a bowel prep before a procedure. Only afterwards did Cory realize his actions were not as helpful as he thought.

I was a fairly new nurse, still less than a year out of school. This was definitely one of those formative experiences I had early on as a nurse that I've never forgotten, and I use it as a teaching example for student nurses now!

I had a patient, 65-year-old named Barbara, who was scheduled for a colonoscopy. She'd had some blood in her stool, and her primary care provider wanted her to have a GI consult to help get to the bottom of it. I called her to go over all the preop information and made sure she understood the bowel prep protocol—and she was so nervous about it. I tried to reassure her that while it's no fun, most people get through it just fine. I even gave her a tip I'd picked up from other patients, which is that chilling the beverage tends to help it taste better. She was receptive to doing her best, and I encouraged her.

The night before her procedure, she called the surgeon's office to talk to the on-call—she was having a terrible time with the prep. They told her how important it was that she keep going and get through it, and she said she'd try. The next morning, she called again right after I came in and since I'd done her preop education, I said I'd be happy to talk to her. Well, she was just about in tears. She'd been "sick all night" from the prep and said she absolutely could not finish the rest of it. I gently told her that she needed to do the whole prep, but she just couldn't continue on, and she promised me "there wasn't anything left to come out" at that point. I just felt for her, really I did. And she was full-on crying. So, I told her it was fine, she could stop the prep. She was so relieved, thanked me. I told her we'd see her in a few hours for her procedure.

Well, she came in on time, and got through preop fine. She looked pretty exhausted, though, and she thanked me again for not making her "suffer any more" with the rest of the prep.

Now, I thought I'd done the nice, compassionate thing...but in reality, I had made her situation so much worse. See, when the surgeon went in with the scope, she couldn't see anything. The bowel hadn't been cleared, and the whole

procedure had to be stopped. And when the patient woke up, I was the one who had to break it to her that they couldn't do the procedure because she hadn't finished the prep...and now she'd have to start all over again.

25.3 Preoperative Nursing Care Plan

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Describe the nursing care plan to ensure patient safety during the preoperative phase
- Describe the nursing care plan to initiate the prevention of complications during the preoperative phase
- Discuss the role of the nurse in providing education and psychosocial support to the patient and their family

The preoperative nursing care plan includes interventions aimed at preparing the patient both physically and psychologically for the procedure while prioritizing patient safety. The nurse must be familiar with the patient's history, preadmission assessment and diagnostic results, surgeon orders and preferences, type of procedure, any special positioning required during the surgery, and type of anesthesia being used to adequately prepare the patient for surgery. The preoperative phase affects the entire surgical and recovery process, so it is crucial that the nurse effectively prepares the patient for surgery and documents nursing interventions.

Nursing Care Plan for the Preoperative Patient

The nursing care plan for the preoperative patient encompasses a variety of nursing interventions aimed at maintaining the safety of the patient and preventing complications. It's important for the nurse to remember that every patient is at risk for becoming overwhelmed, confused, and anxious, or developing infections and complications like fluid and electrolyte imbalances and blood loss. While there will be patients who will be at a higher risk, the nurse should still take care to prepare all patients for their procedures.

Ensuring Patient Safety

Patients undergoing a procedure may experience anesthesia complications, physiological stress on the body, and the invasiveness of the procedure itself. To ensure patient safety in the preoperative phase, the nurse must ensure that the patient is stable enough to undergo the procedure by obtaining vital signs, obtaining any laboratory tests that were not done during the preoperative testing or need to be repeated, verifying medications taken or held for surgery, and taking steps to prevent a wrong-site surgery. The nurse must perform a proper preoperative assessment and surgical preparation, such as administering medications as ordered and hair clipping around the surgical site, if necessary. They will also monitor and manage the patient throughout the preoperative phase. Jewelry should not be worn into the operating room due to the risk of injury.

INTERDISCIPLINARY PLAN OF CARE

Preoperative Team

Interdisciplinary care is vital to patient outcomes and patient safety. Each member of this team has their own role in the plan of care for a surgical patient. The following members play a vital role in the preoperative stage:

Surgeon**:** the provider who orders and performs the surgery, provides patient with vital information for informed consent, typically sees patient for a preoperative and postoperative appointment.

Anesthesia provider: the provider who provides anesthesia for the surgery, performs assessment prior to surgery, develops and explains anesthesia care plan to patient, oversees anesthesia care if a certified registered nurse anesthetist is present for surgery. A **certified registered nurse anesthetist (CRNA)** is an advanced practice RN who has received special training to administer anesthesia.

Preoperative nurse: the nurse who analyzes patient history, verifies surgery and informed consent, reviews medication, performs assessment, preps patient for surgery, reports any findings that may impact surgery or patient safety.

Other members may include:

- A social worker in the event the patient is in need of financial assistance
- A radiologist may be needed for any preoperative scans or X-rays
- A dietician to assist the patient with nutrition after surgery
- Medical interpreters may be needed when the patient does not read, speak, or understand English

Patient Identification

Patient identification is an important component of patient safety. The nurse must verify the patient's name and date of birth and ensure that the patient has an ID wrist band. The nurse should also have the patient verify that the spelling of their name is correct. Any time the nurse is part of a patient handoff, the receiving nurse and transferring nurse should both verify patient name and date of birth comparing the wrist band to the patient chart and orders. This is especially important if the patient has received anesthetic agents and is not able to speak coherently.

Preventing Wrong-Site Surgery

Preventing wrong-site surgery is crucial to patient safety. Wrong-site surgeries are considered a **sentinel event**, or any unexpected event that causes serious harm to a patient or leads to death. Multiple steps are followed leading up to the surgery to prevent this from happening. As mentioned in 25.1 Preadmission Assessment and Education, the preoperative testing process is the first chance to ensure that the surgery the patient states they are having matches the surgical orders and consent. On the day of surgery, the preoperative nurse should ask the patient again to state in their own words the surgery they are having, including having them state the location of the surgery site without any coaching. For example, a patient having a joint replacement would be asked not only what surgery they are having, but also to identify the extremity and joint that is being replaced. The preoperative nurse should check the patient's statements against the orders and consent. If they do not match, the nurse should contact the surgeon to correct the surgical orders and consent. The nurse should ensure any prep is being performed on the correct site and that the surgeon has marked the site correctly (Figure 25.2). Once the patient is ready to transfer to the operating room, a safety handoff is performed between the preoperative and intraoperative nurse to confirm the surgery and laterality with the patient and confirm with the orders, consent, and site the surgeon has marked.

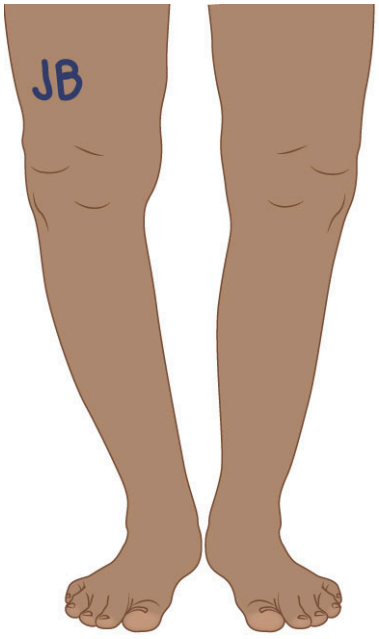

FIGURE 25.2 The surgeon marks the surgical site in preop after providing informed consent to the patient. This site is verified during handoff between the preoperative and intraoperative nurse as well as during handoff in the operating room with the surgeon, intraoperative nurse, CRNA, and other members of the surgical team that may be present. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

REAL RN STORIES

Nurse: Ashley, BSN

Years in Practice: Ten
Clinical Setting: Preop department
Geographic Location: The inner city of a large metropolitan area in Texas

We are a surgical hospital that has the capacity to do inpatient or outpatient procedures. We have a freestanding emergency room as well and can receive emergency and urgent cases. Most surgeries at our facility at this time are podiatry, spine, orthopedic, gynecologic, and general.

One day, I was preparing to bring a patient back to preop to prep for surgery. I had reviewed the patient chart prior to going into the room to learn patient history and preoperative assessment, medication list, surgeon orders, and consents. The preop nurse wrote down the patient was having a left total knee arthroplasty. The orders and consents were also marked for the left knee.

When I brought the patient back to the preop room, I verified everything was correct. I asked the patient to tell me in his own words what procedure he was having done. The patient stated, "I am having my right knee replaced." I responded to let the patient know that the surgeon had marked the left knee on his orders. The patient stated he had the left knee done two years ago and pulled his pant leg up to show me his scar. I advised the patient I would get this updated and resolved.

I walked to the nurse's station to call the surgeon; however, he had just arrived. I let him know what had happened. The surgeon pulled the patient's history and physical out, and in the surgeon's notes, he states the patient is to have the right knee replaced. The surgeon apologized for the error. My charge nurse reprinted the consents to state the correct laterality while the surgeon and I walked into the patient's preop room together. The surgeon and patient agreed the right knee was the correct laterality. I had the surgeon correct his orders, and the surgeon went ahead and explained the surgery, risks, and benefits to the patient for informed consent. During that time, my charge nurse also had our surgery scheduler update the surgery details in the computer to reflect the correct surgery. I notified the operating room charge nurse as well.

After the patient changed clothes, I continued with surgical preparation, completed an assessment, prepped the right knee for surgery, placed compression stocking on the left leg to promote blood return, started an IV with fluids, and administered preop medications per the surgeon's order. Once respiratory therapy and anesthesia had completed their tasks, the intraoperative nurse was ready to take the patient to surgery. We verified in handoff, with the patient, the patient's name, date of birth, allergies, family member present, and surgery type with laterality. I checked on the patient after surgery, and the right knee was replaced. This is one of those examples that makes you glad you verified to avoid a wrong-site surgery.

Preoperative Laboratory Tests

While many tests can be performed during preadmission testing, some laboratory tests are not performed until the day of surgery for accuracy. For example, a pregnancy test performed the day of the surgery is more current than days prior to the surgery to confirm whether a patient is pregnant. A blood test may be done the day of the surgery for accuracy (Wechter, 2024). Fasting blood glucose should be assessed the day of the surgery to ensure that the patient has a stable blood glucose before undergoing the procedure.

Blood type screening for AB antibodies, in case of an emergency and blood transfusions are needed, can be done prior to the surgery date as well. However, most facilities have a policy that a blood identification wrist band is good for a certain period of time. The nurse will need to follow facility protocol on the timing of blood typing. The preoperative nurse should review the results prior to the patient going into surgery to ensure any lab or diagnostics are within range to not cause harm to the patient. Any critical or abnormal values should be reported to the surgeon and anesthesia provider.

Medication Safety

Another way to ensure patient safety is to verify the patient's medication list and when the last dose of each medication was taken. Some medications can interact with anesthetic agents and have major complications or risks, and some medications can pose a risk of heavy bleeding. The preoperative nurse should be familiar with the medications that pose risks and make sure that the surgeon is aware of any medications that were taken that could cause harm to the patient during the procedure. The nurse should also verify allergies, ensure that the patient has

an allergy band if they do have an allergy, and ensure that the allergy is documented in the patient's chart. The nurse should also confirm with the patient the symptoms associated with the allergy and ensure that the intraoperative and anesthesia teams are aware.

Prevention of Complications

The preoperative nurse is typically the first health-care professional to meet the patient the day of surgery. They are in the position to assess for risks, verify patient information, obtain a baseline of vital signs, confirm that surgery site and laterality are correct, and get the patient's consent. The nurse will also ask the patient questions, such as:

- When they last ate or drank
- Medication history and last doses
- Last shower
- Wounds or rashes
- Metal or implants in the body
- Use of corrective devices
- Previous problems with anesthesia
- Allergies and associated symptoms
- Who will take them home after the procedure

While the preoperative nurse is not in the operating room with the patient, there are interventions they can implement to help prevent complications during surgery. Patients having surgery are at risk for a variety of complications, including anesthesia complications, aspiration, injury, blood clots, and infection. Diligent care by the preoperative nurse helps minimize these risks. Ensuring a thorough and accurate assessment and history of the patient is crucial for their safety. The preoperative nurse should review the patient's chart and be familiar with the patient's history and ask any questions that need clarification. For example, a patient's medications must be reviewed in case they have started any new medications between their preoperative appointment and the surgery, and any that could pose a risk must be reported to the surgeon in case the procedure needs to be delayed to avoid harm.

CLINICAL SAFETY AND PROCEDURES (QSEN)

QSEN Competency: Safety

Definition: "Minimize risk of harm to patients and providers through both system effectiveness and individual performances" (Quality and Safety Education for Nurses, 2020, Table 5).

Knowledge: The nurse will analyze basic safety principles, understand evidence-based practice standards, be familiar with facility and anesthesia protocols as well as state regulations, and reflect on unsafe nursing practices (for instance, stating the surgery rather than the patient stating the surgery and laterality in their own words).

Skill: Demonstrate effective use of strategies to reduce risk of harm to self or others, the nurse will:

- Describe factors that facilitate a culture of safety in surgery, such as time outs (see 26.3 Intraoperative Nursing Management), obtaining health history, performing assessments, medication reconciliation
- Value personal role in error prevention (verifying surgical sites, medications)
- Value the contribution of reliability for safety (preventing patient harm or near-miss events)
- Use national patient safety resources for own professional development (National Patient Safety Goals from The Joint Commission)
- Communicate observations or concerns related to hazards and errors to patients, health-care team members, and families (for example, if the patient states a different laterality than the surgeon, then the nurse should clarify and correct to ensure the correct site surgery is performed)
- Examine human factors and other basic safety design principles
- Examine commonly used unsafe practices (not verifying laterality, not reading over patient health history, not verifying medications)
- Value continuous improvement of own conflict resolution and communication skills

Attitude: Nurses caring for those undergoing surgery must prioritize patient safety and exhibit the practices listed precedingly. Surgery is a special instance where patients are not always able to advocate for themselves due to anesthetic agents, pain medications, mental state, health status, or the type of injury. The nurse must be aware of the vulnerability of the patient, be prepared to intervene when necessary, stopping immediately if something that threatens patient safety is suspected or apparent. The nurse possesses the knowledge and skills needed to promote optimal patient outcomes and uses clinical judgment to maintain patient safety.

(QSEN Institute, n.d.)

Decreasing Complications with Anesthesia

Some complications that may arise with anesthesia include:

- Anaphylaxis or allergic reaction
- Malignant hyperthermia
- Tooth damage
- Nausea and vomiting
- Aspiration
- Nerve injury
- Stroke
- Respiratory depression
- Cardiac events
- Awareness under anesthesia
- Embolisms

The anesthesia provider or CRNA will be monitoring the patient throughout the procedure to prevent complications and be able to intervene quickly if necessary. The preoperative nurse should ensure an adequate history of allergies and anesthesia and report any previous problems with anesthesia that the patient or a blood-related family member has experienced. The patient's teeth should be examined prior to surgery to identify any loose teeth or potential for damage due to intubation. Patients with a history of nausea and vomiting are at risk for aspiration. The anesthesia provider may request the preoperative nurse apply a scopolamine patch to the patient, or they may opt to adjust the anesthesia medications through the IV to aid with preventing nausea and vomiting. Special precautions are implemented for patients with a personal or family history of **malignant hyperthermia**, a serious genetic condition that causes a life-threatening elevation of body temperature and muscle spasms, among other severe symptoms. The preoperative nurse must follow the facility and anesthesia protocol.

Decreasing Aspiration Risk

To prevent aspiration, the preoperative nurse must assess when the patient last had anything to eat or drink. If the patient ate breakfast or had a large amount of something to drink prior to coming into a procedure, they are at risk for vomiting during surgery. If the patient vomits, they are at risk for aspiration. If the nurse suspects the patient is not being truthful, they should educate the patient about the risks of aspiration. A patient who experienced nausea and vomiting with a past surgery is also at risk for aspiration.

Decreasing Injury Risk

The preoperative nurse can aid in decreasing injury risk by assessing the patient and ensuring a thorough history has been obtained. The preoperative nurse should be aware of the patient's position during the surgery, as this aids in the decision of where to place an IV line that is not in the way or poses a risk of injury to the patient. Swelling could also occur due to positioning and pose injury risk or impaired circulation. The preoperative nurse assesses for any metal or jewelry on the patient, which can pose a burn risk in the operating room. Metal such as jewelry can cause sparks and is a fire hazard. Patients may be able to leave on various clothing items as long as there is no metal present. To avoid pressure injuries, the intraoperative nurse is generally the one to implement those interventions, as the patient will transfer to an operating room bed in the operating room.

Decreasing Clot Risk

Depending on the surgery, the surgeon may order compression stockings or thromboembolic deterrent (TED) hose for the patient to be worn on either both legs or a specific leg. These garments help stimulate blood flow to help reduce the risk of clots after surgery, particularly in patients who will be spending time immobile or in bed. While the

preoperative nurse is applying the TED hose, they should explain to the patient how to appropriately put them on and to ensure they are not up walking without socks or shoes that provide traction to avoid slipping. The surgeon may also order sequential compression devices to be used on a patient during a surgery, or the facility may have protocols in place for surgeries over a certain length of time. The patient should be educated on how to prevent blood clots postoperatively. Interventions include frequent position changes, walking as soon as possible (unless contraindicated), and the use of compression stockings or hose.

Decreasing Infection Risk

One of the main goals of a preoperative nurse is to prevent infection. Surgical site prevention is crucial, as the number of identified infections continues to increase. The burden of surgical site infections (SSIs) has been shown to be increasing over the last 10 years (Utzolino et al., 2021). This is due to the increasing number of comorbidities patients are presenting with and the number of surgical procedures being performed continuing to rise. According to the CDC, over half of SSIs are deemed preventable using evidence-based strategies (Utzolino et al., 2021).

The patient's vital signs and bloodwork should be analyzed for potential signs of infection, and any abnormalities should be reported to the provider. The patient's skin is assessed for any wounds or rashes. The preoperative nurse must take special care in performing skin preparation to the surgical site per facility or surgeon order and explain to the patient that the intraoperative nurse will repeat the skin preparation in the operating room as well.

LINK TO LEARNING

The CDC defines surgical site infections (https://openstax.org/r/77SurgSiteInfct) as well as provides guidelines on how to prevent the infections. Many of these guidelines are tools that have been adapted by facility protocols and surgeon orders to aid in preventing surgical site infections. However, the patient must understand their role at home in preventing infection as well.

Patient and Family-Centered Care

Patient and family-centered care can have a positive impact on the surgical experience, as fear or anxiety is common among people undergoing surgery and their families. Preoperative nurses provide patient and family-centered care by focusing on education, reducing anxiety and fear, and providing emotional support.

Education

Some fear and anxiety associated with surgery can be due to the patient or family being unaware of what to expect. The preoperative nurse should explain what to expect on the day of surgery. For example, the patient should be informed of all the steps that will be taken in preop, what transferring to the operating room looks like, where the patient will recover, and about how long the patient will be in recovery as long as there are no complications. The nurse should educate the family about where they will wait while their loved one is in surgery and that they will be reunited with the patient once the surgery is completed and the patient is stable in the recovery room.

Education should also include any preparation performed in preop. If compression devices such as TED hose are required, the patient and family should be instructed on how to put them on, the need to smooth out wrinkles, and not to walk around without assistance or nonslip socks to avoid falling. Any skin preparation should also be explained, as well as any signs of intolerance or allergies. For example, if iodine was used, the patient should be educated to contact the surgeon's office if any rashes, hives, itching, or other symptoms appear. The preoperative nurse should also educate on any medications given in preop, side effects, and why they are being given.

The preoperative nurse should ask if the patient or family has any questions. If it is anything related to the surgery, its risks and benefits, or alternatives, the nurse should direct those questions to the surgeon to ensure the patient has informed consent of the procedure. Most postoperative education is given in the PACU by the postoperative nurse unless the physician has already outlined their instructions. If the surgeon has prepared postoperative instructions, the preoperative nurse can provide those as well.

Reducing Anxiety and Fear

If the patient or family is still experiencing anxiety or fear after the nurse has provided education, the preoperative nurse should ask if there is anything specific that they are nervous about. The nurse can address those concerns if it

is something that the nurse knows the answer to. If the nurse is unsure of the answer, they should inform the patient they will find out and come back with an answer. Some resources may be available if it is a financial concern, such as contacting a social worker. If a patient requests prayer or a visit from a spiritual advisor, the nurse should make accommodations.

Most facilities have a way for the family to monitor the patient while they are in surgery. The preoperative nurse should ensure that the family is aware of how to track their loved one throughout surgery. Some patients and families may be concerned about the length of the surgery or how long the patient has been in the operating room. The nurse should assure them that the length of time has no bearing on the severity of an operation. The length of time is determined by preparation that needs to be performed by anesthesia and the intraoperative team prior to the surgeon starting the case. In addition, some patients are taken to the preop holding area in advance of the surgery starting, and the surgeon could still be in a previous surgery, causing a delay in the surgical start time of their family member.

Providing Emotional Support

Preoperative nurses can provide emotional support by active listening and remaining empathetic. The nurse should encourage the patient to be a part of the care plan in order to provide person-centered care. There is usually a waiting area with amenities (drinks, snacks, television) for the family while their loved one is undergoing surgery. Some facilities even have resources available to visitors, such as notary services, in the case legal documents like advance directives need to be signed. A staff member should also provide frequent updates on the progress throughout the procedure.

CLINICAL JUDGMENT MEASUREMENT MODEL

Applying the CJMM to the Preoperative Patient

Recognize and Analyze Cues

Before recognizing cues, nurses must make sure they have enough information about a patient's situation before interpreting the information and developing a plan of care. For example, the preadmission testing nurse completes a health history prior to the patient's arrival at surgery. On the day of surgery, the preoperative nurse reviews the patient's health history, performs an assessment, and verifies the patient's medication list is up to date and accurate.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

When the nurse considers the patient's history and assessment, they can then move on to the next step of the CJMM to prioritize a hypothesis and take action. During this step in the preoperative phase, the nurse will need to use their knowledge and skill to determine the patient's safety. For example, any unexpected wounds or rashes that could interfere with the surgery or pose risk of infection or any medications taken that were not supposed to be taken day of surgery need to be addressed with the surgeon and anesthesia provider to ensure the patient is safe to undergo the procedure. If the patent is safe to undergo the procedure, the nurse can continue with any surgeon orders or preferences per facility protocol like skin preparation, starting an IV, administering fluids, administering medications, drawing labs for diagnostic testing, and notifying respiratory therapy to come in for any incentive spirometer education or ECG testing. The nurse will also assess and care for the patient's psychosocial status as well.

Evaluation of Nursing Care/Evaluating Outcomes

After the surgical preparation has been performed, the nurse should verify the patient's tolerance. For example, the nurse should verify that the patient did not have any signs of allergic reaction with any medications or skin preparation. The nurse should also verify the results of any testing performed. Any abnormal or critical values should be reported to the surgeon. Some values may warrant the surgery to be postponed or warrant intervention, like a medication to be administered prior to surgery. Any education given to the patient in preop should be assessed for patient understanding. The nurse should document any interventions performed, patient tolerance, education given, and patient understanding (return demonstration, verbalized). In the event of any undesirable outcome, the nurse may have to start over with the Clinical Judgment Measurement Model in order

to reach an optimal outcome. However, with surgery, if the patient is unable to have surgery on that day, the Clinical Judgment Measurement Model will start over when the patient comes back in for surgery.

(National Council of State Boards of Nursing, n.d.)

25.4 Special Preoperative Considerations

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Identify measures to improve preoperative safety
- Discuss preoperative care changes of a patient requiring emergency surgery
- Identify how to adjust preoperative care to meet the needs of special populations

As with any specialty in nursing, the preoperative nurse must be aware of special considerations. Preoperative nursing requires special attention to promote safety. Many surgeries may be done on an elective or preplanned basis. However, there are instances where there may be an urgent or emergency surgery. There are also instances that require extra care or accommodation. The preoperative nurse must be aware of these special considerations to effectively care for various patient populations undergoing a variety of surgery types.

National Patient Safety Goals

The National Patient Safety Goals aim to promote patient safety. When it comes to surgery, these goals include (The Joint Commission, 2022):

- Identifying patients correctly
- Improving staff communication
- Using medicines safely
- Using alarms safely
- Preventing infection
- Identifying patient safety risks
- Preventing mistakes in surgery

Many interventions that support these goals have been discussed. The preoperative nurse plays a major role in performing or verifying that the proper steps are taken to promote patient safety. For example, the nurse verifies the medication record and implements interventions that promote the prevention of blood clots and surgical site infections.

LINK TO LEARNING

The Joint Commission's Hospital National Patient Safety Goals (https://openstax.org/r/77HospSftyGoal) aim to improve patient safety. This outlines safety goals for surgery and how to meet those goals.

Emergency Surgery Cases

Most surgeries are planned; however, there are instances where an emergency arises, leaving little time for surgical preparation. For example, a patient with a gunshot or stab wound requires immediate surgical intervention. When situations like this arise, there is generally not a preadmission testing appointment, and time is limited. Therefore, the patient does not receive presurgical instructions. These instances require the preoperative nurse to obtain as thorough a history as possible from either the patient or family member to verify medical history, medications, and allergies to try to prevent complications. The preoperative nurse must communicate these findings to other members of the surgical team. A quick assessment should also be performed to identify any possible signs of injury when trauma cases present. In emergent cases, skin preparation is often done in the OR to prevent delay of getting the patient into the OR.

Special Populations

Surgery is not a "one size fits all" procedure. Considerations are required for special populations like older adults, bariatric patients, and patients with disabilities. The preoperative nurse should remain knowledgeable of special populations to promote safety across each phase of surgery. The nurse should strive to be a lifelong learner and seek out opportunities for professional development related to their desired nursing specialty. The National League for Nurses (NLN), the American Nurses Association (ANA), and the Association of Operating Room Nurses (AORN) are a few examples of recognized organizations within the field of surgical nursing. Each hosts webinars, training, and workshops across the nation allowing OR nurses to remain up to date with best practice standards.

Older Adults

The older adult population is considered special because they have unique needs and require knowledge of the requirements to provide tailored care. People 65 and older not only have age-related changes that can impact the surgical process, but often they present multiple comorbidities that can impact surgical recovery outcomes. When a person reaches an advanced age, the organ systems tend to have lower reserves for recovery and may take longer to "bounce back" to the patient's baseline after surgery. Cardiac and respiratory complications are common causes of postoperative morbidity and mortality in older adults. The prevalence or incidence of an illness within a population is called **morbidity**. The death of a population measured and expressed as a ratio is called its **mortality**. Changes in kidney function, body composition, and gastrointestinal physiology lead to variations correlated with pharmacokinetics and pharmacodynamics of most drugs (Maanen et al., 2020). This means that the older adult does not recover as quickly as the younger adult and metabolizes anesthetic agents and pain medications more slowly or are generally more sensitive to those drugs.

Advancing age is also associated with skin changes like dry, itchy skin that is more fragile. This requires careful precautions when moving older adults from one bed to another. Older adults are also more likely to experience temperature changes due to a reduction in adipose tissue. Maintaining as warm an environment as possible, applying a warming blanket or temperature monitoring system, if available, and asking if the patient feels warm enough are appropriate interventions. The patient's subjective report of temperature may not reflect their actual body temperature; therefore, the nurse will also need to continue to monitor temperature to ensure not just comfort, but safety. Patients with decreased body temperatures are at risk for surgical site infections, blood loss, altered medication metabolism, increased pain, and cardiac arrythmias (Brooks & Bosserman, 2022).

LIFE-STAGE CONTEXT

Older Adults and Surgical Procedures

Older adult patients are more at risk for surgical complications than younger adults. Therefore, the preoperative nurse must ensure they have performed a comprehensive preoperative exam. Postoperative and post-anesthesia care must also be thorough and skillful to promote optimal patient outcomes (Salzman et al., 2022). Postoperative care must also focus on effective communication to educate the patient about postsurgical care and pain management. Older adults may need more time to cover the education with multiple explanations to appropriately understand the information (Kumar et al., 2021).

Bariatric Patients

This special patient population requires meticulous care as there are a number of complications that may arise with surgery as shown in Table 25.2 (Rakhlin, n.d.).

Possible Complication	Reasoning
Surgical site infections or delayed wound healing	Reduced blood flow to the area; diabetes or uncontrolled blood glucose; malnutrition
Blood clots	Higher amounts of estrogen in the body; more difficult to ambulate after surgery
Hypoventilation, atelectasis, pneumonia, or other pulmonary complications	Shallow breathing in supine position; sleep apnea
Wound dehiscence or hernia	Increased tissue weight exerting forced on dependent tissue
Increased cardiac demand	1 mile of capillaries must be created to perfuse 1 pound of excess weight; risk for poor oxygenation
Anesthesia complications	High blood pressure may affect perfusion; airway obstruction from excess fat; high cholesterol and lipid metabolism may alter anesthesia effects (Ramírez-Reyes-Reyes et al., 2021; Seyni-Boureima et al., 2022)

TABLE 25.2 Surgical Complications in Bariatric Patients

If a patient with obesity also smokes, they are at an increased risk of wound infections due to the reduction of oxygen available to the tissues. Excess adipose tissue can lead to impaired circulation. Decreased oxygenation and reduced circulation are directly related to impaired healing. Reduced oxygenation can cause impaired immune function (de Frel et al., 2020). Due to the potential complications associated with surgery, the preoperative nurse will want to ensure a thorough and accurate assessment has been obtained.

Pregnant Patients

Pregnant patients may need surgery that is related or unrelated to their pregnancy. In either case, the health and safety of both the patient and the fetus are addressed during preoperative care. Even if the patient is having a non-obstetric procedure, their pregnancy care provider will be an important collaborator during planning.

While a pregnant patient will receive much of the same preoperative care, counseling, and education as a non-pregnant patient, they will likely have some specific concerns about the well-being of the fetus that the nurse will need to address. For example, a patient may worry that the anesthesia during the surgery could harm the fetus, or that the procedure itself could be harmful. The nurse will want to address the patient's concerns fully and make sure they understand the risks and benefits of having the procedure.

While an elective procedure can often be postponed until after delivery, surgery cannot always be delayed. In the case when a procedure is medically necessary for a pregnant patient, coordination between care team members is key to ensuring the health and safety of both the patient and the fetus. This involves close monitoring of both the mother and baby and taking proactive steps to prevent complications like preterm labor and thrombosis. Ideally, the procedure would be done at a facility with a neonatologist or pediatric specialist who can be present during the procedure (ACOG, 2022).

Patients with Disability

The preoperative nurse will care for patients with both physical and mental disabilities. The nurse may need to make accommodations for the use of any needed assistive devices, modify patient education, or ensure additional assistance is available to aid with transferring or positioning. The preoperative nurse should verify the needs of the patient, as well as document what type of assistive devices the patient brought with them to the facility and where those items were placed prior to surgery. This allows the postoperative personnel to ensure the patient receives their belongings after surgery.

Patients with mental disabilities may be accompanied by a caretaker or advocate who can help facilitate clear communication. While the person overseeing their care does need to be made aware of the details, that does not mean a patient with a mental disability can simply be "talked over" or ignored during the preoperative assessment. A patient's capacity to fully understand the reasons for the procedure and what will happen during it will depend on their intellectual function, so the nurse will need to meet the patient where they are in terms of understanding. The education should be aligned with the patient's level of comprehension, and other forms of media (such as graphics or videos) may also be helpful.

Generally, patients are asked to move from the stretcher to the operating room bed at the start of the surgery and back after the surgery. Patients that are either unable to hear or understand instructions or unable to move independently will require assistance in the operating room. Therefore, it is important that the preoperative nurse communicate those needs to the intraoperative nurse when transferring care.

Cultural Considerations

Cultural considerations the preoperative nurse must consider include but are not limited to language, eye contact, gender, touch, and spirituality. Patients who speak and understand another language require a medically trained interpreter for consent and education. Materials should be provided in the language that the patient reads and understands. The medical protocols seen as common to some are not allowed in certain cultures or communities. For example, the administration of blood products is not allowed in the Jehovah's Witnesses community (Cummins & Nicoli, 2018).

Other cultures may have preferences when it comes to gender. For example, some Chinese cultures view the husband's role as protector of his wife. The husband may answer questions on behalf of his wife, or act as a buffer to provide protection (Badanta et al., 2022). Another example is touch. Touching a person can be a sign of comfort or compassion to some people, while others may consider touch to be greatly offensive or inappropriate. Providing culturally competent care means the nurse should ask the patient and their family what their preferences are regarding care.

Summary

25.1 Preadmission Assessment and Education

- The perioperative surgical experience includes the preoperative phase, intraoperative phase, and the postoperative phase.
- The preoperative phase starts when the decision is made to proceed with a surgery or procedure and ends upon transfer to the operating room and is crucial to ensure patient safety.
- The preoperative phase requires a nurse to possess strong communication, teamwork, and patient assessments skills to promote optimal outcomes and avoid errors or adverse events.
- Preadmission care provides the nurse and anesthesia provider the opportunity to ensure that the patient is safe and in a stable condition prior to a procedure or surgery.
- Preadmission assessment includes obtaining many variables, such as the patient's demographics, allergies, height, weight, medications, health history, surgical history, any potential problems with anesthesia, pertinent family history, history of falls, any metal or implants in the body, and social history of smoking, as well as alcohol or recreational drug use.
- Preadmission testing may vary and is dependent on surgeon orders or anesthesia protocol.
- Preoperative education includes arrival time, surgery start time, clothing, showering, medications, corrective devices that cannot be worn in surgery, transportation, advanced directives, and that the postoperative nurse will provide recovery education prior to discharge from the facility.

25.2 Preoperative Nursing Priorities

- Preoperative nurses have several responsibilities and priorities, including documentation, preoperative assessment, physical assessment, and preoperative patient care.
- Documentation should include any assessments, testing, education, and interventions. Informed consent should be verified and documented prior to surgery in order to ensure that the patient is willingly undergoing the procedure and was given all the information regarding the procedure, alternatives, risks, and benefits.
- The preoperative physical assessment ensures that the patient is stable enough for surgery and identifies any issues that should be addressed prior to surgery. The preoperative physical assessment evaluates the respiratory, cardiovascular, renal and hepatic, and endocrine systems and should consider fluid and nutritional status, medications, immune system function, drug and alcohol use, and psychosocial status.
- Patient care in the preoperative setting may include skin and bowel preparation. Any preparations should be followed as ordered by the surgeon or per facility protocol.

25.3 Preoperative Nursing Care Plan

- The preoperative nursing care plan includes interventions aimed at preparing the patient both physically and psychologically for the procedure while prioritizing patient safety.
- The preoperative nurse ensures patient safety by verifying the patient's identity, performing assessments, evaluating the stability of the patient, obtaining vital signs, obtaining any laboratory tests that were not done preoperatively or need to be repeated, verifying medications taken or held for surgery, and taking steps to prevent a wrong-site surgery.
- The preoperative nurse completes interventions to aid in preventing surgical complications.
- Examples include following established protocols and taking steps to decrease complications such as risk for aspiration, injury, and SSI.
- Not only does the preoperative nurse care for the patient, but also for the family. Patient and family-centered care focuses on providing education, reducing anxiety and fear, and providing emotional support.

25.4 Special Preoperative Considerations

- The National Patient Safety Goals aim to promote patient safety and include identifying patients correctly, improving staff communication, using medicines safely, using alarms safely, preventing infection, identifying patient safety risks, and preventing mistakes in surgery.
- Special considerations are required for unplanned or emergency surgeries when immediate intervention is warranted. A quicker, but thorough, assessment should be performed with the patient or their family.
- Older adults not only have age-related changes that can impact the course of their surgical process, but they

often also have comorbidities that affect the surgical course and outcomes.
- Meticulous care is warranted with bariatric surgeries due to the complications or risks associated with obesity.
- Patients with mental and physical disabilities may need accommodations for the use of needed assistive devices, modified education, or additional assistance with transferring or positioning.
- Cultural considerations the preoperative nurse must remember including language, eye contact, gender, touch, and spirituality. It is essential that the nurse be culturally competent to avoid cultural bias or insensitivity.

Key Terms

advance directive document that allows a patient to convey, in writing, their wishes for care if they are unable to advocate for themselves due to a medical condition
certified registered nurse anesthetist (CRNA) advanced practice RN who has received special training to administer anesthesia
detoxification withdrawal from substance
incentive spirometer tool used for breathing exercises to promote lung function
malignant hyperthermia serious genetic condition that causes a life-threatening elevation of body temperature and muscle spasms, among other severe symptoms
morbidity illness measured in prevalence or incidence within a population
mortality death measured within a population expressed as a ratio
NPO nothing by mouth
preoperative phase begins when the decision is made to proceed with a surgery or procedure and ends when the patient arrives in the operating room
sentinel event unexpected event that leads to serious patient harm or death

Assessments

Review Questions

1. What phase starts when the patient determines to have a surgical procedure?
   a. Perioperative phase
   b. Preoperative phase
   c. Intraoperative phase
   d. Postoperative phase

2. What is a component of preadmission nursing care? Select all that apply.
   a. Verifying patient surgical history
   b. Verifying patient medications
   c. Performing ordered tests
   d. Marking the surgical site

3. The preadmission nurse has explained what to expect the day of surgery to a patient having an outpatient procedure to remove cataracts. What patient statement lets the nurse know that they need to reinforce education to ensure safety after the procedure?
   a. “I will be able to drive myself home.”
   b. “I will bring my glasses case for my glasses.”
   c. “I will leave jewelry at home.”
   d. “I should hold my metformin the morning of surgery.”

4. The nurse is reviewing a consent form with a patient whose native language is not English. What action should the nurse take?
   a. Have the patient’s English-speaking family member to go over the consent form and document the family member’s name as the interpreter.
   b. Ask a nurse coworker who speaks the patient’s language to verify the consent form with the patient and document their name as the interpreter.

c. Call a medically trained interpreter to verify the consent form either over the phone or in person and obtain the interpreter's name and ID for the consent form and chart.
d. Reschedule the surgery until a medically trained interpreter can be present for the day of surgery.

5. The preoperative nurse brings the patient to the preop room to begin an assessment and prepare for surgery. The patient appears fearful and is crying and tugging on the sleeves of their jacket. What intervention should the nurse implement? Select all that apply.
a. Let the patient's family come back with them.
b. Keep the interview going, as nervousness is a normal part of surgery.
c. Ask the patient if there is anything in particular they are nervous about.
d. Ask about any spiritual or cultural beliefs or practices the patient may have.

6. The nurse provides a patient with preoperative instructions. The nurse understands the need to reinforce education when the patient makes what statement?
a. "I should hold all my vitamins and supplements until after surgery."
b. "I can take my baby aspirin the day of surgery."
c. "I should not have anything to eat or drink after midnight."
d. "My husband will need to drive me home after the procedure."

7. A 25-year-old female presents to the facility for a right knee arthroscopy. The preoperative nurse advises the patient that a urine sample is needed. The patient states that "If this is for pregnancy, I just took a test last week, and it was negative." How should the preoperative nurse best respond?
a. "Okay, if you took a test last week, then we will skip the test today."
b. "I understand, but it is protocol to test the day of surgery."
c. "I'm sorry, I cannot trust your previous test was accurate."
d. "It doesn't matter. We have to test all patients prior to surgery."

8. The preoperative nurse brings a patient to the preop room to begin an assessment and prepare for surgery. What steps will the nurse take to prevent complications? Select all that apply.
a. Have the patient remove any jewelry.
b. Verifying the last doses of medications.
c. Allow the patient to put the hospital gown over their clothing.
d. Prep the skin and verify there are no open wounds near the surgical site.

9. The preoperative nurse has provided the patient and family with education related to the events of the surgery day. The nurse knows that education needs to be reinforced when the patient's partner makes what statement?
a. "I can go into the operating room with my partner."
b. "I can watch the screen in the lobby for updates with my partner's case number."
c. "I will be the one to drive us home."
d. "The provider will come talk to us before my partner goes back to the operating room."

10. What is a goal of the National Patient Safety Goals? Select all that apply.
a. Identifying patients correctly
b. Preventing infection
c. Improving patient communication
d. Improving staff communication

11. The preoperative nurse is reviewing a chart for a next day surgery patient who has a BMI of 47. What complications should the nurse recognize? Select all that apply.
a. Wound dehiscence
b. Pulmonary complications
c. Surgical site infections

d. Blood loss

Check Your Understanding Questions

1. The preadmission nurse has performed an assessment on a patient. The patient denies being diabetic but states they take metformin. What should the nurse do?
2. Describe how a patient's drug and alcohol use may impact surgery.
3. The preoperative nurse is reviewing the consent with the patient. The patient states the surgeon has not explained the procedure nor its risks and benefits. The patient asks the nurse to explain it. What should the nurse do?
4. Describe the patient safety measures the preoperative nurse can take.
5. Describe how the preoperative nurse's workflow will be different for emergency surgery compared to elective procedures.

Reflection Questions

1. What information should the nurse obtain when performing a preadmission assessment for a surgical patient?
2. What interventions should a preoperative nurse perform to prevent complications?
3. The preoperative nurse is verifying the surgery with the patient. The orders and consent are written for a left total knee arthroplasty, but the patient states the surgery is supposed to be on his right hip. What should the nurse do?
4. What special considerations should the preoperative nurse remember with older adults?
5. The preoperative nurse is preparing the surgical chart for a deaf patient. What interventions should the nurse implement?

Critical-Thinking Questions about Case Studies

1. Why is it important to ensure the patient has not taken any ibuprofen for 7 days prior to the knee replacement surgery?
2. Explain why it is important to ensure a surgical consent form was signed and placed in the medical record?

Competency-Based Assessments

1. Prepare a Do and Do Not education handout to provide to a surgical patient during the preoperative assessment and interview.
2. Prepare a checklist that the nurse could use to perform a physical assessment of a preoperative patient.
3. Prepare a handout with a checklist that covers education for a patient and family on the day of surgery.
4. Complete an internet search for best practice standards. Prepare a checklist of cultural considerations that the preoperative nurse should be aware of that are specific to surgery patients.

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CHAPTER 26
Intraoperative Care

FIGURE 26.1 The nurse's role is pivotal for the patient's care during surgery. The nurse must collaborate with other providers on the surgical team to ensure the patient's safety before, during, and after the procedure. (credit: "Aviano's surgical team" by Airman 1st Class Ryan Conroy/U.S. Air Force, Public Domain)

CHAPTER OUTLINE

INTRODUCTION The surgical experience is a multifaceted journey that encompasses a range of emotions, preparations, and procedures. From the initial consultation with a health-care provider to the postoperative recovery period, patients navigate a series of critical steps designed to ensure their safety and the success of the operation. This journey often begins with a detailed evaluation and diagnosis, followed by meticulous planning and coordination among a team of medical professionals. The actual surgery, whether elective or emergency, marks a significant event, demanding both physical and emotional resilience from the patient. Post surgery, the recovery phase involves continuous care and monitoring, aiming to restore the patient's health and well-being. Understanding the comprehensive nature of the surgical experience is essential for patients and their families, as it helps in setting realistic expectations and fostering a sense of preparedness and confidence. *Perioperative* describes the time frame surrounding surgery. It is used to encompass the time between going to the facility, having the procedure, and then returning home afterward. This chapter will discuss the second of the three phases included in perioperative nursing.

26.1 Overview of the Surgical Experience

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Describe the various surgical settings
- Differentiate the three surgical categories
- Compare the common types of surgery by their suffixes
- Distinguish the members of the surgical team

The intraoperative phase is the second of three phases of perioperative care. The **intraoperative phase** begins when the patient is transferred to the operating room bed and ends when the patient is transferred to the post-anesthesia care unit (PACU). Just like the previous phase, the intraoperative phase is also broken down into distinctive responsibilities and tasks for all team members. In recent years, emphasis has been placed on adhering to strict protocols and developing best practice standards throughout the surgical procedure, ensuring the highest level of safety for each procedure. This chapter will explore the complexities involved with intraoperative care, roles of the surgical team, safety and infection prevention, and nursing management.

Surgical Settings

Surgical settings can vary based on the type of procedure, the medical facility, and the complexity of the patient's individual scenario. There are several primary surgical settings:

- An **inpatient hospital operating room** is the most common surgical setting for patients (Figure 26.2). Hospitals have dedicated operating rooms with specialized equipment, surgical tools, anesthesia, and monitoring devices to perform safe and effective surgery. Inpatient facilities have strict sterilization protocols and are staffed by surgeons, anesthesiologists, nurses, and other support members of the interprofessional team. This setting can also be used for robotic-assisted surgical procedures.
- An **ambulatory surgical center (ASC)** is a facility designed for outpatient procedures that do not require the patient to be monitored overnight. They offer a more convenient and cost-effective alternative to the inpatient operating room setting. ASCs are equipped to perform minor and minimally invasive surgeries, such as cataract surgery, minor cosmetic surgery, colonoscopies, and minor orthopedic procedures, such arthroscopy of the knee.
- Clinics or specialty provider offices host minor surgeries such as wisdom teeth extraction, skin lesion removals, and biopsies. The types of procedures that can be done in a clinic or provider's office are minimally invasive and require no long-term observations of the patient. These settings are equipped with the essential surgical equipment for minor surgical procedures. This type of practice promotes cost-effective care by only requiring local anesthetic, and no admission or discharge to a facility resulting in low costs to the patient.

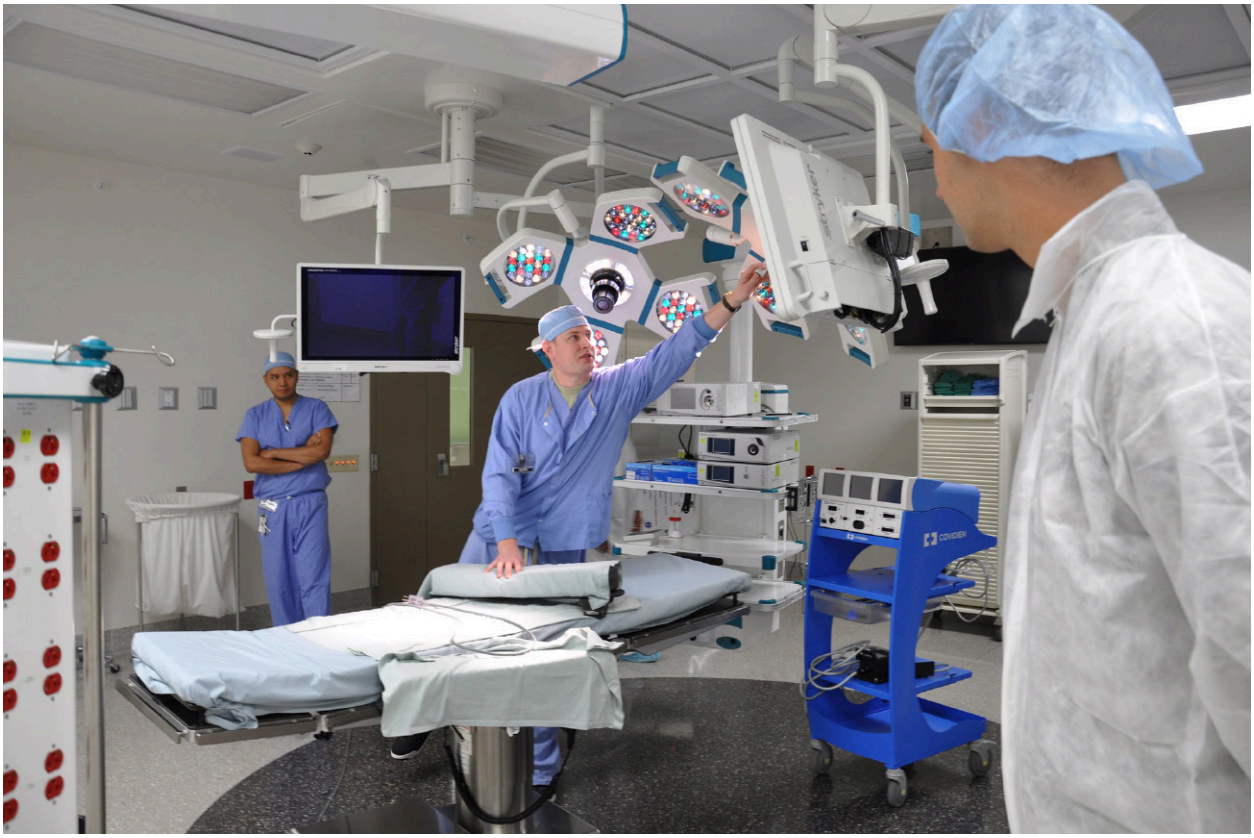


FIGURE 26.2 A standard operating room contains specialized equipment, tools, and monitoring devices. (credit: "New operating rooms at WPAFB Medical Center Complex" by LouisvilleUSACE/Flickr, CC BY 2.0)

Surgical Categories

Surgical procedures are categorized based on the timing and necessity of the operation deemed by the surgical team. Using a system to categorize surgeries can help the medical and surgical teams prioritize and manage the care needed for patients. There are three primary categories used to organize surgical procedures: elective, urgent, and emergent.

An **elective surgery** is defined as a non-emergent, planned procedure that is scheduled in advance based on the patient's preference, surgical procedure, location of procedure, and surgeon's availability. These surgeries are performed to improve a patient's quality of life, address chronic illnesses, or address non–life-threatening medical issues. They can be scheduled in advance, giving patients time to prepare for the surgery. Procedures like joint replacements, cosmetic surgeries, cataract removal, hernia repairs, and some tumor removals may fall under this category.

An **urgent surgery** is a necessary procedure that must be performed promptly, usually within twenty-four to forty-eight hours. While they are not considered life-threatening, these surgeries address conditions that could worsen without intervention by the surgical team. Delaying these surgeries can lead to complications, causing the patient's condition to turn into a life-threatening problem. Procedures such as long bone fractures, infections that require drainage devices, or acute gallstones are often considered urgent.

An **emergency surgery** is an immediate, unplanned procedure performed to save a patient's life or prevent severe disability. Emergent surgeries are necessitated by acute, life-threatening conditions or injuries that require immediate intervention. Examples of emergency surgeries include perforation to the bowel or bladder, rupture of an organ like spleen or appendix, severe trauma, burns, active bleeding, or organ damage.

Surgical Procedures

Surgical procedures are often named for the location, body part, condition, and specific technique that is used. The suffix provides insight into the nature of the surgery. (Table 26.1) lists common surgical suffixes and their meanings.

Suffix	Meaning	Examples
-graphy	Imaging or recording	Mammography (imaging of the breast tissue) Angiography (imaging of blood vessels)
-ectomy	Excision or surgical removal	Lobectomy (removal of a lung lobe) Hysterectomy (removal of the uterus)
-otomy	Cutting into or incision	Tracheotomy (incision into the trachea/windpipe) Craniotomy (surgical opening of the skull bone) Laparotomy (abdominal incision to access the abdominal cavity)
-ostomy	Artificial opening or creating an opening	Colostomy (creation of an artificial opening in the colon to the outside of the abdomen) Urostomy (surgical opening for urine diversion)
-plasty	Surgical repair or reshaping	Mammoplasty (augmentation or reduction of the breast tissue) Rhinoplasty (surgical reconstruction of the nose)
-scopy	Examination or visualization	Thoracoscopy (minimally invasive visualization inside the thoracic cavity) Endoscopy (examination of internal organs using an endoscope)

TABLE 26.1 Common Surgical Suffixes

Understanding the suffix at the end of the words can give an idea of the type of procedure being performed. This can help surgeons, nurses, and other medical professionals prepare the proper equipment for a safe and effective surgical procedure.

The Surgical Team

In the intricate realm of health care, the surgical team stands as a collaborative force at the forefront of medical intervention. This section explores the dynamic and multifaceted world of the surgical team, shedding light on the diverse roles, responsibilities, and expertise that each member brings to the operating room.

The Patient

First and foremost, the most important team member is the patient. The role of the patient in the operating room is fundamentally passive but essential to the success of the surgical process. As the individual undergoing surgery, the patient plays a critical role in entrusting their well-being to the surgical team. Before the procedure, the patient collaborates with health-care professionals to provide a thorough medical history, disclose any allergies, and offer pertinent information to ensure safe surgery. The surgical team trusts the patient to perform all presurgical instructions, such as washing with surgical soap the night before, not eating or drinking per instructions, and taking medications as ordered.

While in the operating room, the patient is prepared for the procedure by the anesthesia team, to induce a state of unconsciousness or sedation. While sedated the patient is relying on the surgical team to treat their body with dignity and respect, such as only exposing areas needed for the procedure, and maintaining professionalism throughout the surgery. The patient relies on the expertise of the surgical team to perform any necessary interventions if anything unexpected happens.

Following the surgery, the patient's role shifts to more active participation in their recovery. Compliance with postoperative instructions, medication schedules, and follow-up appointments is crucial for a successful recovery. The patient's trust, cooperation, and adherence to medical advice contribute significantly to the overall efficacy of the surgical process and the achievement of positive health outcomes.

Nursing Roles

The surgical team is comprised of several nursing roles, each with their own set of responsibilities during the surgery. This section will discuss the three main roles of a nurse within the surgical team. The **RN circulator**, also known as a circulating nurse**,** is responsible for coordinating and managing various aspects of the operating room before, during, and after surgery, which is critical in ensuring the smooth and safe functioning of surgical procedures. Before the procedure, the circulating nurse prepares the operating room by ensuring all necessary equipment, supplies, and instruments are available and in working order. During surgery, they maintain a sterile environment, monitor the team's compliance with aseptic techniques, and manage the flow of communication and materials. The circulating nurse also advocates for patient safety and liaises between the surgical team and other health-care professionals. Post-surgery, they assist in transferring the patient to the recovery area and document the procedure for the patient's medical records. The role demands excellent organizational skills, attention to detail, and the ability to handle high-pressure situations to ensure optimal patient outcomes and a well-coordinated surgical experience.

LINK TO LEARNING

The Association for Operating Room Nurses (AORN) has created evidence-based best practice guidelines for perioperative practice (https://openstax.org/r/77PeriOpBPGuide) to help nurses care for surgical patients safely and effectively and to ensure workplace safety.

The role of a scrub nurse in the operating room is indispensable, contributing significantly to the efficiency and safety of surgical procedures (Russell, 2022). The **scrub nurse** is tasked with maintaining the sterility of the surgical environment. They play a pivotal role in preparing and organizing the sterile instruments and supplies needed for the surgery. Before the procedure, they collaborate closely with the surgical team to ensure all necessary equipment is available, sterilized, and organized. During the surgery, the scrub nurse passes instruments to the surgeon, anticipates the surgeons' needs, and remains vigilant to preserve the sterile field. They also assist in counting surgical instruments and supplies to prevent any items from being left inside the patient. Additionally, the scrub nurse collaborates with the circulating nurse in managing the overall flow of the surgery, ensuring seamless communication and coordination among the team members. Their meticulous attention to detail, knowledge of surgical procedures, and ability to work effectively under pressure contribute significantly to the success of surgical interventions and the well-being of patients.

The last of the three main nursing roles in the operating room is the RN first assist. The **registered nurse first assist (RNFA)** controls bleeding during surgery, sutures incisions and wounds, and assists in stabilizing patients when necessary. RNFAs must earn additional education and credentials that certify their ability to perform in this expanded role. To become an RNFA, students must take advanced coursework, earn certifications, and undergo an extensive training process. According to the Association of Perioperative Registered Nurses (AORN). RNFAs practice intraoperatively at a surgeon's direction while not concurrently functioning as scrub nurses (Croke, 2020).

Medical Providers

The operating team has two types of medical providers. The first type, and the lead of the surgical team, is the surgeon. The **surgeon** is a medical doctor with extensive training in performing surgical procedures. The role of the surgeon in the operating room is central to the success of any surgical procedure. Surgeons are highly trained medical professionals with the expertise to diagnose, plan, and execute a variety of surgical interventions. In the operating room, the surgeon is responsible for leading the surgical team, providing guidance, and making critical decisions throughout the procedure. They are tasked with performing the surgery which requires skill, precision, and knowledge to address the patient's medical condition. Surgeons work collaboratively with the other surgical team members to ensure a smooth and coordinated process. Communication is crucial, as the surgeon directs the team, communicates with the patient when necessary, and collaborates with colleagues to optimize patient outcomes.

Beyond the operating room, surgeons are involved in preoperative and postoperative care, obtaining informed consent, discussing treatment plans, and monitoring the patient's recovery. The surgeon's role demands a combination of technical proficiency, decision-making skills, and effective communication to navigate the complexities of surgery and provide the best possible care to patients.

The second type of provider on the surgical team is the anesthesiologist. The role of anesthesiologists in the operating room is paramount in ensuring the comfort, safety, and maintenance of the patient's airway throughout the surgical process. An **anesthesiologist** is a highly trained professional responsible for administering anesthesia, monitoring the patient's vital signs and airway, and managing the patient's pain during surgery. Before the procedure, the anesthesia provider evaluates the patient's medical history, assesses the patient's overall health, and develops an anesthesia plan tailored to the individual's needs. During the surgery, they administer the appropriate type and amount of anesthesia, ensuring the patient is in a controlled state of unconsciousness or sedation. Anesthesia providers continually monitor vital signs, such as heart rate, blood pressure, and oxygen levels, adjusting the anesthesia to maintain stability. Their expertise extends to managing potential complications and responding to emergencies, contributing significantly to patient safety.

Another anesthesia provider that works directly under the guidance of the anesthesiologists includes the certified registered nurse anesthetist (CRNA), who is a master prepared and board-certified advanced practice nurse in the specialty of anesthesia. Additional roles include anesthesia assistants, and resident physicians. Postoperatively, anesthesia providers oversee patients' recovery from anesthesia and manage pain control. Their crucial role in optimizing the patient's experience in the operating room underscores the importance of their skill, knowledge, and vigilance in ensuring a successful and comfortable surgical outcome.

Other Personnel

In addition to the core members of the surgical team, the intraoperative phase involves the collaboration of various other personnel who play crucial roles in ensuring the smooth progression and success of surgical procedures. These include surgical assistants, who provide invaluable support to the surgical team and contribute to the seamless execution of surgical procedures. Their responsibilities encompass a wide range of tasks, from ensuring the sterility of instruments and supplies to actively participating in the surgical procedure. Surgical assistants collaborate closely with the surgeon, anticipating needs, providing instruments, and aiding in complex aspects of the surgery. With a keen understanding of anatomy, instrumentation, and aseptic techniques, they contribute to the precision and efficiency of the surgical process. Beyond technical proficiency, surgical assistants serve as liaisons between team members, fostering effective communication and maintaining a harmonious workflow. Their role is dynamic, adapting to the specific demands of each procedure, and their contributions significantly enhance the overall success and safety of the intraoperative experience for both the surgical team and the patient. Their comprehensive nursing knowledge and attention to detail ensure that patients receive optimal care from preoperative preparation to postoperative recovery. Collectively, these dedicated personnel form an integral part of the intraoperative team, working collaboratively to uphold the highest standards of patient care and safety in the operating room.

26.2 Intraoperative Considerations

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Describe the surgical environment in relation to the intraoperative phase
- Discuss the use of sterile technique to maintain surgical asepsis
- Explain the importance of the time-out during a surgical procedure
- Explore patient positioning used in the surgical setting
- Define airway management during the surgery
- Differentiate types of anesthesia and sedation used during the surgical experience

The intraoperative phase is uniquely situated at the heart of surgical interventions, which can pose unique challenges and opportunities for health-care professionals dedicated to providing optimal care. The surgical team must create and maintain a secure environment to ensure patient safety and the prevention of post-surgical infection. From the implementation of rigorous aseptic techniques to vigilant monitoring and communication, the pursuit of excellence in intraoperative safety and infection prevention is integral to fostering successful surgical

outcomes and safeguarding the well-being of those entrusted to the surgical team's care.

The Surgical Environment

The environment for surgical procedures serves as the stage for the delicate interplay of medical expertise and technological advancements through a strictly controlled workspace. The **surgical environment** is a controlled and sterile setting in which surgical procedures are performed, including the operating room, associated equipment, and related practices and protocols designed to maintain asepsis. The operating room, often referred to as the "surgical suite," is meticulously designed to facilitate optimal conditions for surgical procedures. Characterized by its spotless surfaces, advanced equipment, and an array of specialized tools, the environment prioritizes the prevention of infection and the maintenance of patient safety. Controlled temperature, humidity, and airflow contribute to asepsis, reducing the risk of postoperative complications. Lighting and ergonomic considerations are paramount, providing surgeons with optimal visibility and comfort during intricate procedures. Beyond the physical attributes, the surgical environment thrives on collaboration and communication among the diverse members of the surgical team. The collective commitment to maintaining sterility, adhering to safety protocols, and working as a team within this environment underscores its pivotal role in ensuring the success of surgical interventions and, ultimately, the well-being of the patient.

Principles of Surgical Asepsis and Sterile Technique

Principles of surgical asepsis and sterile technique form the bedrock of infection prevention in the operating room, safeguarding patients from potential complications and promoting successful surgical outcomes (Table 26.2). The set of practices designed to maintain a sterile field and prevent the introduction of microorganisms into the surgical environment is called **surgical asepsis**. This includes rigorous hand hygiene (Figure 26.3), the use of sterile attire, and the meticulous preparation and handling of surgical instruments and supplies. The **sterile technique** extends to the creation of a sterile field around the surgical site, ensuring that only sterile items come into contact with the patient and the surgical wound. Adherence to these principles is critical in mitigating the risk of surgical site infections and other complications. Aseptic and sterile techniques are both crucial in preventing contamination and infection in medical and operating room settings.

FIGURE 26.3 Hand hygiene is one critical step in ensuring asepsis during surgery. (credit: "Magicians behind the curtain: 88th Surgical Operations Squadron" by Matthew Fink/U.S. Air Force, Public Domain)

Technique	Definition	Objective	Applications	Key Practices
Aseptic technique	Involves practices and procedures that help reduce the risk of infection by minimizing the presence of pathogenic microorganisms	To prevent contamination and maintain asepsis by reducing the number of pathogens to a safe level	Applied during the handling of sterile instruments, dressing wounds, and administering injections	Hand washing, wearing gloves, masks, gowns, sterilizing instruments and surfaces, and using barriers such as sterile drapes
Sterile technique	Involves procedures that eliminate all microorganisms, including spores, from an area or object	To achieve and maintain sterility, ensuring an environment free from all microorganisms	Surgical environments and compounding pharmacy	Sterilization of instruments and supplies, creation of a sterile field where only sterile items are used, and using sterile gloves, gowns, and drapes

TABLE 26.2 Comparison of Aseptic and Sterile Techniques

Surgical attire plays a crucial role in infection prevention. Surgeons, nurses, and other members of the surgical team don specialized attire, including gowns and gloves, to maintain a barrier between their own microbiota and the sterile field (Table 26.3). The attire is designed to be impermeable and covers the entire body, minimizing the risk of microbial contamination. Proper donning and doffing procedures are followed to maintain the integrity of the sterile environment. Surgical attire not only serves as a protective measure for health-care professionals but also reflects the dedication to patient safety, ensuring that the surgical team operates within the highest standards of cleanliness and sterility throughout the perioperative process.

Attire	Description
Scrub suit	Top and pants (scrubs) are laundered by the hospital that are lightweight and breathable; usually in the color of blue or green
Surgical Cap/ bouffant	Covers scalp hair to prevent contamination, both disposable or reusable
Surgical mask	Covers mouth and nose and beard hair to prevent the spread of microorganisms; disposable
Protective eyewear	Protects eyes from splashes and droplets; can be goggles or a full face shield
Shoe covers	Covers shoes to prevent contamination; disposable

TABLE 26.3 Surgical Attire Requirements for the Operating Room

Time-Out

The surgical **time-out** represents a critical moment in the perioperative process designed to enhance patient safety and reduce the risk of errors. This best practice standard involves a brief pause in the operating room immediately before the start of a surgical procedure. During this intentional break, the entire surgical team comes together to confirm essential details. Including verifying patient identity (name and date of birth), surgical site, surgical procedure, and verified consent. After the verification of the correct patient, correct procedure, and correct surgical team, the surgical area of the patient is clearly marked with marker by the surgeon, and all labs and tests are reviewed. This time serves as the last break to discuss anything of concern before the start of the procedure.

CLINICAL SAFETY AND PROCEDURES (QSEN)

Teamwork and Collaboration: Surgical Time-Out

Disclaimer: Always follow the agency's policy for surgical time-out procedures.

Definition: Function as an effective and efficient team member utilizing clear, concise communication, professionalism and respect, and an overall shared goal for optimal patient care outcomes.

Knowledge: The intraoperative nurse will have a strong knowledge of surgical concepts and surgical best practices. The nurse will stay current in learning new knowledge as discoveries are made for best practice standards.

Skill: The nurse will:

- avoid distractions during the surgical time-out to minimize mistakes.
- instruct each team member to introduce themself and their role in the surgical setting.
- verbalize all concerns relating to the patient (allergies or other pertinent information for the procedure).
- read the procedure directly from the consent form.

Attitude: The nurse will place value on the knowledge and experience of each team member.

(QSEN Institute, n.d.)

The primary goals of the time-out include the prevention of wrong-site surgeries, identification of potential errors, and reinforcement of effective communication within the team. The World Health Organization (WHO) and various health-care accreditation bodies endorse the implementation of the time-out as a standard safety measure for all procedures, and in all surgical settings (Figure 26.4).

FIGURE 26.4 A surgical time-out allows the surgical team to confirm key details about the patient and procedure. This review helps prevent errors and improves patient safety and, ultimately, patient outcomes. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

This brief yet pivotal pause fosters a culture of collaboration, safety, and accountability among the surgical team. It underscores the commitment to patient safety and serves as a final checkpoint to catch any discrepancies or oversights before the surgical intervention commences. The surgical pause is a testament to the proactive approach taken in modern health-care settings to minimize the occurrence of preventable errors and ensure the highest standards of care for every patient undergoing surgery.

Patient Positioning

The surgical experience is not merely a physical event; it is an emotional and often transformative passage for patients facing medical challenges. This patient is in a mental state where it is important for the interdisciplinary team to take care of the patient holistically, not just their condition. The surgical team's commitment to patient-centered care and the pursuit of excellence becomes the guiding force that ensures not only the success of the procedure but also the patient's overall outcome and satisfaction.

Intraoperative patient positioning is a crucial aspect of surgical care, designed to optimize exposure, accessibility, and patient comfort during a procedure. The proper positioning of the patient is a collaborative effort between the

members of the surgical team, to ensure the safety of the patient and promote the best outcome.

Accurate and careful positioning is essential to avoid complications such as pressure injuries, nerve damage, and circulatory issues. The surgical team considers the patient's anatomy, any pre-existing medical conditions, and the requirements of the surgical procedure when determining the most suitable position. Intraoperative positioning must allow the surgical team optimal access to the operative site while accommodating the use of equipment and ensuring proper alignment of the patient's body. Proper padding and support and vigilant monitoring of the patient's vital signs and neurovascular status are maintained throughout the surgery to identify and address any issues promptly.

Common Intraoperative Positions

In the operating room, various patient positions are used based on the surgical procedure's requirements, the surgeon's preferences, and the patient's medical condition. Each positioning serves specific purposes to optimize exposure, accessibility, and safety during surgery. The following table identifies common positions based on surgical procedures (Table 26.4). Proper training and adherence to established protocols are crucial to ensure the effective and safe use of these devices in the operating room.

Position	Description	Illustration
Supine	Patient lies on their back with arms either tucked at their sides or positioned on arm boards. Commonly used for abdominal, chest, cardiac, and many other procedures.	 (modification of work from *Clinical Nursing Skills*. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)
Fowler's	Patient lies supine but with the head of the bed raised. Commonly used for cranial surgeries, ophthalmic procedures, and some neck surgeries.	 (modification of work from *Clinical Nursing Skills*. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)
Orthopneic (tripod)	The patient is in a sitting position, leaning on an overbed table. Commonly used for intraspinal procedures such as placement of an epidural.	 (modification of work from *Clinical Nursing Skills*. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)
Prone	Patient lies face down, often with supports under the chest and pelvis. Commonly used for spinal surgeries, posterior cranial surgeries.	 (modification of work from *Clinical Nursing Skills*. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

TABLE 26.4 Common Patient Positions

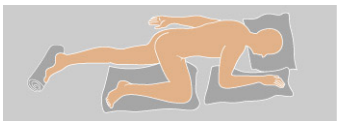
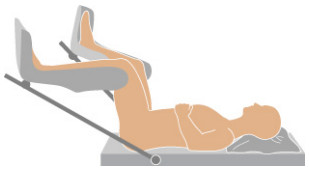
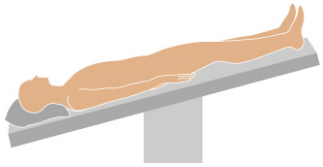
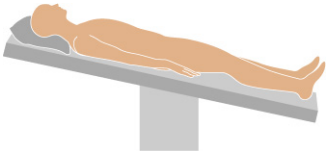
Position	Description	Illustration
Lateral (side-lying)	Patient lies on their side with the operative side facing up or down. Commonly used for hip surgeries, kidney surgeries, thoracic procedures.	 (modification of work from *Clinical Nursing Skills*. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)
Sims (semiprone)	Patient lies in a position between prone and lateral positions.	 (modification of work from *Clinical Nursing Skills*. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)
Lithotomy	Patient lies on their back with legs elevated and positioned in stirrups. Commonly used for gynecological and urological procedures.	 (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)
Trendelenburg	Patient lies on their back with arms at their sides and is positioned with the head down and feet up. Commonly used for pelvic and abdominal surgeries requiring better visualization.	 (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)
Reverse Trendelenburg	Patient lies on their back with arms at their sides and is positioned with the head up and the feet down. Commonly used for neurosurgical procedures, upper abdominal surgeries.	 (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)
Knee-chest	Patient lies on side with torso positioned diagonally across table and with hips and knees flexed; can also be with patient in prone position, on their knees with chest and face on the table.	 (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

TABLE 26.4 Common Patient Positions

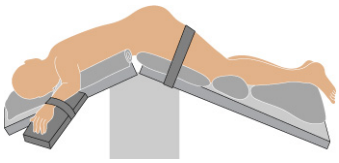
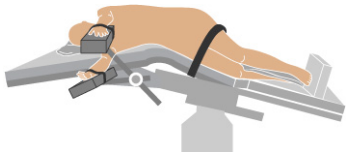
Position	Description	Illustration
Jackknife	Also called Kraske; patient lies prone on the table, and the table is split to lift the hips and lower the head and legs.	 (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)
Kidney	Patient lies in a modified lateral position; the table is split, lowering the head and legs.	 (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

TABLE 26.4 Common Patient Positions

Positioning Devices

Operating room positioning devices are essential tools designed to support and maintain the proper positioning of patients during surgical procedures. These devices, when used appropriately, contribute to the precision and safety of surgical procedures and can help prevent complications related to poor positioning. Devices optimize exposure and accessibility for the surgeon while ensuring the safety and comfort of the patient. Various types of positioning devices are used based on the surgical procedure and the desired patient position (Table 26.5).

Positioning Device	Description	Features
Surgical table	Adjustable tables are designed to support the patient in different positions.	The tabletop can be tilted, raised, lowered, and rotated to accommodate various surgical positions.
Headrests and skull clamps	Devices to secure and support the patient's head during head and neck surgeries.	May include gel pads or foam cushions for comfort and stability.
Armboards	Extensions attached to the side of the surgical table to support the patient's arms.	Adjustable height and angle to ensure proper arm positioning without compromising blood circulation.
Stirrups	Devices attached to the end of the surgical table to support the patient's legs in lithotomy position.	Adjustable to provide proper leg elevation and abduction.
Body supports and bolsters	Cushions or pads placed under specific body parts to maintain proper alignment.	Different shapes and sizes to support areas such as the spine, shoulders, or pelvis.

TABLE 26.5 Common Positioning Devices

Positioning Device	Description	Features
Gel pads and positioning pillows	Soft pads or pillows used to provide additional support and pressure distribution.	Conform to the body's contours, helping to prevent pressure injuries.
Bean bags	Soft, moldable bags filled with small beads that conform to the patient's body shape.	They are used for positioning in various surgical procedures, providing stability and support.
Vacuum bean bags	Similar to traditional bean bags but with a vacuum system to remove air, creating a firm and moldable surface.	Offers enhanced stability and immobilization during surgery.
Shoulder chairs	Chairs designed for shoulder surgeries, allowing the patient to be positioned in a seated or semi-seated position.	Adjustable to accommodate different patient sizes and surgical approaches.
Traction devices	Devices used for limb traction during orthopedic procedures.	Provide controlled and adjustable traction to the limb being operated on.

TABLE 26.5 Common Positioning Devices

Positioning Complications

While proper positioning is essential for the success of surgical procedures, there are potential complications associated with patient positioning in the operating room (Table 26.6). These complications can arise due to inadequate support, prolonged immobility, pressure on vulnerable areas, or interference with blood circulation. To mitigate these complications, the surgical team should follow established protocols, communicate effectively, and regularly reassess the patient's positioning throughout the procedure. Proper padding, positioning devices, and vigilance are essential to ensure patient safety and to prevent adverse events related to positioning in the operating room.

Positioning Complication	Cause	Prevention
Pressure injuries (pressure ulcers)	Prolonged pressure on a specific area, particularly over bony prominences.	Regular repositioning, adequate padding, and using pressure-relieving devices.
Nerve injuries	Compression or stretching of nerves during positioning, leading to neurologic deficits.	Careful padding, avoiding excessive stretching or compression of nerves, and monitoring for signs of nerve injury.
Musculoskeletal injuries	Improper positioning leading to strains, sprains, or joint injuries.	Careful handling during positioning, using appropriate supports and padding.
Compartment syndrome	Increased pressure within a muscle compartment, often due to improper limb positioning.	Monitor for signs of swelling, maintain proper limb alignment, and avoid excessive pressure.

TABLE 26.6 Common Positioning Complications

Positioning Complication	Cause	Prevention
Peripheral nerve palsies	Pressure on blood vessels leading to compromised blood flow.	Monitor vascular status, avoid excessive compression, and ensure proper positioning to maintain blood circulation.
Eye injuries	Pressure, compression, or excessive stretching of the eyes during surgeries involving head positioning.	Use appropriate eye protection and ensure careful positioning.
Airway complications	Inadequate airway management during positioning leading to respiratory distress.	Proper placement of airway devices, ensuring adequate ventilation, and monitoring respiratory status.
Patient falls	Improper securing or instability of the patient on the operating table.	Adequate restraints, secure positioning, and careful handling during transfers.
Positioning-related infections	Compromised skin integrity or breaches in aseptic technique during positioning.	Strict adherence to sterile techniques, proper skin preparation, and maintaining a clean environment.

TABLE 26.6 Common Positioning Complications

Airway Management

Airway management during the intraoperative phase is a critical component of anesthesia care, ensuring the patient's respiratory function and oxygenation are adequately maintained throughout the surgical procedure. Anesthesia providers employ a range of techniques to secure and manage the airway, including endotracheal intubation or the use of supraglottic airway devices. The selection of the appropriate method depends on various factors: the type and duration of surgery, patient characteristics, and the preferences and expertise of the anesthesia team. As patients under general anesthesia are completely unconscious, their vital functions are supported by mechanical ventilation. Continuous monitoring of the patient's airway pressure, oxygen saturation, and end-tidal carbon dioxide levels is imperative to promptly detect and address any complications or deviations from normal respiratory parameters. The anesthesia provider's expertise in airway management is crucial in navigating potential challenges, ensuring proper ventilation, and safeguarding the patient's respiratory well-being throughout the intraoperative phase.

LINK TO LEARNING

Watch these videos that explain respiratory anatomy and physiology (https://openstax.org/r/77RespAnatPhys) in depth.

Anesthesia Awareness

Also known as intraoperative awareness, **anesthesia awareness** is a rare but potentially distressing phenomenon where a patient becomes partially or fully aware of their surroundings during surgery despite being under general anesthesia. This condition occurs when the depth of anesthesia is insufficient to block consciousness, leading to the patient experiencing sensory perceptions, sounds, or even the awareness of the ongoing surgical procedure. While the exact incidence of anesthesia awareness is low, its potential psychological impact on patients is considerable. Patients who experience awareness may recall sensations, conversations, or even feelings of paralysis, creating lasting emotional distress. In cases where awareness does occur, postoperative support and counseling are essential to address the patient's emotional well-being. Anesthesia awareness underscores the delicate balance in achieving optimal depth of anesthesia to ensure patient comfort and safety, highlighting the ongoing efforts within

the anesthesia community to refine monitoring techniques and prevent this rare but significant occurrence.

Types of Anesthesia and Sedation

Anesthesia and sedation are critical components of modern medical procedures, ensuring patient comfort and pain management during surgeries and other interventions. Anesthesia can be classified into several types, including general anesthesia, regional anesthesia, and local anesthesia, each serving different purposes and levels of patient sedation. These techniques are chosen based on the type of procedure, patient health, and desired outcomes, ensuring safety and comfort throughout the medical process. Table 26.7 provides a brief overview of the types of commonly used anesthesia.

Type of Anesthesia	Use of Anesthesia	Forms of Administration	Commonly used Medications
General anesthesia	Induces a reversible state of unconsciousness	Combination of intravenous and inhalation medications	IV: Propofol, benzodiazepines and opioids Inhaled: sevoflurane, isoflurane, and desflurane
Multimodal anesthesia	Employs a diverse array of strategies, including regional anesthesia, non-opioid analgesics, and adjunct medications	Combination of intravenous and PO (by mouth) medications	Nonopioid medications (e.g., acetaminophen, nonsteroidal anti-inflammatory drugs, and gabapentinoids alongside regional techniques like spinal, epidural, or nerve blocks
Regional anesthesia	Encompasses a diverse set of techniques aimed at providing targeted pain relief to specific regions of the body	Spinal, epidural, and peripheral nerve blocks	Short acting: lidocaine and mepivacaine Long-acting ones are bupivacaine and ropivacaine
Moderate sedation (conscious sedation)	A controlled state of reduced consciousness that allows patients to undergo medical procedures while remaining responsive and able to maintain their own airways	Intravenous utilized for procedures such as endoscopies, dental treatments, and minor surgeries	Propofol, benzodiazepines, and opioids

TABLE 26.7 **Commonly Used Anesthesia**

General Anesthesia

The sophisticated medical technique that induces a reversible state of unconsciousness, allowing patients to undergo surgical procedures without experiencing pain, awareness, or discomfort is called **general anesthesia**. It involves a combination of intravenous medications and inhaled anesthetics. The intravenous drugs, often including an induction agent and muscle relaxants, initiate unconsciousness, while inhaled anesthetics maintain the state of general anesthesia throughout the surgery. Anesthesia providers carefully monitor the patient's vital signs, including heart rate, blood pressure, and oxygen levels, to ensure the patient's safety and well-being. General anesthesia allows for a controlled and pain-free surgical experience, making it suitable for a broad range of procedures, from minor surgeries to complex interventions. The advancements in anesthetic agents and monitoring technologies have contributed to the safety and precision of general anesthesia, making it an essential and integral component of modern surgical care.

General anesthesia involves a combination of inhaled and intravenous administration of medication. This combination is a cornerstone of modern anesthetic practice, offering a rapid and efficient means of inducing and maintaining a controlled state of unconsciousness during surgical procedures. Anesthesia providers administer intravenous (IV) anesthetics directly into the bloodstream, facilitating a quick onset of anesthesia and allowing for precise titration to achieve the desired depth of unconsciousness.

Intravenous medication in combination with inhaled medication offers advantages such as a smoother emergence from anesthesia, reduced risk of postoperative nausea and vomiting, and a faster recovery compared to inhaled anesthetics. However, meticulous attention to dosage, continuous monitoring of vital signs, and consideration of individual patient factors are imperative to ensure patient safety during the perioperative period. The intravenous route of administration remains a critical component in anesthesia administration, allowing for precise control and customization of anesthesia to meet the unique needs of each patient and each surgical procedure.

Multimodal Anesthesia

An evolving approach in perioperative care that seeks to optimize pain management by combining various techniques and medications to achieve a balanced and comprehensive analgesic effect is called **multimodal anesthesia**. Unlike traditional methods relying solely on opioids, multimodal anesthesia employs a diverse array of strategies, including regional anesthesia, nonopioid analgesics, and adjunct medications. By targeting pain from different angles, this approach aims to reduce reliance on opioids and to minimize the associated side effects such as respiratory depression and nausea. Incorporating nonopioid medications (e.g., acetaminophen, nonsteroidal anti-inflammatory drugs [NSAIDs], gabapentinoids) alongside regional techniques like epidurals or nerve blocks, provides a synergistic effect in pain control. The continual refinement of this approach underscores its growing importance in optimizing pain relief while minimizing the potential adverse effects associated with traditional opioid-centric analgesia. Multimodal anesthesia reflects a patient-centered paradigm in modern perioperative medicine, tailoring pain management strategies to individual needs and promoting a holistic approach to surgical care.

Regional Anesthesia

The diverse set of techniques aimed at providing targeted pain relief to specific regions of the body is called **regional anesthesia**. By interrupting nerve signals, regional anesthesia effectively blocks sensation to a localized area, allowing patients to undergo various surgical procedures without the need for general anesthesia. Common forms of regional anesthesia include spinal anesthesia, epidural anesthesia, and a peripheral nerve block. These techniques offer several advantages: reduced systemic exposure to anesthetic agents, decreased postoperative pain, faster patient recovery, and improved patient outcomes. Regional anesthesia is particularly well-suited for surgeries involving the extremities, abdominal, pelvic, and thoracic regions. The application of ultrasound guidance has enhanced the precision and safety of regional anesthesia, allowing for more accurate placement of needles and catheters. The versatility and efficacy of regional anesthesia make it an integral component of contemporary anesthesia practice, contributing to enhanced patient satisfaction and improved perioperative care.

Epidural Anesthesia

The widely employed technique in regional anesthesia, providing effective pain relief for various surgical procedures and obstetric interventions is called **epidural anesthesia**. It involves the injection of local anesthetic agents into the epidural space surrounding the spinal cord, providing a controlled and prolonged analgesic effect. Commonly used in obstetrics for pain management during labor and delivery and in the postoperative period, epidural anesthesia allows patients to remain conscious while experiencing reduced sensation in the lower half of the body. The insertion of a catheter into the epidural space permits continuous or intermittent administration of local anesthetics or opioids, tailoring the pain relief to individual needs.

Epidural anesthesia is favored for its versatility, providing targeted analgesia for abdominal, pelvic, and lower extremity surgeries. While generally considered safe, meticulous attention to sterile technique, proper dosage calculation, and continuous monitoring are essential to minimize potential complications. Potential problems include low blood pressure, headaches, temporary changes in bladder control nerve damage, and infection. The widespread use of epidural anesthesia underscores its efficacy in enhancing patient comfort and satisfaction across a spectrum of medical procedures.

Spinal Anesthesia

The well-established and widely utilized form of regional anesthesia that involves the injection of local anesthetic agents (e.g., bupivacaine, lidocaine) into the cerebrospinal fluid surrounding the spinal cord is called **spinal anesthesia**. This results in a temporary loss of sensation and motor function in the lower half of the body, facilitating various surgical procedures without the need for general anesthesia. Administered through a lumbar puncture, spinal anesthesia offers rapid onset and reliable anesthesia, making it particularly suitable for lower abdominal, pelvic, and lower extremity surgeries. Its advantages include a quicker recovery, reduced postoperative pain, and minimized systemic effects compared to general anesthesia. While spinal anesthesia is generally safe, careful patient selection, proper dosage calculation, and meticulous attention to sterile technique are essential for its successful administration. Patients are at an increased fall risk and due to the half-life of this type of anesthesia, pain can reappear quicker than other types. The technique's effectiveness and widespread applicability make spinal anesthesia a valuable option in modern anesthesia practice, contributing to improved patient outcomes and satisfaction in a variety of surgical settings.

Peripheral Nerve Blocks

A specialized form of regional anesthesia that involve the precise injection of local anesthetic agents near specific nerves to block sensation in a targeted region of the body is called a **peripheral nerve block**. This technique provides effective pain relief for surgical procedures or chronic pain management without the need for general anesthesia. By temporarily interrupting nerve signals, peripheral nerve blocks can result in complete or partial anesthesia, depending on the location and extent of the nerve block. Commonly used local anesthetics for peripheral nerve blocks include lidocaine, bupivacaine, and ropivacaine. The advantages of peripheral nerve blocks include reduced systemic drug exposure, decreased postoperative pain, and potentially faster recovery times. These blocks can be administered for various purposes, including orthopedic surgery, limb surgeries, and certain outpatient procedures. While the procedure is generally well-tolerated, careful consideration of the patient's medical history, and potential complications are crucial for the safe and effective administration of peripheral nerve blocks. The use of ultrasound guidance has enhanced the precision of these blocks, contributing to their growing popularity as an integral component of multimodal pain management strategies in contemporary medical practice.

Moderate Sedation

Also known as conscious sedation, **moderate sedation** is a controlled state of reduced consciousness that allows patients to undergo medical procedures while remaining responsive and able to maintain their own airways. During moderate sedation, patients are in a state of relaxed wakefulness, experiencing diminished anxiety and discomfort. This type of sedation is commonly administered by anesthesia providers or trained health-care professionals using medications such as benzodiazepines and opioids, which induce a calming effect and provide pain relief. It is important for the nurse to know what medication was used and how long its effectiveness will last. Pain will return immediately. If the nurse is aware of when the medication will possibly wear off, they can proactively administer pain medication to help with a smooth transition. While under moderate sedation, patients can respond to verbal commands and tactile stimulation but may have impaired memory of the procedure. The level of sedation is carefully titrated to achieve the desired effect while ensuring patient safety.

Moderate sedation is frequently utilized for procedures such as endoscopies, dental treatments, and minor surgeries, offering a balance between patient comfort and the ability to maintain vital functions independently. Close monitoring of the patient's respiratory status, cardiovascular function, and level of sedation is essential throughout the procedure to prevent complications and ensure a smooth recovery. Overall, moderate sedation plays a valuable role in facilitating a wide range of medical interventions while optimizing patient comfort and cooperation.

Monitored Anesthesia Care

The specialized approach to anesthesia that combines elements of local anesthesia and sedation to provide a controlled and comfortable experience for patients undergoing certain procedures is called **monitored anesthesia care (MAC)**. Unlike general anesthesia, MAC allows patients to remain conscious and maintain protective reflexes while alleviating pain and discomfort. During MAC, anesthesia providers administer sedative medications intravenously, tailoring the dosage to achieve the desired level of conscious sedation. Simultaneously, providers closely monitor vital signs, including heart rate, blood pressure, and oxygen saturation, to ensure the patient's safety and comfort. This form of anesthesia is commonly employed for minimally invasive procedures, such as

endoscopies, certain diagnostic tests, or minor surgical interventions. The key advantage of MAC lies in its ability to balance patient comfort and cooperation with the need for pain control, all while maintaining the flexibility for rapid conversion to general anesthesia if necessary. The vigilant oversight and personalized care provided during monitored anesthesia care contribute to its effectiveness in enhancing the overall patient experience during various medical interventions.

26.3 Intraoperative Nursing Management

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Explain appropriate application of the clinical judgment medical model (CJMM) for a patient during surgery
- Identify appropriate education for the patient during surgery
- Discuss potential complications and corresponding interventions during the surgical experience

Nurses play a pivotal role in ensuring the safety, comfort, and well-being of patients throughout the surgical journey. In the dynamic and intricate environment of the operating room, intraoperative nurses serve as crucial members of the surgical team, with responsibilities that range from patient advocacy and communication to aseptic technique and surgical site care. As advocates for patient safety and guardians of infection prevention protocols, intraoperative nurses contribute significantly to the seamless execution of surgical procedures.

The Clinical Judgment Measurement Model: The Patient During Surgery

The clinical judgment measurement model (CJMM) is a systematic and patient-centered approach aimed at ensuring the delivery of safe and effective care. For a patient who is having surgery, this includes the pre-operative, perioperative, and postoperative periods. The process typically begins with a thorough pre-operative assessment, where the nurse collects comprehensive information about the patient's health history, medications, allergies, and psychological status. This assessment lays the foundation for individualized care planning, addressing the unique needs and potential risks of the patient. During the intraoperative phase, nurses are actively involved in patient positioning, maintaining a sterile environment, and collaborating with the surgical team to ensure optimal conditions for the procedure. Continuous monitoring of vital signs, administering medications as prescribed, and addressing any emergent issues are crucial components of nursing care.

Nursing Care

In the intraoperative phase, nursing care plays a critical role in ensuring the safety, comfort, and well-being of the patient undergoing surgery. The intraoperative phase encompasses the time from when the patient enters the operating room until their transfer to the post-anesthesia care unit. Nursing care during this phase involves a range of responsibilities that contribute to the overall success of surgical interventions. Pre-operative assessments should encompass a thorough review of the patient's medical history, including chronic conditions, medications, and any potential age-related impairments. Monitoring vital signs becomes even more crucial in the older adult population, considering the heightened risk of cardiovascular and respiratory complications. Maintaining a normal body temperature is essential, as older adults may be more susceptible to temperature fluctuations. Particular attention should be given to preventing postoperative delirium, a common concern in older adults, through strategies like minimizing anesthesia exposure and ensuring a quiet, familiar environment during recovery. Additionally, collaboration with the patient's family or caregivers is vital, as they often play a significant role in providing support and ensuring continuity of care during the perioperative period. Communication strategies should be adjusted to accommodate potential sensory deficits or cognitive impairments.

LIFE-STAGE CONTEXT

Gerontological Considerations

When caring for older adults in the intraoperative phase, nurses must consider various gerontologic considerations to ensure optimal outcomes. Age-related changes, such as altered pharmacokinetics, need to be considered when caring for older adults. For example, older adults metabolize mediations at a slower rate and dosage should include renal considerations. They may have a more increased effect of medication due to decreased metabolism. Older

adults also have a reduced physiological reserve, meaning they often have multiple comorbidities that prevent "bouncing back" from anesthesia as fast as they could when younger and in a healthier state. Older adults tend to have blood pressures in the lower range after administration of anesthesia for longer periods of time than a younger, healthier people. Older adults are also at increased susceptibility to complications, such as airway complications and increased risk of infection, due to lower immunity thresholds, all of which necessitate a tailored approach.

Cultural competence is imperative in intraoperative nursing care to provide patient-centered and respectful treatment. Cultural considerations encompass a range of factors, including beliefs, values, practices, and preferences. Understanding a patient's cultural background enhances communication, builds trust, and contributes to positive patient outcomes. Language barriers may arise, requiring the use of professional interpreters to ensure accurate communication with the patient and their family. Respect for cultural norms regarding modesty and privacy is crucial when positioning and draping patients in the operating room. Moreover, dietary restrictions, religious practices, and rituals should be considered during pre-operative preparations and postoperative care. Cultural competence extends beyond the patient to the entire surgical team. Sensitivity to diverse cultural perspectives within the team fosters effective collaboration and enhances the overall quality of care.

CULTURAL CONTEXT

Religious and Spiritual Practices in the Operating Room

A cultural consideration in the intraoperative phase revolves around the use of human-derived products. For example, many Jehovah's Witnesses do not accept any human-derived product, such as blood, for medical treatment, as it is against their beliefs. Because surgical procedures can cause a need for blood transfusions, alternative medical approaches should be considered. Some Jehovah's Witnessess may be willing donate their own blood for use during the procedure, but this may not be an option for all. It is important to note that Jehovah's Witnesses' beliefs may vary, but health-care providers should plan for no use of human-derived products for these patient populations during surgery

(Cho et al., 2019)

Postoperatively, nursing care extends to the recovery phase, including monitoring for complications, managing pain, and facilitating the patient's transition to a stable condition. Effective communication with the patient, their family, and other health-care team members is important for fostering trust and ensuring the delivery of holistic care that aligns with the patient's unique needs and preferences.

READ THE ELECTRONIC HEALTH RECORD

Intraoperative EHR Information Verification

Patient Information
Name: Mrs. Joan Smith
Date of Birth: 03.04.1954
Medical Record Number: 290879999
Procedure: Emergency laparotomy for acute bowel obstruction confirmed by X-ray and CT scan
Allergies: Latex
Pre-operative Assessment:

- Vital Signs: Stable
- PMH: HTN, DM
- Medication: Metformin, lisinopril
- Social History: Lives alone, no one with her
- Surgical History: The appendix was removed when the patient was 7 years old.
- Surgical Consent: Signed and completed appropriately.
- Blood Consent: Declined due to religious beliefs.

- Advance Directives: Not available

1. What information on the EHR concerns you?
2. What information is the *most* concerning?
3. What is an expected finding?
4. What information should you question?

Recognizing Cues

The assessment phase of the nursing process during surgery is a foundational step in providing individualized and comprehensive care to the patient. This critical stage involves a thorough and systematic gathering of information about the patient's health status, medical history, and psychosocial factors. Pre-operative assessments include evaluating the patient's baseline physiological parameters, identifying potential risks and allergies, and obtaining a detailed medication history. Additionally, the nurse assesses the patient's emotional and psychological well-being, addressing any concerns or anxieties related to the impending surgical procedure. This holistic approach ensures that the nursing care plan is tailored to the unique needs of the individual. During the intraoperative phase, ongoing assessments involve monitoring vital signs, ensuring proper positioning, and promptly addressing any emergent issues. The assessment continues postoperatively, focusing on the patient's response to the surgical intervention, pain management, and the detection of potential complications. A comprehensive and diligent assessment is the cornerstone of effective nursing care during surgery, guiding subsequent interventions and contributing to the overall well-being and safety of the patient throughout the perioperative period.

REAL RN STORIES

Nurse: Elizabeth, MSN, RN, CNOR
Years in Practice: Six
Clinical Setting: Operating room in a large hospital
Geographic Location: Metropolitan area of Columbus, Ohio

We serve a diverse patient population in the inner city. This hospital is a Level II trauma center and is ranked the nation's top leader for oncology care. On average, this hospital completes a thousand or more intraoperative procedures monthly. This story reflects why the patient interview prior to the surgical procedure can make a difference in safety concerns in the intraoperative phase of care.

Just like any other workday, I came in to work and verified I was on the designated surgical team. I went to the nurse's station to familiarize myself with the first surgical procedure of the day. My patient, a 67-year-old woman, was scheduled for 7:30 a.m. for an above-the-knee amputation (AKA) on the right leg, due to the metastasizing of renal cell carcinoma to her bones. As I read through the patient chart, I noticed some red flags in the documentation and provider notes from her clinic visits the week prior. On her current medications list, it was noted she takes Plavix by mouth daily. There were also notes indicating uncertainty and hesitation about this procedure based on her anticoagulant medication, as noted by the surgical team in the clinic setting.

Prior to all surgical procedures, part of role as the intraoperative nurse is to pre-operatively assess and interview the patient before surgery. I ask important questions that can plan care in the intraoperative phase. As I walked into the pre-operative room, I quickly recognized cues that my patient was exhibiting anxiety and fear. I even noticed anxiety from her family members standing around her bed.

My first action was to introduce myself and ask her to tell me how she was feeling. As nurses, we sometimes forget to ask our patients how they are doing mentally because of our fast, repetitive routine checking boxes. She stated that she was still concerned about this procedure and was not sure she understood what was really going to happen. I read the consent form to her that she signed at the surgical clinic, and she stated she did not realize they would remove her entire leg above the knee. She thought they were just taking out the tumor on her tibia bone. I called the surgeon to come explain the procedure to her again for understanding.

After she agreed to the procedure, I asked if she stopped her Plavix for seven days for surgery. She replied that she taken her Plavix on her way to the hospital this morning and had not stopped it. She started to cry and stated that she didn't know she was supposed to stop it.

At this point I called the surgeon to come back to the patient's bedside, as there was now a safety risk for bleeding: first, because we are doing surgery very shortly, and second, because renal cell carcinomas tend to bleed uncontrollably. The surgeon explained to the patient the need to stop the medication for the next seven days and the procedure was canceled for today. I went over all the patient education related to pre-surgery instruction with the family at the bedside to make sure everyone understood the importance of following the plan of care. The intraoperative assessment and interview were crucial in identifying a safety risk. I was able to prevent the patient from unnecessary blood loss, and other potential complications during her surgical procedure.

Analyzing Cues and Prioritizing Hypotheses

In the nursing process for the patient during surgery, the diagnosis and identification of collaborative problems are integral steps aimed at formulating a precise and patient-centered care plan. Following the comprehensive assessment, nurses analyze the collected data to identify actual and potential health issues. Diagnosing involves synthesizing information to recognize the patient's responses to the surgical experience, potential complications, and any pre-existing conditions. Common nursing diagnoses during surgery may include impaired gas exchange, risk for infection, anxiety, and altered comfort. Collaborative problems, which require joint efforts with other health-care team members, are also identified. This collaborative aspect is crucial, involving effective communication and teamwork to address issues that fall beyond the scope of independent nursing interventions. The nurse collaborates with surgeons, anesthesiologists, and other health-care professionals to manage complex situations and ensure a seamless continuum of care. Accurate diagnosis and collaborative problem identification lay the groundwork for an effective nursing care plan, allowing the health-care team to anticipate, prevent, and address potential challenges, thereby promoting positive surgical outcomes and enhancing the overall well-being of the patient.

Generating Solutions

The planning phase of the nursing process for the patient during surgery is a meticulous and patient-centered endeavor that involves formulating a comprehensive care plan tailored to the individual's needs. Building upon the earlier stages, the nurse collaborates with the health-care team to establish clear and achievable goals and interventions. Planning encompasses a range of considerations, including the type of surgery, the patient's health status, and any potential complications. Strategies for maintaining aseptic technique, ensuring proper patient positioning, and managing pain are integrated into the plan. Attention is given to preventive measures, such as infection control protocols and risk reduction strategies. In collaboration with the patient, the nurse discusses the plan, sets expectations, and addresses any concerns. Flexibility is key, as the plan may need adjustments based on the evolving dynamics of the surgical process. Through effective planning, nurses strive to optimize patient outcomes, enhance recovery, and contribute to a positive and safe surgical experience for the patient.

Taking Action

The intervention phase of the nursing process during surgery involves the execution of a carefully devised care plan to ensure the safety, comfort, and well-being of the patient. Intraoperatively, nurses play a vital role in implementing aseptic techniques to maintain a sterile environment, assisting with patient positioning to optimize surgical access, and monitoring vital signs to address any deviations from normal parameters promptly. Medication administration, including anesthesia and other prescribed drugs, is carried out with precision. The nurse collaborates closely with the surgical team, providing essential information, anticipating needs, and addressing any emergent issues. Pain management interventions are initiated to ensure the patient's comfort postoperatively. Moreover, the nurse acts as an advocate, consistently communicating with the patient, their family, and other health-care team members to uphold the highest standards of care and keep all parties informed and reassured throughout the surgical process. The implementation of these interventions demands a blend of clinical expertise, compassion, and effective communication, reflecting the commitment of nurses to optimizing patient outcomes during the intricate phases of surgery.

Evaluating Outcomes

The evaluation phase of the nursing process for the patient during surgery is a critical step in assessing the effectiveness of the care plan and interventions. Nurses systematically review the patient's response to the surgical

experience, monitoring for expected outcomes and identifying any unanticipated complications. Parameters such as vital signs, pain levels, and the patient's overall well-being are continually assessed to gauge the success of the implemented interventions. The nurse collaborates with the health-care team, including surgeons and anesthesia providers, to ensure a holistic perspective on the patient's condition. Any deviations from the expected outcomes prompt a reassessment of the care plan, allowing for necessary adjustments to enhance patient recovery and address any unforeseen challenges. Continuous communication with the patient is maintained to gather feedback and address concerns. Successful evaluation of the nursing process not only contributes to positive patient outcomes but also provides valuable insights for refining perioperative care practices and promoting continuous improvement within the surgical setting.

UNFOLDING CASE STUDY

Care of the Surgical Patient: Part 2

See Care of the Surgical Patient: Part 1 for previous information on this patient.

Nursing Notes	**3/12/24, 9:30 a.m.** **Assessment** Patient is escorted to the OR suite with the surgical nurse. The patient is planned for general anesthesia. Education provided by intraoperative nurse regarding time frame a typical partial knee replacement operation typically lasts.
Flow Chart	**Intraoperative Patient Education** The nurse reinforced teachings from the surgeon, asking the patient if they have any follow-up questions. The nurse explains, we will start with inspection of the left knee joint. The surgeon will make an incision at the front of the knee. They will then explore the three compartments of the knee to verify that the cartilage damage is, in fact, limited to one compartment and that the ligaments are intact. If the surgeon feels that the knee is unsuitable for a partial knee replacement, they may instead perform a total knee replacement. The surgeon will have discussed this contingency plan with the patient before the operation to make sure they agree with this strategy. The intraoperative nurse explains a partial knee replacement operation typically lasts between 1 and 2 hours and explains the equipment and monitoring devices in the surgical suite and general anesthesia administration by the anesthesiologist. **3/12/24, 9:00 a.m.** Pre-intubation Blood pressure: 126/80 mm Hg Heart rate: 96 bpm Respiratory rate: 20 breaths per min Temperature: 98.1°F / 36.7°C Oxygen saturation: 98% on room air Physical examination: Head, eyes, ears, nose, and throat (HEENT): pupils equal and reactive to light, mucus membranes dry, no thyroid enlargement Lymphatic: lymphatic nodes were not swollen or enlarged Respiratory: respirations easy and unlabored, without dyspnea or shortness of breath, lungs clear with auscultation Cardiovascular: cardiac monitor displays normal sinus rhythm (NSR) with a rate of 96 bpm Abdomen: soft, denies pain, abdomen not distended, bowel sounds present all four quadrants Musculoskeletal: No weakness or numbness in all four extremities, moves all extremities with limited mobility of her left knee Skin: Warm and dry

Flow Chart	**3/12/24 10:00–13:00** Intraoperative phase: As the surgery begins, Mrs. Johnson was induced with general anesthesia, with the surgical team administering the medications. The anesthesiologist also administers antiemetics during the intraoperative phase to prevent her from hyperemesis postoperatively. The patient has several risk factors for hyperemesis postoperatively. These include female sex, history of prior reaction to anesthesia medications immediately postoperative, motion sickness, and a nonsmoker. The patient experienced very minimal estimated blood loss (EBL). Patient tolerated the procedure well. Patient had intermittent hypotensive readings with blood pressure ranging from 88/58 mm Hg, 90/60 mm Hg, 87/48 mm Hg during the surgery and received two 1,000 ml IV fluid over 3 hours. O_2 saturation remained 97–100%. Heart rate was 88 bpm to 112 bpm and sinus rhythm was borderline sinus tachycardia. Hypotension can be the result of significant blood loss, fluid shift, third spacing losses, lack of oral intake or changes in vascular permeability as a result of the anesthesia. **Assessment Post-Intubation** Blood pressure: 120/76 mm Hg Heart rate: 88 bpm Respiratory rate: 20 breaths per min Temperature: 96.0°F / 35.5°C Oxygen saturation: 100%
Diagnostic Tests/ Imaging Results	**Intraoperative pre-discharge to post-anesthesia unit (PACU)** **Intraoperative diagnosis: L knee x-ray of total left knee replacement.** The postoperative radiographic impression confirmed the left total knee replacement prostheses and their specific indications along with a detailed review of the patient post-surgical anatomic and critical angles, alignment, and correct positioning of femoral and tibial components was successful.

1. Which of the following choice(s) is/are based on the individualized plan of care when identifying the risks during surgery?

   Word Choices

   Fever
   Dysrhythmias
   Aspiration
   Seizures
   Bleeding

2. After the nurse prioritizes the patient's clinical problems and needs, identify the correct solutions from Option 2 with the correct complication, from the choices provided in Option 1.

Options for 1	Options for 2
Hypovolemia	Provide appropriate IV fluid management per provider order.
Emesis, PONV	Administer an antiemetic per provider order.
Hypertension	Administer antihypertensive as per provider order.

Options for 1	Options for 2
Depression, pre-operative	Prepare the postoperative team. The patient will require support and empathy when learning of the total knee replacement due to admitted depression.
Blood loss	Transfuse 1 unit red blood cells prior to discharge from the surgical suite.

Patient Education

Patient education is a pivotal component of nursing care during surgery, aiming to empower individuals with the knowledge and understanding necessary to participate actively in their care and recovery. Pre-operative education involves providing information about the surgical procedure, potential risks, and expected outcomes. This helps alleviate anxiety and fosters a sense of preparedness. Clear instructions regarding pre-operative fasting, medication management, and postoperative expectations contribute to a smoother perioperative experience. Intraoperatively, nurses educate patients about the monitoring devices, anesthesia administration, and any specific aspects of the procedure. Postoperatively, comprehensive education covers topics such as pain management, wound care, and activity restrictions. The nurse tailors information to the individual's learning preferences, ensuring comprehension and addressing any concerns. A well-informed patient is better equipped to collaborate in their care, make informed decisions, and actively participate in the recovery process. Patient education not only enhances the patient's experience but also plays a crucial role in promoting positive outcomes and preventing complications throughout the surgical journey.

Potential Complications During the Intraoperative Phase

The goal of any surgical procedure is to achieve optimal outcomes and promote patient well-being. However, the complexity of surgery inherently introduces the potential for intraoperative complications. Any complications can create challenges that require swift identification and management. From unforeseen changes in a patient's physiological status to technical difficulties within the operating room, understanding and addressing these potential complications are crucial for the surgical team.

Nausea and Vomiting

Nausea and vomiting are recognized as potential intraoperative complications that can significantly impact the well-being of patients undergoing surgical procedures. Referred to as PONV, this complication is multifactorial, influenced by patient-related factors, surgical characteristics, and the type of anesthesia administered. PONV can be distressing for patients, affecting their immediate postoperative recovery experience. Risk factors for PONV include female sex, a history of motion sickness or previous PONV, nonsmoking status, and the use of certain anesthetic agents. Anesthesia providers employ proactive strategies to minimize the risk of PONV, including the administration of antiemetic medications, appropriate fluid management, and the avoidance of volatile anesthetics or opioids when possible. As part of comprehensive perioperative care, anesthesiologists remain attentive to patient risk factors, continually refining strategies to reduce the incidence of PONV and improve the overall surgical experience.

Anaphylaxis

Anaphylaxis is a rare but critical intraoperative complication that demands immediate attention and intervention. It can occur in response to various substances, including medications administered during surgery (e.g., antibiotics, muscle relaxants) or latex-based products used for the procedure. Anaphylaxis manifests rapidly; patients may exhibit difficulty breathing, swelling, hypotension, and cardiovascular collapse. Anesthesia providers are trained to recognize the signs of anaphylaxis swiftly and respond with prompt and targeted interventions. These may include stopping the administration of the suspected allergen, administering epinephrine, providing supportive measures such as intravenous fluids, and ensuring adequate ventilation.

Preventive measures involve thorough pre-operative assessments to identify potential allergies and employing

alternative medications when needed. The unpredictability of allergic reactions necessitates constant vigilance and preparedness within the operating room, emphasizing the importance of comprehensive allergy histories and ongoing education for the entire surgical team. Prompt and effective management of anaphylaxis is paramount to ensure patient safety and mitigate the potentially severe consequences of this rare intraoperative complication.

Hypoxia and Other Respiratory Complications

A condition characterized by low oxygen levels in the body, **hypoxia** can result from factors such as airway obstruction, respiratory depression, or inadequate ventilation. Other respiratory complications may include bronchospasm, atelectasis, or pulmonary aspiration. Anesthesia providers use various measures to prevent these complications, including proper airway management, administration of supplemental oxygen, and vigilant monitoring of respiratory parameters. Endotracheal intubation and mechanical ventilation may be employed to secure and maintain the airway during certain procedures.

Timely recognition of these complications allows for immediate corrective actions, such as adjusting ventilation parameters, administering bronchodilators, or addressing airway concerns. The goal is to ensure optimal oxygenation and ventilation to prevent hypoxia and minimize the risk of adverse respiratory events during the intraoperative phase. Continuous assessment and proactive measures underscore the commitment of anesthesia providers to maintaining patient safety in the complex and dynamic environment of the operating room.

Hypotension/Hypertension and Other Cardiac Complications

Hypotension (low blood pressure) may result from factors such as excessive vasodilation, blood loss, or inadequate fluid replacement, potentially leading to compromised organ perfusion. Conversely, hypertension (high blood pressure) can be triggered by factors such as pain, anxiety, or a heightened sympathetic response to surgery. Anesthesia providers employ various strategies to maintain hemodynamic stability, including fluid administration, vasopressor or inotropic support, and careful titration of anesthetic agents. Continuous blood pressure, heart rate, and electrocardiogram monitoring is fundamental in the early detection of cardiac complications. Additionally, patients with pre-existing cardiac conditions may need clearance from their cardiologist before any surgical procedure.

Fluid and Electrolyte Imbalances

Fluid and electrolyte imbalances are potential intraoperative complications that require anesthesia providers to maintain physiological equilibrium and support optimal organ function. Surgical procedures can lead to shifts in fluid balance due to factors such as blood loss, third-space losses, or changes in vascular permeability. Anesthesia providers carefully monitor and manage fluid administration to prevent hypovolemia or fluid overload. Electrolyte imbalances, including disturbances in sodium, potassium, and calcium levels, may arise during surgery and impact cardiac, neuromuscular, and renal function. Regular assessment and correction of electrolyte levels are essential components of anesthesia care. Strategies such as intravenous fluid therapy, blood product transfusions, and the administration of electrolyte solutions are employed to address imbalances promptly. Advanced monitoring technologies, including arterial blood gas analysis and laboratory tests, aid in the real-time assessment of fluid and electrolyte status.

Residual Muscle Paralysis

Residual muscle paralysis, also known as postoperative residual neuromuscular blockade, is a potential intraoperative complication associated with the use of neuromuscular blocking agents (NMBAs) during surgery. These drugs induce muscle relaxation, facilitate intubation, and improve surgical conditions. However, incomplete reversal or prolonged effects of NMBAs can lead to residual muscle weakness and compromise respiratory function in the postoperative period, resulting in hypoxia or difficulties in spontaneous respiration. Anesthesia providers utilize neuromuscular monitoring techniques, such as train-of-four (TOF) monitoring (Figure 26.5), to assess the degree of muscle blockade and guide the administration of reversal agents like neostigmine or sugammadex. Ensuring complete recovery of neuromuscular function is crucial for patient safety and is part of the comprehensive approach to preventing postoperative respiratory issues.

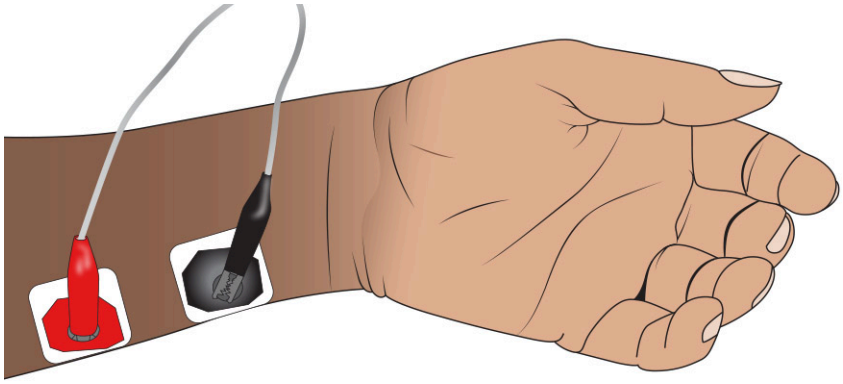


FIGURE 26.5 The train-of-four monitoring technique uses electromyography to determine the level of paralysis induced by medication. When the ulnar nerve is stimulated, if the fingers twitch four times, then the paralysis is less than 75 percent effective. When the fingers do not twitch, the paralysis is 100 percent effective. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Hypothermia

A patient's core body temperature dropping below the normal range, called **hypothermia**, is a potential intraoperative complication. Hypothermia can adversely affect metabolic processes, coagulation, and immune function, potentially leading to complications such as surgical site infections and delayed recovery. Surgical procedures, especially those involving prolonged exposure or open body cavities, can cause heat loss. Anesthesia providers mitigate the risk of hypothermia through the use of warming blankets, forced-air warming systems, and heated intravenous fluids. Maintaining normothermia is a key aspect of perioperative care, as it not only supports optimal physiological function but also enhances patient comfort and facilitates a smoother recovery.

Malignant Hyperthermia

The rare but potentially life-threatening intraoperative complication characterized by a hypermetabolic response to certain drugs, most notably volatile anesthetics and succinylcholine is called malignant hyperthermia (MH). MH manifests as a rapid and uncontrolled increase in body temperature, muscle rigidity, and a cascade of metabolic changes. The condition is primarily triggered by a genetic predisposition and affected individuals may not be aware of their susceptibility. Anesthesia teams undergo rigorous training to respond effectively to MH and must maintain a high level of vigilance to recognize the early signs. Common signs and symptoms include:

- Cardiac dysrhythmias
- Changes in CO_2 absorbance (temperature, color)
- Hypercarbia (excessive amounts of carbon dioxide in the blood)
- Hyperkalemia, hypercalcemia, lactic acidemia
- Hypoxia and dark (desaturated) blood in the operative field
- Metabolic and respiratory acidosis
- Muscle stiffness or rigidity
- Myoglobinuria (presence of myoglobin in the urine indicating muscle hypoxia)
- Peripheral mottling, cyanosis, or sweating
- Rising body temperature (1°C–2°C every 5 minutes)
- Pronounced elevation in creatine kinase level
- Tachycardia
- Tachypnea (may not be seen in a paralyzed patient)
- Unstable or elevated blood pressure

Immediate cessation of triggering agents, administration of dantrolene to mitigate the hypermetabolic state, and supportive measures such as cooling interventions are crucial in managing MH. Early detection and swift intervention are needed to prevent severe complications, including organ failure and death.

Neurological Problems

Neurological problems pose potential intraoperative challenges requiring careful management by anesthesia providers. Patients with pre-existing cognitive conditions, such as dementia, may experience heightened vulnerability during surgery, necessitating a tailored approach to minimize perioperative cognitive decline. Other

potential complications include prolonged awakening and paresthesia.

Prolonged awakening, although rare, can be attributed to various factors, including drug interactions, individual patient response, or incomplete metabolism of anesthetic agents. Anesthesia providers diligently monitor patients during the emergence phase to ensure timely recovery and address any issues contributing to delayed awakening. Physical signs include:

- Delayed responsiveness: the patient takes longer than expected to respond to verbal commands or physical stimuli
- Reduced consciousness: the patient remains in a stuporous or semi-conscious state for an extended period
- Slowed reflexes: the patient exhibits decreased or sluggish reflexes that persist longer than usual
- Impaired breathing: the patient exhibits shallow, irregular, or weaker than normal breathing patterns for an extended duration
- Low blood pressure: the patient exhibits low blood pressure longer than anticipated post-anesthesia
- Prolonged muscle weakness: the patient exhibits muscle relaxation and/or the inability to move or respond appropriately
- Paresthesia: the patient complains of abnormal sensations such as tingling or numbness; may occur due to nerve compression, positioning, or other factors related to the surgical procedure

Nurses must have a comprehensive understanding of each patient's medical history, and employ vigilant monitoring and proactive measures to optimize the overall safety and well-being of patients undergoing surgery.

Summary

26.1 Overview of the Surgical Experience

- Surgery can take place in various facilities. The most common is an inpatient hospital operating room. Others include ambulatory surgical centers, and specialty providers offices or clinics.
- Surgical procedures can be organized into three categories: elective, urgent, and emergency. Each requires the same type of diligent attention to detail, with the difference being how fast the procedure is scheduled.
- Suffixes in the name of the procedure signal the type of surgery to the health-care team members. For instance, -*ostomy* means artificial opening or creating an opening; -*plasty* means surgical repair or reshaping; -*scopy* means examination or visualization.
- To be a competent and safe nurse within the surgical team, one must fully understand the roles and responsibilities assigned to each team member. Team members consist of medical providers like surgeons and anesthesiologists, and specialized nursing roles like circulating nurse, scrub nurse, and RNFA. The team is also comprised of support staff who play a vital role in creating a seamless continuum of care.
- The surgical team functions as a cohesive unit, using a variety of skills and expertise to deliver comprehensive and patient-centered care throughout the perioperative process.
- Collaboration and communication among the surgical team members are pivotal, emphasizing the importance of a harmonious working relationship.
- The continuous commitment to excellence and collaboration underscores the significance of the surgical team in navigating the complexities of the operating room and ensuring a positive surgical experience for the patient.

26.2 Intraoperative Considerations

- The surgical environment is one that is strictly controlled to maintain best patient outcomes and reduce safety errors. Maintaining a secure and aseptic environment during surgical procedures is critical.
- Implementation of principles of surgical asepsis, sterile technique, and appropriate surgical attire minimizes the risk of infections.
- Surgical time-out is an evidence-based standard practice paramount for maintaining patient safety and reducing any errors during the surgical procedure.
- Meticulous planning and execution of patient positioning, tailored to the specific requirements of each surgical procedure, contribute to optimal exposure and accessibility while prioritizing patient safety.
- There are many types of anesthesia each with their own unique purpose. General anesthesia refers to a complete state of reversible unconsciousness. Moderate sedation means the patient remains conscious but has no pain or memory of the procedure.
- Airway management, a cornerstone in ensuring adequate ventilation and oxygenation, requires careful assessment and intervention by anesthesia providers to mitigate potential complications.
- The administration of anesthesia demands precision, and takes into account patient factors, type of surgery, and monitoring to achieve the delicate balance of inducing and maintaining a controlled state of unconsciousness.

26.3 Intraoperative Nursing Management

- The intraoperative nurse utilizes the clinical judgment medical model (CJMM) as a critical thinking tool to recognize and analyze cues for risks or complications related to the surgical procedure. Then, the nurse will prioritize the cues and develop a hypothesis for implementation of care. After the nurse acts through a seamless integration of aseptic techniques, vigilant patient monitoring, and collaboration with the surgical team, they will evaluate the outcomes to allow for real-time adjustments, ensuring the effectiveness of interventions.
- Patient education is a foundational aspect of nursing care. Education empowers patients with knowledge about the surgical process, monitoring devices, and postoperative care, allowing the patient to play a role as a vital team member.
- The nurse must use critical thinking and clinical judgement skills to prevent complications related to the surgical process. Examples of complications include blood loss, impaired airway, anaphylaxis, and impaired thermoregulation such as hyper- or hypothermia.

Key Terms

ambulatory surgical center (ASC) facility designed for outpatient procedures that do not require the patient to be monitored overnight

anesthesia awareness (also: *intraoperative awareness*) rare but potentially distressing phenomenon where a patient becomes partially or fully aware of their surroundings during surgery despite being under general anesthesia

anesthesiologist highly trained medical professional responsible for administering anesthesia, monitoring the patient's vital signs, airway, and managing the patient's pain during surgery

elective surgery non-emergent, planned procedure that is scheduled in advance based on the patient's preference, surgical procedure, location of procedure, and surgeon's availability

emergency surgery immediate, unplanned procedure performed to save a patient's life or prevent severe disability

epidural anesthesia injection of local anesthetic agents into the epidural space surrounding the spinal cord, providing a controlled and prolonged analgesic effect

general anesthesia involves a combination of intravenous medications and inhaled anesthetics

hypothermia body temperature below the normal range

hypoxia inadequate oxygen levels in the body's tissues

inpatient hospital operating room most common surgical setting for patients

intraoperative phase begins when the patient is transferred to the operating room bed and ends when the patient is transferred to the post-anesthesia care unit (PACU)

moderate sedation controlled state of reduced consciousness that allows patients to undergo medical procedures while remaining responsive and able to maintain their own airways; also known as conscious sedation

monitored anesthesia care (MAC) specialized approach to anesthesia that combines elements of local anesthesia and sedation to provide a controlled and comfortable experience for patients undergoing certain procedures

multimodal anesthesia combines various techniques and medications to achieve a balanced and comprehensive analgesic effect

peripheral nerve block specialized form of regional anesthesia that involves the precise injection of local anesthetic agents near specific nerves to block sensation in a targeted region of the body

regional anesthesia blocks sensation to a localized area, allowing patients to undergo various surgical procedures without the need for general anesthesia

registered nurse first assist (RNFA) controls bleeding during surgery, sutures incisions and wounds, and assists in stabilizing patients when necessary

RN circulator responsible for coordinating and managing various aspects of the operating room before, during, and after surgery; also known as a circulating nurse

scrub nurse tasked with maintaining the sterility of the surgical environment

spinal anesthesia well-established and widely utilized form of regional anesthesia, involves the injection of local anesthetic agents (e.g., bupivacaine, lidocaine) into the cerebrospinal fluid surrounding the spinal cord

sterile technique extends to the creation of a sterile field around the surgical site, ensuring that only sterile items come into contact with the patient and the surgical wound

surgeon medical doctor with extensive training in performing surgical procedures

surgical asepsis involves a set of practices designed to maintain a sterile field and prevent the introduction of microorganisms into the surgical environment

surgical environment controlled and sterile setting in which surgical procedures are performed, including the operating room, associated equipment, and related practices and protocols designed to maintain asepsis

time-out critical moment in the perioperative process designed to enhance patient safety and reduce the risk of errors

urgent surgery necessary procedure that must be performed promptly, usually within twenty-four to forty-eight hours

Assessments

Review Questions

1. A nursing student is reviewing information about the roles within the surgical team. What statement

demonstrates an accurate understanding of the role of the surgeon in the operating room?

a. The surgeon primarily manages the sterile field and passes instruments to the scrub nurse.
b. The surgeon is responsible for coordinating activities, obtaining necessary supplies, and ensuring aseptic conditions in the operating room.
c. The surgeon leads the surgical team, makes decisions during the surgery, and is responsible for the overall success of the procedure.
d. The surgeon administers anesthesia to the patient, monitors vital signs, and ensures the patient's comfort and safety.

2. A nursing student is studying communication within the operating room (OR) team. What statement best reflects the importance of effective communication among the surgical team members during a procedure?

a. Communication in the OR is optional, as everyone knows their role and responsibilities.
b. Effective communication in the OR is essential to ensure a positive work environment but has minimal impact on patient outcomes.
c. Communication in the OR is critical for ensuring patient safety, coordinating activities, and responding promptly to changes in the surgical environment.
d. Communication among the surgical team is primarily the responsibility of the circulating nurse, as they coordinate activities in the operating room.

3. During the intraoperative phase, what is the primary responsibility of the circulating nurse?

a. assisting the surgeon with the surgical procedure
b. monitoring the patient's vital signs and anesthesia administration
c. managing the sterile field and passing instruments to the surgeon
d. advocating for the patient's safety and coordinating activities in the operating room

4. A patient is scheduled for a surgical procedure to remove their gallbladder due to the presence of gallstones. What suffix would be the proper ending for surgical removal?

a. -otomy
b. -ectomy
c. -plasty
d. -scopy

5. What surgical setting would be appropriate for a patient needing a tonsillectomy?

a. inpatient
b. ambulatory
c. clinic
d. trauma hospital

6. The nurse is caring for a patient who has been diagnosed with acute appendicitis, with potential rupture. What surgical category would this patient fall under?

a. emergency
b. urgent
c. elective
d. none of the above

7. A nurse is preparing to participate in a surgical time-out procedure before a scheduled surgery. What is an example of a statement that accurately reflects the purpose and components of a surgical time-out?

a. The surgical time-out is an optional break for the surgical team to relax before the procedure.
b. It is a moment for the circulating nurse to review the patient's medical history with the team.
c. The time-out involves a review of important details by the surgical team to ensure patient safety before the surgery begins.
d. It is a mandatory waiting period for the patient to reconsider and provide consent for the surgery.

8. A nurse is preparing a patient for surgery and is reviewing the plan of anesthesia with the anesthesiologist. The nurse knows that what type of anesthesia involves the injection of a local anesthetic into the subarachnoid space, resulting in a reversible loss of sensation and motor function below the level of injection?
   a. local anesthesia
   b. general anesthesia
   c. epidural anesthesia
   d. spinal anesthesia

9. A nurse is preparing a patient for surgery and is responsible for ensuring appropriate positioning in the operating room. Why is proper patient positioning crucial during surgery? Select all that apply.
   a. to make the patient more comfortable
   b. to facilitate communication with the surgical team
   c. to optimize exposure of the surgical site and access for the surgical team
   d. to prevent the patient from seeing the surgical instruments

10. A nurse is monitoring a patient in the operating room who is positioned for surgery. What potential complications could be linked to improper positioning?
   a. enhanced surgical exposure
   b. facilitated communication with the surgical team
   c. increased risk of nerve damage or pressure injuries
   d. improved visual access for the anesthesia provider

11. An intraoperative nurse is caring for a patient who exhibits signs of malignant hyperthermia, including increased temperature and muscle rigidity. What is the priority nursing intervention in managing malignant hyperthermia? Select all that apply.
   a. administer antipyretic medications
   b. provide a cooling blanket and monitor vital signs
   c. continue airway management and administer dantrolene
   d. discontinue triggering agents

12. A nurse is caring for a patient with a history of cardiac complications who is scheduled for surgery requiring anesthesia. What is the nurse's primary role in collaborating with the anesthesia care team for this patient?
   a. administer prescribed anticoagulants to prevent clot formation
   b. monitor the patient's blood pressure and heart rate during the surgery
   c. educate the patient on the risks and benefits of anesthesia
   d. communicate the patient's history and relevant information to the anesthesia team

13. Utilizing the *analyze* step of the CJMM, what is a medical treatment that would be avoided for a patient who is a Jehovah's Witness?
   a. blood or blood products
   b. antinausea medications
   c. male surgical team members
   d. surgery performed on sabbath

14. During your intraoperative interview and assessment, you discover new information. What is a situation that would be contraindicated and indicate the need to contact the surgeon?
   a. Patient is anxious and fearful about the procedure.
   b. Patient did not use the entire bottle of surgical wash the night before.
   c. Patient did not stop taking anticoagulants seven days prior as instructed.
   d. Patient's wife forgot to pack additional contact lenses.

Check Your Understanding Questions

1. Describe the meaning of emergency/emergent surgical procedures.
2. The circulating nurse is coordinating the time-out and is feeling pressure from other members of the surgical team to skip or abbreviate the time-out. Why is the time-out necessary?
3. As a nurse, how would you prioritize the patient's surgical experience, and prep the surgical environment to ensure optimal care and support throughout the perioperative journey?
4. Describe sterile technique and its relation to surgical asepsis.
5. Explain three key points a nurse should include in the patient education for a patient scheduled for surgery regarding the intraoperative phase.
6. Describe the most important aspects of the *taking action* step when using the CJMM as a critical thinking tool for a patient in the intraoperative phase.

Reflection Questions

1. What communication skills should the nurse use to work with a large interdisciplinary team?
2. Describe the difference between general anesthesia and conscious sedation.
3. You are a nurse caring for a patient in the intraoperative phase. Identify an experience where you would apply the CJMM. Describe how you would utilize each step to ensure optimal care and safety for the patient during this critical phase of their surgical journey.
4. As a nurse caring for a patient undergoing anesthesia, consider the patient who has experienced hypoxia during past surgical procedures. What aspects must be assessed?

Critical-Thinking Questions about Case Studies

1. Refer to Care of the Surgical Patient: Part 2.
   The nurse is planning next actions for this patient. Select the cues the nurse should be aware of that are individualized for this patient during the intraoperative phase. Choose the appropriate cues from the choices provided in Option 1 that correlate to rationales in Option 2.

Options for 1	Options for 2
Routine use of ibuprofen	Bleeding
Prior history of hyperemesis as a related to anesthesia	Prevent aspiration and immediate post-extubation emesis
Depression	Unstable vital signs during surgery, drop in O_2 saturation
Increased anxiety	Patient will under anesthesia and unable to experience anxiety
Inability of surgeon to perform a partial knee replacement	Total knee replacement

Competency-Based Assessments

1. Conduct an internet search to find articles for best practices standards for airway management while providing intraoperative nursing care. Develop a presentation for your peers outlining what steps should be taken.

2. Draw a chart outlining the different positions used during surgery and provide one example of each procedure used for the identified position.
3. Develop a patient care education pamphlet for instructions prior to a knee arthroscopy. Share with your peers.
4. Develop a presentation to share with your peers about nursing care for a patient experiencing malignant hyperthermia.

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CHAPTER 27

Postoperative Care

FIGURE 27.1 Postoperative nursing care transitions the patient from surgery to recovery. (credit: Airman 1st Class Kyle Johnson/Joint Base Elmendorf-Richardson, Public Domain)

CHAPTER OUTLINE

INTRODUCTION Today, as the number and intricacy of surgical procedures performed increases, the nurse must remain up-to-date with best practice standards to achieve quality patient care. The perioperative specialization was recognized in nursing prior to 1889; however, the first documented reference is found in the appendix of the text *Notes on Nursing* by Florence Nightingale, which states, "The surgical nurse must always be alert, always on guard, against the lack of cleanliness, musty air, lack of light" (Salazar Maya, 2022, para. 2). Perioperative describes the time frame surrounding surgery encompassing the time between going to the facility, having the procedure, and then returning home afterward. This chapter discusses the last phase of perioperative nursing: postoperative care.

27.1 Postanesthesia Recovery and Care

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the admission and nursing priorities of a patient in the PACU
- Identify ways to manage postoperative nausea and vomiting
- Differentiate patient discharge to home versus patient transfer to another hospital unit from the PACU

Precision and compassion combine to help each patient through the path to successful recovery. Understanding and

meeting the unique needs of each postoperative patient is at the core of effective postoperative nursing. The transition of a patient from surgery to a **postanesthesia care unit (PACU)**, the hospital unit where patients are temporarily admitted after a surgery, requires different nursing duties and responsibilities, such as airway management and assisting a patient with postoperative nausea and vomiting. Understanding and effectively treating common postoperative complications are important in order to maximize patient comfort while mitigating potential complication risks. Nurses also face complex decisions when distinguishing between discharging patients to home or transferring patients to another unit from PACU.

Postanesthesia Care Unit Admission and Care

A smooth transition from a surgical operating room where the patient's vitals and airway are supported and monitored throughout the surgery into the PACU is a key element to a successful outcome for the patient. The **postoperative phase** begins when the patient is transferred to the PACU and ends when the patient is transferred to another unit or discharged home.

PACU nurses serve a bridge between a surgical procedure and the recovery process by acting as intermediaries that facilitate safe transitioning of the patient. Communication between the surgical team and the PACU nurse is important, as nurses relay relevant details regarding patient health status or unexpected findings to anesthesiologists and surgeons for immediate attention as well as plan ahead for what lies next in the patient's journey of care.

In many hospitals, there are two phases within the PACU: Phase I and Phase II. Each phase provides different levels of care and resources to the patient during the immediate postoperative recovery. A **phase I PACU**, often referred to as main or primary PACU, usually accommodates surgical procedures of higher severity as well as higher acuity patients. This unit is staffed with highly experienced nurses capable of overseeing complex cases requiring major surgeries or patients who present with significant comorbidities. Phase I PACUs offer advanced monitoring capabilities, sophisticated life-support systems, and an assortment of medications designed to address postoperative needs. Phase I PACUs focus on providing intensive postoperative care that ensures prompt intervention. Most patients who receive an endotracheal tube (ETT), or artificial airway, during surgery will have it removed during the phase I PACU stay. Patients are monitored for confirmation that the ETT is no longer required. Patients who have had serious and extensive surgery such as an open heart or thoracic surgery may retain the ETT and be transferred to an intensive care unit (ICU).

The **phase II PACU**, or an extended care unit, offers treatment for patients who need less acute support after surgery. Patients requiring less complicated surgeries or less immediate postoperative needs tend to visit phase II PACUs as the nursing assignment includes multiple patients, whereas phase I units may have fewer patients per nurse due to the higher acuity compared with phase II units. Patients do not transition from a phase I PACU to a phase II PACU as this is only a category of the acuity setting. A phase II PACU is common in same-day surgery and monitoring equipment and resources can be tailored specifically for less acute cases. Patients admitted to a phase II PACU still receive vigilant care, yet the surgeries are not as complex and a quicker PACU recovery is expected (Glick, 2024).

Assessment

As patients emerge from anesthesia, they move from the controlled environment of an operating room into the PACU where attention shifts to postoperative care immediately afterward. Once a patient is admitted into PACU care, the primary nursing priority is to assess the patient's physiological stability to facilitate a smooth recovery following anesthesia. Ensuring a stable airway for oxygen delivery is the priority of care. Monitoring vital signs such as heart rate, blood pressure, respiratory rate, and oxygen saturation levels are key nursing tasks. The standard for interval frequency of checking vital signs begins at every five minutes for the first fifteen minutes, and then every fifteen minutes after that if stable (Thran, 2018). In addition to the basic vital signs, nurses should assess heart rhythm as dysrhythmias may occur due to changes in fluids and electrolytes.

REAL RN STORIES

Nurse: Ezechiel, RN

Years in Practice: Thirteen
Clinical Setting: PACU
Geographic Location: Inner-city metropolitan hospital, MD

I was working on a busy phase II PACU. One of my patients was an older person who had undergone a left hip replacement (ORIF). The surgical procedure went smoothly with no noted complications or extenuating circumstances.

As I entered the patient's room to do a set of vital signs, I noticed he was alert and able to answer my questions. However, I did notice the patient breathing rather fast, at twenty-eight breaths per minute. He was taking quick shallow breaths, which I knew was an ineffective breathing pattern. The patient's temperature was 98.8 F, and pain level was 8 on a 0–10 scale. The patient's heart rate was 114 bpm, and his blood pressure was 136/88 mmHg.

I asked the patient's wife at the bedside, "Has he been breathing like this for a while?" Using my years of experience and critical thinking skills, I was able to immediately identify ineffective breathing. I grabbed a pulse oximeter and collected the patients SPO_2 at 88 percent. I immediately placed the patient on 3 L of oxygen per our facility's post-op protocol and notified the surgeon. Now that I was getting a closer assessment of the patient, I recognized his skin was pale and he was using his accessory muscles to breathe. This meant not only was his breathing ineffective, but he was working hard just to maintain this level of oxygenation. The surgeon arrived at the bedside and ordered the patient to be transferred to the intensive care unit (ICU) for closer monitoring, and more extensive oxygen therapy.

Close observation of a patient's level of consciousness, airway patency, and response to stimuli are vital to identify any signs of complications or adverse reactions from anesthesia. At the same time, nurses conduct surgical site assessments for bleeding, swelling, signs of infection, or other postoperative concerns that require immediate action. Additionally, nurses provide pain management, which is vital for patient comfort and healing (see Chapter 7 Pain Assessment and Management). Nurses also assess patient consciousness levels using standard scales while monitoring pain levels to ensure maximum comfort levels are reached.

The ABCs

In a PACU, a nursing assessment focuses on the ABCs—airway, breathing, and circulation—to maintain both immediate and ongoing physiological stability for those recovering from anesthesia and surgery.

Airway assessment by nurses involves:

- carefully evaluating airway patency
- looking out for obstructions or signs of compromise (e.g., secretions, swelling)

Promptly acting upon any concerns is needed through nursing actions, such as repositioning or using airway adjuncts (e.g., an oral airway, nasopharyngeal airway, or bag valve mask) (see Chapter 11 Gas Exchange, Airway Management, and Respiratory System Disorders).

Breathing assessment involves:

- monitoring respiratory rate and depth
- assessing breath sounds
- capnography
- assessing the need for supplemental O_2
- using pulse oximetry to measure oxygen saturation levels

LINK TO LEARNING

This video provides different examples of abnormal breath sounds (https://openstax.org/r/77AbnrmlBreath) most commonly heard.

Circulation assessments focus on:

- heart rate
- blood pressure
- temperature
- color, temperature of skin
- ECG
- peripheral pulses
- capillary refill

Patients who are not recovering well after surgery may show signs of dehydration, which may present as tachycardia, hypotension, weak pulses, and slow capillary refill. Patients may also exhibit signs of respiratory complications manifested by tachypnea, gurgling secretions in the airway, or irregular breathing. Comprehensive ABC assessments are performed regularly and consistently every fifteen minutes to detect any deviations from normal parameters early; prompt actions can ensure patient safety and recovery within PACU units.

UNFOLDING CASE STUDY

Care of the Surgical Patient: Part 3

See Care of the Surgical Patient: Part 2 for previous information on this patient.

Nursing Notes	**3/12/24, 13:15** **PACU Triage Assessment** The patient's postoperative diagnosis: Total left knee replacement. Patient received from surgery to Phase I PACU by the use of the ISBAR format of a handoff report. Patient is attended by the anesthesiologist and surgical nurse. Patient was extubated in surgery, is sedated, but arousable. Can open eyes and nods appropriately to simple questions, however continues to be very sleepy. Pallor color, cool, and dry to touch. Airway open and patent with minimal secretions. Patient suctioned orally with scant whitish color secretions. Lungs are clear on auscultation. Respirations 16 and easy, unlabored with adequate depth on inspirations. Heart rhythm: normal sinus rhythm (NRS) Respiration: 16 breaths per min BP: 100/68 mmHg Heart rate: 88 Temperature: 97.0 F Capillary refill of nailbeds < 2 sec Pulse oximetry 99% on 2 LPM nasal cannula Left knee dressing clean, dry, and intact. No drainage noted. Patient able to move lower extremities, including legs and feet on command. Left foot pale, cool to touch, able to move. Palpable bilateral pedal pulses both posterior tibial and dorsalis pedis. Patient moaning and grimacing whispering "pain." Patient had emesis after moving and settling on cart. **Physical Examination** HEENT: Pupils equal and reactive to light, mucous membranes dry, no thyroid enlargement. Lymphatic: Lymphatic nodes were not swollen or enlarged Respiratory: 16, easy, and unlabored Cardiovascular: HR 88, RSR on monitor, capillary refill good, < 2 sec. Abdomen: Soft, denies pain, not distended. No bowel sounds present all four quadrants. Musculoskeletal: Patient able to help roll side to side in bed to reposition. Patient able to move lower extremities, including legs and feet on command. Left foot pale, cool to touch, able to move. Palpable bilateral pedal pulses both posterior tibial and dorsalis pedis. Skin: Cool and dry **3/12/24 13:30** Patient vomiting yellowish bile-like liquid. Ondansetron 4 mg IV given per anesthesiologist order. Patient c/o pain, number 9 on pain scale. Hydromorphone 1 mg IV given Post pain reassessment with moderate relief reporting a pain score of 6. **3/12/24 18:15** Patient had a restless night, short periods of sleep. Continues with severe pain lasting 2 hours of relief after hydromorphone 1 mg IV administered. Continues with nausea and emesis. Ordered antiemetic provided throughout the night with relief of N/V. Voiding through the night, walking with walker and assist of one to the bathroom. Voiding measured at 300 ml during the shift. **3/13/24 06:00** Ambulate with walker and assist of one to bathroom Only tolerated liquids and few bites of dry toast for breakfast Pt N/V- Ondansetron 4 mg po every 4 hours for nausea or vomiting Ketorolac 30 mg IV every 6 hours (NSAID-anti-inflammatory) Psychological support and resources for depression and panic attacks provided by licensed

	social worker (LSW). Chaplin in to see patient per request. Advanced diet to regular per patient's preferences for lunch. Pain is controlled on hydrocodone 7.5 mg every 3 hours PO for a post pain assessment level of 5–6. IV changed to 0.9% at a rate of 125 ml/hour. K+ IV bolus of 20 meq in 100 ml 0.9% NS over 1 hour.
Flow Chart	**3/12/24 18:00** Transferred to observation bed Vital signs: BP: 106/72 mmHg Respiration: 20 breaths per minute HR: 90 bpm T: 97.9 F O_2 saturation on room air: 98% on room air **3/13/24 06:00** Vital signs: B/P: 108/72 mmHg HR: 76 bpm Respirations: 20 breaths per minute T: 98.1 Pulse oximetry on room air: 99% on room air
Lab Results	**3/13/24 06:00** WBC: 6.2×10^3 cells/mm^3 CBC with differential: pending Hgb: 14 g/dl Hct: 41% BUN: 14 mg/dl Creatinine: 0.09 mg/dl Na: 133 mEq/L K+: 3.2 mEq/L Cl: 94 mEq/L

Provider's Orders	**3/12/24 1315** Ondansetron 2 mg IV stat per anesthesiologist. **Labs stat:** CBC Electrolytes Hct Hgb Continuous IV Lactated Ringer's at the rate of 125 ml/hr Hydromorphone 0.5mg IV push every 30 min × 2. Hold if B/P < 90/50 Then hydromorphone 1mg IV push every 4 hours for moderate pain (4–6 on pain scale) Hydromorphone 1 mg IV every 3 hours for severe pain (7–10 on pain scale) When tolerating fluids: Switch to hydrocodone 7.5 mg po every 4 hours for moderate pain (4–6 on pain scale) Hydromorphone 7.5 mg every 3 hours for severe pain (7–10 on pain scale) Ondansetron 4 mg IV push slowly, over 30–60 seconds every 4 hours for nausea or vomiting Ketorolac 30 mg IV every 6 hours Ice chips, advance to clear liquids as tolerated Physical therapist to teach ambulation with assistive device when transferred to observation unit Discontinue O2. Maintain O2 saturation > 92%, if pulse O_2 drops below 91%, place O_2 2 LPM NC Transfer to observation unit once awake and VS, Pulse oximetry > 92%. Repeat labs in a.m.: CBC, electrolytes, Hct, Hgb **3/13/24 11:00** Discharge to home after dinner Discontinue IV Provide discharge instructions and review education for postoperative care of a total knee replacement. Begin home care physical therapy 3 × week for 2 weeks. Then continue with outpatient PT rehabilitation. Prescriptions sent to patient's pharmacy. Follow-up appointment made with surgeon in 2 weeks.
Diagnostic Tests/ Imaging Results	Total left knee x-ray: Unchanged from the last x-ray The postoperative radiographic impression confirmed the left total knee replacement prostheses and their specific indications alongside a comprehensive review of the assessment of important angles, alignment, and correct positioning of femoral and tibial components was successful.

1. Based on the patient's assessments and labs at 6:00 on 3/12/24, what are the most important nursing actions in caring for this patient? Select all that apply.

    a. IV fluid replacement of 0.9% NS
    b. obtain a CXR
    c. administer antiemetics as ordered
    d. ABT every 4 hours
    e. administer pain medication as ordered, observing for a BP of > 90
    f. do not administer ketorolac if administering hydromorphone for pain

2. What patient outcomes would most likely indicate the patient is improving and ready for discharge? Select all that apply.

a. The patient is eating regular solid food as tolerated.
b. The patient has metabolic acidosis.
c. The patient has multiple organ dysfunction syndrome.
d. The patient has K+ level of 4.0 mEq/L.
e. The pain is controlled with taking hydrocodone 7.5 mg every 3 hours po with a pain level of 5–6 post pain assessment.

Postoperative Nausea and Vomiting

Nurses play an invaluable role in postoperative care by managing **postoperative nausea and vomiting (PONV)**, or the excessive nausea and vomiting associated with administration of anesthesia. The nurse's role is to enhance patient comfort and avoid complications. Nursing approaches for managing PONV begin with conducting a comprehensive evaluation to detect early signs and symptoms, with open patient communication to better understand the nature and severity of nausea. Nurses consider contributing factors like pain or anxiety as part of the evaluation. Nurses administer antiemetic medications per provider order for each patient according to their medical history and type of surgery.

Maintaining proper fluid balance through intravenous therapy is essential to prevent dehydration in patients with compromised oral intake, especially due to vomiting (Siparsky, 2024). Encouraging good oral hygiene practices and providing oral care items to minimize nausea can be helpful. With a provider's order, patients usually start with clear liquids before progressing to regular foods as tolerated after an abdominal surgery. Patients recovering from short-term surgeries or those not requiring general anesthesia may begin on a regular diet as tolerated. Many same-day surgeries offer a full diet as tolerated (Ho et al., 2022).

CLINICAL SAFETY AND PROCEDURES (QSEN)

Volume Resuscitation for the Patient with PONV

The delivery of volume replacement for the patient with PONV will depend on the volume of fluids being lost. If volume loss is high, the nurse will anticipate hanging a crystalloid solution of 0.9 percent isotonic normal saline or lactated Ringer's solution. Hemodynamic monitoring with serial pulses, oxygen saturation, and blood pressures will gauge the patient's response to treatment. If the patient's fluid losses are low, other medications such as antiemetics may be considered to reduce the symptoms. Patients who have recently undergone any type of surgical procedure should be monitored closely for fluid volume loss.

Education is an integral component of nursing care for PONV management, and nurses should provide patients with vital information regarding potential triggers of nausea and vomiting. Continuously monitoring vital signs and evaluating patient responses to actions are also integral aspects of PONV treatment management duties performed by nurses. Collaboration among health-care team members, such as providers and anesthesiologists, ensures an integrated, holistic approach that tailors treatment according to the needs of each patient, and making adjustments to treatment plans as needed. Table 27.1 lists common medications used to treat PONV.

Medication	Class	Route of Administration	Typical Dosage	Common Side Effects
Ondansetron	5-HT3 Receptor Antagonist	Oral, IV, IM	4–8 mg	Headache, constipation, dizziness
Metoclopramide	Dopamine Antagonist	Oral, IV, IM	10–20 mg	Drowsiness, fatigue, restlessness

TABLE 27.1 Medications Used to Treat PONV

Medication	Class	Route of Administration	Typical Dosage	Common Side Effects
Promethazine	Antihistamine	Oral, IV, IM, Rectal	12.5–25 mg	Drowsiness, dry mouth, blurred vision
Prochlorperazine	Dopamine Antagonist	Oral, IV, IM, Rectal	5–10 mg	Drowsiness, orthostatic hypotension
Dimenhydrinate	Antihistamine	Oral, IV, IM	50–100 mg	Drowsiness, dry mouth, dizziness

TABLE 27.1 Medications Used to Treat PONV

Discharge or Transfer from the PACU

In the critical phase of patient discharge and transfer from the PACU, nurses take great care and attention in making sure each patient is prepared to continue into the next stage of recovery. Nurses play an instrumental role in patient transfers between hospital units by overseeing and communicating any pertinent information to a receiving unit. Nursing duties consist of conducting a detailed evaluation to confirm that patients fulfill all established discharge criteria, such as stable vital signs within acceptable ranges, effective pain management, and recovery from anesthesia without loss of baseline alertness and orientation. Additionally, nurses confirm the voiding and safe ambulation status of the patient, which is reported to the receiving nurse. Nursing responsibilities often extend to providing emotional support, addressing patient concerns, and helping with patient anxiety during this transitional phase. Patient and family education is important to help with the transition from one unit to the next.

INTERDISCIPLINARY PLAN OF CARE

Interdisciplinary Approach to Discharge Readiness

Nurses work within an interdisciplinary team and coordinate care for patients in the postoperative phase of recovery. The following professionals may be part of the team to determine discharge readiness:

- Postoperative nurse: Assesses subjective symptoms and objective data for recovery, and determines the patient's level for postoperative compliance.
- Surgeon: Assesses patients for stabilized vital signs and no signs of postoperative complications before implementing discharge orders.
- Pulmonologist and critical care intensivist: May be necessary if the patient was transferred to critical care unit after surgery. Sometimes complications are immediately resolved, and other times they are so severe that the patient requires sedation and intubation to maintain their airway.
- Case manager: Coordinates follow-up discharge appointments and referrals to any needed rehabilitation care or other community services such as arranging for home delivery of durable medical equipment.

Any time a patient is discharged from one unit and transferred into another unit, a formal system of communication known as ISBAR (introduction, situation, background, assessment, and recommendation) is used. All health-care personnel should follow this system when moving a patient from one unit to another to share information in a consistent manner. Using the ISBAR format meets the Quality Safety and Education for Nurses criteria (Rotolo et al., n.d.).

Table 27.2 gives an example of a discharge nurse, Marcus, preparing to transfer a patient, Ms. Johnson, from the PACU to an inpatient surgical unit, using ISBAR. Marcus contacts Lina, the receiving nurse on the medical-surgical unit. Lina acknowledges the information, reassuring Marcus that Ms. Johnson will be welcome at the surgical ward and her room is ready. Using ISBAR facilitates clear and structured communications exchange, encouraging a smooth transition of care while upholding patient safety during the transfer processes.

Stage	Information
I	Hello, Lina! This is Marcus RN from the PACU calling to give you a report for Kathy Johnson.
S	Kathy Johnson is a fifty-eight-year-old female postoperative patient who underwent a laparoscopic cholecystectomy at 0700. She is ready for transfer into your surgical unit now that it's 1015.
B	Ms. Johnson underwent an uncomplicated surgical procedure and is recovering well in our PACU. She's been here for approximately two hours, is awake, vital signs are stable, ondansetron 8mg was given at 0930 for nausea and 2 mg Morphine Sulfate IV was given at 1000 and is currently providing effective pain control from a previous rating of 8/10 down to 3/10.
A	Vital signs for this patient remain stable: heart rate is 80, blood pressure 120/70, and respiratory rate is 16, while oxygen saturation on room air is 98%. She is alert and oriented, moving all extremities well, reporting pain at 3/10 after morphine was given by IV. Her surgical dressings remain dry and intact without signs of bleeding or other complications.
R	I recommend transferring Ms. Johnson to your unit for ongoing recovery and monitoring, as she has started on a clear liquid diet of apple juice and is tolerating it well. She is ambulating with assistance and requires routine postoperative care. Please continue her pain management plan as prescribed while being mindful to any signs or complications. I will accompany her for a smooth transfer and provide detailed handover instructions as per postoperative instructions provided prior to surgery. Do you have any questions?

TABLE 27.2 Example of ISBAR Communication

Preparation for Discharge

Communication of postoperative instructions pertaining to wound care, medication administration, activity restrictions, and potential signs of complications are essential to a successful postdischarge for both patients and their caregivers (Figure 27.2). According to the National Institutes of Health, most patient medication errors and complications occur during these periods of transition (Flatman, 2021; Wheeler et al., 2018). Documenting patient conditions, nursing actions, and instructions accurately in their medical record ensures continuity of care and ensures effective collaboration among health-care providers. Collaboration among interdisciplinary team members such as anesthesiologists, surgeons, physical therapists, and occupational therapists is imperative to facilitate an uninterrupted transfer of care.

FIGURE 27.2 Nurses help prepare patients for discharge after surgery. (credit: Jacob Sippel, Naval Hospital Jacksonville Public Affairs/All Hands Magazine of the U.S. Navy, Public Domain)

LINK TO LEARNING

The Agency for Healthcare Quality and Research developed an evidence-based tool to simplify discharge planning called the IDEAL tool. Go to the AHRQ website to see an overview and printable checklist (https://openstax.org/r/77IDEALPlanning) for incorporating the IDEAL discharge planning tool.

Going Home after Surgery

When a patient is ready for discharge to their home, nursing responsibilities encompass making any follow-up arrangements, so the patient has all their appointments or home care instructions on hand. Depending on the patient's needs, nurses may also need to consult with the social worker to order **durable medical equipment (DME)** such as elevated toilet seats, walkers, or ambulatory devices in preparation for a discharge to home after surgery. By being diligent with these duties, health-care providers ensure a seamless experience for patients as they transition out from PACUs, postrecovery surgical units, and back to their homes.

27.2 Postoperative Pain Management

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Define how to assess the patient's postoperative pain
- Describe how to manage the patient's postoperative pain
- Discuss the nurse's responses when pain interferes with healing

Pain assessment and management are essential nursing duties to ensure patient comfort during the postoperative recovery phase. As patients wake from anesthesia, they frequently experience various degrees of discomfort caused by surgery, necessitating an extensive and tailored postoperative pain management plan developed in collaboration with the patient's health-care providers. To create a baseline for developing a successful plan, the nurse must understand key information about a patient's pain experience, including the location and quality of the pain and any aggravating or alleviating factors. Depending on the patient's pain, nurses can implement various therapies to alleviate discomfort and aid recovery, including administering analgesic drugs as prescribed or encouraging nonpharmacological techniques such as positioning, relaxation techniques, or distraction methods to promote patient comfort.

Assessment of Acute Postoperative Pain

Postoperative pain assessment is at the core of comprehensive nursing care during the postoperative recovery phase. As soon as a patient transfers from an operating room to the PACU, nurses take on the responsibility of evaluating postoperative pain severity. The first tasks of the pain assessment entail developing effective communication with patients and ascertaining their subjective experience of pain. An important consideration is that the expression of pain is subjective and should not be judged by the nurse to be different than what the patient claims it is.

Pain Scale Consideration

Nurses play an invaluable role in early recognition and management of acute postoperative pain, aiding patient comfort while speeding recovery time. Their attentive observation skills, effective communication, and use of assessment tools makes a substantial contribution toward early pain recognition and management, ultimately optimizing recovery process and recovery outcomes. The numeric pain scale is used most often, having the patient rate their current pain on a scale of 0–10 with zero being no pain and ten being the worst pain they have ever felt. Nurses must carefully consider specifics of the surgical procedure when assessing a patient's pain, while examining surgical sites for signs of inflammation or swelling that could worsen postoperative pain. Furthermore, nurses investigate potential factors that exacerbate or relieve postoperative pain such as patient movement or changes to body position. This continuous assessment allows for the development of personalized pain management plans tailored to each patient's unique needs and responses in the recovery phase.

As discussed in Chapter 7 Pain Assessment and Management, culture plays an essential role in shaping individual perception, expression, and management of pain, affecting patient experiences with the health-care system. Culture shapes how individuals communicate and display pain and may also affect health-care providers' assessments and interpretations of patients' pain, affecting the accuracy of pain assessments and decision-making regarding treatment decisions. Patients may also use complementary or alternative therapies alongside mainstream medical interventions, as dictated by their culture.

REAL RN STORIES

Nurse: Sarah, RN
Years in Practice: Four
Clinical Setting: PACU
Geographic Location: Central New Jersey

In the busy PACU, I welcomed Juan, a male patient after his appendectomy surgery. Initially uneasy and wincing occasionally in discomfort, Juan showed signs of distress during recovery, and I realized he spoke very little English. I recognized the necessity of effective pain assessment and chose the FACES pain scale, an international tool that transcends language barriers. While waiting for the charge nurse to call the medical interpreter, I explained this universal tool using facial expressions from no pain (smiling face) to severe suffering (tearful/crying face). I gestured toward the faces on the scale to convey their correlation to different pain levels, encouraging Juan to select a face that reflected his current discomfort. Despite his limited proficiency in English, Juan comprehended the visual scale and indicated moderate discomfort. At this time, the charge nurse brought in the cell phone with the medical interpreter on the line. The interpreter explained the pain scale to Juan, and then stated that Juan said his pain was moderate, a 6 out of 10 on the scale. By using the correct type of assessment scale, and a medical interpreter to address the communication barrier, I helped to ensure that Juan's pain was accurately evaluated and that his pain medication was adjusted accordingly.

Methods of Pain Management

Postoperative pain management is an integral aspect of patient care, comprising various strategies designed to mitigate discomfort and promote recovery. Pharmacological interventions are a primary approach, employing various analgesic medications such as opioids and nonopioids. Medication choices depend upon several factors, including type of surgery performed and patient medical history. Regional anesthesia techniques like epidural analgesia and peripheral nerve blocks offer targeted pain relief by temporarily impeding pain signals at specific

spinal sites. During the PACU phase, IV narcotic analgesics are very effective for acute pain. Typical opioids used in PACU settings include fentanyl, hydromorphone, morphine, oxycodone, oxymorphone, and tramadol (Mayo Clinic, 2024). An important concept for patients to understand is that postsurgical use of narcotics for acute pain will not lead to narcotic substance use disorder as it is meant to be short-term. An important note, however, is that for those who have a substance use disorder, higher doses to control postsurgical pain may be needed (Pashkova, 2020). Nonpharmacological interventions for postoperative pain management that can be used outside of the PACU may include physical therapy, heat and cold therapy, acupuncture and acupressure, rest, distraction, and position changes, which also provide a holistic approach for managing postoperative pain beyond the PACU setting.

Patient education and counseling play an essential part in providing pain management while encouraging active involvement in the recovery processes. Psychological interventions such as cognitive behavioral therapy and relaxation techniques aim to address psychological aspects of pain perception, while innovative techniques like virtual reality and distraction techniques may offer alternate forms of relief from postoperative discomfort. Health-care providers strive for comprehensive yet personalized management of postsurgical pain, tailoring interventions according to each patient's specific needs and the nature of the surgical procedure to optimize postoperative pain control management and achieve comfort for their patients.

Pharmacological Pain Management

In hospital settings, various pharmacological interventions are utilized to effectively manage postoperative pain and increase patient comfort. The provider may prescribe opioid analgesics such as morphine, oxycodone, and hydromorphone, which can provide effective pain management after surgery for moderate to severe discomfort. These medications work by acting on the central nervous system to relieve pain. Depending on the provider's order, the nurse will administer these medications intravenously, orally, or via a patient-controlled analgesia system. A patient-controlled analgesia (PCA) system is a method of pain management that allows the patient to push a button that administers the prescribed medication via an IV site. The nurse is responsible for regularly monitoring the PCA for proper functioning.

Nonopioid analgesics such as acetaminophen and nonsteroidal anti-inflammatory drugs (NSAIDs), such as ibuprofen or ketorolac, play an integral part in pain management strategies. Acetaminophen has long been recognized for its analgesic and antipyretic effects in postsurgical settings. Meanwhile, nonsteroidal anti-inflammatory drugs (NSAIDs) provide relief in muscle-skeletal surgeries. Local anesthetics may be administered using epidural catheters or nerve blocks in specific surgical locations to provide targeted pain management. Adjuvant medications, such as gabapentin or pregabalin, also known as anticonvulsants, have increasingly become part of postoperative pain management plans to enhance the effectiveness of analgesic medications and provide enhanced analgesia relief. Adjuvant medications work by modulating nerve signals, making them effective treatments for neuropathies like neuropathic pain conditions. By employing a multimodal approach, health-care providers hope to maximize pain relief while simultaneously minimizing any potential adverse side effects linked with any single class of medication.

These same medication classes may be given at discharge for the patient; however, they are transitioned from IV route with a fast onset, to the oral route, which has a more extended release. IV pain medication should not be administered prior to discharge because the patient must be monitored for signs of respiratory depression. Manageable pain control is a criterion for discharge (Certain et al., 2022).

Nonpharmacological Pain Management

Nonpharmacological pain management strategies form an integral component of holistic health care both within hospital settings and as self-care practices in daily life at home. While in the hospital, a provider's order needs to be obtained before these modalities may be applied. Table 27.3 outlines nonpharmacological methods that can be used in both the hospital and home setting (Skelly et al., 2020).

Method	Mechanism of Action for Pain Management
Physical therapy	Muscle relaxation helps to relieve pain by releasing endorphins. Muscle strength and endurance training help prevent pain.
Heat/cold therapy	Vasoconstriction and vasodilation are known to relieve pain at the nerve endings.
Massage, acupuncture, acupressure	Increase circulation, which encourages oxygenated blood flow to the muscle area.
Transcutaneous electrical nerve stimulation (TENS) units	Stimulation of the nerve cells blocks pain signals to the brain. Electrical pulses also release endorphins, a natural pain chemical.
Cognitive behavioral therapy (CBT)	Pain is managed by altering one's thought processes and repetition of behaviors to reduce pain.
Guided imagery, deep breathing exercises, and progressive muscle relaxation	Relaxation techniques are used to distract the pain sensation and redirect the pain gate signals.
Art, music, and pet therapy	Activities stimulate an increase in oxytocin, which induces relaxation and diversion from pain process.

TABLE 27.3 Nonpharmacological Approaches for Postoperative Pain Management

CULTURAL CONTEXT

Culture and Expressions of Pain

Varying cultures have diverse beliefs about the expression of pain. Some cultures encourage stoicism and may view the outward expression of pain as weakness, whereas other cultures embrace the expression of pain through crying loudly. Communication styles also impact how patients describe their pain, including language and euphemisms, making it important for the nurse to clarify what the patient means. Gender roles influence expressions of pain such as men downplaying their pain to be perceived as strong, whereas women may be more vocal about their pain. Family dynamics can also impact expressions of pain as some may rely on the patriarch or matriarch of the family to verbalize the pain of the patient.

When Pain Interferes with Healing

Painful events can greatly disrupt the natural healing process and present difficulty for patients recovering from surgeries or injuries. Compromised immunity can slow healing while increasing the risk for infections or any related ailments. Painful experiences often elicit physiological responses such as release of cortisol hormone; in excess, cortisol may impair immunity function, increase blood glucose levels, and hinder the overall healing process. Persistent pain may increase inflammation levels and contribute to a prolonged delay in tissue repair and an increase in scar formation, which can exacerbate existing conditions and cause greater scar formation. Painful conditions may restrict mobility and discourage patients from engaging in necessary physical activities and rehabilitation exercises that would support restoration of function and strength, further impeding healing efforts.

27.3 Hospitalized Postoperative Patient

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Explain the process of receiving a transfer from the PACU
- Discuss care of the postoperative patient in relation to differentiating normal versus concerning findings
- Describe interventions for the postoperative patient to promote healing

After a patient has undergone a surgery that requires a hospital stay, there will be a time of recovery from anesthesia in the PACU until a transfer to a recovery unit. The PACU stay will be for several hours until the patient is stable.

Accepting the PACU Transfer

The nurse who is accepting the PACU transfer should plan to receive pertinent info in ISBAR format. The receiving nurse should confirm there is a room ready to receive the patient. The nurse who is receiving a patient from PACU should expect to receive the following information about the patient:

- Patient information: full name, date of birth, and medical ID number, allergies, code status, previous medical history
- Surgery details: type of surgery, duration, and any complications that occurred, patient response to anesthesia
- Postsurgical drains: any drains, locations, and or dressings
- Vital signs: current and any significant patterns
- Fluid status: IV and blood products received, and current urine output
- Medications: medications and pain management
- Postoperative complications: focused assessment on respiratory status and hemodynamics such as bleeding
- Level of consciousness: orientation to person, place and time—current and baseline prior to surgical procedure
- Special needs: wound care, allergies, limitations to mobility, bariatric needs, language, special preferences postoperatively, names and relations of any family present
- Procedures: pending tests or procedures to be done after transfer

Care of the Postoperative Patient

Postoperative patient nursing care can be divided into various components that begin immediately in the PACU, continuing throughout the recovery period and beyond. The following is a list of nursing actions to care for a postoperative patient:

- Patient complete assessment: physical, mental, and vital signs
- Pain management
- Monitoring: vital signs, pulse oximetry, changes from baseline
- Fluid balance: provide fluid resuscitation as ordered, monitor imbalances between input and output (I&Os), noting a minimum of 30 ml/hr of urine production
- Surgical site/wound care
- Nutritional support
- Mobility and ADL assistance
- Patient and family education
- Preparation for discharge

INTERDISCIPLINARY PLAN OF CARE

Interdisciplinary Care for Patient Transfer

Nurses work with an interdisciplinary team and coordinate care for patients transferring from PACU to another unit within the facility, such as the intensive care unit (ICU). The following are examples of these team members:

- PACU nurse: provides handoff and transfer of care

- ICU nurse: receives handoff reports and accepts patient care
- Respiratory therapist: sets up any cardiopulmonary equipment such as a ventilator, or sleep apnea machine; provides the patient with education on pulmonary exercises such as incentive spirometer and breathing treatments.
- Surgeon: orders the transfer of the patient to an alternative unit, provides the receiving provider a handoff report, and orders any specialty referrals needed to manage patient care
- Case manager: coordinates ancillary departments needed for the patient's plan of care and coordinates resources for the family once the patient is able to be discharged

Postoperative Priorities

Care of postoperative patients requires acute clinical observation in order to distinguish normal recovery from potential complications. After surgery, it is common for patients to experience some discomfort, pain, and fatigue as part of postoperative recovery. Vital sign monitoring is a key part of general nursing duties and nurses need to be watchful for changes within normal ranges in vital sign readings. Initial heart rate and blood pressure spikes due to stress or pain may occur; however, any persistent abnormalities or substantial deviations from baseline warrant further examination. Monitoring surgical sites for potential signs of inflammation such as mild redness and swelling is also necessary for successful surgery outcomes. Drainage or minimal oozing may occur postoperatively, but any signs of excessive bleeding or an abnormal color change should prompt medical intervention and further evaluation.

While mild postoperative nausea is normal, persistent or severe nausea that leads to vomiting should be addressed quickly. Health-care providers should administer antiemetics and/or adequate fluid replacement as treatment measures, and nurses must remain alert for signs of dehydration or electrolyte imbalance that might require other intervention strategies. Dehydration may present with tachycardia, hypotension, poor capillary refill, disorientation, thirst, headache, and dizziness.

As postoperative patients are susceptible to atelectasis and pneumonia, routine use of an incentive spirometer as well as monitoring oxygen saturation levels can assist in early identification of potential respiratory complications (Figure 27.3). Persistent respiratory distress, increased oxygen requirements, or diminished breath sounds could signal more critical health concerns requiring immediate action to address. Mild confusion or disorientation immediately following surgery could be the result of residual anesthesia effects; however, persistent changes to consciousness or neurological deficits could signal complications like cerebral hypoxia or adverse reactions that require further evaluation. Thorough and frequent neurological assessments, including evaluation of orientation, strength, and sensory function, are crucial. Overall, keen observation, prompt intervention, and effective collaboration within health-care teams can help ensure optimal postoperative patient care.

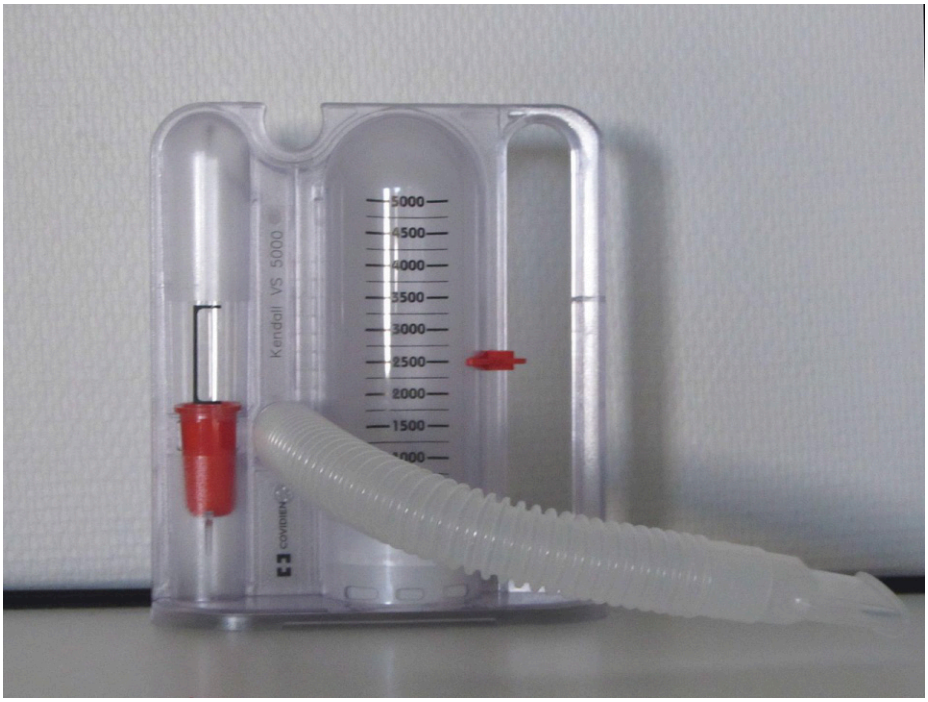

FIGURE 27.3 Patient use of incentive spirometry can decrease postoperative respiratory complications. (credit: "Incentive spirometer2" by Stefan Bellini/Wikimedia Commons, CC0 1.0)

Identifying Normal versus Concerning Findings

In postoperative care, nurses must be able to distinguish normal from abnormal findings to protect patient safety and ensure a successful recovery. Monitoring vital signs with an awareness of acceptable ranges is crucial to recognizing trends and concerning changes that need immediate attention. Adherence to pain control standards while remaining aware of signs that indicate complications or inadequate relief is a key component to effective pain management. Regular inspection of surgical sites is necessary to detect infections or any issues with wound healing, while respiratory and cardiovascular assessments help detect distress signs or complications, necessitating rapid intervention. Fluid balance, electrolyte status, and neurological assessments are essential in early identification of imbalances or deficits. Furthermore, monitoring of both digestive and urinary functions aids in the prevention of complications like ileus or urinary retention. Wound care and patient education on how to identify symptoms and adhere to postoperative instructions is important to promote positive patient outcomes. Effective communication with the interdisciplinary team as well as prompt reporting of concerns ensures comprehensive care that contributes to overall well-being of the postoperative patient (Bendowska, 2023).

REAL RN STORIES

Nurse: Alex
Years in Practice: Four
Clinical Setting: Medical-surgical unit
Geographic Location: New York

In a bustling surgical ward, I found myself facing a challenging shift. Amidst the flurry of patient care tasks, I received a call from the recovery room about a patient, Mrs. Martinez, who had developed a fever shortly after undergoing abdominal surgery. The patient appeared flushed and uncomfortable, with a temperature reading of 101.5°F. Sensing Mrs. Martinez's distress, I introduced myself and began a systematic assessment. I checked Mrs. Martinez's vital signs, noting her elevated heart rate and respiratory rate. I carefully inspected the surgical incision site for signs of infection, but it appeared clean and without new blood. I also inquired about Mrs. Martinez's pain level and any other symptoms she might be experiencing. I explained the possible causes of postoperative fever, including inflammation from surgery, atelectasis, or infection. With gentle reassurance, I assured Mrs. Martinez that we would work together to address her fever and ensure her comfort.

Drawing upon my nursing knowledge, I collaborated with the interdisciplinary team to develop a tailored plan of care. I initiated a fever-reducing medication and encouraged Mrs. Martinez to increase her fluid intake to prevent dehydration. I also collaborated with the physician to order blood tests and a chest x-ray to rule out underlying infection or pulmonary complications.

Over the next few hours, I diligently monitored Mrs. Martinez's condition, documenting vital signs and responses to treatment. As the fever began to subside, Mrs. Martinez's symptoms improved. My commitment to providing rapid, patient-centered care made all the difference. My proactive approach to assessing and treating postoperative fever exemplified the impact of nurses on positive patient outcomes.

Postoperative complications related to deep vein thrombosis (DVT) and pulmonary embolism (PE) require intensive nursing intervention to identify them quickly and initiate treatment. A thrombus is a clot, but when it moves to a different location such as the lungs or the head, it is known as an embolism. A clot to the legs generally lodges in the lungs, whereas a clot in the heart can lodge in the head (Bui et al., 2019). Postoperative patients are a risk for DVT and PE due to factors like immobility, surgery-related trauma, and altered blood clotting factors. DVT occurs when blood clots form in deep veins of the legs. Left untreated, DVT may develop into PE, which occurs when one or more blood clots break loose from their original location and travel directly into one or more pulmonary arteries, blocking these passages and preventing adequate airflow to tissues. Many nursing actions for the postoperative patient are to aid in prevention of these two complications. Early and frequent ambulation is key to stimulating blood flow and avoiding stasis as immobility increases circulatory stagnation. Leg exercises and ankle pumps can be used to promote circulation, and compression stockings, or sequential compression devices (SCDs) may be recommended to reduce the risk of blood clot formation in lower extremities. Health-care providers may prescribe prophylactic anticoagulant medication based on patient risk factors.

Even with preventive measures in place, nurses must recognize signs and symptoms of DVT, including swelling, tenderness, and discoloration of an affected limb, in order to recognize potential concerns about DVT promptly and report any concerning findings immediately. Symptoms of PE include sudden chest pain, shortness of breath, and increased heart rate, which should all be immediately treated as indicators of a problem. Proper patient education on reporting any unusual signs as soon as they occur as well as adhering to prescribed preventive measures are crucial. Any deteriorating respiratory problems require that the nurse sit the patient up in bed with pillow support, measure vital signs, including oxygen saturation, and call the provider immediately for further instructions. Possible postoperative complications are summarized in Table 27.4.

Complication	Clinical Presentation	Nursing Actions
Atelectasis	Decreased breath sounds, low oxygen saturation, dyspnea, tachypnea	Encourage deep breathing, coughing exercises, use of incentive spirometer, early ambulation and frequent repositioning of the patient, as well as monitor oxygen saturation
Dehiscence	Separation of wound edges, increased drainage, visible underlying tissues	Apply sterile dressings, notify the surgeon immediately, keep the patient calm, avoid strain on the wound, apply an abdominal binder if indicated
Deep vein thrombosis (DVT)	Swelling, pain, warmth, redness in one leg, positive Homans sign	Encourage early ambulation and leg exercises, apply compression stockings or SCDs, administer anticoagulants as ordered, monitor for signs of PE
Fever	Temperature > 101	Administer antipyretics, apply cool washcloths to forehead or feet, remove layers of sheets or clothing to cool patient

TABLE 27.4 Postoperative Complications (Stephenson et al., 2020)

Complication	Clinical Presentation	Nursing Actions
Hemorrhage	Hypotension, tachycardia, excessive bleeding at surgical site, decreased hemoglobin and hematocrit	Apply pressure to the bleeding site, notify the surgeon immediately, do not leave the patient, prepare for possible return to surgery, administer IV fluids and blood products as ordered
Infection	Redness, swelling, warmth, pain at surgical site, fever, purulent drainage	Maintain sterile technique during wound care, maintain strict adherence to hand hygiene practices, administer antibiotics as prescribed, monitor temperature and white blood cell count, educate patient on signs of infection
Nausea and vomiting	Nausea, vomiting, retching, abdominal discomfort	Administer antiemetics as prescribed, encourage slow and small sips of clear fluids, monitor for dehydration, maintain a clean and calm environment
Paralytic ileus	Abdominal distension, absence of bowel sounds, nausea, vomiting, constipation	Encourage ambulation, administer IV fluids, insert and manage nasogastric tube if ordered, monitor bowel sounds and abdominal girth
Pneumonia	Cough, fever, purulent sputum, chest pain, crackles on auscultation, dyspnea	Encourage coughing and deep breathing, use incentive spirometer, administer antibiotics as prescribed, monitor respiratory status, elevate the head of the bed
Pulmonary embolism	Cough, absent or diminished breath sounds, shortness of breath, chest pain, tachypnea, tachycardia, hemoptysis, cyanosis	Activate the hospital's alert system for medical rapid response team, provide oxygen at high flow mask for SaO_2 > 90%, administer anticoagulant low molecular weight heparin or thrombolytic therapy (alteplase)
Urinary retention	Inability to void, bladder distension, lower abdominal or back pain	Assess for urinary retention with bladder scan, catheterize if necessary and ordered
Wound infection	Redness, warmth, swelling, increased surgical site pain, purulent drainage	Clean wound with sterile technique and dressings, administer antibiotics

TABLE 27.4 Postoperative Complications (Stephenson et al., 2020)

Interventions to Promote Healing

Early mobilization and ambulation are encouraged as an essential way of avoiding postoperative complications and improving overall recovery. Respiratory care is of utmost importance, including deep breathing exercises, incentive spirometry use, and supplemental oxygen administration when necessary. Monitoring for signs of inflammation and regular dressing changes according to surgical protocol are integral parts of care management. Nutritional support should be tailored specifically to each patient; nutrient intake and feeding requirements should be taken into consideration.

Whenever a patient presents with symptoms of shortness of breath and increased respiratory rates, nurses should quickly identify and address potential sources of respiratory distress. At first, a nurse should ensure the immediate safety of the patient by offering a comfortable and upright position to facilitate maximum lung expansion. At the same time, nurses should measure oxygen saturation using a pulse oximeter and administer additional oxygen as necessary to ensure adequate levels. A comprehensive respiratory examination should then take place, including auscultation to identify any abnormal lung sounds such as wheezing, crackles, or decreased breathing patterns.

Assessing skin color and mucous membrane status of patients can give additional clues regarding oxygenation. Vital signs, including heart rate and blood pressure measurements, should be regularly assessed to detect signs of respiratory distress or impending respiratory failure. Based on assessment findings, nurses should promptly contact health-care providers to report patient symptoms as soon as possible and receive further advice for interventions or diagnostic evaluations. Other interventions could involve conducting arterial blood gas analysis to evaluate their respiratory status and initiating treatments such as bronchodilators as needed. Depending on the severity and underlying cause, additional diagnostic tests such as chest x-rays or CT scans may also be needed to pinpoint its source and find relief for respiratory distress.

Patient Education

Patient education plays a pivotal role in postoperative care as the patient is the center of care and needs to be involved in the care plan. Nurses should provide the patient with details regarding surgery procedures, recovery processes, and discharge instructions. For example, a patient may need to know how to correctly use an incentive spirometer, and the nurse should follow up on the patient's progress with the spirometer throughout the hospital stay to ensure adequate expansion of the lungs to prevent respiratory complications. In addition to clinical care, psychosocial support is integrated through the postoperative care plan to meet the patient's emotional needs: screen for anxiety or depression symptoms and encourage open dialogue among the patient, their family members, and the interdisciplinary team. Furthermore, nurses collaborate with interdisciplinary team members to plan discharge with assessments of self-care abilities as well as follow-up care plans designed to ease back into daily living.

27.4 Postoperative Nursing Care Plan

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Relate interventions for the postoperative patient to common postoperative concerns
- Describe the nursing plan of care to prevent complications during the postoperative period
- Discuss the role of the nurse in providing education and psychosocial support to the postoperative patient and their family

Establishing a postoperative care plan is an integral aspect of nursing practice and must include everything a patient needs for optimal recovery while mitigating potential complications. An effective care plan should be customized to the needs of the individual patient. The process begins with an evaluation of a patient's health status as well as any preexisting health issues or concerns they have. From this information gathered during an assessment, a nurse can identify specific nursing diagnoses, such as reduced mobility, knowledge deficit, risk of infection, or altered comfort that will serve to guide goal setting and intervention strategies (Rao et al., 2021).

Goals set during postoperative care plans aim at meeting both physiological and psychological needs for each patient during recovery, including preventive measures, monitoring protocols, and interventions to address potential complications. Communication is at the center of creating care plans. Communicating key details regarding patient conditions, goals, and interventions between health-care team members, including dietitians and physical therapists, can promote collaborative and cohesive care delivery. Furthermore, postoperative care plans often extend well beyond postsurgical recovery to incorporate education and discharge planning. Nurses provide guidance to both their patient and the patient's support system about postoperative care, potential complications to monitor for at home, and follow-up appointments. This proactive approach allows and encourages active participation from everyone involved during recovery.

Common Postoperative Concerns

Ongoing assessment includes vital signs, pain levels, respiratory and cardiovascular status, surgical site condition as well as the emotional well-being of a patient. Regular assessments allow the nurse to adapt the care plan as required, keeping up with evolving patient needs and recovery progress. The most serious postoperative complications, as previously discussed, include a DVT or PE. Additionally, hemorrhage from a surgical site can cause hypotension, changes in hemodynamics, and shock. The most common postoperative concerns are typically postoperative nausea and vomiting (PONV), pain, hemodynamic changes, and urinary retention.

Postoperative Nausea and Vomiting

Assessing and treating PONV are integral components of nursing care for surgical recovery patients. Nurse assessments begin by reviewing each patient's medical history and symptoms to identify potential risk factors of PONV, such as previous episodes of motion sickness or recent surgical procedures that increase PONV risk. After surgery, nurses monitor patients closely for any signs and symptoms of PONV, including patient reports, facial expressions, and physiological indicators like increased salivation or pallor (Jin et al., 2020). There are pharmacological and nonpharmacological interventions the nurse can use to help decrease PONV.

Pain Management

Effective postoperative pain management is key for optimizing patient comfort and supporting recovery. Combining both pharmacological and nonpharmacological interventions tailored to an individual patient's specific needs and the nature of surgical procedure should be used. Pharmaceutical interventions might include taking analgesics. Nurses carefully assess a patient's level of pain using validated pain scales and administer analgesics as recommended by health-care providers. As discussed earlier, there are pharmacological and nonpharmacological interventions the nurse can use to help decrease postsurgical pain.

Hemodynamics

Managing postoperative hemodynamics requires vigilant observation and intervention by the nurse to protect the patient's cardiovascular function and to avoid potential complications. Hemodynamics deals with the flow of blood and the body's ability to perfuse tissues, which is measured by blood pressure and pulse. Nurses frequently monitor vital signs following surgery to evaluate a patient's overall hemodynamic status. Continuous electrocardiogram (ECG) monitoring provides real-time information regarding cardiac rhythm, allowing early identification of any arrhythmias or abnormalities that might develop. Hemodynamics reflect tissue perfusion and adequate oxygenation. Central venous pressure or pulmonary artery pressure monitoring may be utilized to assess fluid status and cardiac function more accurately. Nurses may need to administer intravenous fluids and medications to support hemodynamic stability. Fluid management should consider each patient's individualized needs, surgical factors, and potential comorbidities to avoid both hypovolemia and fluid overload.

Nurses monitor and are prepared to respond to changes of cardiac function, specifically hypotension or hypertension. For hypotension, nurses may give a **bolus** (a single large dose of fluid) to increase blood pressure per the provider's order. When electrolytes are increased and blood pressure is low, often a simple bolus of normal saline can restore normal hemodynamics and balance the electrolytes. For hypertension, nurses need to evaluate the cause, which may be from pain, emotional stress or fear, or cardiac overload of fluids. With a provider's order, interventions may include diuretics to help the body rid excess fluid and avoid peripheral edema and respiratory congestion.

As indicated, **inotropic** (medications that impact the speed of cardiac contraction) or vasopressor medications may be administered to optimize cardiac output and blood pressure. Assessing peripheral perfusion is important, and nurses need to monitor skin color, temperature, capillary refill time, and peripheral pulses closely in order to spot indicators of inadequate tissue perfusion. Recognizing and taking prompt corrective action upon any deviations from baseline hemodynamic parameters is of vital importance. Nursing interventions for postoperative hemodynamics management may include changing a patient's position, providing oxygen therapy, or initiating fluid resuscitation/vasopressor support as directed by the health-care provider. Nurses should communicate any concerning findings to the provider immediately to facilitate prompt interventions and modifications of a patient's care plan. Patient education is important, especially focusing on discharge planning, to help the patient understand the impact of the surgery on their circulatory system and when to call their provider.

If a nurse detects a postoperative patient is experiencing low blood pressure or tachypnea after surgery, immediate action must be taken. Nurses should immediately conduct an ABC assessment to pinpoint potential sources of hemodynamic instability and identify any possible solutions. When there are signs of compromised airway or breathing conditions, interventions such as repositioning, administering additional oxygen therapy, or calling for respiratory support should be implemented immediately. Concurrently, a nurse should assess the surgical site for signs of bleeding or hematoma that might explain any observed decreases in blood pressure. Communication between the nurse and the health-care provider is of utmost importance at this point in order to report findings, discuss possible causes, and get guidance regarding further interventions. Based on the severity of a situation, additional actions could include administering intravenous fluids or medications or prepping for advanced

monitoring or interventions. Close monitoring, ongoing assessment, and effective communication with the health-care team are all integral parts of responding effectively to postoperative hemodynamic instability as a nurse.

Urinary Retention

Nursing management of postoperative urinary retention includes proactive assessment, monitoring, and intervention to address potential complications related to impaired urinary elimination. The inability to urinate after surgery even when the bladder is full is called **postoperative urinary retention (POUR)** (Pomajzl & Siref, 2023). After surgery, nurses regularly assess a patient's urinary status by tracking intake and output as well as asking the patient about any difficulty or discomfort experienced while urinating. Patients at risk of postoperative urinary retention include those who have undergone lower abdominal or pelvic surgeries, have received epidural anesthesia, or have an established history of urinary issues. Nurses ensure the patient has access to a bedside commode or urinal and should encourage frequent attempts at voiding. When a patient reports difficulty or inability in passing urine postoperatively, nurses can implement various strategies for managing urine retention. These may include providing privacy and an unhurried environment in which to void, aiding with positioning that promotes relaxation of pelvic floor muscles, and providing ample hydration to promote urine production. In certain circumstances, nurses may utilize bladder scanning technology to assess urine volume in the bladder and ascertain the need for intervention.

If noninvasive measures prove ineffective, catheterization might become necessary under medical guidance and the provider's order. Intermittent straight catheterization may help relieve urine retention and avoid complications such as urinary tract infections or bladder distension. Catheterization should be used only as a last resort due to associated risks with infection. Generally, if an indwelling urinary catheter was placed during surgery, it is removed within six hours postoperatively. Research indicates the quicker a urinary catheter is removed after surgery, the less risks the patient has for long-term infections (Gad & AbdelAziz, 2021).

Patient education plays a vital part in nursing management for POUR. Patients should immediately be assessed if they report any difficulty with voiding and practice strategies to support normal urinary function. Routine evaluation of urinary output, assessment of signs and symptoms of bladder distention, and ongoing communication with patients contribute to effective nursing management of POUR. In many facilities, it is a requirement for the patient to urinate once before being allowed to return home after a same-day surgery.

Prevention of Complications

Prevention of complications is an essential aspect of nursing care for postoperative patients. Nurses need to monitor, assess, and intervene quickly to handle potential complications such as infections, respiratory ailments, or thromboembolic events. Implementation of evidence-based practices like proper wound care, administration of prescribed medications, and early patient ambulation has proven highly successful in mitigating adverse events and improving recovery times. Patient education on warning signs, postoperative care instructions, and follow-up appointments empower individuals to actively take part in their recovery while seeking timely assistance when needed. Nurses' expertise in anticipating, identifying, and responding to potential complications benefits both patients and health-care delivery systems by decreasing hospital readmission rates, hospital-acquired infections, and their associated costs.

Decreasing Aspiration Risk

Aspiration can pose serious danger, particularly to postoperative individuals who may experience altered consciousness or compromised protective airway reflexes. Preventing aspiration in postoperative patients is of vital importance, and nurses play a pivotal role in ensuring patient safety during recovery phase. Nurses assess risk factors associated with the effects of anesthesia as well as the presence of comorbidities and employ positioning techniques (e.g., keeping the head of the bed ≥30 degrees) that lower regurgitation risks. Patients must adhere to preoperative fasting guidelines and tolerate the gradual return to oral intake postoperatively, to prevent aspiration during recovery. Nurses should actively watch for any signs of aspiration, such as coughing, choking, or respiratory distress, to identify patients who require emergency intervention such as withholding oral intake until the patient's protective reflexes and swallowing ability has fully returned.

Decreasing Respiratory Impairment Risk

Nurses bear a responsibility to safeguard postoperative patients' respiratory function as compromised breathing

poses significant health risks during recovery. As part of postoperative patient care, nurses monitor respiratory status by measuring oxygen saturation levels, respiratory rates, and chest movement. Early mobilization, incentive spirometry, and deep breathing exercises are integral parts of nursing interventions to maintain lung expansion and avoid atelectasis. Patients with obstructive sleep apnea are also at risk for postoperative complications. They should be monitored for adequate oxygenation after surgery. Pain management strategies must also be strategically applied in order to provide patient comfort without suppressing respiratory function. Prompt assessment and interventions such as improved positioning, administration of additional oxygen therapy, or collaboration between medical services providers and respiratory therapy services promotes positive patient outcomes. Effective patient education on the significance of good respiratory hygiene practices and early ambulation allows individuals to actively take part in their respiratory health care, reducing the risks of postoperative complications while hastening recovery.

Decreasing Clot Risk

Preventing blood clot formation, particularly DVT and its potentially life-threatening complication of a pulmonary embolism (PE), is an integral component of nursing care for postoperative patients. Nurses play a pivotal role in providing effective thromboprophylaxis strategies such as early mobilization, use of sequential compression devices (SCDs) (Figure 27.4), compression stockings, and anticoagulant medications as part of evidence-based protocols for prevention.

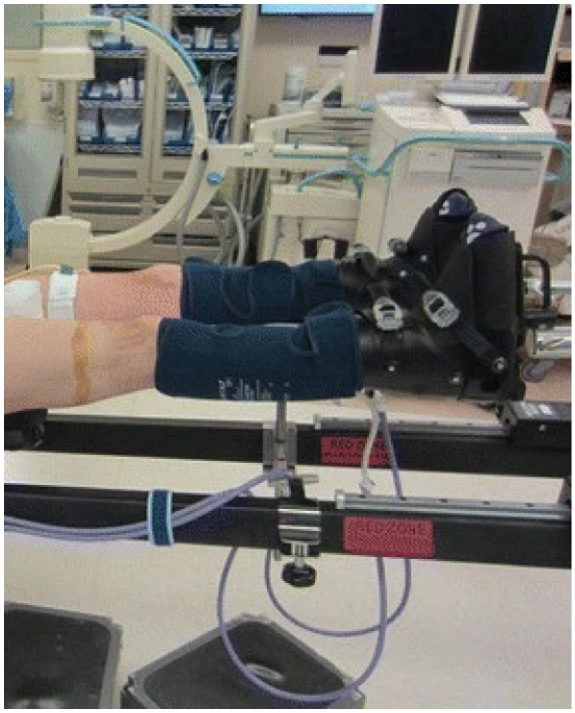

FIGURE 27.4 Use of SCDs or compression stockings can reduce the risk of DVT complications. (credit: modification of "Figure 1" by Ziran, N.M., Sherif, S.M. & Matta, J.M./ Patient Safety in Surgery Journal, CC BY 4.0)

Regular assessments of risk factors associated with blood clot formation such as immobility, type of surgery performed, and any coexisting diseases inform an individualized prevention plan tailored specifically for each patient. With thorough education on the symptoms and prevention measures associated with thromboembolic events, nurses can empower patients to actively take an active part in ensuring their own safety. Nurse work closely with interdisciplinary team members to ensure that prevention plans can be customized as required to minimize risk and enhance postoperative patient well-being.

Decreasing Infection Risk

SSIs or surgical site infections are a quality assurance risk that all members of the health-care team must diligently reduce. Surgical wounds are susceptible to bacterial contamination that can result in life-threatening complications. Preventing infection should always be a priority when caring for postoperative patients. As preventive measures, nurses utilize aseptic practices, and ensure proper hand hygiene, sterile dressing changes, and meticulous wound

care. Monitoring for signs of infection at surgical sites, such as redness, swelling, warmth, or drainage, allows for early identification and intervention (Figure 27.5). Administering prescribed antibiotics and promptly removing drains and catheters also help to combat infection. Patient education on wound care, hygiene practices, and reporting any signs of infection helps individuals take an active part in their own recovery while aiding early detection.

FIGURE 27.5 Redness and swelling are signs of infection. (credit: "Figure 1. Examples on the different types of infection" by Bjerknes S, Skogseid IM, Sæhle T, Dietrichs E, Toft M/PLOS Journals, CC BY 4.0)

CLINICAL SAFETY AND PROCEDURES (QSEN)

Preventing Postoperative Complications

Preventing postoperative complications is a critical aspect where QSEN competencies are directly applicable. Here's how nurses observe QSEN competencies to prevent postoperative complications:

1. Patient-centered care
   Involving patients and families: Nurses involve patients and their families in the care plan, ensuring they understand postoperative care instructions, potential complications, and when to seek help.
   Respecting patient preferences: Tailoring pain management and care plans according to the patient's needs, cultural backgrounds, and preferences enhances recovery and reduces the risk of complications.
2. Teamwork and collaboration
   Effective communication: Nurses communicate clearly and regularly with the surgical team, anesthesiologists, and other health-care providers to ensure a seamless transition of care and address any issues promptly.
   Interdisciplinary collaboration: Collaborating with physical therapists, dietitians, and other specialists helps in creating a comprehensive care plan that addresses all aspects of patient recovery and reduces the risk of complications such as deep vein thrombosis (DVT) and pneumonia.
3. Evidence-based practice
   Implementing best practices: Nurses stay informed about the latest evidence-based guidelines for postoperative care, including infection control, pain management, and early mobilization strategies.
   Continuous education: Engaging in lifelong learning ensures that nurses are up-to-date with the latest research and techniques to prevent postoperative complications effectively.
4. Quality improvement
   Monitoring outcomes: Nurses participate in quality improvement initiatives by tracking postoperative outcomes, identifying trends, and contributing to the development of strategies to improve patient care.
   Feedback and reflection: Regularly reflecting on care practices and outcomes allows nurses to identify areas for improvement and implement changes to prevent future complications.
5. Safety
   Preventing infections: Adhering to strict aseptic techniques and protocols for wound care, catheter care, and

hand hygiene minimizes the risk of postoperative infections.
Medication safety: Carefully managing and administering medications, including anticoagulants and antibiotics, to prevent complications such as DVT and surgical site infections.
Fall prevention: Implementing safety measures such as ensuring the patient's environment is free of hazards and assisting with ambulation to prevent falls during the postoperative period.

6. Informatics
Electronic health records (EHR): Utilizing EHRs to document and track patient information accurately, ensuring that all members of the health-care team have access to up-to-date patient data.
Decision support systems: Using clinical decision support systems to identify potential risks and alert health-care providers to implement preventive measures promptly.
By integrating QSEN competencies into daily practice, nurses play a crucial role in preventing postoperative complications and ensuring high-quality, safe patient care. This holistic approach not only improves patient outcomes but also enhances overall health-care quality and safety.

Decreasing Hemorrhage Risk

Nurses caring for postoperative patients must prioritize preventing hemorrhage as an essential goal, given that surgical procedures carry inherent risks of bleeding complications. Nurses monitor vital signs closely, assess surgical sites for signs of excessive bleeding, and educate patients to recognize abnormal blood loss or hemorrhage symptoms. Administration of prescribed hemostatic medications on an optimal schedule and close monitoring of drainage and blood loss help prevent hemorrhages. Furthermore, early intervention when abnormal bleeding occurs is also essential to preventing complications. Patient education on activity restrictions, adhering to postoperative care guidelines, and being alert for signs of bleeding help facilitate active patient participation in their healing journey. Nurses play an invaluable role in mitigating hemorrhagic risks and encouraging safe postoperative recovery for their patients through vigilant monitoring, effective communication with the interdisciplinary team, and proactive patient education.

Patient and Family-Centered Care

The focus of all health practice is patient-centered care. Including the patient's family and support network is paramount to successful outcomes. Family members and close friends provide emotional support, comfort, and encouragement that contribute significantly to the patient's overall well-being and mental health during recovery periods. Their involvement can also improve continuity of care by knowing and reinforcing the patient's postoperative instructions, medication schedules, and rehabilitation exercises. Family members can provide invaluable advocacy on behalf of their loved one by communicating any changes or concerns with health-care staff. Encouraging open dialogue and collaboration between nurses and the families of patients generates an atmosphere of support that enhances the recovery journey, provides a sense of safety, and creates more positive postoperative experiences.

Patient Education

Patient education after surgical treatment involves many crucial elements to ensure successful healing and a good recovery. Nurses should offer the patient guidance in pain management strategies, emphasizing the need to quickly report a change in pain levels to enable timely interventions that meet the patient's needs. Wound care instructions, including signs of infection and proper dressing changes, are provided to the patient to minimize complications at surgical sites. Mobility exercises and ambulation techniques, medication education, and respiratory exercises are all included as part of a postoperative education plan, along with instructions regarding potential complications. Educating patients and family members about the importance of follow-up appointments and when to notify their health-care provider if concerns or complications develop, along with the rest of the postoperative plan, create an informed and empowered patient who experiences a smoother postoperative recovery process.

Providing Emotional Support

Nurses can offer postoperative patients emotional and spiritual support by cultivating open communication and showing genuine care and empathy. Acknowledging any worries, fears, or anxiety around surgical experiences and recovery processes as soon as they arise is helpful for proper healing and wellness. Nurses should strive to create an atmosphere in which a patient feels free to express themselves without the fear of judgment. This is key to building trusting and therapeutic relationships with patients. Nurses can offer assurance and realistic expectations

regarding recovery processes while clearing up any misconceptions or uncertainties patients may have. Providing information to the patient about their progress, including the patient in decision making where applicable, and encouraging the patient to express their feelings all foster an atmosphere of control and empowerment. Nurses work collaboratively with other interdisciplinary team members, such as social workers or counselors, to provide additional emotional support as needed, further strengthening postoperative patients' overall well-being and resilience during recovery.

Summary

27.1 Postanesthesia Recovery and Care

- Perioperative refers to the entire surgical experience from preoperative to surgery to postoperative within the postanesthesia care unit (PACU). Postoperative refers to the time after surgery and includes the monitoring and interventions from the interdisciplinary team.
- PACU duties include stabilizing the airway and monitoring vital signs.
- Nurses must intervene to manage PONV for patient comfort by administering medications, maintaining proper fluid balance through intravenous therapy, and educating patients.
- From the PACU, patients can be discharged to their home or transferred to another hospital unit.
- Nurses use the ISBAR communication strategy when communicating about patients, especially during transitions of care.

27.2 Postoperative Pain Management

- Pain is a subjective experience and not to be judged by the nurse's interpretation of pain.
- Pain management is a key task in the PACU, and nurses need to use a variety of tools to complete an effective pain assessment.
- Pharmacological and nonpharmacological methods are available for nurses to manage postoperative pain.
- Nurses educate patients about the relationship between pain management and the healing processes, encouraging adherence to prescribed medications and engagement in rehabilitation activities.

27.3 Hospitalized Postoperative Patient

- Transfer from the PACU to an inpatient unit such as an ICU, should focus on airway management and stabilization of vital signs.
- ISBAR is the best practice standard for reporting or handing off from one health-care team member to another.
- A key nursing activity for a postoperative patient is to differentiate between normal and abnormal physical findings.
- Nursing duties beyond the PACU include activities to prevent complications and promote healing, such as providing hydration, nutrition, promoting mobility, and patient education.

27.4 Postoperative Nursing Care Plan

- Nursing care of the postoperative patient involves monitoring vital signs and surgical wound sites to quickly identify any complications.
- Nursing care can help prevent many common complications, such as thromboembolic events (DVT and PE).
- Nurses create a plan of care to prevent complications during the postoperative period.
- By providing patient education, the nurse can support the patient and family's psychosocial needs in the postoperative period. Collaborating with interdisciplinary team members helps strengthen the resources the patient has for best outcomes. Involving the family members and the patient's support network in the postoperative care can be an emotional strength to a patient during recovery.

Key Terms

bolus single large dose of fluid or medication
durable medical equipment (DME) equipment such as elevated toilet seats, walkers, or ambulatory, mobility devices
inotropic medications that impact the speed of cardiac contraction
phase I PACU accommodates complex surgical and high-acuity patients; also known as main or primary PACU
phase II PACU extended care units for patients who need less acute support after their surgery
postanesthesia care unit (PACU) hospital unit where patients are temporarily admitted after a surgery
postoperative nausea and vomiting (PONV) excessive nausea and vomiting that occurs as a result of anesthesia
postoperative phase begins when the patient is transferred to the PACU and ends when the patient is transferred to another unit or discharged home
postoperative urinary retention (POUR) inability to urinate after surgery even when the bladder is full

Assessments

Review Questions

1. In the immediate postoperative period in a PACU setting, what nursing task is most essential?
    a. administering postoperative medications
    b. discussing discharge instructions with the patient and family
    c. assessing vital signs and airway status
    d. giving an ISBAR to the receiving medical surgical unit nurse for future transfer

2. To help address PONV, what key aspects of nursing care will the nurse implement for postanesthetic recovery in PACUs?
    a. administering narcotics to help with pain control
    b. encouraging early ambulation
    c. advancing from a liquid diet to regular diet to decrease nausea
    d. assessing nausea and vomiting regularly and treating it promptly

3. What nursing duty is key when preparing patients to leave the PACU?
    a. administering antiemetic drugs at prescribed times
    b. assessing wound healing every hour
    c. sending patients to their next unit with an incentive spirometer
    d. communicating clear postoperative instructions to the patient and caregivers

4. What action by the nurse demonstrates competency in the assessment of postoperative pain management?
    a. employing a pain assessment tool regularly to evaluate both pain intensity and response to interventions
    b. administering pain medications on a fixed schedule without assessing patient pain level
    c. relying solely on self-report of pain without considering objective indicators
    d. asking the family member if the patient is in pain

5. What nursing intervention is appropriate when treating postoperative pain for patients who have shown prior opioid sensitivity?
    a. administering the same opioid dosage prescribed to other patients
    b. employing only nonpharmacological interventions
    c. conducting a thorough pain evaluation in conjunction with health-care team to devise alternative analgesic strategies
    d. performing a pain assessment and consulting with health-care team for alternative analgesic approaches

6. What action is appropriate for a nurse to take when managing a patient's postoperative pain that considers the patient's cultural background?
    a. administering the maximum of the doctor's pain medication available regardless of the patient's expression of pain
    b. encouraging the patient to only use a numerical scale as it's the most objective
    c. considering both verbal and nonverbal expressions of pain
    d. relying on family members to describe the patient's pain level

7. A postoperative patient is hesitant to report their pain and frequently states, "I can handle it," despite grimacing and wincing. What should the nurse do next?
    a. Respect the patient's wishes and withhold pain medication.
    b. Educate the patient about the importance of pain management for healing and encourage open communication about their pain.
    c. Increase the dosage of pain medication without informing the patient.
    d. Wait until the patient has severe pain and is willing to express it.

8. A nurse is caring for a postoperative patient who reports severe pain that rates as an 8 out of 10 and requests additional pain relief after receiving an opioid only one hour ago. What should the nurse do?
   a. Administer the additional dose as ordered even if before the scheduled time.
   b. Call the health-care provider to request earlier administration of the next dose.
   c. Inform the patient no additional can be administered due to the patient's risk for substance use disorder.
   d. Explain to the patient the importance of adhering to the doctor's prescribed medication schedule and offer nonpharmacological options to help control pain in between doses.

9. You are the nurse caring for a postoperative patient who complains of increasing pain despite receiving the prescribed analgesics. What is the best action?
   a. Administer an additional dose of the ordered pain medication.
   b. Assess the patient's vital signs and surgical site and report findings to provider with pain issues.
   c. Educate the patient that postoperative pain is expected and teach nonpharmacological methods to deal with the pain.
   d. Document the pain and assess vital signs per routine on the unit.

10. After completing a physical assessment, the nurse notes that the breath sounds on one side are diminished and the patient reports difficulty breathing. What is the priority action of the nurse?
   a. Administer a bronchodilator of your choice to improve respiratory function.
   b. Encourage the patient to use an incentive spirometer.
   c. Document the findings and continue with the routine nursing care.
   d. Sit the patient up in bed and notify the health-care provider immediately.

11. What intervention should the nurse prioritize to prevent a deep vein thrombosis for a postoperative patient?
   a. Encourage early safe ambulation and mobility.
   b. Administer acetaminophen to decrease inflammation.
   c. Limit fluid intake to avoid overloading the heart.
   d. Apply heat packs to the lower calves to promote circulation.

12. A nurse is preparing to ambulate a postoperative patient for the first time. What interdisciplinary team member should the nurse collaborate with to ensure the patient's safety?
   a. pharmacist
   b. dietitian
   c. physical therapist
   d. social worker

13. To prevent postoperative respiratory complications such as atelectasis and pneumonia, the nurse educates the patient on the use of an incentive spirometer. What QSEN competency is the nurse demonstrating?
   a. informatics
   b. safety
   c. quality improvement
   d. patient-centered care

14. What nursing intervention is essential for preventing a postoperative deep vein thrombosis (DVT) and involves the interdisciplinary team?
   a. administering antibiotics
   b. encouraging early ambulation and leg exercises
   c. providing high-protein diet recommendations
   d. teaching wound care techniques

15. A postoperative patient is at risk for infection. The nurse collaborates with the interdisciplinary team to monitor and manage this risk. What specific role does the pharmacist play in this process?

a. developing a mobility plan
b. managing antibiotic therapy
c. teaching wound care
d. assessing nutritional needs

16. To ensure a patient understands the signs of postoperative complications and how to manage them at home, the nurse provides detailed discharge instructions. What QSEN competency does this action best represent?
    a. evidence-based practice
    b. teamwork and collaboration
    c. patient-centered care
    d. safety

Check Your Understanding Questions

1. Explain the process of giving an ISBAR to report the status of a patient during transitions of care.
2. Depending on the patient's needs, nurses may also need to consult with the social worker to order durable medical equipment (DME). What are some examples of DME?
3. Education is an integral component of nursing care for PONV management. What should the nurse include in the education for a patient with PONV?

Mr. Thompson, a fifty-four-year-old male, has been admitted to PACU following a laparoscopic cholecystectomy. He is currently awake and alert but appears restless and uncomfortable. His vital signs are: blood pressure 135/85 mmHg; heart rate 90 bpm; respiratory rate 18 breaths per minute; and oxygen saturation 97 percent on room air. Mr. Thompson states, "I'm in quite a bit of pain, about 7 out of 10." He is grimacing, holding his abdomen, and shifting frequently in bed. The provider has ordered postoperative pain medication as needed.

4. Using the preceding data, how would you assess the patient's postoperative pain?
5. After analyzing the given cues, how would you manage the patient's postoperative pain?
6. The nurse notices the patient's pain is preventing him from completing the postoperative deep breathing exercises, which could impact his healing. What should the nurse do?
7. Explain the process of receiving a transfer from the PACU.
8. Describe two concerning findings of a postoperative assessment.

Reflection Questions

1. Describe to a friend the interventions for the postoperative patient to prevent common postoperative complications.

Critical-Thinking Questions about Case Studies

1. Describe ways the postoperative nurse can manage nausea and vomiting during the recovery phase.
2. What are the priorities when caring for a patient admitted to the PACU?
3. Referring back to the case study in this section, how would the nurse know the patient is meeting criteria for discharge?

Competency-Based Assessments

1. Develop a presentation for your peers differentiating the interventions needed for home discharge versus discharge to another inpatient unit such as the intensive care unit (ICU).
2. Using the pain scale, practice assessing the pain levels of your peers or family members.
3. Develop an educational pamphlet outlining tasks the patient can do to promote postoperative healing.
4. Develop a five-minute presentation outlining psychosocial support interventions for the postoperative patient and their family.

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CHAPTER 28
Inflammation and Healing

FIGURE 28.1 Welcome to where the art and science of nursing meet: caring for wounds with compassion. Providing wound care requires a knowledge base of healing pathophysiology, wound etiology, patient factors, and appropriate treatment selection. (credit: Dr. Steven Galvan/Joint Base San Antonio, Public Domain)

CHAPTER OUTLINE

INTRODUCTION For nurses, wound care exemplifies the union of the art of compassion and the science of care. To best meet patient needs and provide optimal wound care, it is important to understand what is occurring beyond the surface. How does a wound heal? How do you select the best dressing or treatment among the hundreds of products? How do you know if the treatment is working? This chapter will explore inflammation in the context of healing wounds of all kinds—from the cellular level to the application of topical therapies—and the nurse's various roles along the way to support the best outcomes possible for each patient.

28.1 Cellular Response and Adaptation in Wound Healing

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Describe the anatomy and function of the skin
- Define the four phases of the wound-healing process
- Identify the major physiological aspects of wound healing

Let us understand the skin we are in. Aside from being the largest human organ, the skin is the first physical barrier a human body has against the external environment. In addition to protecting the underlying structures of the body, among other responsibilities, our skin must be able to protect itself and heal when an injury occurs. This module will explore the anatomy and physiology of our largest organ, review the phases of healing when a wound occurs, and discuss the physiological components that accompany the healing process.

Skin Anatomy and Physiology

The skin consists of three layers (see Figure 14.2). The outermost layer is the epidermis, the middle component is the dermis, and the deepest layer is subcutaneous tissue. Each layer plays an integral part in the external and internal roles of the skin. Therefore, in caring for different client populations, it is important to know and understand the skin's underlying structures.

Structure and Function

As previously mentioned, there are three major layers that compose the skin: the epidermis, the dermis, and subcutaneous tissue (see Figure 14.2). The epidermis is the waterproof outermost layer. It is **avascular**, or lacks blood vessels, and contributes to an individual's skin tone. Depending on its location in the body, the epidermis consists of four or five sublayers of cells. Moving from superficial presentation to deep, the typical four sublayers are the stratum corneum, stratum granulosum, stratum spinosum, and stratum basale. A fifth sublayer, typically found on thicker-skinned areas such as the palms of the hand or soles of the feet, is located between the stratum corneum and stratum granulosum and is called the stratum lucidum. This extra sublayer provides added strength and protection to the skin in regions where the skin is subject to constant pressure or rubbing. The melanocytes, which produce melanin, are located in the epidermis. It is the melanocytes that determine the pigment of skin, which can range from fair to dark with a variety of shades and hues.

The dermis contains hair follicles, blood vessels, lymphatic vessels, nerves, and sweat glands. This core layer is divided into two distinct sublayers, the papillary and reticular dermis. The subcutaneous layer, also known as the hypodermis, consists of fat and connective tissue. This layer links the skin to the underlying structures, which include fascia, muscles, and bones.

The functions of the skin include regulation of temperature, protection, mobility, sensation, endocrine activity, and exocrine activity (Table 28.1).

Function	Description
Protection	The layers of the skin work together to protect the body against microorganisms, dehydration, and mechanical damage. Skin pigmentation is a defense mechanism against UV radiation.
Temperature regulation	The skin regulates body temperature and homeostasis by conserving or releasing heat.
Mobility	The skin allows for smooth body movement. Damage to the skin (e.g., burns and scarring) and the healing process can cause restrictive movements.
Sensation	Sensation begins with the skin. Pain, temperature, and pressure are all felt due to receptors within the skin.

TABLE 28.1 General Functions of the Skin

Function	Description
Endocrine activity	The skin is involved with biochemical processes such as production of Vitamin D and prevention of excessive water loss.
Exocrine activity	The skin participates in exocrine activity by releasing water, urea, and ammonia. In addition, the skin secretes products including cytokines, pheromones, sweat, and sebum.

TABLE 28.1 General Functions of the Skin

Age Considerations

Skin development begins during the first trimester of gestation. The various structural features are formed by thirty-four weeks gestation, and maturation continues until full term. The **dermal-epidermal junction** acts as the barrier between the epidermis and the dermis. In preterm newborns, the dermal-epidermal junction is weaker, containing less collagen, water, and melanin than in older counterparts. As a result, newborn skin has a greater risk of heat loss and is more fragile, susceptible to infections, and vulnerable to toxicity from topical agents. The skin continues to mature through the first year of life and closely resembles adult skin by the time a person is two years old. Table 28.2 details how quickly a person's epidermal cells are renewed throughout the life span.

Age	Rate of Turnover in Days
Newborn to 3 months	Approximately every 2 days, depending on site
Infant	14 days
Teens to 20s	14–30 days
Adults 30s–40s	28–42 days
Adults 50+	45–85 days

TABLE 28.2 Epidermal Turnover Rates by Age (Rahma & Lane, 2022; Maeda, 2017)

LINK TO LEARNING

Watch this video for a visual and auditory review of the layers of skin (https://openstax.org/r/77skinlayersrev) including their various functions throughout the life span.

At the opposite end of the care spectrum, aging results in the thinning of the epidermis and dermis as well as a potential decrease of the hypodermis. The thinning of the hypodermis may result in reduced support, increasing the risk for pressure injury development, and impaired temperature regulation. As we age, the skin loses its elasticity due to impaired barrier function and a decrease in sebum production, which may result in dry skin and wrinkles. Melanocytes decrease with age as do the numbers of sweat glands, blood vessels, and nerves. These normal consequences of aging make the skin more susceptible to damage and cause wounds to heal up to four times more slowly.

LIFE-STAGE CONTEXT

Wound Healing in the Older Adult

Changes in the dermis in different age categories can affect how we approach treatment and support the patient in their wound-healing journey. Older adult patients generally heal more slowly than younger patients. Skin breakdown and delayed wound healing may result from comorbid conditions, inadequate nutrition intake, and dehydration. An

individual's body build can impair wound healing. For example, excessive adipose tissue impairs blood flow, while a lack of adipose tissue can delay healing due to lack of nutrition and oxygen transport.

Consider the following when caring for an older adult with a wound:

- Older patients may be at risk for chronic wounds due to comorbid conditions and impaired circulation.
- Nonsteroidal anti-inflammatory medications (NSAIDs), such as aspirin and ibuprofen, are often used to treat arthritis but may interfere with the inflammation stage of the healing process.
- Dry skin is more vulnerable to excoriation and infection.

Phases of Wound Healing

The physiological process of wound healing includes four phases (Figure 28.2). These phases occur in a predictable manner that resembles a cascade of events as opposed to a series of distinct steps. Regardless of wound etiology, the biological repair process is the same for all wounds. As soon as damage occurs, the healing process begins. Keratinocytes, fibroblasts, vascular endothelial cells, and immune cells all play essential roles in supporting inflammation, cell migration, and angiogenesis.

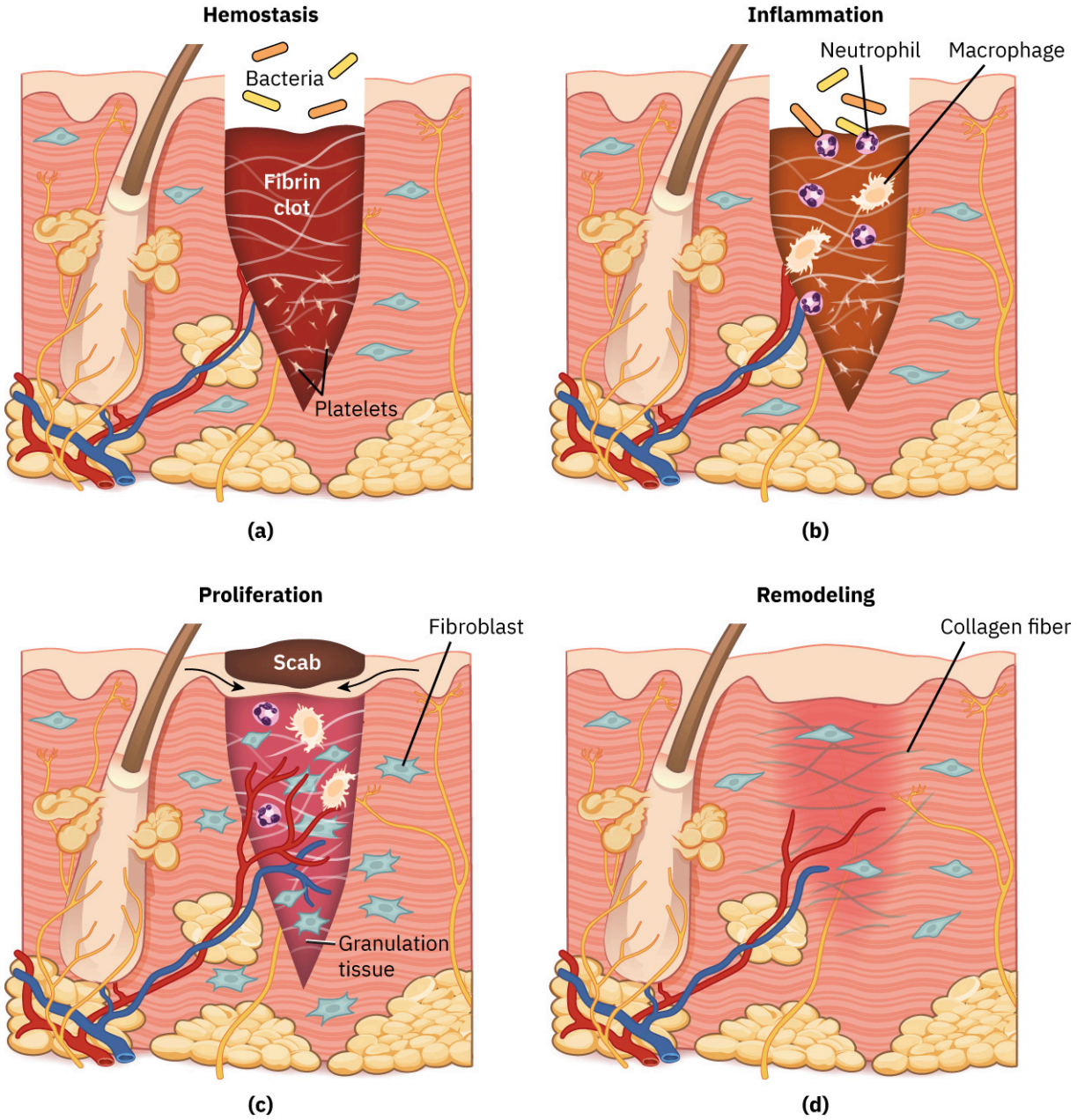


FIGURE 28.2 Wound healing is a physiological process that includes four phases: (a) hemostasis, (b) inflammation, (c) proliferation, and (d) remodeling. Each phase features cellular and molecular responses that resemble a cascade rather than a series of distinct steps. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Hemostasis

The first phase in the wound-healing cascade, called hemostasis, is marked by the cessation of bleeding (Wallace et al., 2023). When injury occurs, such as a break in the skin, blood vessels contract and clotting factors, such as fibrin, are released, which help stop the bleeding. In addition, platelets release growth factors that signal cells to start the repair process at the wound location. Depending on the severity of the injury, the hemostasis phase can last as much as sixty minutes.

Inflammation

The second phase of the wound-healing cascade is the **inflammation** phase. Acute inflammation begins immediately after injury and is essential for the orderly and timely healing of a wound. This phase is marked by vasodilation, facilitating the movement of white blood cells (neutrophils, macrophages, lymphocytes, mast cells) to the wound bed, where they start cleaning. Typically, the inflammation phase lasts three to seven days, depending on the injury. During the inflammatory process, the wound can present with redness, pain, swelling (edema), and

possibly exudate.

Proliferation

During the **proliferation** phase, the wound fills with new tissue, the wound margins contract, and the wound is covered. Proliferation does not have a specific starting point but can begin within a few days after the injury and last several weeks. This phase includes four distinct processes: epithelialization, angiogenesis, collagen formation, and contraction. The regeneration of the epidermis and the formation of granulation tissue is **epithelialization**. During epithelialization, various cell types actively proliferate to replace the damaged or loss tissue. For example, a **keratinocyte** is a cell that participates in the contraction and migration of cells across a wound bed to facilitate healing. They migrate from the wound edges, where they multiply until they meet in the middle of the wound bed. New connective tissue with fragile, thin-walled capillaries is called **granulation tissue**. In a healthy wound, granulation tissue can appear pink or red with an uneven texture. Healthy granulation does not bleed easily. If the granulation tissue appears dark and is friable (bleeds easily), it can be a sign of infection.

Proliferation also involves **angiogenesis**, the creation of new blood vessels. Additionally, cells called fibroblasts help to produce new collagen and repair the avascular epithelial tissue, causing the wound to contract.

Maturation and Remodeling

The maturation phase, also known as the **remodeling** phase, is the longest phase of wound healing, beginning around week three and lasting up to twelve months. Maturation involves the reorganization and transformation of collagen into scar tissue. Cellular activity slows, and the number of blood vessels in the wound is reduced. Collagen fibers continue to reorganize while the tissue remodels and matures. As a result, the tissue increases its tensile strength; however, the maximum strength is limited to 80 percent of the preinjured strength. During the maturation phase, any scarring may reduce in size, flatten, increase in strength, or change color.

28.2 Wound Healing Process

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Differentiate types of common wounds
- Distinguish between partial-thickness and full-thickness wounds
- Identify types of wound closure
- Describe barriers to wound healing

The wound-healing cascade, or process, is a complex overlapping system of biochemical and physiological pathways that secrete inflammatory cells and cytokines on the way to healing. Although the process contains the same four phases for all wounds, different types of wounds may require different approaches by the care team. This module will introduce the reader to the various types of wounds, as well as various methods for wound closure and barriers that wounds may encounter while healing.

Types of Wounds

Clinicians, including nurses, care for many types of wounds; it is important to understand the different types of wounds and their identifying characteristics, as each type has a specific treatment. Some therapies may be appropriate for one type of wound and detrimental to another. Understanding the wound's etiology helps foster treatment as well. For example, an acute wound progresses through the phases of healing without complication. In contrast, a chronic wound is a wound that fails to progress through the phases of wound healing in a timely fashion.

Open wounds are another important category in nursing practice. They involve an external or internal break in the tissue. Examples of open wounds include abrasions, lacerations, punctures, avulsions, skin tears, and incisions (Table 28.3).

Open Wound Type	Description
Abrasion	Removal of the skin from rubbing against a hard surface
Laceration	Torn or jagged wound caused by blunt force trauma
Puncture	Wound caused by a sharp, pointed object that penetrates the skin
Avulsion	Partial or complete tearing away of the skin and underlying tissue; also known as degloving
Skin tears	Wound caused by friction or shear, causing separation of skin layers
Incision	A surgical wound made to facilitate a procedure

TABLE 28.3 **Common Open Wound Types**

Other common wound types that a nurse may encounter include venous ulcers, arterial ulcers, diabetic foot ulcers, and pressure injuries.

Partial-Thickness vs. Full-Thickness Wounds

A **partial-thickness wound** is a superficial injury that involves the epidermis, dermis, or both. Partial-thickness wounds can present as a crater, abrasion, or blister. Although the topic of pressure injuries will be discussed in 28.3 Pressure Injury, it is important to understand that Stage 1 and 2 pressure injuries are considered partial-thickness wounds. In contrast, a **full-thickness wound** extends through all skin layers, potentially extending to the muscle fascia or bone. Stage 3, Stage 4, unstageable, and deep tissue injuries are examples of full-thickness injuries.

Types of Wound Closure

Wound closure from healing occurs through three methods: primary, secondary, or tertiary intention. Regardless of the closure method, a wound will progress and heal by moving through the four phases of wound healing.

Primary Intention

Primary wound closure, also referred to as healing by **primary intention**, is the fastest type of wound closure. Primary intention refers to the healing of a wound or injury with clean edges that can be **approximated**, or brought close together. The approximated edges allow wound contraction, proliferation, and epithelization to occur quickly, resulting in limited scarring. Surgical wounds closed by sutures, staples, or surgical glue typically heal by primary intention.

Secondary Intention

Healing by **secondary intention** occurs with wounds whose edges cannot be approximated or brought together, so the wound heals from the "bottom up" with granulation tissue. Secondary intention occurs when the wound cannot be surgically closed. This is often seen in wounds such as venous leg ulcers, pressure injuries, and skin tears. Wounds that heal by secondary intention are at a higher risk of infection and scar formation. Medical devices such as negative pressure wound therapy (NPWT) may assist with healing wounds from the bottom up. Therapies such as NPWT will be addressed later in the chapter.

Tertiary Intention

The term **tertiary intention**, also referred to as delayed primary intention, involves a plan to allow the wound to remain open. Reasons for the delayed closure could include waiting for the infection to resolve or preparing the wound for primary closure via a graft, flap, or skin substitute.

CULTURAL CONTEXT

Religious Considerations

Cultural competency is a cornerstone of patient-centered health care. Certain religious doctrines or cultures may define the appropriate consumption or use of certain animals and forbid the use of others. Some wound care products contain ingredients that are animal-derived. For example, certain skin substitutes are derived from pig placentas. However, religions such as Islam and Judaism, as well as some Christian denominations, forbid the use of pork products. If providing wound care to a Muslim or Jewish patient, the nurse would likely need to inform the patient about or use alternatives to pig-derived products. Furthermore, knowledge of animal-derived ingredients can help foster deeper conversations with patients about spiritual and cultural needs.

Barriers to Wound Healing

There are a variety of barriers to wound healing, such as those due to physical, physiological, local, and systemic origins. Several main risk factors that impede wound healing include age, immune status, perfusion, smoking, comorbidities, and immune and nutritional deficiencies. Comorbidities such as diabetes are directly linked to delayed wound healing. Extrinsic factors contributing to delayed wound healing include support surfaces, friction, and shearing forces.

Chronic wounds are wounds that fail to progress through the wound-healing cascade in a timely manner. According to the U.S. Centers for Medicare and Medicaid Services (CMS), if a wound has not closed or progressed within thirty days, it is considered chronic (Baranoski & Ayello, 2020). For a wound to heal or progress through the healing cascade, the wound bed must be prepared in a manner known as wound bed preparation (WBP). WBP begins with assessing the patient and their environment and determining their knowledge of their wound and health literacy. It is important for the nurse to assess the whole patient, not just the wound. Wound bed preparation is a nonsequential process of assessment, intervention, and evaluation that can be achieved through the acronym TIME, which stands for tissue, infection/inflammation, moisture, edges. The TIME principles of wound bed preparation guide the clinician in addressing the local barriers to healing and aligned interventions.

LINK TO LEARNING

The TIME principles focus on wound assessment and allow the clinician to assess the patient and wound in a systematic fashion. This article explains the evolution of TIME (https://openstax.org/r/77TIMEevolution) and its holistic nature, as well as how to implement TIME principles in practice.

Tissue Degradation

The presence of necrotic or devitalized tissue is a critical barrier to wound progression and healing; if the keratinocytes cannot migrate or granulation cannot fill a wound due to “roadblocks” of necrotic tissue, a wound will not heal. The **necrotic tissue**, or avascular debris, can appear as eschar, slough, or biofilm—a layer of microscopic bacteria or other microorganisms, usually combined with a polysaccharide matrix, which adheres to a wound surface. Necrotic or nonviable tissue requires debridement for removal. The purpose of wound bed debridement is to stimulate healing through the removal of necrotic tissue, elimination of dead space harboring bacteria, and drainage of pus; it also helps to reduce pressure, allowing for an inspection of underlying tissue, and optimize the site for topical preparations. The choice of the most appropriate debridement technique involves patient factors, wound appearance, environmental factors, and practitioner competence.

Infection and the Inflammatory Process

Many chronic wounds are identified as hosting bacteria or fungi. This is because the wound bed has typically been open for an extended period and becomes further exposed to environmental factors during each dressing change. Chronic wounds also often have poor perfusion to the wound bed, creating a favorable environment for organisms. Most chronic wounds are accompanied by biofilm development. A biofilm can perpetuate the inflammatory phase, inhibiting chronic wounds from healing (Ozgok & Regan, 2023). The best way to interrupt the biofilm is debridement.

If infection is evident, the provider may add antibiotics to the wound care orders.

Moisture Imbalance

Traditionally, people thought that drying out a wound sped healing. However, studies have shown, and best practices support, that a wound requires an amount of moisture to help facilitate the migration of keratinocytes to accelerate epithelialization (Nuutila & Eriksson, 2021). Achieving appropriate moisture balance involves the creation and maintenance of a warm, moist wound bed and the stimulation of components in the moisture that have a positive impact on wound healing, such as growth factors. An appropriate amount of moisture is needed for the optimal effects of growth factors and cytokines and for the growth of proliferating cells, such as keratinocytes, endothelial cells, and fibroblasts. Excessive moisture may lead to the maceration of wound edges, whereas inadequate moisture may inhibit cellular activities and promote eschar formation.

To address the excess or deficiency of moisture, depending on the institution's policy, the nurse or provider should select the appropriate wound care dressing or treatment. To add moisture, a hydrogel dressing or saline-moistened gauze is applied to the wound bed. Common dressings used to manage moisture include foam dressings, alginate dressings, gauze, or negative pressure wound therapy (NPWT).

Impact on the Edge of a Wound

One of the key indicators of a healing wound is progression of the edge of a wound in terms of epidermal cell and keratinocyte migration and wound contraction. Once tissue viability, infection, inflammation, and moisture have been addressed, wound edge advancement should indicate healing progression. Wound edge management is an important part of the healing process. Wound edges may become callused or rolled, or they may develop maceration, undermining, or tunneling. All these conditions require intervention so the wound may progress through closure.

The wound edge tells a story that the nurse must understand. If the wound edge has a callus, such as with a diabetic foot ulcer, the callus needs to be removed to allow the edge to epithelialize. Typically, this is achieved through sharp debridement. When wound edges become rolled instead of advancing across the wound surface, the condition is called **epibole**; it also requires debridement. The erosion of the tissue under edges of a wound is called **undermining**, whereas **tunneling** is the formation of a sinus tract, which can harbor bacteria. Undermining and tunneling require wound packing to advance toward healing.

Physiological Components of Wound Healing

The many processes involved with wound healing create a large metabolic demand that is met with oxygen and glucose transported to the wound site by newly formed endothelial vessels. Factors leading to vasoconstriction limit this blood supply and thus prevent proper wound healing. Causes of vasoconstriction include pain, cold, fear, nicotine, beta antagonists, and hypovolemia. Health-care providers attending to patients with healing wounds should be aware of these factors and control for them when possible. Patients should be screened for and counseled about the use of substances and medications that might impair or delay wound healing. Furthermore, comorbidities or underlying health or medical conditions can impact wound healing. Common conditions include diabetes, peripheral vascular disease (PVD), anemia, stress, peripheral neuropathy, and arterial disease. Patient education should include how comorbid conditions and lifestyle choices impact or influence the wound-healing process.

Nutritional Status

Nutritional status affects wound healing. The wound-healing process makes greater energy and nutrient demands on the body. Nutritional deficiencies, including low levels of vitamin C, zinc, iron, and vitamin A, have been linked to an increased risk of infection and decreased wound tensile strength (Ozgok & Regan, 2023).

Wound Complications

In addition to delayed wound healing, other complications can occur. Common wound complications include hematoma development, infection, and dehiscence.

A **hematoma** is an area of blood that collects outside of large blood vessels. A hematoma occurs when small veins and capillaries under the skin break. The development of a hematoma at a surgical site can lead to infection and incisional dehiscence. Upon inspection, hematomas related to wound care can appear as blood-filled blisters that are purple or deep red in color.

The separation of the edges of a surgical wound is called **dehiscence** (Figure 28.3). A dehisced wound can appear fully open, with visible tissue underneath, or with partial separation. The most common areas for dehiscence include abdominal surgeries and vascular surgical sites. Regardless of the incision site, patients with a history of stroke, chronic obstructive pulmonary disease (COPD), diabetes, or cancer have higher rates of dehiscence. Dehiscence is always a risk in a surgical wound, and the risk increases if the patient has obesity, is a smoker, or has other comorbidities, such as diabetes, that impact wound healing. Wound dehiscence can occur suddenly. Some signs of impending dehiscence include redness around wound margins and increasing drainage from the incision. The wound will also likely become increasingly painful.

FIGURE 28.3 Wound dehiscence can lead to further surgeries. (credit: modification of "Wound dehiscence following TKA in an obese patient" by *Journal of Orthopaedic Surgery and Research*, CC BY 2.0)

To prevent the dehiscence of a wound, surgical patients must carefully follow all postoperative instructions, including restricting activities, avoiding heavy lifting, and protecting the site from external damage.

28.3 Pressure Injury

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Define pressure injury
- Identify the causes of pressure injuries
- Identify the different stages of pressure injuries
- Discuss strategies for preventing and treating pressure injuries

Each year an estimated one to three million people in the United States are affected by skin and soft-tissue pressure injuries (Mondragon & Zito, 2024). According to the Agency for Healthcare Research and Quality, pressure injuries are considered "never events," meaning they are preventable and thus should never happen; nevertheless, they can result in devastating consequences, including death, to a patient (Smith et al., 2018). Pressure injuries have a long history of nomenclature, including terms such as *decubitus ulcer*, *pressure ulcer*, and *bed sore*. Preventing pressure injuries is an interdisciplinary team effort that requires diligence, creativity, and education. The cornerstone of pressure injury prevention is to reduce pressure, moisture, and friction to any at-risk sites. As the bedside providers, nurses are key to preventing injuries.

Pathophysiology

Per the National Pressure Injury advisory panel, a **pressure injury** is localized damage to the skin and underlying soft tissue, typically over a bony prominence (Figure 28.4). The injury can present as intact skin or an open ulcer and may be painful.

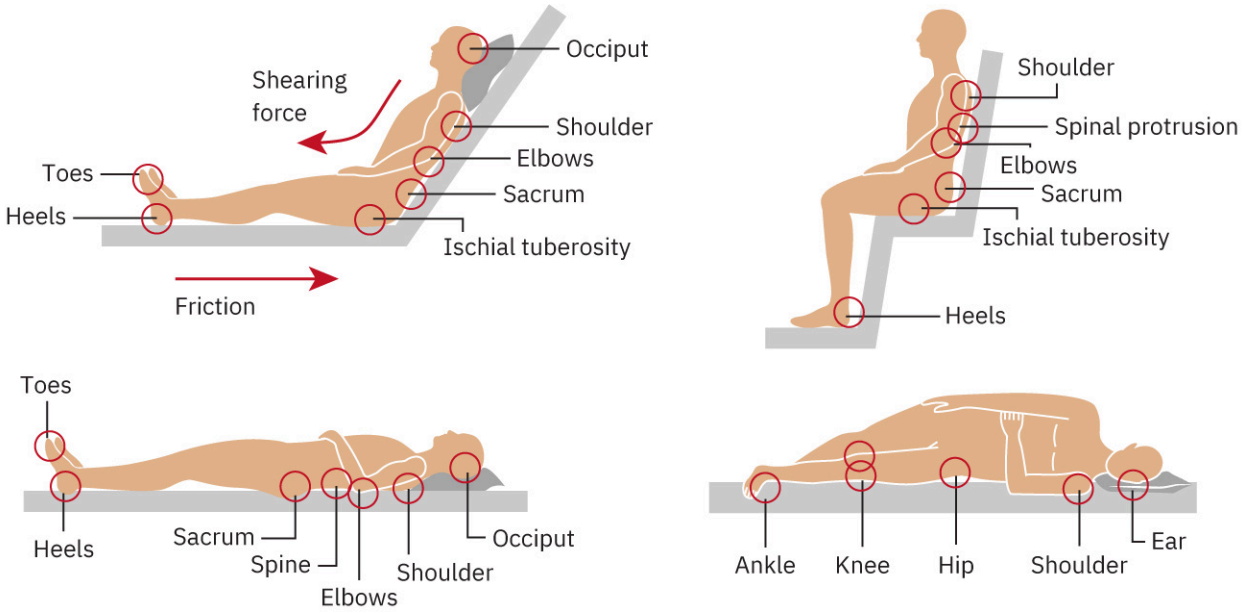


FIGURE 28.4 Pressure injuries commonly develop as people press bony prominences in their body against the surface upon which they are sitting or lying. As the patient changes positions, other areas become at risk. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Simplistically, a pressure injury occurs because of intense or prolonged pressure, or pressure in combination with shear, over a bony prominence. Thus, the causes may be multifactorial, involving both external and internal factors, but they all produce a common pathway that leads to ischemia and necrosis.

The tolerance of soft tissue for pressure and shear may also be affected by microclimate (e.g., skin temperature, moisture), nutrition, perfusion, comorbidities, and condition of the soft tissue. For example, moisture can cause ulcers and worsen existing ulcers via tissue breakdown and maceration.

LINK TO LEARNING

Visit the National Pressure Injury Advisory Panel site (https://openstax.org/r/77NPIAP) to access the most current and comprehensive guidelines for the prevention and treatment of pressure injuries.

Staging

The correct staging of a pressure injury has both clinical and legal implications. It is imperative to understand the pressure injury staging system when documenting the injury. Best practice tip: if the nurse is uncomfortable or unsure how to stage a pressure injury, it is best simply to describe the wound as it is assessed. Pressure injuries are the only wounds that are staged, and health-care workers must use the internationally accepted guidelines set forth by the National Pressure Injury Advisory Panel (NPIAP), the European Pressure Ulcer Advisory Panel (EPUAP), and the Pan Pacific Pressure Injury Alliance (PPPIA).

Stage 1

A Stage 1 pressure injury is considered intact skin with a localized area of nonblanchable erythema, or redness that does not fade when pressure is applied (Figure 28.5). In darkly pigmented skin, a Stage 1 pressure injury may appear as either a darker-pigmented or lighter-pigmented area over a bony prominence. Noticeable changes in sensation, temperature, or firmness may precede visual changes. Stage 1 changes do not include purple or maroon discoloration, as such findings may indicate deep tissue pressure injury.

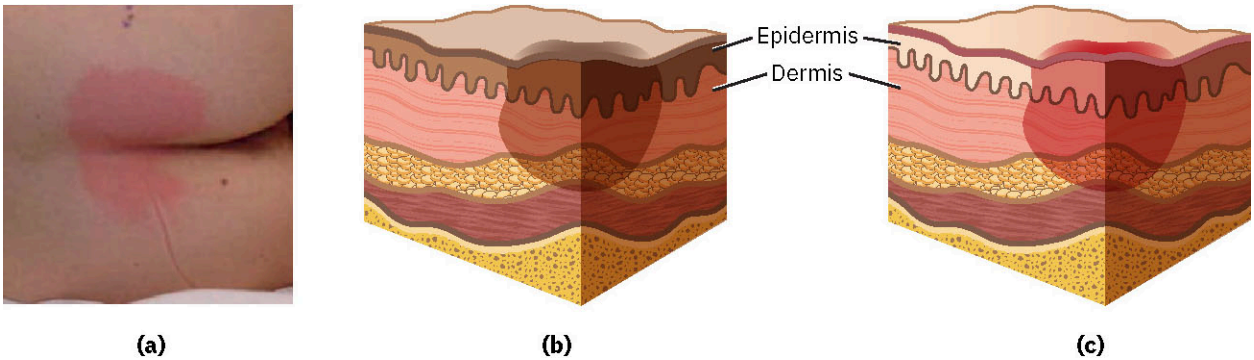


FIGURE 28.5 (a) A Stage 1 pressure injury appears as localized erythema. (b) In darkly pigmented skin, the area of concern is a different shade than the surrounding tissue on a bony prominence. (c) In a light-skinned individual, an area of pink and red erythema may be seen over a bony prominence. (credit a: Dweekat et al./*International Journal of Environmental Research and Public Health*, CC BY 4.0; credit b and c: attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Stage 2

A Stage 2 pressure injury is a partial-thickness loss of skin with exposed dermis (Figure 28.6). The wound bed is viable, moist, and pink or red; it may also present as an intact or ruptured, serum-filled blister. Adipose and deeper tissues are not visible. Granulation tissue, slough, and eschar (hard black dead tissue) are not present. This stage should not be used to describe moisture-associated skin damage (MASD), including incontinence-associated dermatitis (IAD), intertriginous dermatitis (ITD), medical adhesive-related skin injury (MARSI), or traumatic wounds (skin tears, burns, abrasions).

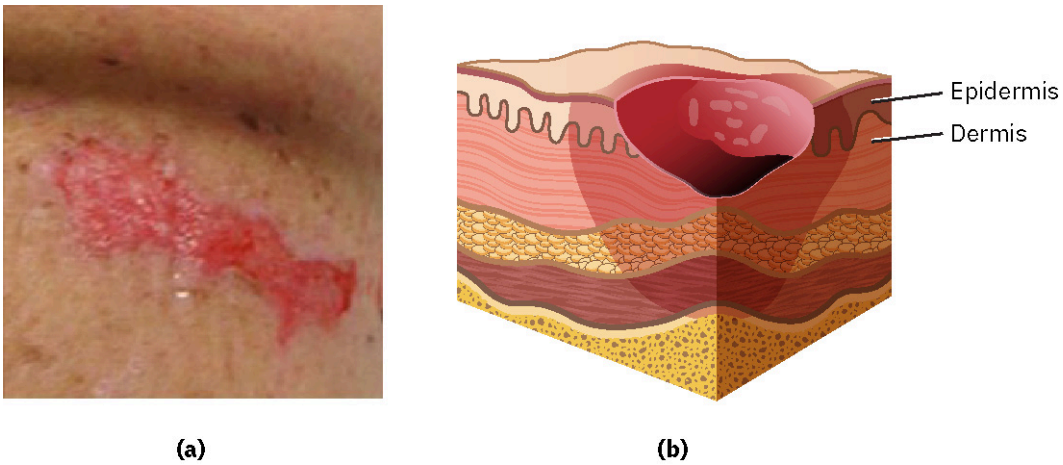


FIGURE 28.6 (a) A Stage 2 pressure injury is a partial-thickness loss of skin with exposed dermis but without visible underlying structures. (b) The diagram depicts a Stage 2 pressure injury. (credit a: Dweekat et al./*International Journal of Environmental Research and Public Health*, CC BY 4.0; credit b: attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Stage 3

A Stage 3 pressure injury is a full-thickness loss of skin; adipose tissue is visible in the ulcer, and granulation tissue and epibole are often present (Figure 28.7). Slough or eschar may also be visible. The depth of tissue damage varies by anatomical location; areas of significant adiposity can develop deep wounds. Undermining and tunneling may occur. Fascia, muscle, tendon, ligament, cartilage, and bone are not exposed. If slough or eschar obscures the extent of tissue loss, then such an injury is considered an unstageable pressure injury.

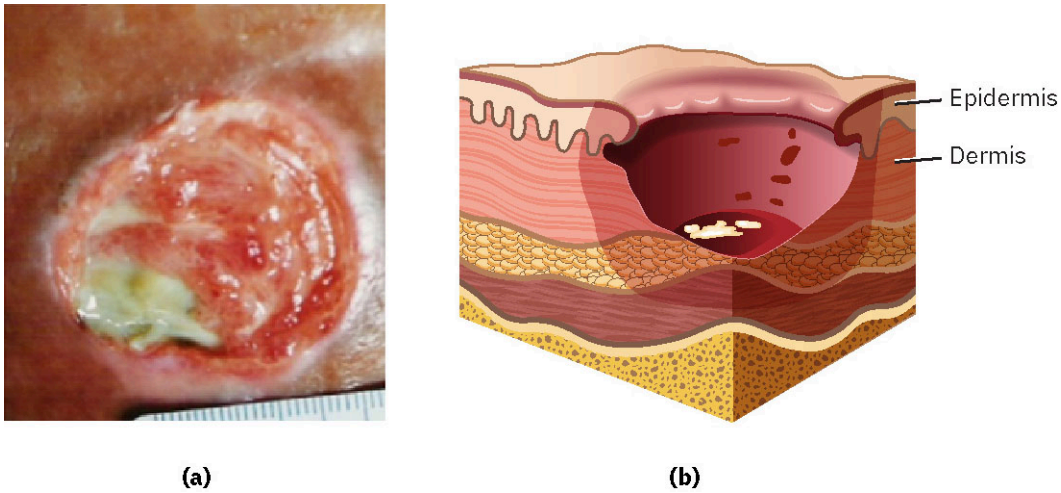


FIGURE 28.7 (a) This Stage 3 pressure injury has visible necrotic tissue and epibole. (b) The diagram shows a side view of the impact of underlying structures. (credit a: Dweekat et al./*International Journal of Environmental Research and Public Health*, CC BY 4.0; credit b: attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Stage 4

A Stage 4 pressure injury involves full-thickness skin and tissue loss with exposed or directly palpable fascia, muscle, tendon, ligament, cartilage, or bone in the ulcer (Figure 28.8). Slough or eschar may be visible. Epibole, undermining, or tunneling commonly occur. Depth varies by anatomical location.

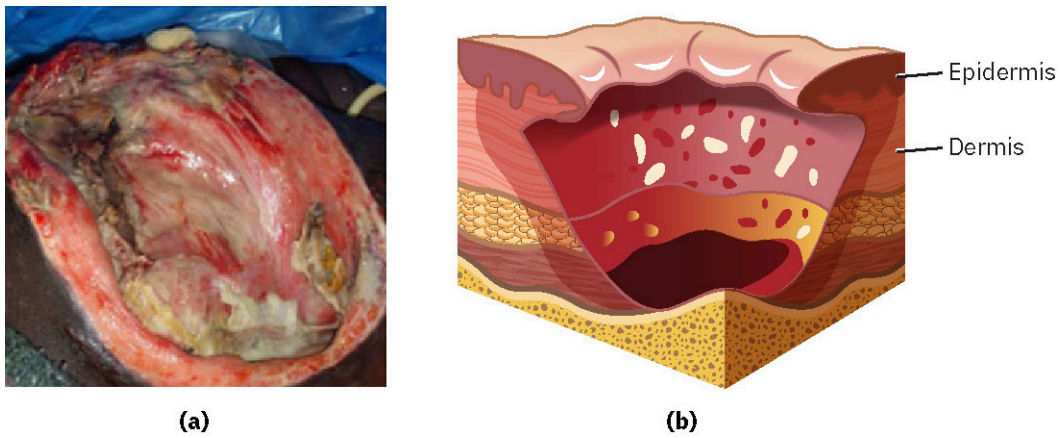


FIGURE 28.8 (a) This Stage 4 pressure injury extends to the bone, with necrotic tissue and epibole. (b) This side view shows the impact of a pressure injury on underlying structures. (credit a: Dweekat et al./*International Journal of Environmental Research and Public Health*, CC BY 4.0; credit b: attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Unstageable

An unstageable pressure injury is understood to have full-thickness skin and tissue loss, but the extent of tissue damage within the ulcer cannot be determined because it is obscured by necrotic tissue (Figure 28.9). If slough or eschar is removed, a Stage 3 or Stage 4 pressure injury will be revealed. Stable eschar on the heel or ischemic limb should not be softened or removed.

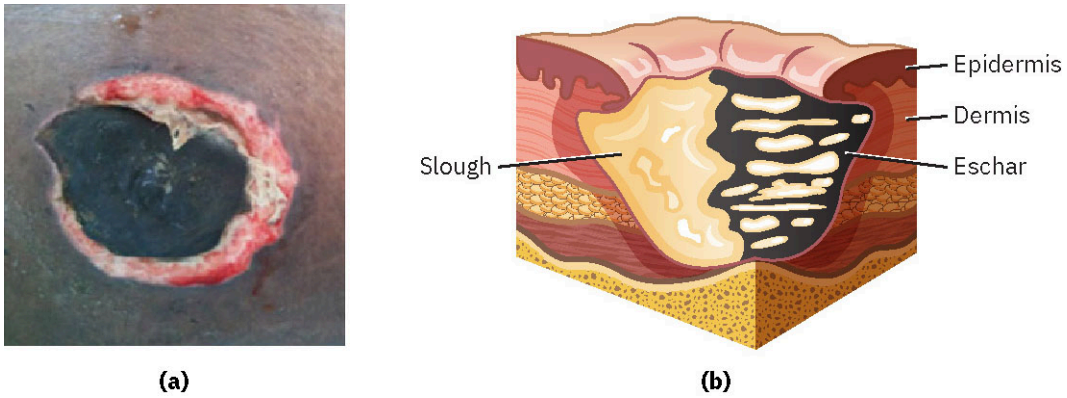


FIGURE 28.9 (a) The presence of both eschar and slough occludes the true depth of this pressure injury, making it unstageable. (b) This diagram shows the depth of damage that cannot be seen from the surface level. (credit a: modification of "Stages of pressure injuries (adapted from [1])" by ResearchGate, CC BY 4.0; credit b: attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Deep Tissue Injury

A deep tissue pressure injury (DTPI) is characterized by persistent, nonblanchable discoloration that is deep red, maroon, or purple (Figure 28.10). It may involve intact or nonintact skin with possible epidermal separation that reveals a dark wound bed or blood-filled blister. Discoloration may appear differently in darkly pigmented skin. This injury results from intense or prolonged pressure and shear forces at the bone-muscle interface. The wound may evolve to reveal the actual extent of tissue injury or resolve without tissue loss. If necrotic tissue, subcutaneous tissue, granulation tissue, fascia, muscle, or other underlying structures are visible, this indicates a full-thickness pressure injury that should be staged as Stage 3, Stage 4, or unstageable. Do not use DTPI to describe vascular, traumatic, neuropathic, or dermatologic conditions.

FIGURE 28.10 A deep tissue injury is seen on a patient's heel. Notice the deep-purple, blood-filled appearance. (credit: Dweekat et al./*International Journal of Environmental Research and Public Health*, CC BY 4.0)

Mucosal Membrane Pressure Injury

A mucosal membrane pressure injury occurs on mucous membranes with a history of a medical device used at the location of the injury. Due to the anatomy of the tissue, these ulcers cannot be staged. Examples of medical devices posing risk to mucosal membrane pressure injury development include nasogastric (NG) or orogastric (OG) tubes, oxygen cannulas or masks, endotracheal tubes, and urinary and fecal containment devices.

Medical Device-Related Pressure Injury

Medical device-related pressure injuries result from prolonged use of any device designed and applied for diagnostic or therapeutic purposes. The resultant pressure injury generally conforms to the pattern or shape of the device. The injury should be staged using the staging system. Examples of equipment and devices that may cause pressure injuries include but are not limited to:

- intravenous (IV) catheters, including hubs
- orthopedic devices
- SPO_2 probes
- wires or lines, such as from ECG, blood pressure cuff, or IV lines
- bed pans
- feeding tubes
- restraints
- ID bands
- braces and casts

Prevention

The best way to prevent pressure injuries is to alleviate pressure; it is also important to decrease the incidence of contributing factors such as friction, shear, and moisture. Often, this can be easier said than done. Typically, the unofficial rule of turning and repositioning every two hours is implemented for all patients at risk for skin breakdown; although this is a general rule, some patients require more frequent turns (or fewer manual turns if they are able to reposition themselves). Specialty beds, pillow usage, and foam dressing applications can help reduce pressure load on bony prominences, which in turn reduces the risk of pressure injuries. Protocols and interdisciplinary teamwork can help reduce and prevent pressure injuries from forming.

Some institutions have implemented a turn team to help implement a "quality turn"; this procedure ensures that the patient is off-loaded from at-risk bony prominences and not propped sideways.

REAL RN STORIES

Nurse: BC, RN
Years in Practice: Fifteen
Clinical Setting: Inpatient rehab
Geographic Location: Midwest

Pressure injury prevention is pretty straightforward: off-load the pressure areas to avoid breakdown, for example, by elevating heels off the bed with a pillow. But straightforward does not always mean easy. There are so many factors at play that can interfere with a plan for prevention such as medications, patient clinical status, pain, etc. One way to help with preventive measures is to engage the patient, which allows you to get a little creative.

Once I was caring for a sixty-seven-year-old female named Joyce. Joyce was in the unit for rehab after a heart attack. She was shaken up and very nervous about moving, which is a red flag for many things, including the risk of skin breakdown. I explained to her the importance of repositioning and movement for not only her skincare, but also for her overall health and recovery. She asked if she could have a "donut pillow," and I explained how they are actually one of the worst devices we could use, as they increase the pressure on the sacral area. We discussed why she was so anxious and devised a plan we called "move and groove." Every time she is in the chair, she would reposition every fifteen minutes by leaning to a side and singing a song chorus, and every hour or so she would stand with assistance and "wiggle it out." This empowered Joyce to take control, start to move more to prevent skin breakdown, and slowly gain confidence for the larger-scale rehab required.

Screening Tools

Common screening tools to help identify patients at risk for pressure injury development are the Braden Scale and the Norton scale.

- The **Braden Scale** assesses six risk factors—sensory perception, moisture, activity, mobility, nutrition, and friction and shear—on a scale from 1 (poor) to 4 (excellent). A total score of 12 or less represents high risk.
- The **Norton Scale** assesses five risk factors—physical condition, mental condition, activity, mobility, and incontinence—on a scale from 1 (poor) to 4 (excellent). A total score of 14 or less represents high risk, with a score of 10 or less indicating very high risk.

Although these tools are helpful, recent studies have demonstrated that a nurse's clinical judgment is just as, if not

more, effective at identifying individuals at risk for pressure injury development.

Risk Factors

Common risk factors for development of a pressure injury include advanced age, immobility, friction, shear, poor nutrition, excessive moisture and incontinence, altered level of consciousness, poor perfusion, certain skin infections, and comorbid conditions.

Patients at the highest risk are patients in an operating room and those in critical care settings due to hemodynamic instability and the increased use of medical and life-sustaining devices and vasoactive drugs. Other at-risk populations include older adults and immunocompromised individuals.

LINK TO LEARNING

Several tools are available to help prevent pressure ulcers in hospitals and assess risk (https://openstax.org/r/77pressureulcer) for skin breakdown and pressure injury development.

Treatment

Treatment of pressure injuries is similar to measures used for prevention. Keeping the patient off the wound is important to facilitate healing and remove the trigger. Treatment selection follows the same methodology described in the earlier discussion of prevention techniques: follow the principles of wound bed preparation and select the appropriate topical treatment. Nurses should conduct daily inspections of the wound for any signs of infection or decreased healing, collect data such as wound measurements (e.g., length, width, and depth), and administer any specialized wound treatment. When measuring length, use the patient's head as top and feet as bottom for a directional pathway. Measure width from the patient's right arm to left arm, and measure depth from the deepest part of the wound bed.

28.4 Debridement

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Define debridement
- Distinguish the various types of debridement
- Identify clinical implications and contraindications for debridement therapy

A wound cannot heal in the presence of necrotic or nonviable tissue. The first documented reference to the debridement of a wound for treatment dates to 25 CE, when a Roman author described the surgical removal of burned tissue to treat a wound (Heitzmann, Fuchs, & Schiefer, 2020). Debridement has become the cornerstone of the comprehensive management of patients with nonhealing wounds.

Necrotic tissue creates a physical barrier that prevents the cell migration that facilitates wound healing and acts as a medium for bacterial growth and infection. As tissue dies, it changes color, consistency, and adherence to the wound bed. It is critical for the nurse to both recognize and differentiate necrotic tissues from healing tissue. This module will focus on the importance of debridement in treating wounds by breaking down the various debridement methods and identifying the clinically appropriate debridement method for the wound.

Types of Debridement

Debridement is essential in treating acute and chronic wounds. Although nonviable tissue is devitalized, it may be burdened with senescent cells. A **senescent cell** is a nonfunctioning cell that has stopped dividing but has not died. The debridement process removes foreign debris, necrotic tissue, and bacteria from the wound's surface. Debridement stimulates a chronic wound's healing response by creating an acute wound and restarting the healing cascade.

Slough and eschar are two terms used to describe necrotic tissue in full-thickness wounds. The two are differentiated by appearance. The yellow or tan fibrin that typically lies on top of the wound bed is called **slough**. The texture of slough can be stringy, loose, or adherent. Slough should not be used interchangeably with purulence,

which is a sign of infection.

Necrotic tissue that is brown, black, or tan in appearance is known as eschar. Its texture can be soft or hard, depending on the location of the wound. It is essential to note stable intact eschar, like that found on the heels, should not be removed. Intact eschar is dry and adherent, with no signs of cracking or redness. In this instance, the eschar is a natural barrier to infection. If the eschar texture or appearance becomes unstable, then it should be debrided. Unstable eschar appears wet, boggy, loose, or draining, and it can be erythematous. Eschar is not the same as the word *scab*, and the two should not be used interchangeably. A scab is the formation of a crust by exudate or blood coagulation; in contrast, eschar is nonviable tissue.

Selecting a debridement method is based on the appearance of the wound bed, wound type, amount of necrotic tissue, patient condition, and care setting.

Autolytic Debridement

The most conservative type of debridement, called **autolytic debridement**, is the process of using the body's intrinsic debriding mechanism to remove nonviable tissue. This type of debridement involves a highly selective process that affects only necrotic tissue.

Autolytic debridement requires a moist environment, as this technique induces the softening—and, eventually, separation—of the necrotic tissues. Selecting the correct dressing will facilitate autolytic debridement. For example, if the necrotic tissue is dry, the clinician must "donate" moisture to facilitate debridement. Hydrogels or medicinal honey are common moisture-donating agents. If the tissue is already moist, hydrocolloid or foam dressings will work best. Dressing and product selection is discussed later in the section.

Autolytic debridement relies on a functioning immune system and is indicated for noninfected wounds through a process called autolysis: the destruction of cells by one's own enzymes. Compared with other forms of debridement, autolysis is a slow process and should be evaluated on a case-by-case basis (Heitzmann, Fuchs, & Schiefer, 2020). It is an adjunctive therapy for treatment of infected wounds in that it can be used with other debridement techniques. The overall effectiveness of autolytic debridement relies on the amount of devitalized tissue needed to be removed and the size of the wound. For example, if a wound measures 3 by 3 cm with thick, black eschar, autolytic debridement would take longer than taking a scalpel and removing the necrosis. In contrast, a 3 by 3 cm wound with yellow slough in the wound bed would likely benefit from autolytic debridement to further degrade and soften the necrotic tissue for removal.

Biological Debridement

The process of **biological debridement**, also known as maggot larval therapy (MT), uses sterile larvae of the *Lucilia sericata* species of the green bottle fly. The maggots are sterilely prepared and applied to the wound bed, either in a bio bag or free range, for one to four days. The success of maggot therapy is due to the secretion by the maggots of proteolytic enzymes, which break down the necrotic tissue. The maggots then ingest the liquified tissue. It is an effective mode of debridement, particularly appropriate in large, chronic wounds for which a painless method for removal of necrotic tissue is needed.

Enzymatic Debridement

The process of **enzymatic debridement**, also known as chemical debridement, is a selective method that uses an exogenous enzyme known as collagenase. Collagenase ointment, commercially known as SANTYL (from Smith+Nephew), actively debrides the necrotic tissue along the denatured collagen strand of the enzyme. Currently in the United States, SANTYL ointment is the only FDA-approved enzymatic debriding agent; it requires a prescription for use. Clinicians who are applying the ointment must follow the manufacturer's guidelines to ensure optimal therapeutic outcomes.

LINK TO LEARNING

Visit this site to learn more about the application of SANTYL Ointment (https://openstax.org/r/77SANTYLapp) to help with wound healing.

The application of SANTYL is critical to achieving therapeutic success for those cases in which it is used. Although

the application process itself is simple, if the wound is not prepared to receive the medication, the debridement will not be optimally efficacious, thus prolonging the wound-healing process.

Surgical Debridement

The process of **surgical debridement**, also known as sharp debridement, involves the use of a scalpel, forceps, curette, scissors, or other instruments to remove necrotic tissue from the wound base. The terms are used interchangeably and often reflect the site of care in which the therapy is used: the process can be done at the bedside, in an office setting or wound care center, or within an operating room. The location of service depends on the severity of the wound and the ability to control potential perioperative complications such as bleeding or pain. Surgical debridement should be performed by a skilled, trained, qualified provider who is licensed to provide surgical treatments. The main advantage of this type of debridement is the speed of wound cleaning and visualization. Disadvantages of this technique include adverse events from the procedure itself, such as blood loss or infection.

Surgical debridement is indicated for removing thick, adherent, or large amounts of nonviable tissue. This method can be used as a form of adjunctive therapy, in conjunction with other debridement modalities. Often the provider will add an antibiotic solution to be used as irrigation to avoid infection during wound care.

Mechanical Debridement

The process of **mechanical debridement** is a nonselective type of debridement in which physical force is applied to remove necrotic tissue. The procedure is nonselective in that it removes both devitalized tissue debris and viable tissue. Examples of mechanical debridement include wet-to-dry gauze dressings and wound irrigation. Mechanical debridement is indicated for acute and chronic wounds with moderate to large amounts of necrotic tissue, regardless of the presence of an active infection.

Wet-to-dry gauze dressings are well known. However, in recent years they have fallen out of favor as a clinical practice due to the frequency of dressing changes, associated pain, and nonselectivity. Wet-to-dry gauze dressings can be challenging and costly to apply and may cause maceration to the surrounding tissues. Moreover, wet-to-dry gauze dressings may release airborne organisms and cause cross-contamination.

Wound irrigation removes necrotic debris using pressurized fluids. Hydrotherapy is a form of wound irrigation, using specialized tubs with jets. Another example includes pulse lavage or high-pressure irrigation, which involves delivering between 8 to 12 pounds per square inch (psi) of fluid to the wound bed. The process may involve using a 35-ml syringe with 19-gauge angiocatheter to deliver fluid, such as saline, to the wound. The allotted pressure permits enough force to separate the necrotic tissue from the wound bed but not so much as to push bacteria into the wound bed. Clinicians performing this bedside procedure should wear personal protective equipment (PPE) to protect against potential bacterial contamination and the potential aerosolization of bacteria.

Clinical Implications

The debridement method selected for a wound is based on the wound's presentation, the provider's evaluation of the current treatment plan, and the patient's comprehensive history and physical. It is critical to remember the whole patient, not just "the hole in the patient."

For a bedside nurse, the most important role will be to support the patient by explaining the procedure, and anticipated outcomes. Understanding how to apply the prescribed therapy—whether collagenase ointment, hydrogel, or biobag—is critical for the nurse. Always refer to the institution's guidelines as well as policy and procedure for debridement therapy. The nurse's role can also include monitoring and evaluating the wound post-treatment, assessing and treating pain, providing emotional support, and facilitating dressing changes. For surgical debridement, the bedside nurse will support the provider performing the debridement by dressing the wound, assessing and evaluating the patient's tolerance for the therapy, and providing education to the patient.

Contraindications

Therapy contraindications must be considered, even in wound care and in the debridement processes. As a critical rule, it cannot be overstated that debridement is inappropriate if there is dry, stable eschar present, such as in unstageable pressure injuries with no overt signs of infection. In these instances, the dry eschar acts as a natural covering. Precautions should be taken for patients with poor perfusions, such as patients with arterial disease.

Beyond ensuring blood flow and stable eschar presentation, contraindications are specific to the specific debridement technique.

Contraindications for surgical debridement include accounting for the patient's overall condition and risk stratification. Examples of contraindications for surgical debridement include patients who are hemodynamically unstable, those with bleeding disorders, and those currently undergoing anticoagulation therapy. Surgical debridement is also contraindicated in patients with an intact eschar and no clinical evidence of an underlying infection. Depending on choice of modality of the mechanical debridement, contraindications include analyzing the presence of granulation tissue and the ratio of granulation tissue to devitalized tissue; providers must also consider the patient's level of perfusion and their own ability to control the patient's pain.

When using autolytic debridement, the clinician must consider the overall goal and presentation of the patient. Autolytic debridement takes several days to work. If the wound requires an immediate and significant decrease in necrotic tissue, a different modality should be considered. If autolytic debridement is selected and improvement is not observed within one or two days, a different debridement method should be considered for the patient. Contraindications to using biological debridement include pyoderma gangrenosum wounds in patients with immunosuppression therapy and abdominal wounds adjacent to the intraperitoneal cavity. Enzymatic debridement contraindications include use on wounds with a known infection and concurrent use with silver products. The therapy is also contraindicated if a patient is allergic to any of the ingredients within the enzymatic debriding agent.

28.5 Wound Care and Dressing

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Differentiate the etiologies for common lower leg ulcers
- Identify topical steps for wound bed preparation
- Compare the different types of topical dressing
- Select the appropriate dressings for the different wound etiologies

This module will introduce the reader to common lower leg ulcers and explain how the treatment of each differs. Then, we will explore the numerous treatment modalities for addressing and treating wounds of varying presentations.

Types of Wounds and Treatment Selection

Recall that wounds can be differentiated by time duration and tissue involvement. Chronic wounds are wounds that have failed to heal or progress toward healing within thirty days. Partial-thickness wounds involve the first two layers of skin and may require minimal intervention and topical therapy, whereas a full-thickness wound may require several topical wound care tools. Whether acute or chronic, partial-thickness or full-thickness, managing a wound with the appropriate dressing selection is key. When determining what is best for the wound and the patient, examine the wound etiology, current presentation, and goal for treatment.

Common Lower Leg Ulcer

Common chronic ulcers of the lower extremities may appear similar but require vastly different treatment approaches, as demonstrated in Table 28.4. To determine the appropriate treatment, it is important to understand the origin and pathophysiology of the wound. For example, venous leg ulcers (VLU) most often occur on the medial lower leg, are irregularly shaped, and present with extensive drainage (Figure 12.34). Skin can appear scaly, brown, red, or edematous. Treatment focuses on compression and wound management. VLUs involve changes to tissue as a complication of chronic venous insufficiency. A VLU can develop after a minor injury if the patient's lower extremity circulation is compromised.

Arterial ulcers, although also caused by impaired perfusion, commonly occur on the ankle or toes of the patient (see Figure 12.35). These ulcers can be very painful, and the pain can increase at night. Wounds appear punched out or circular and are typically dry. Arterial wound treatment focuses on moist wound healing. Due to the compromised circulation, compression is contraindicated unless the appropriate studies, such as an ankle-brachial index (ABI), have been performed.

LINK TO LEARNING

This video shows how to perform the ABI (https://openstax.org/r/77ABIhowto) typically conducted by a wound specialist or health-care provider. It is important to understand if the study has been performed and if perfusion is adequate before compressing any wound for a patient with a history of compromised circulation.

Diabetic foot ulcers (DFUs) are often located on the plantar, or bottom portion, of the foot and are caused by angiopathy and neuropathy (Figure 28.11). DFUs typically have a round, punched-out appearance with a callus surrounding the wound. DFUs are managed with off-loading devices and debridement of the devitalized tissue.

FIGURE 28.11 Diabetic foot ulcers have a punched-out appearance and have a thick callous surrounding the wound. (credit: modification of "Diabetic Foot Ulcer" by StatPearls/National Center for Biotechnology Information, CC BY 4.0)

Type of Wound	Cause	Location	Wound and Periwound Appearance	Common Treatment
Arterial wound	Compromised perfusion	Ankle, toes	Punched-out Dry Eschar	Moist wound healing
Venous leg ulcer (VLU)	Venous insufficiency	From knee to ankle; medial calf area "Gator area"	Irregularly shaped Moderate to heavy exudate Maceration Edema Red or brown staining	Exudate management Compression
Diabetic Foot Ulcer (DFU)	Neuropathy Angiopathy Glycemic control	Typically, plantar aspect of foot	Punched out/circular Calloused edges	Off-loading Glycemic control Debridement

TABLE 28.4 Common Lower Leg Ulcers

Wound Bed Preparation

Wound healing requires comprehensive and holistic management. The goal of wound bed preparation is to create a

local environment that supports healing. As discussed, wound bed preparation begins with assessing the wound bed and aligning with the TIME principles:

- T = Tissue (devitalized or necrotic)
- I = Infection/Inflammation
- M = Moisture balance
- E = Edges of wound/Epithelialization

Prepping the wound bed begins with cleansing and selection of topical therapies to facilitate a healing environment.

Cleansing Agents

Wound bed preparation begins with cleansing the wound. The goal in cleaning the wound is to remove as much devitalized tissue, bacterial burden, and exudate as possible without damaging proliferative cells. Appropriate noncytotoxic solutions include saline, commercial wound cleansers, and potable tap water. Cleansing of a dirty or infected wound requires 4 to 15 psi irrigating force and may involve antiseptics. Antiseptic solutions are generally preferred if the goal is to kill bacteria in an infected wound or one with abundant necrosis. Common examples of cytotoxic antiseptic solutions include Dakin's solution (sodium hypochlorite) and acetic acid, both of which provide temporary cleansing until the wound bed is clean.

Topical Dressing Materials

Dozens of wound dressings are commercially available. It is important to select the right dressing for a given wound type at a given time in the treatment process. Understanding the clinical implications and limitations of a primary or secondary dressing will allow the nurse to make the appropriate selection or offer an alternative if the wound changes and requires additional topical support. For example, primary dressings, such as gauze pads and nonadherent dressings, are like the first layer of protection directly on a wound, while secondary dressings, like adhesive bandages and foam dressings, provide extra cushioning or support over the primary dressing to aid in healing. Table 28.5 summarizes the common topical dressings used.

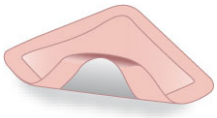
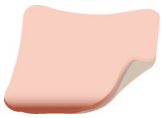
Type of Dressing	Use	Image
Foam (adhesive)	Exudate management	 (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)
Foam (nonadhesive)	Exudate management	 (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)
Hydrocolloid	Low exudating wounds	 (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

TABLE 28.5 Common Topical Dressings

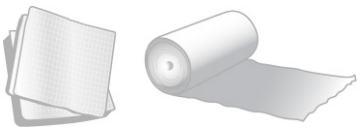
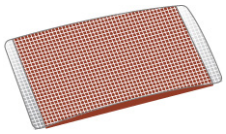
Type of Dressing	Use	Image
Alginate	Exudate management	(attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)
Hydrofiber	Exudate management	(attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)
Hydrogel	Donate moisture to desiccated, or dry, wound	 (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)
Contact layer	Protects tissue from direct contact with other dressings	(attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)
Transparent film	Secondary dressings or securement	 (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)
Gauze	Absorbs draining; packing	 (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)
Cadexomer iodine	Antimicrobial dressing	 (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

TABLE 28.5 **Common Topical Dressings**

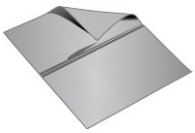
Type of Dressing	Use	Image
Honey	Antimicrobial dressing	 (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)
Silver	Antimicrobial dressing	 (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

TABLE 28.5 Common Topical Dressings

Foam Dressings

Foam dressings are very versatile dressings that can be used for almost any wound with exudate. Foam dressings are available in a variety of shapes and sizes, with or without borders; they may be adhesive or nonadhesive and may or may not have antimicrobial agents. Foam dressings can be used as either primary or secondary dressings. They are appropriate for low- to moderate-exudating wounds, as well as heavily draining wounds. Foam dressings help maintain a moist wound environment through absorption capacity while allowing enough moisture to remain in the wound bed to facilitate healing. The frequency of dressing change is dependent on the amount of exudate and the absorptive capacity of the dressing. Manufacturer guidelines commonly indicate the absorptive capacity of the dressing and the recommended timetable for changing the dressing.

Hydrocolloid

Hydrocolloid dressings are occlusive, wafer-like dressings made of gelatin materials. They are self-adhesive. Some hydrocolloids have a thin border around the dressing. Because the dressing is occlusive, water vapor cannot escape, and the dressing must absorb the moisture secreted by the skin together with the wound exudate. The dressing interacts with wound exudate, which allows for atraumatic removal. Hydrocolloids are appropriate for low-exudating, shallow wounds; because they are occlusive dressings, they are contraindicated in infected wounds. Wear time varies from three to seven days depending on the volume of exudate.

Alginates and Hydrofibers

Alginate dressings are often referred to as calcium alginate or seaweed dressings. These dressings are nonwoven and composed of polysaccharide fibers derived from seaweed. The dressings are available in ropes or sheets. Some alginates are impregnated with antimicrobial agents, such as silver. Alginate dressings absorb a moderate amount of exudate; some form a gel as they absorb the exudate, which allows for atraumatic removal. The frequency of dressing changes depends on the exudate amount but on average ranges from daily to every three days. Typically, alginates are reserved for moderately to highly draining wounds; they are not appropriate as the primary dressing choice for wounds with exposed tendons or bone.

Hydrofiber dressings are similar to alginates; however, hydrofibers are composed of sodium carboxymethylcellulose, making them highly absorptive. Similar to alginates, when the hydrofiber absorbs exudate, it forms a gel. Hydrofibers are available in ribbon or sheet form and can be plain or antimicrobial in design. Hydrofibers are also nonadherent, which means that a secondary dressing or cover dressing is always required. The frequency of dressing changes depends on the exudate amount but on average ranges from daily to every three days. Hydrofibers are indicated for moderately to heavily draining wounds and contraindicated in dry wounds, wounds with eschar, and third-degree burns.

Hydrogels

Hydrogels are designed to hydrate wounds through donation of water. There are two types of hydrogels: amorphous and solid gel dressings. Amorphous hydrogels are a combination of water and polymers, which can be applied

directly to the wound bed or to another dressing such as gauze. Amorphous hydrogels are available as viscous liquids and impregnated dressings, such as gauze, ropes, and strips. This type of hydrogel is typically used in wounds with depth or tunnels and for wounds with minimal exudate. Solid gel sheets are available with and without borders. They can absorb varying amounts of exudate and offer a cooling effect. Hydrogel dressings are ideal for any wound with minimal to no exudate. The frequency of dressing changes depends on the wound and dressing selected but on average changes occur about every three days.

Contact Layers

Contact layers are dressings placed in direct contact with the wound bed to help maintain a moist and protective environment. Contact layers are porous, allowing exudate to pass through for absorption by a secondary dressing while protecting the wound base from trauma. Typically, a contact layer is a single layer of nonadherent dressing material impregnated with petroleum derivatives; it may also be silicone-based. Contact layers are most appropriate for surface wounds, particularly extremity wounds. If utilized in a wound with depth, contact layers are appropriate for clean wounds (that is, wounds free of necrotic tissue). Contact layers are inappropriate for wounds with viscous exudate, wounds with undermining or tunneling, or third-degree burns. These dressings can remain in the wound for as long as one week, depending on the wound and manufacturer guidelines.

Transparent Film

Transparent film dressings are thin sheets of plastic or acrylic with a layer of adhesive on one side. Transparent films are widely used as primary and secondary dressings and most commonly to protect IV sites. A common brand name of transparent film is Tegaderm by 3M. The technology involved with transparent film allows for water vapor to transpire and evaporate out of the dressing, which in terms of wound care promotes autolytic debridement—a process known as moisture vapor transmission. Despite moisture vapor transmission, transparent films have no absorptive capacity. They are used for shallow, dry, or minimal exudate wounds or as cover dressings. Wear time varies and is dependent on wound depth, exudate level, location, and indication. When used as a primary dressing, the typical wear time is three to seven days.

Gauze

Gauze is a commonly used dressing that can be used for wound cleansing and as a wick, wound filler, or cover dressing. Gauze is available in a variety of forms, including rolls, sheets, or strips; it is also available in antimicrobial forms. Nonwoven gauze is usually preferred as a dressing, as woven gauze contains loose strands. All gauze can be cut to fit the wound bed and “fluffed” to help fill the wound depth. Overpacking a wound with gauze may interfere with perfusion and compromise granulation tissue development, so it is important to abide by the adage “fluff not stuff” when using gauze to pack a wound. Gauze is more appropriate as a secondary dressing; as it dries fairly quickly, it should be moistened prior to placement in contact with the wound bed.

Antimicrobial Wound Dressings

Management and treatment of infected and critically colonized wounds is a common issue facing clinicians. Ideal antimicrobial dressings provide sustained antimicrobial activity and a moist healing environment; they absorb and retain bacteria and are comfortable, conformable, and atraumatic upon removal. We will discuss some of the more commonly seen antimicrobial dressings. Each provides a unique but familiar mechanism of action to address wound care needs.

Cadexomer Iodine

Iodine has a broad spectrum of activity and works in various ways; however, not all preparations are suitable for wound care due to the cytotoxicity relative to overall concentration. Cadexomer iodine describes the mechanism of delivery rather than the iodine itself. Cadexomer iodine provides a sustained, steady release of iodine that is toxic to the bacteria but not the healthy cells. The dressing progresses from brown to cream colored as the iodine is released and should be changed every seventy-two hours depending on the amount of drainage. Contraindications for cadexomer iodine include known allergies to iodine, dyes, or shellfish. The cadexomer iodine also requires moisture to release the iodine; dry wounds may not activate the dressing.

Honey

Honey has been used on open wounds for centuries. Medical grade honey has unique properties that provide antimicrobial effects, including a highly acidic environment that is toxic to bacteria. Medical honey is also hygroscopic, meaning it draws moisture out of the environment, thus dehydrating the bacteria. Honey dressings are

available in alginate, hydrocolloid, and paste form. The dressing can be left in place for as long as seven days. Contraindications include an allergy to honey.

Silver

Silver has proven antimicrobial activity and has been used for centuries to treat wounds. Silver dressings work either by directly donating silver to the wound surface or destroying bacteria within the carrier or dressing. Silver is available in amorphous hydrogels, alginates, foams, silicones, ointments, irrigation solutions, negative pressure foams, and contact layers. Another modality, silver nitrate, is a chemical cauterization agent that can help achieve hemostasis on a variety of wounds, including epibole and hypergranulation tissue. Nurses can apply silver nitrate after the health-care provider has assessed the wound and placed an order.

CLINICAL SAFETY AND PROCEDURES (QSEN)

Patient-Centered Care: Dressing Changes

Always review and follow your institution's policy and procedure regarding dressing changes.

Procedure for changing a basic wound dressing without a drain:

1. Gather supplies: Supplies may include nonsterile or sterile gloves per policy, wound cleansing solution or sterile saline, sterile 2″ × 2″ gauze for wound cleansing, and advanced wound dressing as ordered.
    - Use the smallest size of dressing for the wound.
    - Take only the dressing supplies needed for the dressing change to the bedside to minimize waste.
2. Perform safety steps:
    - Perform hand hygiene.
    - Check the room for transmission-based precautions.
    - Confirm patient ID using two patient identifiers (e.g., name and date of birth).
    - Explain the process to the patient and ask if they have any questions.
    - Be organized and systematic.
    - Use appropriate listening and questioning skills.
    - Listen and attend to patient cues.
    - Ensure the patient's privacy and dignity.
    - Assess ABCs.
3. Prepare the environment.
    - Ensure proper body mechanics and create a comfortable position for the patient.
    - Adjust the height of the bed and turn on the lights for good visibility to assess the wound.
    - Premedicate, if indicated, to ensure the patient's comfort before and during the procedure.
4. Perform hand hygiene.
5. Arrange supplies at bedside.
    - Place a clean, dry barrier on the bedside table.
    - Create a sterile field if indicated by agency policy.
6. Pour sterile normal saline into opened sterile gauze packaging to moisten the gauze.
    - A normal saline container must be used for only one patient and dated and discarded within at least twenty-four hours of being opened.
    - Commercial wound cleanser may also be used, if indicated or ordered.
7. Expose the dressing.
8. Perform hand hygiene and apply nonsterile gloves.
9. Remove the outer dressing.
10. Remove the inner dressing if necessary.
11. Remove gloves, perform hand hygiene, and put on new gloves.
12. Assess the wound.
13. Drape the patient with a water-resistant underpad, if indicated, to protect the patient's clothing and linen.
14. Apply gloves and other PPE as indicated, such as goggles, face shield, or mask.
15. Cleanse the wound based on agency policy, using moistened gauze, commercial cleanser, or sterile irrigant.

- When using moistened gauze, use one moistened 2″ × 2″ sterile gauze per stroke. Strokes should move from a clean area to a dirty area and from top to bottom.
- Note: A suture line is considered the "least contaminated" area and should be cleansed first.

16. Apply new dressing, using nontouch technique so that the dressing touching the wound remains sterile/clean.
17. Apply outer dressing if required. Secure the dressing with tape or transparent film as needed.
18. Remove gloves and perform hand hygiene.
19. Assist the patient to a comfortable position; ask if they have any questions.
20. Ensure safety measures when leaving the room:
    - Bed is at the lowest position and locked.
    - Call light is within reach.
    - Side rails are up and secured.
    - Side table is within reach.
21. Perform hand hygiene.
22. Document the procedure and assessment findings.
23. Compare the wound assessment to previous documentation and analyze healing progress. Report any concerns according to institution's policy.

28.6 Medical Management

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Explain the clinical implications of hyperbaric oxygen therapy
- Describe other common treatment modalities for wound care
- Examine the interdisciplinary team members and their roles in the treatment of the wound care patient

Sometimes wounds require specialized therapy or medical interventions. This module explores several treatment options used to manage and treat complex wounds. For example, **hyperbaric oxygen therapy (HBOT)** is known for treating deep sea divers affected by rapid changes in pressure around them. HBOT is also used to treat a variety of health problems, including wounds. As with all aspects of health and patient care, teamwork is essential for specialized interventions. From the bedside nurse to the occupational therapist, every team member plays a role in helping the patient achieve their wound care goal.

Hyperbaric Oxygen Therapy

HBOT involves breathing pure oxygen in a pressurized environment, known as a chamber. This type of therapy helps to heal wounds. There are two types of hyperbaric chambers: monoplace and multiplace. A monoplace chamber accommodates one person. It is a long plastic tube that resembles an MRI machine. The patient lies on a table within the chamber and breathes oxygen while the pressure slowly increases. A multiplace chamber (or room) can accommodate two or more people. Patients breathe oxygen through a mask or hood. HBOT prevents reperfusion injury and encourages formation of new collagen. Therapy typically lasts two hours. Examples of wound types treated by HBOT include radiation injuries, infections, burns, crush injuries, necrotizing fasciitis, decompression sickness, and gas gangrene. The most significant contraindication to HBOT is untreated pneumothorax. Other contraindications for HBOT include patient claustrophobia, COPD, history of seizures, febrile patients, or the presence of a pacemaker or implantable device.

Nursing Considerations

Hyperbaric oxygen therapy nurses are specially trained to assist with HBOT and supervise patients undergoing this type of therapy. The most common complication after HBOT is trauma to the middle ear; therefore, HBOT should not be used by those with recent ear injury or ear surgery (Sibbald et al., 2021). The primary safety concern during the administration of HBOT is that the use of concentrated oxygen is a fire hazard. Thus, fire prevention is critical. Use of scented perfumes, creams, or lotions is not advised while in the chamber. Examples of other prohibited items include all flammable materials, oils, silk, wool, synthetic textiles, matches, lighters, battery operated materials, electronic hearing aids, metal framed eyeglasses, contact lenses, jewelry, watches, dentures, and other devices. Patients are provided with 100 percent cotton gowns to wear rather than street clothes.

Other Common Wound Treatment Options

Some wounds require additional support to foster healing and or closure. Here we will discuss some of the common treatment options beyond topical.

Negative Pressure Wound Therapy

Vacuum assisted wound closure, or **negative pressure wound therapy (NPWT)**, is a therapeutic technique that applies negative pressure to the wound bed to manage exudate and facilitate healing. The negative pressure applied to the wound bed allows for cells to quickly stretch to the point of replication, facilitating a healing environment for the stalled or difficult-to-heal wound. There are two types of NPWT: traditional therapy and single-use therapy (or portable therapy). Traditional NPWT includes open cell foam filler, cover dressing, fluid collection system, tubing, and a suction pump. Single-use therapy is typically used for incision management or shallow, difficult-to-heal wounds and may include a dressing attached to a pump that can be disposed of when therapy is complete. NPWT pressure ranges from 75 mmHg to 145 mmHg, depending on the type of wound, exudate level, and goal of therapy. Dressing changes occur every forty-eight to seventy-two hours, depending on the exudate level and dressing stability. Single-use devices may be worn as long as seven days. Contraindications to NPWT include untreated osteomyelitis, active sepsis, coagulopathies, allergies to NPWT components, and unexplored fistulas.

LINK TO LEARNING

This video describes how to use negative pressure wound therapy (https://openstax.org/r/77negpressthera) by applying a wound vac to a wound bed.

Drains

Surgical drains are tubes placed near surgical incisions in the postoperative patient to remove exudate, blood, or other fluid to prevent fluid accumulation in the body. The type of drain used is based on patient need, type of surgery, and amount of drainage. Common drains include the Jackson-Pratt, a soft, pliable tube and compressible bulb that creates negative pressure, and the Penrose, a flat, ribbonlike drain with gauze applied at the end to absorb drainage. The nurse's role in managing drains includes assessing the insertion site, securement, drainage amount, and patency.

Interdisciplinary Collaboration

Wound care is a common concern across multiple disciplines, which is why interdisciplinary collaboration is critical to patient care. The team approach incorporates all facets of wound management into a cohesive treatment plan. Some of the team members are surgeons, nurses, podiatrists, physical therapists, dietitians, and accompanying specialists.

Wound Care Nurses Certifications

Wound care nurses assess, treat, and create care plans for patients with complex wounds. They also provide wound prevention recommendations, strategies, and interventions for at-risk patients. There are several avenues to obtaining a wound care certification, and not all programs are created equal. Table 28.6 explains the various certifications a nurse can pursue.

Nursing Credentials	Certification Board	Description
Certified Wound Ostomy Continence Nurse (CWOCN) Certified Wound Ostomy Nurse (CWON) Certified Wound Care Nurse (CWCN) Certified Continence Care Nurse (CCCN) Certified Ostomy Care Nurse (COCN) Certified Foot Care Nurse (CFCN)	Wound Ostomy Continence Nursing Certification Board (WOCNCB)	Only accredited certification by the Accreditation Board of Specialty Nursing Includes Advanced Practice designations RN and BSN minimum requirements Only designated for RNs
Certified Wound Specialist (CWS)	American Board of Wound Management (ABWM)	Requires BSN or higher Any licensed health-care, sales, or marketing professional can obtain
Wound Care Certified (WCC)	National Alliance of Wound Care and Ostomy (NAWCO)	Any licensed professional can obtain

TABLE 28.6 Wound Care Certifications

Physical Therapists and Occupational Therapists

Patients who are weak or struggling to ambulate may require the assistance of a physical therapist (PT). Physical therapists can create an exercise plan that strengthens the patient to help facilitate healing. Some physical therapists focus on wound care and are often the providers performing and making recommendations for care.

Occupational therapists (OT) also have a role within the interdisciplinary team. Prevention of wounds is critical, as discussed, and OTs are experts in the repositioning, placement, and use of equipment while analyzing patient activity. OTs can teach patients how to manage wounds while safely engaging in daily tasks. OTs also have special training to incorporate techniques to assist with the management of lymphedema.

Dieticians

Nutrition, though sometimes overlooked, is critical to successful wound management. For example, macronutrient and micronutrients are essential for proliferation. A dietician can create appropriate meal plans according to a patient's dietary and nutritional needs for healing.

Pain Assessment and Management in Wound Care

A complete pain assessment enables the patient and care team to develop an effective pain regimen. Pain is commonly overlooked when assessing a wound. Dressing changes, debridement, infection, turning, and repositioning are some of the factors that can cause wound-related pain. Pain treatment varies according to the specific wound etiology and associated factors. For example, if pain results from dressing changes, it may be necessary to administer pain medication prior to changing the dressing or dressing type.

28.7 Nursing Management and Care Plan

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Identify components of a comprehensive wound assessment
- Examine best practices with wound documentation
- Discuss legal implications of wound care documentation

Comprehensive and concise wound care documentation is as critical as the assessment and care provided to the

patient. Wound care documentation fosters interdisciplinary communication and protects the nurse and patient from legal consequences. This module will explore the components of the comprehensive wound assessment and examines best practices and legal implications for ensuring wound care documentation is complete.

Wound Assessment

A **comprehensive wound assessment** is the written record and picture of the wound's current status and progress. The wound assessment is the culmination of observation, data collection, and evaluation at each encounter. The initial assessment serves as the baseline for future comparisons; because a wound can change rapidly, it is important to assess for changes in the wound and surrounding skin to signify a need for treatment modifications. Tenderness to touch and the amount of pain the patient reports are essential assessment components. Wound pain is one of the secondary signs of infection, and it is important to differentiate between constant pain and episodic pain, such as that felt only during a dressing change.

CULTURAL CONTEXT

Importance of Skin Color

When caring for a patient, the nurse must be "color aware." Being color aware acknowledges the relevance of skin color to health. Most skin care guides are based off light skin tones and do not reflect the skins tones of all patients. For example, when assessing an at-risk bony prominence of a darker-skinned individual for a Stage 1 pressure injury, the increased amount of melanin in the skin may mask the blanch response. Instead, after applying light pressure, look for an area that is darker than the surrounding skin or skin that is taut, shiny, or indurated (hardened).

Exudate description and language is important to understand and incorporate. Nurses should use multiple senses when assessing a wound. Visual inspection, palpation, and odor are components of the assessment to guide documentation and intervention. Table 28.7 and Table 28.8 list types of wound exudate and the language to describe the amount of exudate, respectively.

Exudate Type	Appearance
Serous	Clear, amber, thin, watery
Serosanguineous	Clear, pink, "blood tinged," watery
Sanguineous	Bloody, reddish, thin, watery
Purulent	Opaque, thick, yellow, green
Seropurulent	Yellow, tan, cloudy, thick; not to be confused with slough
Fibrinous	Cloudy, thin with strands of fibrin
Hemorrhagic	Red, thick

TABLE 28.7 Wound Exudate Types and Their Appearances

Term	Quantity
None	Wound is dry.
Scant	Tissue is moist.

TABLE 28.8 Terms Used to Describe Exudate Quantity for Wound Documentation

Term	Quantity
Small	Wound bed is wet, with moisture evenly distributed. Drainage encompasses up to 25% of dressing
Moderate	Wound bed is saturated. Drainage encompasses 25–75% of dressing
Large	Wound bed is bathed in fluid. Drainage is freely expressed and involves more than 75% of dressing

TABLE 28.8 Terms Used to Describe Exudate Quantity for Wound Documentation

When assessing the odor of a wound, it is important to wait until after the dressing is discarded and the wound is cleaned. Due to microbes and the wound's environment under a dressing, odor there is not uncommon; however, the persistence of foul odor after the cleansing of a wound can indicate infection. Descriptors of wound odor may include terms like strong, foul, pungent, fecal, and musty.

Patient History

A comprehensive patient assessment includes both visually inspecting the wound and the whole patient. A wound assessment encompasses not only the wound but the entire patient profile. When assessing wound components, interviewing the patient, and reviewing the patient's chart, the nurse should assess for wound location, etiology, length of duration, treatments completed or previously attempted, and patient compliance. An assessment includes reviewing accompanying laboratory data. Typical laboratory data to consider and assess for wound care patients include complete blood count (CBC), serum albumin, prealbumin, and blood glucose. A CBC is important to monitor for anemia and infections. Serum albumin and prealbumin are plasma proteins produced by the liver. Low serum albumin counts correlate with increased risk for pressure injury. However, prealbumin is more reliable than albumin in determining the effect of nutritional interventions. Blood glucose is monitored to indicate healing capability. Increased glucose levels are associated with an increased risk of impaired wound healing.

Wound Measurement

Measurement is a critical part of wound care assessment, providing valuable information on the progression or nonprogression of wounds. Consistency and accuracy when measuring a wound are important for meaningful evaluation that can determine the need for treatment modification. All medical institutions should develop and disseminate a protocol for wound measurement, including frequency of assessment, to ensure accuracy. A decrease in wound size is usually an indication of healing.

Wounds should not be compared to objects such as a coin. Rather, wound size should be measured and recorded in centimeters with a measuring device such as a paper or plastic ruler. The most used measurements are length, width, and depth of a wound, as determined and recorded using the linear method, also referred to as the clock method (Figure 28.12). The linear method, with a ruler, is inexpensive, readily available, and causes little to no patient discomfort. Note that this assessment technique does not include the periwound, only the wound base. Imagine the body as the face of an imaginary clock: the head is 12:00 and the feet are 6:00. Length is measured by placing the ruler at the point of maximum length, or from 12:00 to 6:00. Width is measured by placing the ruler at the point of maximum width, or from 3:00 to 9:00. Depth can be assessed by placing a clean cotton tipped applicator into the deepest part of the wound, marking it at the level of the wound edge, and measuring upon removal—similar to the process of assessing a tunnel. Although many wounds are irregularly shaped, the clock method allows for clear communication among assessing clinicians (Figure 28.13).

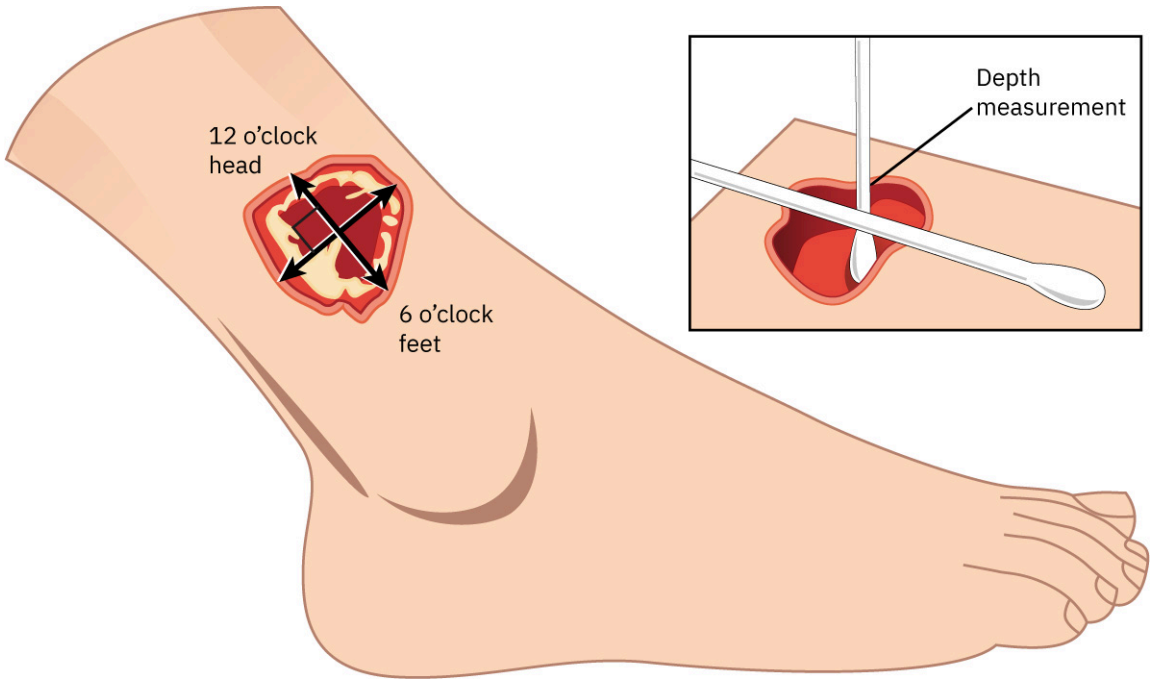


FIGURE 28.12 Determining wound measurements, a clinician measures the maximum length and width of the wound bed. The length is measured from the client's head to toe. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

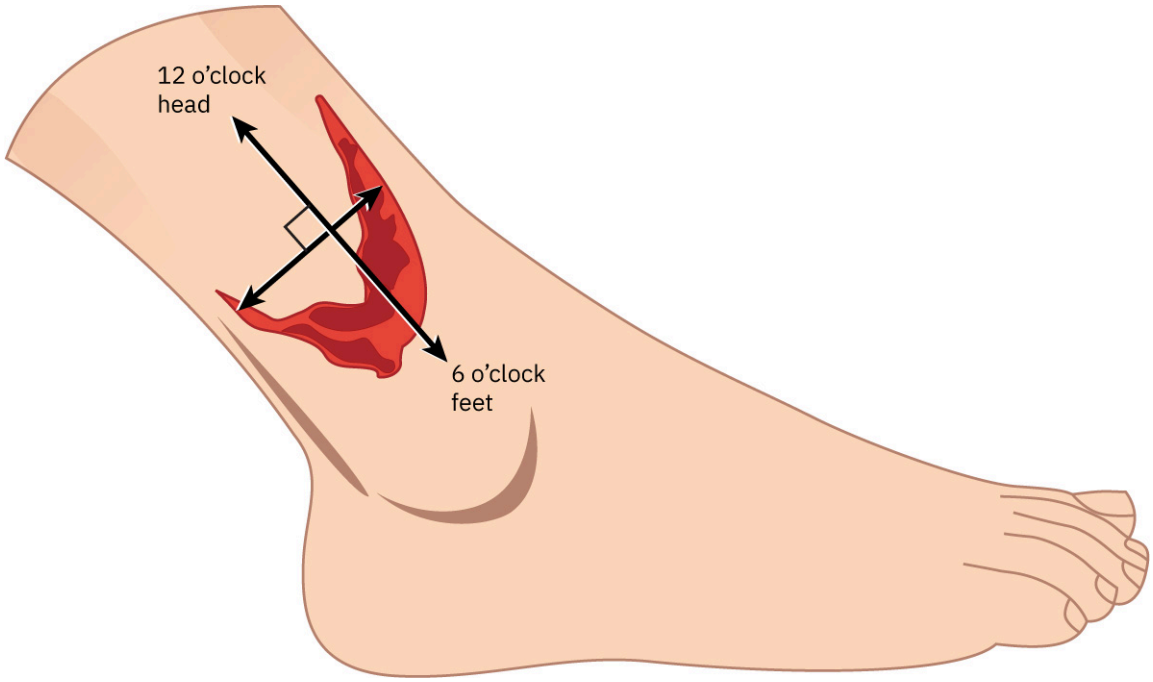


FIGURE 28.13 The same principles apply for irregularly shaped wounds: follow the head-to-toe method and measure the maximum length and width in cm. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

This method can also be applied to foot wounds. When assessing the plantar surface, the toes would be 12 o'clock and the heel 6 o'clock. The "clock" is also a helpful tool for identifying and recording landmarks or other wound assessment components, such as sinus tracts or undermining. For example, a wound might have undermining at 2 cm from 11 o'clock to 2 o'clock, with one 3 cm tunnel at 12 o'clock. This creates a visual image for all clinicians assessing the wound and can prevent unwarranted trauma to the otherwise friable tissue.

Wound Base

The wound base tissue reveals the phase and progress of wound healing through observation of color, degree of moisture, and amount of epithelialization. As previously discussed, a moist wound bed moves fibroblasts,

macrophages, collagenase, and other chemical components across the wound bed, progressing to healing. When assessing the wound base, we refer to the wound bed preparation to guide our visual assessment. Begin by assessing the wound bed, which may appear red, pink, yellow, or black. Clean, granular wounds are typically described as red or pink. If devitalized tissue is present, yellow or black necrotic tissue may also be present. Determine whether the bed is moist or dry and whether granulation is present.

Sometimes a wound can have **hypergranulation**: excess granulation tissue filling the wound bed beyond the height of the surface of the wound. Hypergranulation must be removed. If more than one tissue component is present, such as both granulation and necrotic burden, document the amount as a percentage. For example, the wound may have 75 percent granulation tissue and 25 percent yellow, adherent fibrin. Assessing the amount of each tissue type at each encounter allows the nurse to more easily track progress or regression of wound healing and determine whether wound treatment needs to be modified.

Periwound Assessment

The **periwound** is the skin surrounding a wound. It provides valuable information to the assessing clinician. Erythema and warmth at the periwound may indicate inflammation or infection. Interruptions in the periwound skin integrity may indicate reactions to adhesives. The presence of desiccation or maceration may indicate the dressing is ineffective in managing the wound. The presence of excessive dryness in the periwound is known as **desiccation**. On the other hand, **maceration** is the presence of excessive moisture.

When assessing and documenting the periwound, it is imperative to note the condition of the skin, hydration, skin abnormalities, color, hair and nail growth if appropriate, temperature, and presence of edema. Table 28.9 provides the detailed rationale of selected periwound assessment components.

Assessment Finding	Indication
Condition and quality of skin	• Is the skin thin, fragile, or transparent? Is it prone to tearing or further injury? • Note whether the periwound tissue is dry or cracked, which indicates too little moisture. Conversely, note if maceration is present. • Note any scars, rashes, or abnormalities that indicate other underlying health conditions.
Color	• The color of the periwound and surrounding skin can indicate potential problems. A certain amount of erythema is expected; however, excessive redness should spark concern for infection. • Is the tissue blanchable? Is the skin lighter in color than the surrounding tissue? If so, this may indicate ischemia. • A dusky color of the skin may represent severe ischemia

TABLE 28.9 Periwound Assessment Components

Wound Documentation

Wound documentation is an essential component of wound assessment and should be undertaken thoroughly, accurately, and consistently. Typically, wounds should be documented upon patient admission and transfer or discharge; between these milestones, documentation should happen weekly, with each dressing change, and with any significant changes to the wound or periwound.

Evidence-Based Practice for Wound Care

Documenting a wound care assessment should include all pieces discussed during the evaluation of a wound: type of wound, measurements, description of the wound base and periwound, drainage, odor, pain, and patient response to treatment. Agencies may have their own charting system or sheet to help with the wound assessment and documentation process, but it is imperative that the bedside provider includes all necessary components in the documentation. Documentation should be thorough, objective, and use simple language. There are many terms involved with wound and skin care, and sometimes it can be difficult to remember them all. The most important component of documenting a wound care assessment is describing precisely what is seen—using the correct terms

is helpful but not as important as a precise description. When documenting a wound, you are painting a picture to enable the next clinician or chart reader to visualize what you observed as you assessed and cared for the patient. Using simple terms is acceptable. There are legal implications for incorrectly documenting a term: for example, if a partial-thickness wound on the forearm is documented as a Stage 2 wound, this legally indicates that the wound is a pressure injury. Only pressure injuries should be staged. Timely recording is also a best practice for wound care documentation. If a record is documented after an extended period, note the reason for the delay in the record.

Photography

Wound photography provides a visual record of the wound; when done correctly, it can assist in care decisions and provide litigation support. However, photography should not replace bedside assessments. It is necessary to permanently mark on each photograph the time, date, and patient identification information while maintaining privacy: for example, by using a patient's initials rather than full name. Each photograph should include a sample measure, such as a 5-cm strip of tape for reference. Clinicians need appropriate training and must consistently follow their institution's wound photography protocol and policies. Angle of the camera, lighting, and distance can alter the perception of the wound assessment.

Legal Implications

Medico-legal issues in wound management can arise from low quality documentation. To review, the main purpose of wound care documentation is to communicate a wound's condition and progress to all future providers of the patient. Accurate and clear documentation enables the health-care team to collaborate and share pertinent information about the treatment and care plan. Consistency in documentation is important and prevents gaps in charting. If a patient's chart is presented during a legal proceeding, gaps in documented care or other omitted information make it more difficult for providers to exonerate themselves; they may even be interpreted as evidence of negligence.

The Centers for Medicare and Medicaid Services (CMS) sets reimbursement rates for medical services rendered and equipment used for the care of patients receiving Medicare. Fees and reimbursement rates vary, including for wound care. In terms of wound care reimbursement, CMS's documentation standards reflect the previously discussed best practices. Documentation for a wound should include:

- wound dimensions and depth
- presence and extent or absence of necrotic tissue and devitalized or nonviable tissue
- correct description and location of undermining or tunneling
- report of infection by describing wound exudate

It is important to describe the wound in simple, objective terms, without assigning blame or opinionating. When in doubt, describe what you see in clear, concise language as if you are painting a picture for the next clinician to care for the patient.

Another important nursing role with respect to wound care is educating patients on how to care for their wound; nurses should document all education provided. Lawsuits rarely involve wound care itself; rather, they revolve around not following standards of care, improper documentation, or lack of education around the patient's wound and care.

Summary

28.1 Cellular Response and Adaptation in Wound Healing

- The skin consists of three main layers: epidermis, dermis, and subcutaneous tissue. Each layer and its sublayers play an integral part in the external and internal roles of the skin.
- Regardless of wound etiology, all wounds undergo the same biological repair process, which consists of four phases.
- Understanding the four phases—hemostasis, inflammation, maturation, and remodeling—is important to understanding how to approach the wound and develop a comprehensive care plan.

28.2 Wound Healing Process

- The wound-healing cascade involves complex biochemical and physiological pathways. It includes the secretion of inflammatory cells and cytokines to facilitate healing.
- Various types of wounds require specific treatments based on their characteristics and etiology. Open wounds, such as abrasions, lacerations, punctures, avulsions, and incisions, involve breaks in tissue integrity. Chronic wounds fail to progress through healing phases in a timely manner.
- Wounds can heal through primary, secondary, or tertiary intention. Primary intention involves rapid closure with closely approximated edges, while secondary intention occurs when edges cannot be closed. Tertiary intention involves delayed closure, often to resolve infection or prepare for further intervention like grafting.
- Barriers to wound healing include physical, physiological, local, and systemic factors. Factors like age, immune status, perfusion, smoking, and comorbidities impede healing. The wound bed must be prepared using the TIME principles: tissue, infection/inflammation, moisture, and edges.

28.3 Pressure Injury

- Pressure injuries are preventable occurrences. It is the responsibility of every clinician and health-care provider to prevent them.
- Understanding the risk factors and pathophysiology of pressure injury development is critical for prevention.
- Pressure injuries should be staged.
- Pressure injury treatment follows the same method as other wounds and is accomplished through assessment and maximizing the principles of wound bed preparation.

28.4 Debridement

- Debridement, a cornerstone therapy in wound progression, has five current modalities: autolytic, biological (MT), enzymatic, mechanical, and surgical/sharp.
- Choosing the mode of debridement requires considering the presentation of the wound and the whole patient.
- Contraindications to debridement therapy rely on the specific modality. Regardless of the technique used, the removal of devitalized tissue is critical to facilitating wound progression.

28.5 Wound Care and Dressing

- There are more than a dozen topical therapy options and hundreds of wound care products on the market today. As a nurse, it is important to have a basic working knowledge of the categories of topical therapy and of the basic principles that govern patient care.
- Common lower leg ulcers encountered in wound care practice include venous leg ulcers, arterial ulcers, and diabetic foot ulcers.
- Any patient with a history of compromised circulation must have an ABI performed. If compression occurs and perfusion is compromised, the patient may risk losing or severely damaging the limb.

28.6 Medical Management

- Wound care is a collaborative effort among the interdisciplinary team. Often wounds are complex and require extensive or innovative measures to help heal.
- Specialized therapies include HOBT, NPWT, and drain management.
- As a nurse, it is important to understand what different treatment modalities are available to a patient and how to monitor the therapy.

- If a nurse is interested in specializing in wound care, there are options to continue education and obtain a board certification.
- Wound care is constantly evolving and needs specialists to help educate other clinicians, patients, and caregivers on wound care best practices.

28.7 Nursing Management and Care Plan

- A comprehensive wound assessment documents the status and progress of a wound. It includes a record of the observation, data collection, and evaluation and serves as the baseline for future comparisons.
- The comprehensive wound assessment includes patient history, wound measurement, observation of the wound base, and periwound assessment.
- Wound documentation should occur upon patient admission and transfer or discharge. Additional documentation should occur weekly, with each dressing change, and with any changes in the wound or periwound.
- Documentation should include type of wound, measurements, description of the wound base and periwound, drainage, odor, pain, and patient response to treatment in simple, objective terms.
- Documentation that is not thorough can be considered low quality and can lead to medico-legal issues. Consistency is important and prevents gaps in charting.
- Incomplete documentation can be interpreted as evidence of negligence and may also lead to issues with reimbursements for medical services rendered.

Key Terms

angiogenesis creation of new blood vessels
approximated brought close together, as in the case of wounds with sealed, clean edges
autolytic debridement process of using the body's intrinsic debriding mechanism to remove nonviable tissue
avascular lacking blood vessels
biological debridement use of sterile bottle fly larvae to remove nonviable tissue; also known as maggot larval therapy (MT)
Braden Scale risk assessment tool with six criteria for determining the risk of skin breakdown
comprehensive wound assessment complete, holistic, written, and visual record of the wound's current status and progress
dehiscence separation of the edges of a surgical wound
dermal-epidermal junction barrier between the epidermis and the dermis, which ensures strong resistance to physical stress
desiccation excessive dryness in the periwound
enzymatic debridement selective method of debridement that uses an exogenous enzyme known as collagenase; also known as chemical debridement
epibole severely rolled wound edges
epithelialization regeneration of the epidermis and the formation of granulation tissue
full-thickness wound injury extending through all skin layers, potentially involving muscle, fascia, or bone
granulation tissue new connective tissue with fragile, thin-walled capillaries
hematoma area of blood that collects outside large blood vessels
hyperbaric oxygen therapy (HBOT) therapy in which patients breathe pure oxygen in a pressurized environment to help wound progression and healing
hypergranulation excess granulation tissue filling the wound bed beyond the height of the surface of the wound
hypodermis layer of fat and connective tissue that links skin to the underlying structures
inflammation second phase of wound healing, characterized by the movement of white blood cells to the wound bed
keratinocyte cell that participates in the contraction and migration of cells across a wound bed to facilitate healing
maceration excessive presence of moisture in the periwound, which affects the integrity of the surrounding skin
mechanical debridement nonselective type of debridement that applies physical force to remove necrotic tissue
necrotic tissue avascular debris that can appear as eschar, slough, or biofilm
negative pressure wound therapy (NPWT) therapeutic technique that applies negative pressure to the wound bed to manage exudate and facilitate healing

Norton Scale risk assessment tool with five criteria for determining the risk of skin breakdown
partial-thickness wound superficial injury that involves the epidermis, dermis, or both
periwound skin surrounding a wound
pressure injury localized damage to the skin and underlying soft tissue, typically over a bony prominence or the site upon which a medical device was placed
primary intention healing of a wound with clean, approximated edges
proliferation third phase of wound healing, characterized by epithelialization, angiogenesis, collagen formation, and contraction
remodeling final phase of wound healing, characterized by regrowth and reorganization of collagen
secondary intention healing of a wound from the "bottom up," due to edges that cannot be approximated
senescent cell nonfunctioning cell that has stopped dividing but has not died
slough fibrinous necrotic tissue located on top of the wound bed; characterized as loose or stringy and yellow or tan
surgical debridement use of a scalpel, forceps, curette, scissors, or other instruments to remove necrotic tissue from the wound base; also known as sharp debridement
tertiary intention plan to delay healing while the wound remains open
tunneling formation of a sinus tract under any part of a wound's edge
undermining erosion of tissue under the edges of a wound

Assessments

Review Questions

1. What phase of wound healing is characterized by the migration of keratinocytes across the wound's surface?
   a. hemostasis
   b. inflammation
   c. proliferation
   d. maturation

2. What process involves the regeneration of the epidermis and the formation of granulation tissue?
   a. epithelialization
   b. maturation
   c. angiogenesis
   d. remodeling

3. The maturation phase of wound healing begins around week three. How long can it last?
   a. twelve months
   b. six months
   c. sixty days
   d. thirty days

4. What is the first phase of the wound-healing process?
   a. maturation
   b. proliferation
   c. hemostasis
   d. inflammation

5. What type of wound closure would most likely occur with a dehisced surgical wound?
   a. primary intention
   b. secondary intention
   c. tertiary intention
   d. delayed primary intention

6. What are the most common types of wounds? Select all that apply.

a. incision
b. puncture
c. abrasion
d. avulsion

7. What is the likeliest barrier to wound healing?
a. exercising three times a week
b. nutritional deficiencies
c. borderline hypertension
d. previous surgeries

8. A patient presents with a pressure injury to their right ischial tuberosity. The wound is 3×5 cm wide and 4 cm depth with exposed muscle. What stage would the nurse document for this pressure injury?
a. full-thickness
b. Stage 3
c. Stage 4
d. unstageable

9. What does the intense or prolonged pressure of a pressure injury lead to?
a. ischemia and necrosis
b. immobility and paralysis
c. infection and death
d. aphasia and apraxia

10. What is the most likely cause of pressure injury development?
a. compromised immunity
b. respiratory conditions
c. immobility
d. obesity

11. What are some pressure injury prevention strategies? Select all that apply.
a. use of specialty beds or pillows
b. early assessment screening
c. off-loading bony prominences
d. frequent repositioning

12. A nurse asks a nursing student what the purpose of collagenase therapy is. Which explanation best reflects the student's understanding?
a. "This medication is a debriding agent you apply to a necrotic wound to help prevent infection or biofilm from forming."
b. "Debriding the wound with this medication allows for the removal of nonviable tissue to facilitate wound progression."
c. "By applying this topical therapy, you are slowing the healing process of the wound and cleaning the wound at the same time."
d. "Collagenase is the only therapy available to debride or remove necrotic tissue from a wound."

13. What situation is a clinical implication for debridement therapy?
a. chronic nonhealing wound
b. dry, stable eschar present
c. hemodynamically unstable
d. recent anticoagulant therapy

14. What are the types of debridement? Select all that apply.

a. enzymatic
b. mechanical
c. chemical
d. autolytic

15. A nurse is assessing a patient's venous leg ulcer. The wound measures 3 cm × 5 cm and is extremely weepy. What dressing should the nurse select to manage the exudate volume?
a. foam dressing
b. alginate rope
c. transparent film
d. hydrocolloid

16. What wound presentation best describes a diabetic foot ulcer?
a. a dry, oval wound on the medial ankle
b. an oval wound with a callus on the plantar foot
c. a weepy, irregularly shaped wound on the calf
d. a punched-out, dry wound on the great toe

17. What clinical presentation is contraindicated for hyperbaric oxygen therapy? Select all that apply.
a. a patient arriving at therapy in street clothes
b. a critically ill patient
c. a patient with untreated pneumothorax
d. a claustrophobic patient

18. What is an example of data entry that exemplifies a best practice in wound care documentation?
a. "Wound WNL. Dressing changes without complications."
b. "Stage 2 arterial wound on arm. 4×4 cm. No drainage noted. Dressing changed per order without complications."
c. "Wound to left calf measures 3×5 cm. Minimal serious drainage noted. Redness to periwound, from 12 to 3 o'clock. Dressing applied per order, no complications."
d. "Pressure injury to left elbow. Provider notified. Foam dressing applied for prevention. Educated patient to keep arm elevated as much as possible. Will continue to monitor."

19. What characteristics of a wound should be included in the documentation of a wound assessment? Select all that apply.
a. exudate
b. measurements
c. any undermining
d. any noted odor

Check Your Understanding Questions

1. What are the three main layers of the skin?

2. Describe cues that would indicate a patient is at risk for developing a pressure wound.

3. A patient with necrotic tissue in their lower leg wound visits the health-care facility for debridement therapy. The patient asks the nurse which debridement method would be best for their wound. Describe the five types of debridement techniques and contraindications for each modality.

4. Describe the difference between arterial leg ulcers and venous leg ulcers. Include clinical presentation and common treatment options.

5. Explain the legal importance of an accurate and comprehensive wound care assessment. Provide examples.

Reflection Questions

1. Describe five of the main functions of the skin. Include examples of each.
2. A patient arrives at the unit postoperatively on oxygen via nasal canula, a foley catheter, and a chest tube. They are recovering from a six-hour procedure under general anesthesia. What factors place this patient at risk for pressure injury development? What pressure injury prevention measures should the nurse anticipate and implement?
3. What is the role of the wound care nurse in providing patient care? How does the role of the wound care nurse differ from that of the bedside nurse?
4. Imagine you are assessing a patient with a wound. What signs and symptoms would you recognize as potential infection?

What Should the Nurse Do?

Mrs. Ramos, a sixty-five-year-old female, visits her primary care physician with a nonhealing wound on her lower leg. She reports experiencing persistent pain, swelling, and foul-smelling discharge from the wound for the past three weeks. Mrs. Ramos has a medical history of type 2 diabetes and hypertension. On examination, her vital signs are within normal limits, but her lower leg wound reveals signs of infection and delayed healing.

1. Consider Mrs. Ramos's medical history of diabetes. How does this information contribute to the analysis of the wound's healing challenges, and what potential complications should be considered in the context of diabetes?
2. As the nurse, what immediate actions would you initiate to manage the infection and promote wound healing, and how would you collaborate with the health-care team to address Mrs. Ramos's overall health and comorbidities?

A new patient is admitted to the nurse's unit from a long-term care facility with a urinary tract infection. The nurse is performing a head-to-toe skin assessment on admission. The only injuries to note are intact "caps" of dry eschar on both heels.

3. What information relating to the wounds should the nurse include in their skin documentation, and how should the nurse stage them?
4. Which treatment modality should the nurse anticipate for the bilateral pressure injuries?
5. What preventive measures should the nurse implement?

Mr. Dickinson, a seventy-year-old male, checks into the emergency room with a chronic leg ulcer on his right lower extremity. He reports persistent pain, foul-smelling discharge, and difficulty in ambulation. Mr. Dickinson has a medical history of peripheral vascular disease and type 2 diabetes, both of which contribute to compromised blood circulation and delayed wound healing. On examination, his vital signs are stable, with a blood pressure of 130/80 mmHg, heart rate of 78 bpm, respiratory rate of 18 breaths per minute, and a body temperature of 98.6°F (37°C). The leg ulcer exhibits signs of infection, including redness, warmth, and purulent discharge. Necrotic tissue is present, indicating impaired tissue viability.

6. Considering the signs of infection and necrotic tissue in the leg ulcer, how do these cues inform the nurse's analysis of the clinical implications for debridement therapy? What potential complications should be considered during the analysis?
7. What debridement methods and wound care interventions would you recommend for Mr. Dickinson, considering the presence of infection and necrotic tissue? How would you tailor these solutions to meet his individual needs and promote effective wound healing?

Ms. Lankford, a fifty-five-year-old female, arrives at the emergency room with a nonhealing diabetic foot ulcer on her right foot. She reports persistent pain, foul-smelling discharge, and difficulty in bearing weight on the affected limb. Ms. Lankford has a medical history of type 2 diabetes and peripheral vascular disease. On examination, her vital signs reveal a blood pressure of 130/80 mmHg, heart rate of 88 bpm, respiratory rate of 20 breaths per minute, and body temperature of 98.7°F (37.1°C). The diabetic foot ulcer exhibits signs of infection and delayed healing.

8. What specific cues in Ms. Lankford's medical history and the presentation of the diabetic foot ulcer indicate the potential need for hyperbaric oxygen therapy, and how would you communicate these cues to the wound care team?

9. What other common treatment modalities, aside from hyperbaric oxygen therapy, would you recommend for Ms. Lankford's diabetic foot ulcer, and how would you tailor these solutions to meet her specific needs and promote effective wound healing?
10. The provider has ordered for a postoperative patient to have his wound photographed. What would the nurse verify before photographing the wound?

Competency-Based Assessments

1. Suppose that you work for an assisted living facility. The demographics of the patients you serve are mainly over the age of seventy. Develop a five-minute presentation for your monthly quality improvement meeting. Your presentation should include discussion regarding wound healing in older adults.
2. The nurse is caring for a patient who has a postoperative knee incision. The wound is slightly edematous and not approximated, with some yellow exudate present. What next steps will the nurse take?
3. Develop a pamphlet to present to your peers comparing and contrasting partial-thickness and full-thickness wounds.
4. Identify the cause of pressure injury development and discuss the roles of sustained pressure, shear, and friction in the pathophysiology of pressure injuries. How does this knowledge influence the nurse's approach to prevention and care for patients at risk?
5. Discuss pressure injury prevention strategies, considering both primary and secondary prevention measures. How can nurses collaboratively work with patients, families, and interdisciplinary teams to implement and maintain effective prevention strategies?
6. As a nursing student, how would you outline the essential steps for wound bed preparation, emphasizing the importance of each step in promoting optimal wound healing?
7. Given a scenario involving a venous leg ulcer, describe the rationale for selecting a compression bandage as part of the wound care plan.
8. Develop a sample wound care documentation entry for a pressure ulcer on the lower right leg of a patient.

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CHAPTER 29

Immunological Function

FIGURE 29.1 In June 1987, a small group of strangers gathered in a San Francisco storefront to document the lives they feared history would neglect. Their goal was to create a memorial for those who had died of AIDS, and to thereby help people understand the devastation. The quilt grew over time and is shown on the National Mall in Washington, DC. (credit: Carol M. Highsmith Archive, Library of Congress, Prints and Photographs Division, Public Domain)

CHAPTER OUTLINE

INTRODUCTION The immune system plays a vital role in preventing or limiting infection. When a body comes in contact with harmful bacteria, viruses, or other substances that can cause illness, its immune system kicks into action. Fundamentally, the immune system is designed to recognize "self" from "nonself." That is, it should be able to distinguish between cells that are part of the body's own tissues (self) and substances that come from substances outside it (nonself), which can include bacteria and other pathogens, as well as toxins. These nonself substances are "invaders," and the immune system must differentiate them from cells and tissues of the body so that it can mount an appropriate response. Immunocompromise impedes the body from mounting such a response.

29.1 Immune Response

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the normal anatomical and physiological findings of an immune response
- Identify key components to incorporate into an immune system–focused assessment
- Discuss the effects and role of immunosuppressive medication in patient care
- Discuss recent advances in immunology

The body's specific, protective response to a foreign agent or organism is known as **immunity**. Through a variety of responses, both antibody mediated and cell mediated, the healthy immune system eliminates foreign substances or invaders it deems to be "nonself." Patients who are **immunocompetent** have an efficient immune system that is able to carry out functions properly. Patients who are **immunocompromised** do not have a properly working immune system; as a result, they are at risk for hypersensitivities, autoimmune disorders, infections, and immunodeficiencies.

Anatomy and Physiology Overview

The immune system is an intricate and complex system of specialized physiological structures that work in tandem to protect the body. The immune system's main tasks include the following (Institute for Quality and Efficiency in Health Care, 2020a):

- recognizing and neutralizing harmful substances from the environment
- recognizing and destroying malignant cells
- fighting and removing from the body disease-causing pathogens, such as bacteria, fungi, viruses, and parasites
- removing and destroying dead or damaged cells

Although it is always at work, a properly functioning immune system carries out its tasks automatically and without a person's conscious awareness. As long as they feel well, a person likely will not think about how hard their immune system is working. A weakened immune system is noticeable, however; a person will become ill after being exposed to an agent that the body cannot adequately defend against and develop symptoms that draw their attention to their state of ill health.

To effectively care for patients with a weakened or improperly functioning immune system, the nurse must understand the system's anatomy and physiology. The nurse also needs a solid educational foundation in these topics to educate patients and their families, thereby promoting optimal health and preventing disease.

Anatomy of the Immune System

The immune system is made up of many cells, tissues, and organs (Figure 29.2). White blood cells, or leukocytes, are the primary cells involved in an immune response. These cells are produced in the bone marrow and move through the body in a colorless fluid called lymph, which also contains water, fats, proteins, electrolytes, and antibodies.

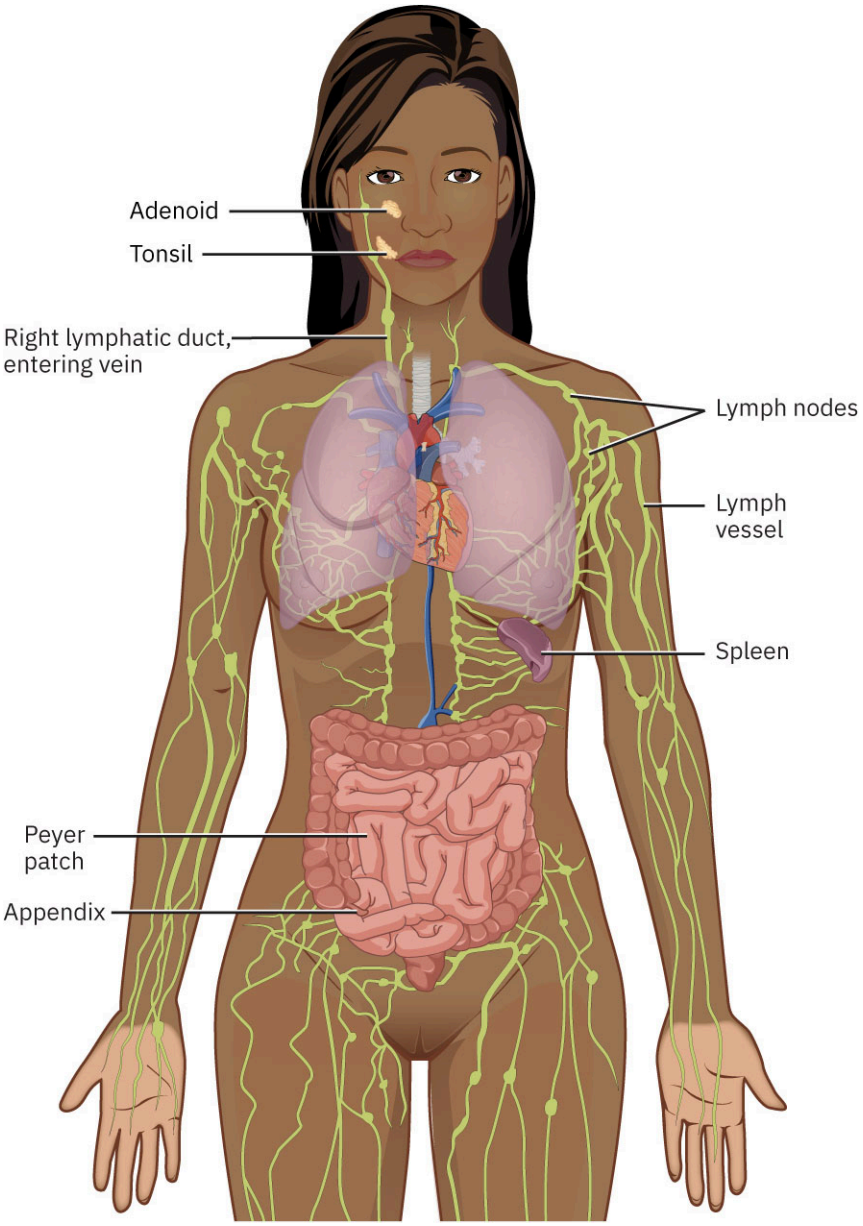

FIGURE 29.2 Various organs, cells, and tissues make up the immune system. Each plays a vital role in how the immune system functions. (credit: modification of work from *Anatomy and Physiology 2e*. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Leukocytes can be divided into different types (Figure 29.3), including granulocytes (neutrophils, eosinophils, and basophils), monocytes, and lymphocytes (T cells, B cells, and natural killer cells). Granulocytes are white blood cells that are involved in defending against infections (Tigner 2022). The different types of granulocytes are the following:

- Neutrophils are the most common type. They quickly respond to infections and destroy bacteria and fungi.
- Eosinophils help fight off parasites and are involved in allergic reactions.
- Basophils are the least common type. They release chemicals like histamine during allergic reactions to help the immune response.

Monocytes are cells that become macrophages when they move into tissues. They eat and digest bacteria, dead cells, and other debris. Lymphocytes are crucial for the body's immune response. The three types of lymphocytes are the following:

- T cells help other immune cells and kill infected or cancerous cells.
- B cells make antibodies that target and neutralize invaders like bacteria and viruses.
- Natural killer (NK) cells destroy infected or cancerous cells without needing to recognize a specific antigen.

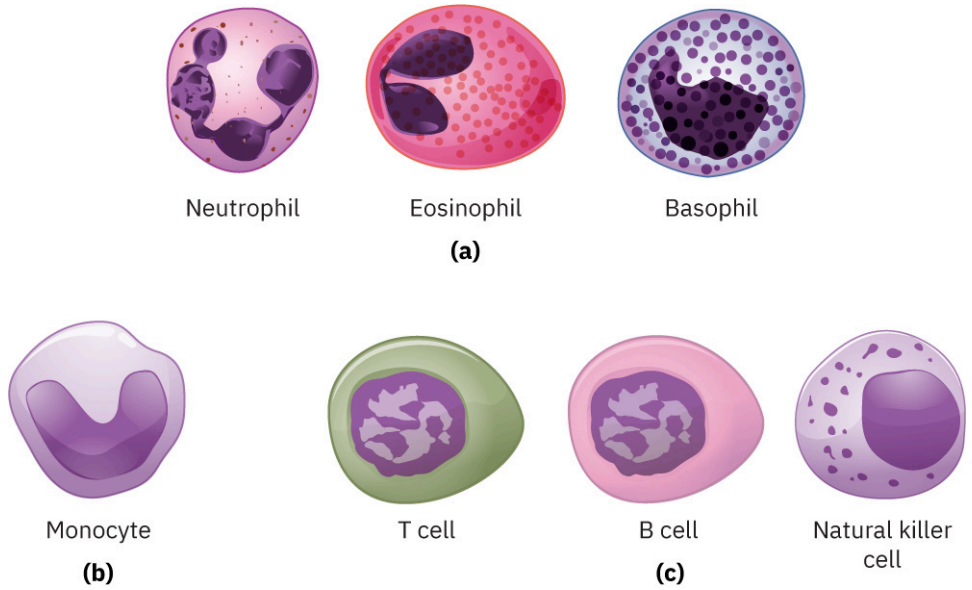

FIGURE 29.3 (a) Granulocytes are derived from myeloblasts and include basophils, neutrophils, and eosinophils. (b) Monocytes are derived from monoblasts. (c) Lymphocytes are derived from lymphoblasts and include T cells, B cells, and natural killer cells. (credit: modification of work from *Anatomy and Physiology 2e*. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Lymphoid tissues include the spleen and lymph nodes (Figure 29.4). The red pulp of the spleen is where injured and old red blood cells are destroyed and the iron recycled back into the body. The white pulp of the spleen houses a concentration of lymphocytes. The lymph nodes keep foreign material from entering the bloodstream by removing it from the lymph system via channels and capillaries. The lymph nodes also serve as a center for proliferation of immune cells.

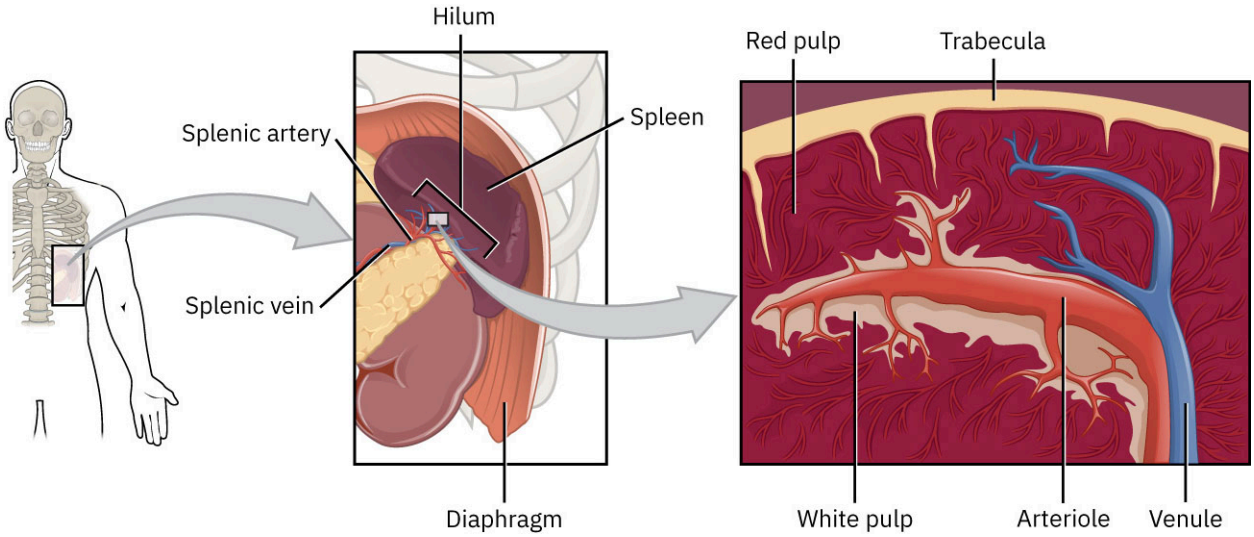

FIGURE 29.4 The spleen, located in the upper left abdomen, is an oval-shaped organ. It consists of a fibrous outer capsule, red pulp for filtering blood, and white pulp for immune functions. The red pulp of the spleen filters and breaks down old or damaged red blood cells, while the white pulp is involved in immune responses, producing and monitoring white blood cells. (credit: modification of work from *Anatomy and Physiology 2e*. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Other lymphoid tissues and organs include the appendix, thymus, intestines (specifically the Peyer patches), tonsils, adenoids, and bronchus-associated lymph tissues. These organs house immune cells that defend the body's mucosal surfaces against pathogens and microorganisms (Rawer, 2021).

Function of the Immune System

The overall function of the immune system is to recognize and destroy foreign antigens. The body's **natural immunity** (also called innate or nonspecific) is present at birth, and its **acquired immunity** (also called adaptive or specific) develops after birth (Table 29.1). Each type plays a distinct role in defending the body, but the respective components are co-dependent.

Characteristic	Natural (Innate) Immunity	Acquired (Adaptive) Immunity
Type	Inherited	Acquired during life (exposure, vaccination)
Duration	Life	Varies
Specific	No (broad)	Yes
Mechanisms	Innate immune cells, barriers/defenses (physical, chemical)	Antibodies (T, B cells)
Vaccination	No	Yes
Timing	Immediate response	Gradual response
Memory	No	Yes

TABLE 29.1 **Innate versus Acquired Immunity Comparison** (Institute for Quality and Efficiency in Health Care, 2020b)

Natural Immunity

Natural immunity is the first line of a host's defense. The innate immune system reacts quickly when contact is made with pathogens. White blood cells are key to an effective response. The macrophages work to digest and dissolve pathogens. Monocytes play a role in **phagocytosis**, engulfing and destroying foreign bodies. Eosinophils protect against parasites; they also increase in number in response to allergic reactions and stress. Basophils release chemotactic substances, such as serotonin, histamine, and heparin, in allergic reactions. Where inflammation occurs, the neutrophils are the first cells to arrive. The **natural killer cells** destroy tumor, fungi, and viral-infected cells as well as foreign tissues.

Other substances also play roles in the innate immune response, including several proteins: **interferons** signal the substances involved in defense against viruses, and **interleukins** are sent messages to direct the actions of the immune system cells, including modulating inflammation. Mucous membranes throughout the body produce secretions that bind invaders until they can be destroyed or removed. Hairlike structures called **cilia** (singular: cilium) remove invaders found in the respiratory tract. The cough reflex is also part of the natural immune response, as the body attempts to remove antigens from the respiratory or digestive system and inhibit them from invading the body further.

The stomach and intestines also play roles in the innate immune response. The stomach produces hydrochloric acid and enzymes that break down proteins and decompose foreign pathogens. The intestinal flora also fend off infections as antibody-producing cells live in the intestinal mucosa (Rawer, 2021).

Acquired Immunity

Acquired immunity is adaptive and complex. It responds to a specific threat, or antigen, by producing antibodies that are designed to target that antigen. It must be able to remember all the various antigens that it encounters to efficiently respond when particular antigens make recurrent attacks.

Lymphocytes play key roles in the adaptive immune system. This is how they break down. B cells, which mature in the bone marrow, form antibodies (also called immunoglobulins) that target specific antigens. T cells, also known as T lymphocytes, mature in the thymus, function to control viral infections, destroy cancer cells, and are also involved in hypersensitivity reactions. T lymphocytes also migrate through the host to monitor body cell surfaces for changes. When T cells make contact with a recognition mark or antigen, they activate to stimulate B-lymphocyte division. T killer cells then terminate infected or degenerated cells. T-helper cells support the immune response. The T-suppressor cells dismiss the immune response and also reduce the risk of autoimmune diseases or allergic reactions by suppressing the immune response in certain interactions (Rawer, 2021).

CLINICAL SAFETY AND PROCEDURES (QSEN)

QSEN Competency: Safety. Infection Prevention

Disclaimer: Always follow the agency's policy for infection prevention.

Definition: Minimizes risk of harm to patients and providers through both system effectiveness and individual performance.

Knowledge: The nurse will analyze basic safety principles, understand evidence-based practice infection prevention standards, and reflect on unsafe nursing practices.

Skills: Demonstrate effective infection prevention strategies to reduce the risk of harm when providing care to patients. This may include but is not limited to practicing frequent, proper handwashing, using personal protective equipment (PPE), using aseptic technique, following disinfection procedures, practicing safe injection, providing patient education, participating in surveillance, and staying current on evolving standards and practices that help prevent infection in the health-care and community settings.

Attitudes: The nurse will respect their individual role in preventing infection by adhering to safe, evidence-based practice standards.

(QSEN Institute, n.d.)

Assessment of the Immune System

Assessment of the immune system starts with obtaining the health history of the patient and performing a physical examination. The nurse should determine the patient's nutritional status and history of immunizations, infections, allergies, surgeries, medications, blood transfusions, and disease and disorder states, such as cancer, chronic illnesses, or autoimmune conditions. The nurse should also palpate the lymph nodes to assess for signs of inflammation or illness, including tenderness, enlargement, and movability. For example, firm, painless lymph nodes can be a sign of cancer, while inflamed lymph nodes from an infection can be tender and movable.

Additionally, the nurse will assess the skin and mucous membranes as well as the neurosensory, cardiovascular, genitourinary, musculoskeletal, gastrointestinal, and respiratory systems, for specific and nonspecific signs of illness, injury, and inflammation, such as redness, fever, and swelling.

Health History

The health history of a patient is an important indicator of how well the immune system functions. Older adults are at a greater risk for **immunosenescence**, the gradual deterioration of the immune system due to natural aging processes (Borgoni et al., 2021). Changes due to aging contribute to a variety of problems and put older adults at an increased risk for infections, metabolic diseases, autoimmune diseases, neurological disorders, and osteoporosis. The aging immune system's inability to recognize malignant cells may also be a contributing factor of cancer in older people (Borgoni et al., 2021).

Gender is another important component. There are differences in immune system functions between males and females. Sex hormones contribute to the development and activity of the immune system. Both innate and adaptive immune systems have receptors for sex hormones and respond to hormonal cues (Moulton, 2018). Consequently, differences in sex hormones help to explain the greater prevalence of autoimmune diseases in females than in males (Pennell et al., 2012)

A person's nutritional status likewise is vital to the efficiency of their immune status. Nutritional deficiencies in micronutrients have been linked to a decline in immune function. Specifically, deficiencies in zinc are associated with several diseases, because zinc plays an important role in immune function, homeostasis, and apoptosis, which is the normal and controlled death of cells. An inadequate intake of protein can result in the atrophy of lymphoid tissue, decreased production of T cells, impaired phagocytic function, and a reduced antibody response—all factors that can make a person more susceptible to infection (Venter et al., 2020).

The nurse should also ask the patient about their immunization history throughout their lifespan. This includes

vaccinations, such as influenza, COVID-19, pertussis, herpes simplex, and pneumococcal disease, as well as childhood and adolescent immunizations, such as measles, mumps, rubella, hepatitis A and B, DTaP, human papillomavirus (HPV), polio, rotavirus, and meningococcal. This history allows the nurse both to assess the patient's immunity against diseases and to determine if a patient needs an immunization. It also provides the nurse with an opportunity to educate the patient about the need for vaccines.

LINK TO LEARNING

The Centers for Disease Control and Prevention (CDC) provides free resources outlining vaccine schedules for children and adolescents (https://openstax.org/r/77vaccine) from birth to 18 years old as well as adults 19 years of age and older.

Another important component of the patient's health history is the patient's known past or present exposure to various infections that can contribute to immunodeficiency, including lifestyle risk factors. The nurse will want to assess the patient's exposure to tuberculosis; blood-borne pathogens, such as hepatitis B, C, D, or HIV; and sexually transmitted infections, such as gonorrhea, syphilis, HPV, and chlamydia. Assess lifestyle risk factors as well, including sexual partner history and drug use. Finally, the nurse should assess for recurrent infections, fevers of unknown origins, lesions, and any type of drainage from a lesion or wound, noting known or suspected dates of exposure, test results, and types of and responses to treatment.

The nurse should ask the patient about allergies. Allergies may include dust, pet dander, cosmetics, pollens, plants, medications, latex, vaccines, or food. The nurse should assess the symptoms experienced, their severity, and the presence or absence of any seasonal variation. The history includes asking about allergy testing, treatments, and effectiveness of treatments. It is crucial that the nurse document all patient allergies and, for those reporting food or medication allergies, create identification bands and alerts to notify other members of the health care team.

History: Disorders and Diseases

Autoimmune disorders result when the immune system malfunctions and attacks the body's own healthy cells, tissues, or organs. Instead of attacking a nonself tissue or invader, the body attacks itself (Figure 29.5). Autoimmune disorders can affect any part of the body and weaken bodily function. Examples include diabetes, lupus, rheumatoid arthritis, and multiple sclerosis (U.S. Department of Health and Human Services, 2022). It is important that the nurse assess for autoimmune conditions to determine how well the patient's immune system functions and if the patient is at risk for infections. The nurse should obtain information about the onset, severity, remissions, and exacerbations of each documented disorder, along with any functional limitations and the types and effectiveness of current or past treatments. The nurse should also obtain information about any family history of autoimmune conditions, because there can be a genetic predisposition.

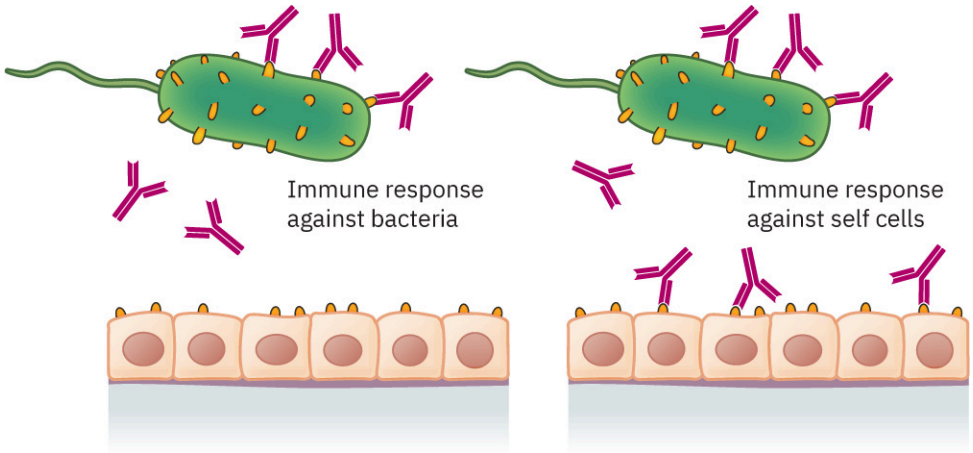

FIGURE 29.5 In an autoimmune disorder, the immune system attacks the body's healthy cells. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Neoplastic diseases are conditions that cause a **neoplasm**, or tumor—an abnormal growth of cells in a confined

area, which may be benign or malignant. A benign tumor is noncancerous and unable to spread to other tissues or organs. A malignant tumor is cancerous and can spread to other tissues or organs in the body, a process known as metastasis. The nurse should obtain the patient and family history of cancer, including type, onset, test results, past and current treatments received, alternative therapies used, and response to treatments; family histories should also include the maternal or paternal relationship of the affected family member to the patient. Immunosuppression can contribute to the development of cancer, and cancer treatment can further contribute to immunosuppression. For example, chemotherapy can diminish bone marrow function and destroy the important lymphocytes needed for adequate immune responses (Cancer Research UK, 2021).

History: Psychoneuroimmunology Factors

The study of how the immune system and central nervous system interact is called **psychoneuroimmunology**. Neurotransmitters, hormones, and neuropeptides have been found to regulate immune cells; in turn, immune cells are capable of communicating with nervous tissue through the secretion of a wide variety of cytokines. The hypothalamus can communicate a warning to the body when it recognizes a potential predator. The hypothalamus can also recognize the release of prostaglandins, interleukins, interferons, histamine, and serotonin during the inflammatory response.

Determining the psychological status of the patient is an important component of the health history. Stress can negatively affect the effectiveness of the immune system and contribute to illness or infection. This is due to the elevated levels of cortisol-releasing hormone, adrenocorticotropic hormone, and cortisol, which can affect the immune system cells in both the short and long term by suppressing the immune response and, over time, reducing its effectiveness (Tausk et al., 2008). Behavioral strategies, including meditation, relaxation, biofeedback, imagery techniques, and hypnosis, can improve a patient's immune response; the nurse should assess the patient's response to and use of these strategies, as applicable.

REAL RN STORIES

Nurse: Casey, RN
Years in Practice: Ten
Clinical Setting: Community health clinic
Geographic Location: Chicago

When I think about the effect that stress can have on the body, I think about a patient I saw quite a bit over the last year after her messy divorce. Alicia was a 35-year-old teacher who had been married for nine years when she discovered her husband had been cheating on her. They had a young son together, and the divorce and custody battle that ensued took a lot out of her. She explained this to me over the course of several appointments that year when she came to the clinic with respiratory infections. She laughed it off and said it was just that her son was "bringing home first-grade yuck" and giving it to her, but I had a feeling the chronic stress and trauma she was experiencing were affecting her immune system. In better times, her body probably would have been much better able to fend off those kiddo germs, but in her completely stressed-out state, she was much more at risk for infection. I explained this to her and asked if she had anyone to talk to, like a counselor. She seemed to have an "ah-ha" moment and said that before the divorce she hardly ever got colds and couldn't even remember the last time she'd had the flu. But over the last few months, it just seemed like she was constantly sick and picking up every bug that went around. She admitted that she hadn't found a therapist to talk to but knew that she probably needed to "work through it all" with a professional. I made sure to connect her with one of our mental health team members before she left her appointment. It has been a few months since she came in with respiratory symptoms, so reducing her stress may have helped bolster her immune system.

History: Medications and Blood Transfusion History

Part of obtaining a health history includes asking the patient for a list of current and past medications. Medications, such as antibiotics, nonsteroidal anti-inflammatory drugs, corticosteroids, cytotoxic agents, and anesthetic agents can suppress the immune system. The nurse should also ask about the use of over-the-counter medications and herbal supplements. While there has not been rigorous testing of all herbal supplements and over-the-counter medications, some are known to cause immunosuppression. It is best practice to obtain information about the

patient's usage and educate them about problematic effects that may alter their immune response. For example, red yeast rice may be used to lower high-density lipoprotein and low-density lipoprotein. This herb has been found to work as an immunosuppressant, however.

The patient's blood transfusion history is also important, because previous exposure to foreign antigens through a transfusion can be linked to an improperly functioning immune system. Although blood to be transfused is tested for HIV prior to being administered and the risk of HIV from a blood transfusion is extremely low, a small risk is still possible.

History: Lifestyle Considerations

A person's lifestyle can greatly affect how well their immune system functions. Factors, such as smoking, poor nutritional status, alcohol consumption, sexually transmitted infections, illicit drug use, stress, lack of sleep, and environmental exposure to radiation and pollutants have been linked to an impaired immune system. Conversely, someone who overexercises is also at risk for a poor functioning immune system due to the physiological stress on their body. The nurse must ask questions to determine any lifestyle factors that may affect the patient's immune system.

Following are examples of questions the nurse may ask to elicit this key information from a patient:

- Do you smoke? How much and for how long?
- What do you normally eat and drink?
- Do you drink alcohol? How much and for how long?
- Do you use any substances? Which ones and for how long?
- Are you feeling stressed out? How would you rate your stress from low to high? What do you to do manage your stress?
- How do you sleep? What time do you go to bed and wake up? Do you feel rested?
- Do you get physical activity during the day? Do you have a workout routine? Are you sitting for most of the day without a break to stand up and move around?
- Are you sexually active? What steps do you take to protect yourself from sexually transmitted infections? Have you ever been diagnosed with a sexually transmitted infection, had symptoms of one, or had a partner who had one?
- Are you concerned about exposure to chemicals at your job or at home? Have you had tests like medical scans that used radiation? Are you concerned about the air quality or levels of pollution in your community?
- Have you been sick recently? Has anyone in your home had a contagious illness recently?
- Do you take any medications or use supplements, including over-the-counter vitamins, medicines, or alternative medicine therapies?

The nurse should also educate the patient and family on the importance of modifying lifestyle factors to promote optimal health (Harvard Health Publishing, 2021).

CLINICAL JUDGMENT MEASUREMENT MODEL

Analyze Cues: Asking Subjective Questions

Before analyzing cues, the nurse must make sure they have enough data to interpret the information. For example, if a patient reports a sore throat, the nurse must recognize the sore throat as a cue to ask follow-up questions such as these: "When did it start?" "How severe is the pain?" "Is there anything that makes it worse or better?" "What other symptoms are you having?" "Have you been exposed to anyone with an illness that you are aware of?" The patient's response will allow the nurse to begin critically thinking about the information in order to hypothesize the likely cause and appropriate treatment. By asking subjective questions, the nurse is able to determine what actions to take next.

Physical Assessment

A physical examination to assess a patient's immune system includes palpation of the lymph nodes found in the anterior and posterior cervical areas, as well as the supraclavicular, axillary, and inguinal lymph nodes. The nurse will determine whether any nodes are swollen or tender. The nurse will also check the skin and mucous membranes

for any lesions, purpura, urticaria, dermatitis, inflammation, or discharge. Take the patient's temperature and assess their joints for tenderness, edema, warmth, or limited range of motion. The nurse should also assess the patient's neurosensory, cardiovascular, genitourinary, musculoskeletal, gastrointestinal, and respiratory systems for signs of possible immune dysfunction, including fever, weakness, fatigue, weight loss, and pain. The nurse must document all findings.

Diagnostic Evaluation

Diagnostic evaluation of the immune system includes various blood and skin tests (Table 29.2). These tests may include humoral, or antibody-mediated, immunity tests, or cellular, or cell-mediated, immunity tests.

Category	Test	What It Checks For
Humoral immunity (antibody mediated)	B-cell quantification with monoclonal antibodies	Number of B cells, overall immune system functioning, and signs of deficiency
	Specific antibody response	Antibodies for specific antigens, signs of specific infections, assess response to vaccines
	Total serum globulins	Number of globulins, health of immune system, signs of deficiency
	Individual immunoglobulins (IgG, IgA, IgM)	Levels of specific antibodies, health of immune system, response to vaccines
Cellular immunity (cell mediated)	Total lymphocyte count	Number of immune cells, health of immune system, signs of deficiencies
	Cytokine production	Number of cytokines being produced, signs of inflammation, infection, autoimmune disease
	Helper and suppressor T-cell functions	T cells' ability to control immune response, health of immune system, and signs of deficiency
	T-cell quantification with monoclonal antibody	Number of specific T cells
	Delayed hypersensitivity skin test	T-cell function by reaction to a harmless substance, assess vaccine response or look for immunodeficiencies
	Lymphocyte response to antigens, mitogens, and allogenic cells	Immune cell reaction to different triggers, assess immune system health, signs of deficiencies
Other tests	Bone marrow biopsy	Immune cells in bone marrow, diagnose diseases of bone marrow or causes of poor immune response

TABLE 29.2 Immune Tests

Collaborative Management with Immunosuppressive Therapy

Collaborative management of a patient with immunodeficiency will vary depending on the diagnosis and severity. The interdisciplinary team may include nurses, psychologists, primary care physicians, infectious disease doctors, rheumatologists, oncologists, endocrinologists, social work, physical therapists, dietitians, or occupational therapists. Treatments may vary to include medications, infusions, surgery, chemotherapy, radiation, lifestyle

modifications, counseling, or rehabilitation.

The interdisciplinary team is involved in the diagnosis and management of immune function disorders, and all members must be aware of the physical discomfort and psychological reactions that may be associated with testing and treatments. Patients may experience grief or anxiety associated with test results or possible implications of a diagnosis that may affect their personal relationships, employment, and future health. The nurse should counsel, educate, and be supportive throughout the process as well as provide resources on counseling and education when needed.

Medical management may include immunosuppressive therapy. This therapy may be prescribed for autoimmune diseases or for those undergoing organ or stem cell transplantation. Immunosuppressive therapy is designed to stop the immune system from mistakenly attacking healthy cells and tissues. Prior to organ or stem cell transplants, immunosuppressive agents are prescribed to prevent the body from rejecting or attacking the transplanted material. Potential side effects of these agents may include hyperglycemia, fatigue, hair loss, headaches, high blood pressure, osteoporosis, tremors, weight gain, nausea, and/or vomiting. The nurse or prescriber must educate the patient to take their medications as prescribed, despite any side effects, as skipping a dose can result in a flare-up or worsening of the condition the drug is intended to treat. It could even cause the patient's body to reject the transplanted organ or cells.

Taking immunosuppressants can have more serious, even life-threatening, consequences, as suppressing the immune system puts the patient at increased risk of infection from any number of pathogens. The patient should be educated on signs and symptoms of infection and the need to immediately report symptoms, such as a fever of 100.5°F (38°C) or greater, decreased urine output, bloody urine, flu-like symptoms, tenderness around the transplanted organ, and skin changes such as rashes or lesions with drainage or redness (Cleveland Clinic, 2023).

Advances in Immunology

Chapter 31 Cancer explores in detail advances in immunology such as stem cells and immunotherapy for cancer, but it is worth briefly discussing each topic in the context of immunological function.

The **stem cells** are cells in the earliest stage of development, before they have become specialized—that is, before they have become blood cells, liver cells, muscle cells, and so on. Stem cells can be **multipotent** (can become the cell type they came from) or **pluripotent** (can become any other kind of cell). Consequently, they can develop into many different cell types in the body during early life and growth. They also continually replenish the body's supply of red and white blood cells. When a stem cell divides, the resulting two daughter cells may both be stem cells; they may also both be differentiated, or specialized. Alternatively, the division may result in one stem cell and one differentiated cell (U.S. Department of Health and Human Services, 2021). Table 29.3 lists the main categories of stem cells (U.S. Department of Health and Human Services, 2021).

Embryonic Stem Cells	Nonembryonic ("Adult") Stem Cells	
	Multipotent	Induced Pluripotent
They are found in embryos.	They are found in fully developed tissues and organs.	They are adult stem cells that have been transformed in a laboratory to become pluripotent (or nearly so).
They are pluripotent, which means they can become any of the cell types in the adult human body.	They can become only the type of cell that makes up the tissue or organ where they came from.	They appear to be identical to embryonic cells and can turn into multiple cell types, but so far scientists have not been able to make them fully pluripotent.

TABLE 29.3 Stem Cell Categories (Stanford Medicine Children's Health, 2024)

Studies have shown stem cell transplantation to have therapeutic effects. In some cases, it has even restored destroyed immune systems (Ebrahimi et al., 2021). Research is ongoing, however, and concerns remain regarding the efficacy and safety of the therapy.

The emerging field of **genetic engineering** is designed to enable the replacement of defective or missing genes using recombinant deoxyribonucleic acid (DNA) technology. There are two facets of this technology relevant to immunotherapy. In one, scientists combine genes from two different types of organisms to produce proteins, lymphokines, and monokines, which have the ability to improve the functioning of the immune system. In the other, scientists attempt to restore normal gene function when a particular gene is missing or defective. This generally involves inserting a recombinant gene into a harmless virus; when the virus joins with a cell in the immune system, it inserts the missing gene into the cell's DNA, fixing the anomaly (Lanigan et al., 2020).

Remember that one function of the immune system is to find and attack malignant cells. Some cancer cells may go undetected by the body due to genetic changes that make them less noticeable, proteins on the cell surface that turn off immune cells, or changes to the normal cells around the cancer that alter how the immune system responds. Immunotherapy treatments are designed to boost a person's own immune system to better recognize and destroy cancer cells. This knowledge has led to more and better treatment options, such as vaccines, monoclonal antibodies, immune checkpoint inhibitors, and cytokines (National Cancer Institute, 2019).

29.2 Autoimmunity

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Define autoimmune disease and identify common pathophysiology of autoimmune disease
- Recognize common autoimmune disorders

The immune system is a network of cells, tissues, and organs that function to protect its host from viruses, bacteria, and other malignancies. To do this work, the immune system must be able to distinguish between "self" and "nonself"—that is, between the body's own, healthy components and threats to its health. With **autoimmunity**, the immune system fails at this fundamental task; it mistakenly targets and attacks the body's own healthy tissues, organs, and cells. The exact cause of this immune malfunction is unknown. It is likely to have a genetic predisposition. Autoimmunity can affect any part of the body and weaken its ability to function; it can even be life-threatening (U.S. Department of Health and Human Services, 2022).

Pathophysiology of Autoimmune Disease

There are several types of autoimmune disorders. While the exact cause of any type is unknown, all such disorders stem from the same fundamental error: the immune system misidentifies the body's own tissues as "foreign" rather than as its "self." Scientists have learned that many autoimmune disorders are characterized by irregular B- and T-cell reactivity to the normal components of the host. Recall that T-helper cells stimulate B cells to produce autoantibodies, and cytotoxic T cells kill or damage potential threats. Mutations of B and T cells may interrupt their normal abilities to recognize foreign antigens and lead to autoimmune disorders.

The autoantibodies, a critical diagnostic finding for autoimmune disease, form immune complexes that deposit within tissues and activate the complement system, which produces inflammation. When there is a pathogen to fight, this response is helpful. But when it is turned on the body, it damages healthy tissue. In some autoimmune conditions, the complexes start in a particular organ because the response has been triggered by a mix-up involving damaged or compromised pieces of genetic material (the acids that make up DNA and RNA). Autoantibodies may also bind to molecules in the blood, which can trigger an immune response via the complement system (Pisetsky, 2023).

According to the American Autoimmune Related Diseases Association, 50 million Americans have one or more autoimmune diseases (2019). This translates to one in five Americans being diagnosed with an autoimmune disorder. Of those affected, 75 percent are women.

LINK TO LEARNING

The American Autoimmune Related Diseases Association has a flier that provides facts about autoimmune disorders (https://openstax.org/r/77autoimmune), including statistics, types, and potential causes and treatments.

Common Autoimmune Disorders

There are more than 100 autoimmune disorders, affecting a wide variety of body parts and systems. While there are important distinctions to be made among them, the nurse will find that they share some commonalities in presentation, diagnosis, and treatment. The signs and symptoms of autoimmune disease can be widespread as well as specific to the organ system(s) being targeted. Nonetheless, nurses will often note general signs and symptoms of inflammation, and assessments for these manifestations, including a physical exam, blood tests, and imaging, are common elements of the diagnostic process. Nursing interventions that are intended to help manage inflammation and its consequences, which may include counseling patients about taking preventive steps to avoid flare-ups as well as providing patient education and ongoing support, will be common.

Many autoimmune diseases have complex disease processes that are discussed in greater detail in other chapters. Table 29.4 describes the pathogenesis of common autoimmune disorders of the endocrine, hematologic, cardiac, gastrointestinal, integumentary, and musculoskeletal systems.

Disorder	Pathogenesis
Endocrine System	
Type 1 diabetes mellitus	In patients with this disorder, the body's immune system destroys the insulin-producing islet cells in the pancreas. Because the body depends on insulin to move sugar from the bloodstream into cells, patients can develop life-threatening hyperglycemia (Shimura & Kobayashi, 2004).
Graves disease	Thyroid-stimulating hormone signals the thyroid to make thyroid hormone as the body needs it. With Graves disease, autoantibodies are activated that stimulate thyroid hormone synthesis and secretion as well as thyroid growth, resulting in a goiter (Shimura & Kobayashi, 2004).
Hashimoto disease	This disorder causes antithyroid antibodies to form and attack thyroid tissue, causing fibrosis. This is thought to be due to the infiltration of lymphocytes and cytokines (Mincer & Jialal, 2022).
Hematologic and Cardiac System	
Idiopathic thrombocytopenic purpura	With this disorder, the macrophages of the immune system attack and destroy platelets, which the body needs to control clotting. The resulting deficiency can lead to easy bruising and internal bleeding (Olsson et al., 2013).
Autoimmune hemolytic anemia	This disorder causes anti-erythrocyte autoantibodies to destroy erythrocytes at a rate faster than the bone marrow can produce new red blood cells (Barcellini, 2015).
Rheumatic heart disease	Streptococci bacteria can cause rheumatic fever. Rheumatic heart disease results from valvular damage caused by an abnormal immune response to *Streptococcus pyogenes* infection (Dass & Kanmanthareddy, 2023).
Gastrointestinal System	
Inflammatory bowel disease (Crohn disease and ulcerative colitis)	Inflammatory bowel disease is driven by the T-cell response. The dysfunctions of the immune pathways leading to Crohn disease are considered to be driven by T-helper-1 cells (cell-mediated immune cells) (Zhang & Li, 2014).

TABLE 29.4 The Pathogenesis of Common Autoimmune Disorders

Disorder	Pathogenesis
Celiac disease	Gluten is a protein found mainly in wheat flour. With this disorder, gluten-derived peptides initiate an altered immune response. The CD4 T lymphocytes trigger a chain of altered immune reactions that lead to chronic inflammation of the small intestine (Parzanese et al., 2017).
Irritable bowel syndrome	Changes in mucosal immunocytes, mast cells, and microbiota are thought to be due to infections such as gastritis or to psychological stress. These changes can lead to inflammation characterized by increased production of cytokines, altered population of circulating cells, and mucosal infiltration of immune cells (Saha, 2014).
Integumentary System	
Psoriasis	The inflammation characteristic of this skin disorder is due to disturbances in the immune response that lead to uncontrolled keratinocyte proliferation and dysfunctional differentiation. Psoriatic plaque is composed of macrophages, T cells, neutrophils, and dermal dendritic cells (Rendon & Schäkel, 2019).
Scleroderma	With this disorder, the immune system triggers cells to produce too much collagen, which is deposited into organs and skin, causing hardening and thickening of the affected areas. This is thought to be due to an altered balance of the innate and acquired immune systems that leads to an overabundance of cytokines, chemokines, and autoantibodies that stimulate the activation of fibroblasts (Rosendahl et al., 2022).
Musculoskeletal System	
Rheumatoid arthritis	The pathogenesis of this disorder involves many types of cells, including macrophages, T and B cells, fibroblasts, chondrocytes, and dendritic cells. It is likely caused by environmental triggers at the mucosal surfaces that induce peptidyl arginine deiminases, which modify arginine to citrulline. These modified proteins are then presented to T cells after being processed by dendritic cells. Vascular permeability is increased in the synovium that triggers synovial cells, leading to inflammation in the joints (Firestein & Guma, 2023).
Multiple sclerosis	The cause of this disorder is multifactorial, so the exact pathogenesis is unclear. Genetic predisposition and environmental factors trigger an immune response that leads to neuronal cell death, nerve demyelination, and neuronal dysfunction. The inflammation of the central nervous system tissues is due to immune cell and cytokine infiltration. T-helper cells initiate interactions between antigen-presenting cells and T lymphocytes that can affect the initiation and progression of this disease (Ghasemi et al., 2017).
Multiple Systems	
Lupus	With this disorder, the immune system attacks its own tissues, causing widespread inflammation and tissue damage affecting the joints, skin, kidneys, brain, lungs, and blood vessels. The main culprits that contribute to the altered immune response are dendritic cells, neutrophils, T cells, B cells, complements, cytokines, immune complexes, and kinases of the intracellular matrix (Pan et al., 2020).

TABLE 29.4 The Pathogenesis of Common Autoimmune Disorders

29.3 Immunodeficiency

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Define primary immunodeficiencies
- Differentiate between HIV and AIDS

The result of the malfunctioning of an underactive or weakened immune system is termed **immunodeficiency**. This is different from an autoimmune disease, in which the body's immune system overreacts and mistakenly attacks the body. While autoimmune disease may attack normal, healthy tissue, immunodeficiency may lead to an inadequate response to pathogens. As such, immunodeficiency disorders impair the immune system's ability to defend the body against foreign invaders. They may lead to infections that develop and recur often and that are typically more severe and longer lasting than usual. They may also result in the development of lymphomas or other types of cancers. There are two types of immunodeficiency disorders: primary and secondary.

Primary Immunodeficiencies

The **primary immunodeficiencies** generally are present at birth; they are genetic and usually hereditary. These disorders typically become evident during infancy or childhood, but some may not be recognized until adulthood. There are more than 100 primary immunodeficiency disorders, and all are quite rare.

CULTURAL CONTEXT

Race and Ethnicity in Primary Immunodeficiency

Because primary immunodeficiencies are linked to genes, the nurse should be aware of the cultural considerations when providing assessment and care. A patient's racial/ethnic background may predispose them to certain primary immunodeficiencies. For example, while it is known that sickle cell disease is more prevalent in Black individuals, systemic racism and bias can often be barriers to diagnosis and treatment (Pokhrel et al., 2023). Navajo Nation and Apache populations have a higher incidence of Athabaskan severe combined immunodeficiency, a secondary combined immunodeficiency linked to the *DCLRE1C* gene (Kniffen, 2023).

Pathophysiology

Primary immunodeficiencies may be caused by mutations to a specific gene. For example, most immunodeficiencies are congenital and have an X-linked (autosomal recessive) inheritance pattern. Mutated genes on the X sex chromosome occur most often in males. Immune cells involved in immunodeficiencies include B and T lymphocytes. B cells transform into plasma cells that produce many antibodies (immunoglobulins) to fight off extracellular microorganisms. If there is a problem with B cells, a person has a high susceptibility to pneumonia, otitis, and other infections caused by extracellular bacteria.

T cells differentiate into helper, cytotoxic, or suppressor T cells. Helper T cells stimulate antibody production. In T-cell deficiencies, antibody production may be compromised to some degree. T cells also fight intracellular microorganisms, such as fungi and viruses, as well as tumors. Microorganisms can infect and tumors may flourish in individuals with HIV, severe combined immunodeficiency, hyper-immunoglobulin M syndrome, and other T-cell deficiencies (Valliant & Qurie, 2022).

Clinical Manifestations

Clinical manifestations of primary immunodeficiencies include infections with opportunistic or unusual organisms, persistent infections despite aggressive treatment, failure to thrive, and a positive family history. Signs of infection will vary depending on the disorder but may include fever, thrush, gingivitis, warts, pus-filled sores, loss of appetite, abdominal pain, liver or spleen enlargement, ear infections, and/or skin infections.

Assessment and Diagnostics

To diagnose an immunodeficiency, nurses should complete a full-body assessment to identify signs and symptoms that could be associated with a disorder. For example, the spleen may be enlarged. In addition, nurses must obtain a family history. The patient should be asked questions about recent infections and their signs, severity, and duration.

A true diagnosis may require genetic testing or blood tests. A complete blood cell count with manual differential can reveal abnormal levels of serum IgG, IgM, and IgA. Antibody responses to vaccines should also be evaluated to detect a humoral immunodeficiency. Genetic testing can assess for gene mutations and whether or not a genetic predisposition exists. Biopsies of samples of the bone marrow or lymph nodes can assess whether immune cells are present.

Prevention

Prevention of primary immunodeficiencies may include family planning to address future pregnancies. Genetic testing can be done in utero to determine the likelihood that the fetus will acquire the disorder. Live vaccines are contraindicated in patients with antibody deficiencies because their bodies may not be able to defend against the weakened form of the virus in the vaccine. Patients should always consult with their provider for the best course of action on an individual basis regarding vaccines. Furthermore, all patients with immunodeficiency should be educated on the measures that can be taken to reduce their risk of infection and illness, such as safe sex practices, antiretroviral drugs, cancer treatment when needed, and blood sugar control (Fernandez, 2023). Infection prevention measures like avoiding public places and masking when in public; frequent, proper hand hygiene; and social distancing are also important for immunocompromised patients.

Collaborative Management

Immunodeficiencies require an interdisciplinary approach. A primary care physician may begin initial testing but generally refers the patient to an immunologist, because affected individuals are at risk for developing severe infections and warrant early detection and medical management. Some individuals are psychologically affected by an immunodeficiency and may need group therapy or individual counseling with a licensed professional. Social work may be needed as well to help affected individuals find resources; treatment and care can become extensive and expensive. Depending on the course of treatment, the patient may need a stem cell transplant, typically performed by a hematologist or oncologist.

To prevent infections in those with immunodeficiencies, the nurse should educate the patient to perform good oral hygiene, avoid eating undercooked food or drinking contaminated water, receive immune globulin treatments if ordered by the physician, and avoid individuals with infections (Fernandez, 2023). Nurses should also educate the patient and family member how to administer therapy at home, if prescribed.

INTERDISCIPLINARY PLAN OF CARE

Plan of Care for Patient with HIV

For a patient with HIV, a comprehensive interdisciplinary plan of care would be crucial to address both medical management and holistic support needs. Infectious disease specialists would lead the medical management, focusing on antiretroviral therapy (ART) initiation or adjustment based on viral load and CD4 count monitoring. They would collaborate with the patient's primary care physician to coordinate overall health maintenance and manage potential drug interactions with other medications.

Other team members may include psychiatrists or psychologists, social workers, nutritionists, pharmacists, and infectious disease nurses. Psychiatrists or psychologists would provide crucial support in addressing mental health aspects, such as depression, anxiety, or adjustment issues related to the HIV diagnosis. They would conduct regular assessments, offer counseling, and monitor the patient's emotional well-being throughout treatment.

Social workers would assess the patient's social support network, financial resources, and housing stability. They would assist in navigating insurance coverage for medications, accessing community resources for HIV support groups, and addressing any legal or employment concerns.

Nutritionists would assess the patient's dietary intake and nutritional status, providing tailored dietary recommendations to support immune function and overall health. They would monitor weight changes and collaborate with the health care team to manage any nutritional deficiencies or gastrointestinal symptoms related to HIV or its treatment.

Pharmacists specializing in HIV care would ensure proper medication adherence, educate the patient on potential

side effects, and monitor for drug interactions. They would also assist in managing medication schedules and addressing any concerns the patient may have about their treatment regimen.

Infectious disease nurses provide ongoing education on HIV transmission prevention, medication adherence strategies, and symptom management. They monitor the patient for any signs of opportunistic infections and collaborate closely with the infectious disease specialist to optimize treatment outcomes.

This interdisciplinary approach ensures that the patient with HIV receives comprehensive care addressing medical, psychological, social, nutritional, and pharmaceutical aspects of their health. It emphasizes the collaborative effort needed to manage HIV effectively and improve the patient's quality of life.

Human Immunodeficiency Virus and Acquired Immunodeficiency Syndrome

More common than a primary immunodeficiency is a secondary immunodeficiency. Secondary immunodeficiencies generally develop later in life and are caused by another disorder or the use of certain medications, such as chemotherapy or corticosteroids. A well-known example is acquired immunodeficiency syndrome (AIDS), which is caused by the human immunodeficiency virus (HIV) (see 22.2 Viral and Fungal Infections). This section briefly describes HIV to provide insight into how it relates to immunity. Human immunodeficiency virus is a blood-borne virus that may be spread by sexual contact, sharing needles, or accidentally sticking oneself with a needle previously used by an infected individual. Although the risk is low, blood transfusions are also associated with the spread of HIV, though most blood products today are screened for the virus. Maternal-child transmissions may occur through the placenta, during childbirth, or through breast milk.

Pathophysiology

Human immunodeficiency virus binds to and enters host T cells via $CD4^+$ molecules and chemokine receptors. Then, RNA and several HIV-encoded enzymes are released into the host cell. Viral replication requires reverse transcriptase copy HIV RNA to produce viral DNA. This mechanism is altered with this infection and results in frequent mutations and new HIV genotypes. These mutations enable the generation of HIV that refuses control by the immune system. This causes progressive destruction of the cell-mediated immune system and eliminates $CD4^+$ T-helper lymphocytes. Eventually, HIV progresses into AIDS, especially if untreated. Characterized by extremely low levels of helper T cells, AIDS leaves the affected individual at risk for a range of life-threatening infections. The time of progression varies depending on when treatment is started and how aggressive treatment is.

Prevention

Prevention includes safe sex practices, such as using condoms and limiting the number of sexual partners, as well as abstinence from sex or exchange of sexual fluids. The use of pre-exposure prophylaxis, such as tenofovir disoproxil fumarate and emtricitabine, may be necessary for high-risk patients, for example, to reduce their chances of acquiring HIV if they are exposed.

The drug treatment regimen of choice will differ depending on a person's risk factors. For example, if they are at risk from sexual exposure or needles used to inject drugs, the treatment differs. The person-at-risk should undergo frequent testing every three months to ensure they have not become infected. Other preventive measures include avoiding sharing razors, toothbrushes, needles, sex toys, or any article that may be contaminated with blood. Affected individuals should be educated to ask if they will accept blood, plasma, sperm, or organ donation. In addition, they should be encouraged to inform any past, present, or future sexual partners of their diagnosis and to adhere to any treatment regimen that is prescribed.

LINK TO LEARNING

Visit this website from the U.S. Department of Health and Human Services for information about HIV prevention (https://openstax.org/r/77hivprevention) that includes where to get tested, what to expect when starting and continuing treatment, and how to live well with HIV. The initial diagnosis can be overwhelming, so the nurse should consider giving patients time to review the information at home.

Risk Reduction of Transmission to Health-Care Providers

To reduce the risk of transmission of blood-borne infection, take standard precautions with any patient, regardless of their HIV status. This includes hand hygiene, use of personal protective equipment, proper handling of soiled equipment and patient laundry, environmental control, respiratory hygiene, use of resuscitation equipment to avoid contact with oral secretions, and sharps safety. In the event of a needlestick injury, the provider should first wash their hands, then immediately report the incident to their infectious disease representative at their facility or per their policy. When possible, blood samples should be taken from the patient to confirm whether they have a blood-borne infection. Postexposure prophylaxis should also be taken as soon as possible, as long as it is with seventy-two hours of possible HIV exposure (CDC, 2024). This includes taking an antiretroviral medication.

Stages of HIV Infection

There are three stages of HIV infection. These stages vary and are dependent on history, physical examination, laboratory testing, signs and symptoms, and other infections or malignancies. Stage one is an acute HIV infection, stage two is a chronic HIV infection, and stage three is AIDS. A person's CD4 count is a tool used to determine their stage of infection (Cachay, 2023), as shown in Table 29.5. If an affected person's CD4 count increases with therapy, however, the patient does not return to a previous stage.

Stage	Name	CD4 Count
1	Acute HIV	≥500 cells/μL
2	Chronic HIV	200 to 499 cells/μL
3	AIDS	<200 cells/μL

TABLE 29.5 Stages of HIV Infection by CD4 Count

Assessment, Diagnostics, and Clinical Manifestations

In the initial stages of HIV infection, a patient may be asymptomatic or have nonspecific flu-like symptoms, such as fatigue, headache, or rash. In the later stages of HIV, a patient may have more immune system–specific symptoms and sequelae, including the following:

- fever
- fatigue
- malaise
- dermatitis
- sore throat
- lymphadenopathy
- herpes
- vaginal candidiasis
- pneumococcal infections
- decreased appetite
- weight loss
- wasting syndrome
- cancer
- skin changes, such as crusted scabies, disseminated bartonellosis, anal carcinoma, and/or Kaposi sarcomas (Figure 29.6)

FIGURE 29.6 Kaposi sarcoma is often seen in patients with AIDS. Diagnostics include CD4 count, plasma HIV RNA levels, and antibody tests (Cachay, 2023). (credit: "Kaposi's Sarcoma," National Cancer Institute, public domain)

LIFE-STAGE CONTEXT

Life Span Considerations and HIV

The number of adults 50 years of age and older who have HIV or AIDS is rising (HIVinfo, 2024). While some were diagnosed in younger years and are benefiting from treatment, there are others who are undiagnosed. Older adults are less likely to get tested, as the signs and symptoms of HIV can be mistaken for age-related changes, such as pain. Older adults with HIV are more at risk for other comorbidities, including heart disease and diabetes (Roomaney et al., 2022). It is therefore essential to assess patients and obtain a history to determine whether they may need to be tested.

Treatment of HIV Infections

Members of an interdisciplinary team for treating HIV infections may vary but could include primary care providers, pharmacists, psychiatrists or other licensed mental health professionals, social workers, and nurses. Antiretroviral therapy (ART) is a treatment designed to suppress HIV replication to reduce HIV-associated morbidity, restore and preserve immunological function, suppress plasma HIV viral load, and prevent HIV transmission. The nurse should encourage the patient to adhere to treatment regimens as well as educate the patient on their disease status, treatment, and prevention. Social workers may be needed to help patients locate resources, such as finances, housing, or food.

Complementary and alternative medicine (CAM) therapies may include mind-body practices, such as massage or yoga, which may be helpful at lowering blood pressure, pain, and anxiety. Other CAM therapies include exercise and adequate nutrition. Patients may be advised to eliminate food allergens, coffee, trans-fatty foods, and refined foods; eat quality protein sources and foods high in vitamins, antioxidants, and minerals; and drink at least 64 oz of filtered water each day (St. Luke's Hospital, 2016).

Emotional and Ethical Concerns

A diagnosis of HIV or AIDS can be devastating to an individual. They may be unsure of when or how they contracted the disease or from whom. While it is important to contact previous sexual partners so they can be tested and treated, patients may find this task prohibitively embarrassing or even frightening. All health care providers on the team must remember to be sensitive to the patient's feelings, preserve their dignity, and encourage therapeutic communication.

While the emphasis is on the patient, providers may also be confronted with complex emotions and reactions to treating patients with HIV. Nurses may fear exposure or infection and have concerns about the patient's

confidentiality. To assuage these fears, precautions should be meticulously followed to avoid the risk of contracting the infection. The nurse has a duty to inform other members of the interdisciplinary team to ensure they are able to continue providing quality care safely. The nurse should also safeguard and protect the patient's privacy from others.

Despite the stigma that may still surround HIV and AIDS, there are legitimate reasons for infected patients to remain optimistic about their prognosis. The mortality rate of those infected was much higher in the 1980s, during the early years of AIDS. In recent decades, researchers have made significant progress, and patients are living longer today because more treatments are available to control the disease's progression. Some people with HIV can go into remission, meaning that they have such low levels of the virus in their body, they no longer need to take ART to prevent progression (Deeks et al., 2021).

Summary

29.1 Immune Response

- The immune system is an intricate and complex system of specialized cells, organs, and tissues.
- The main functions of the immune system are to recognize and destroy harmful substances or malignant cells, fight and remove disease-causing pathogens, and remove and destroy dead or damaged cells.
- Natural (innate) immunity is nonspecific and present at birth. Acquired (adaptive) immunity develops after birth in response to specific pathogens.
- Assessment of the immune system starts with obtaining the health history of the patient and performing a physical examination.
- Assessment should include the patient's nutritional status and history of immunizations, infections, allergies, surgeries, medications, blood transfusions, and disease and disorder states (such as cancer, chronic illnesses, or autoimmune conditions).
- Lifestyle considerations should be taken into account when assessing the patient's immune system.
- Physical examination should include palpation of the lymph nodes and assessment of the skin and mucous membranes, as well as the neurosensory, cardiovascular, genitourinary, musculoskeletal, gastrointestinal, and respiratory systems.
- Immunosuppressive therapy is designed to stop the immune system from mistakenly attacking healthy cells and may be prescribed for autoimmune diseases or for those undergoing organ or stem cell transplantation.
- There have been several advances in immunology, such as stem cells, genetic engineering, and immunotherapy.

29.2 Autoimmunity

- With autoimmunity, the immune system mistakenly targets the body's own healthy tissues, organs, and cells and attacks itself.
- The exact cause of autoimmunity is unknown, but it is thought to have a genetic predisposition.
- There are over 100 autoimmune conditions, and one in five Americans has been diagnosed with at least one autoimmune disorder.
- Common autoimmune disorders include lupus, type 1 diabetes mellitus, Graves disease, Hashimoto thyroiditis, idiopathic thrombocytopenic purpura, autoimmune hemolytic anemia, rheumatic heart disease, inflammatory bowel disease, celiac disease, irritable bowel syndrome, psoriasis, scleroderma, rheumatoid arthritis, and multiple sclerosis.
- Many autoimmune disorders have a complex disease process and their own unique pathogenesis.

29.3 Immunodeficiency

- Immunodeficiency is the result of malfunctioning of the immune system. This may lead to infections that develop and recur often and are typically more severe and last longer than usual.
- Primary immunodeficiencies generally are present at birth, genetic, and hereditary.
- Primary immunodeficiencies may be caused by mutations in a specific gene. Immune cells involved in primary immunodeficiencies include B and T lymphocytes.
- Clinical manifestations vary and may include fever, thrush, gingivitis, warts, pus-filled sores, loss of appetite, abdominal pain, liver or spleen enlargement, ear infections, or skin infections.
- Secondary immunodeficiencies generally develop later in life and are caused by another disorder or the use of various medications. An example is HIV, which progresses into AIDS.
- HIV destroys the body's cell-mediated immunity, leaving affected individuals at risk for life-threatening infections from other pathogens.
- Symptoms of HIV may include fever, fatigue, malaise, dermatitis, sore throat, lymphadenopathy, herpes, vaginal candidiasis, pneumococcal infections, decreased appetite, various cancers, wasting syndrome, and skin changes such as crusted scabies, disseminated bartonellosis, anal carcinoma, and Kaposi sarcomas. There are three stages of HIV infection: acute, chronic, and AIDS.
- Prevention is key for secondary immunodeficiencies. Standard precautions should be used for all patients. Prevention measures should include safe sex practices, avoiding individuals with illness or infection, and avoiding sharing needles or anything that could be contaminated with blood. Pre- and postexposure

prophylactic measures can be taken. Those with HIV or AIDS are not to donate blood, organs, or plasma.

Key Terms

acquired immunity (also: *adaptive or specific immunity*) immunity that develops after birth
apoptosis normal, controlled process of cell death
autoimmunity disordered state in which the immune system mistakenly targets and attacks the body's own healthy tissues, organs, and cells
cilium (plural: *cilia*) hairlike structure that removes invaders from the respiratory tract
genetic engineering emerging field that uses recombinant deoxyribonucleic acid (DNA) technology to enable the replacement of defective or missing genes
immunity body's specific, protective response to a foreign agent or organism
immunocompetent state of having an efficient immune system that is able to carry out functions properly
immunocompromised state of not having a properly working immune system
immunodeficiency result of the malfunctioning of an underactive or weakened immune system
immunosenescence gradual deterioration of the immune system due to natural aging processes
interferon protein that signals the substances involved in defense against viruses
interleukin protein that serves as the messenger substance of the immune system
multipotent stem cells that can become the cell type they came from
natural immunity (also: *innate* or *nonspecific immunity*) immunity that is present at birth
natural killer cell white blood cell in the innate immune system
neoplasm tumor that may be benign or malignant
phagocytosis engulfing and destroying of foreign bodies by monocytes
pluripotent description of stem cells that can become any other kind of cell
primary immunodeficiency immunodeficiency that is genetic and typically hereditary and present at birth
psychoneuroimmunology study of how the immune system and central nervous system interact
secondary immunodeficiency immunodeficiency that generally develops later in life, caused by another disorder or the use of various medications
stem cell cell in the earliest stage of development, before it has become specialized

Assessments

Review Questions

1. What is a component of the immune system? Select all that apply.
   a. cells
   b. blood vessels
   c. tissues
   d. organs

2. The nurse is educating a new mom on natural versus acquired immunity. What is an example of a statement by the mother that shows the nurse that she understood the teaching?
   a. "Natural immunity develops when my baby receives immunizations."
   b. "Natural immunity is only present before the baby is born."
   c. "Acquired immunity develops after birth."
   d. "Acquired immunity develops only after exposure to an illness."

3. What is a rationale that reflects the importance of the nurse asking a patient about their immunization history?
   a. to assess the patient's immunity against diseases and determine the need for further immunizations
   b. to evaluate the patient's dietary habits and potential nutrient deficiencies
   c. to identify any genetic predispositions to autoimmune diseases
   d. to determine the patient's level of compliance for preventive care

4. What is a statement that correctly contrasts benign tumors and malignant tumors?

a. Benign tumors are noncancerous and can spread to other cells; malignant tumors are cancerous and do not spread to other cells.
b. Benign tumors are cancerous and can spread to other cells; malignant tumors are noncancerous and do not spread to other cells.
c. Benign tumors are cancerous and do not spread to other cells; malignant tumors are noncancerous and can spread to other cells.
d. Benign tumors are noncancerous and do not spread to other cells; malignant tumors are cancerous and can spread to other cells.

5. The nurse is reviewing the chart of a patient who has been prescribed tacrolimus to prevent organ rejection after a transplant. What category of immunosuppressant does this drug fall into?
a. corticosteroid
b. antimetabolite
c. calcineurin inhibitor
d. monoclonal antibody

6. What is the primary characteristic of an autoimmune disease?
a. The immune system fails to recognize foreign pathogens.
b. The immune system attacks the body's own healthy tissues.
c. The immune system is overactive and produces excessive antibodies.
d. The immune system is suppressed and cannot fight infections effectively.

7. What disease is a common autoimmune disorder of the gastrointestinal system?
a. Crohn disease
b. Guillain-Barré syndrome
c. Addison disease
d. Sjögren syndrome

8. A patient has recently been diagnosed with psoriasis, and a nurse is educating them about the disorder. What is an example of a statement by the mother that shows the nurse that she understood the teaching?
a. "Too much collagen is produced and deposited into the skin, leading to buildup."
b. "Uncontrolled keratinocyte proliferation causes plaque buildup."
c. "Inflammation from the joints spreads to the skin."
d. "Contact with allergens leads to inflammation of the skin."

9. Primary immunodeficiencies are passed through what mechanism?
a. IgM
b. B cells
c. antibodies
d. autoantibodies

10. What disease is an example of secondary immunodeficiency?
a. X-linked agammaglobulinemia
b. severe combined immunodeficiency
c. Addison disease
d. AIDS

11. The nurse is reviewing blood results for an HIV patient. The nurse knows that the patient is at stage 2 when the CD4 count is at what level?
a. 534 cells/μL
b. 601 cells/μL
c. 100 cells/μL
d. 250 cells/μL

Check Your Understanding Questions

1. Describe the components of the nursing assessment of the immune system.
2. Describe the pathophysiology of autoimmune disorders.
3. Describe primary immunodeficiencies.

Reflection Questions

1. What information might you need to include when educating a patient on signs and symptoms that might indicate a compromised immune system and thus should be reported?
2. Your patient was just diagnosed with an autoimmune disease. What specific educational points should the nurse prioritize to ensure the patient understands their condition and treatment plan?
3. What information might you need to include when educating a newly diagnosed HIV patient on prevention measures?
4. What information might you include when educating a newly diagnosed HIV patient on the stages of the disease?

What Should the Nurse Do?

Mary, a 45-year-old female, presents to the outpatient clinic with complaints of persistent fatigue, recurrent infections, and unexplained weight loss over the past few months. She reports a medical history significant for rheumatoid arthritis, for which she has been taking immunosuppressive medications for the past two years. On assessment, her vital signs are within normal limits, but she appears fatigued and has a low-grade fever of 99.5°F (37.5°C). Physical examination reveals generalized lymphadenopathy and mild hepatomegaly. Mary expresses concern about her recent health decline and seeks guidance on managing her symptoms.

1. What signs and symptoms in Mary's case might indicate a compromised immune response? How do these cues align with the normal and abnormal physiological findings discussed in the module?
2. What interventions can the nurse implement to address Mary's symptoms and optimize her immune response? How can the nurse support Mary in managing her condition effectively?

Maria, a 35-year-old female, presents to the clinic complaining of fatigue, joint pain, and recurring fevers over the past few months. She reports a medical history of type 1 diabetes diagnosed during childhood. Vital signs reveal a slightly elevated temperature of 100°F (37.8°C), blood pressure within normal limits, and a heart rate of 80 beats per minute. Upon further examination, Maria also mentions experiencing dry eyes and mouth recently. Given her symptoms and medical history, autoimmune disease is suspected.

3. Based on the initial assessment findings and suspected autoimmune etiology, what immediate interventions would you implement to address Maria's symptoms and prevent complications?
4. After initiating treatment for Maria's suspected autoimmune disease, how would you monitor her progress and evaluate the effectiveness of interventions? What indicators would suggest a positive response to treatment?

Lee, a 32-year-old, has been living with HIV for the past five years. They present to the clinic with complaints of chronic fatigue, recurrent respiratory infections, and unexplained weight loss over the past few months. They have been inconsistent with their antiretroviral therapy due to side effects and difficulties maintaining the medication schedule. On assessment, their vital signs are within normal limits, but they appear fatigued and have a low-grade fever of 99.3°F (37.4°C). Physical examination reveals oral thrush and swollen lymph nodes. Lee expresses concerns about their declining health and seeks guidance on managing their condition effectively.

5. What should the nurse do first to address Lee's symptoms and concerns?
6. How should the nurse educate Lee about the differences between HIV and AIDS to enhance their understanding of their condition?

Competency-Based Assessments

1. Prepare a fifteen-minute teaching plan covering the anatomy and physiology of the immune system.

2. Compare and contrast the effects of immunosuppressive medications on the immune system with the physiological findings of a normal immune response. How might an understanding of these concepts influence your patient care decisions?
3. Discuss how recent advances in immunology, such as targeted biologic therapies and the study of the microbiome's role in immune function, can contribute to the understanding and management of a patient's condition.
4. Prepare a graphic organizer that compares and contrasts common autoimmune disorders of the endocrine system.
5. Describe two examples of primary immune deficiency diseases and briefly explain how they affect the immune system.
6. Prepare a bullet point list of risk reduction strategies of HIV transmission for health care workers.
7. Create a pamphlet that the nurse educating a newly diagnosed patient with HIV could use to provide teaching on the need to notify past, present, and future sexual partners of their diagnosis.

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CHAPTER 30
Genetics

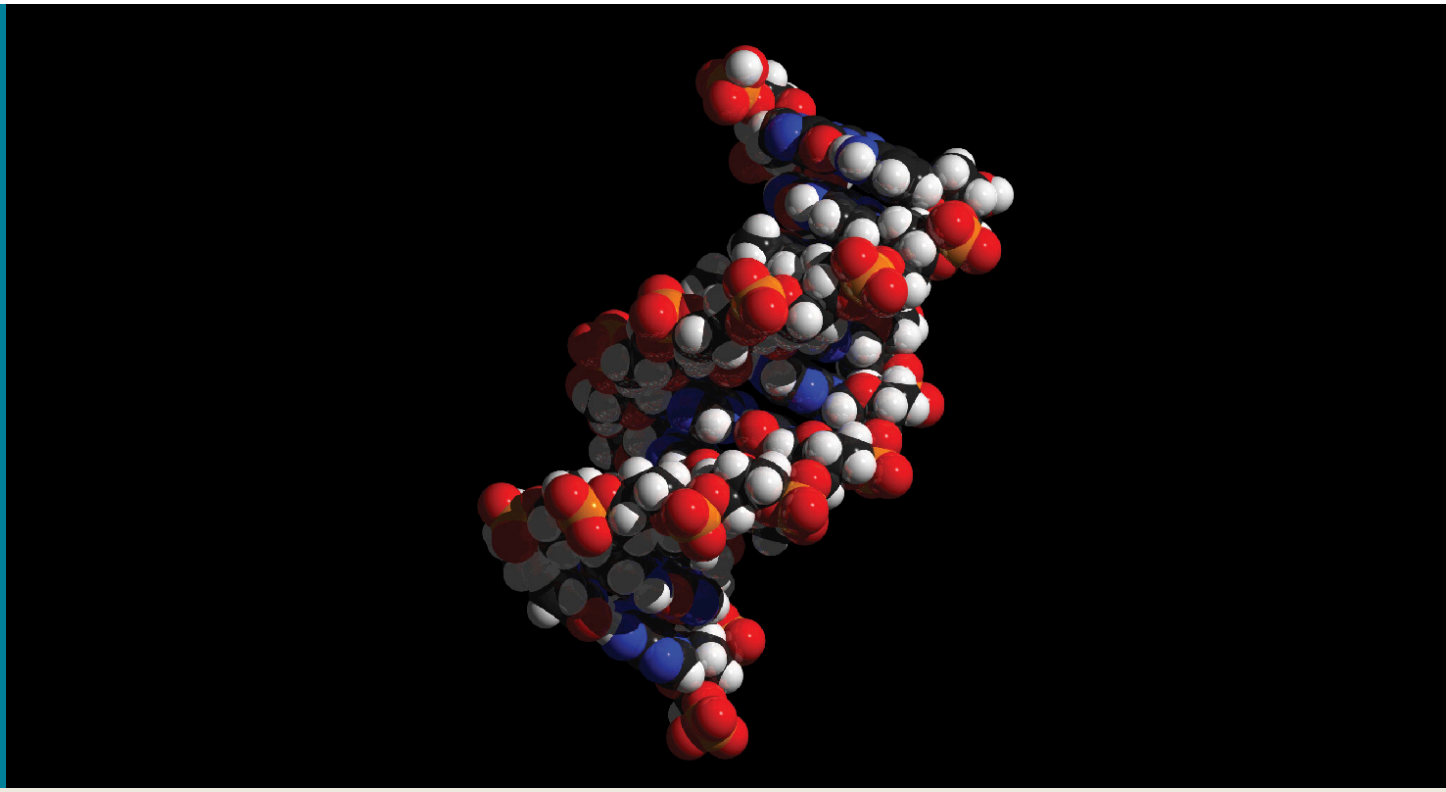

FIGURE 30.1 The deoxyribonucleic acid (DNA) molecule contains the codes for the building blocks of life. (modification of work from *Anatomy and Physiology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

CHAPTER OUTLINE

INTRODUCTION Genetics involves the study of how characteristics and traits are passed on from parent to offspring through the transmission of genes. It encompasses the understanding of the structure, function, and behavior of genes, as well as how they interact with each other and the environment to influence organisms' physical and biological traits. These traits include everything from eye color and height to susceptibility to certain diseases and conditions.

In nursing practice, a comprehensive understanding of genetics and genomics is crucial. Genetics focuses on the role of individual genes and their impact on health and disease, whereas genomics involves the study of all of a person's genes, including interactions among genes and between genes and the environment. These fields are integral to comprehending how genetic variations affect patient care, influence disease risk, and determine responses to treatment. This knowledge is essential for nurses to provide personalized care, to educate patients about their genetic risks, and to guide patients in making informed decisions about genetic testing and interventions.

This chapter will provide an in-depth overview of genetics and genomics, including fundamental concepts and the latest advancements in the field. It will explore how genetic and genomic information is used in clinical practice, including risk assessment, diagnostic testing, and the development of individualized care plans. The module will also cover genetic and genomic information's ethical, legal, and social implications, preparing nurses to address

these complex issues with sensitivity and professionalism. By understanding the principles of genetics and genomics, nurses will be better equipped to improve patient outcomes and contribute to the advancement of health care.

30.1 Genetic Disorders

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Differentiate between genetics and genomics
- Identify common chromosomal and genetic conditions
- Consider the nurse's role in the field of genetics
- Discuss the genomic framework's impact on patient care

Many of the leading causes of death in the United States, such as cardiac diseases, cancers, and cerebrovascular disease, include genetic or genomic factors (Khoury, 2024). In fact, nearly all health conditions have some genetic or genomic factors that will affect health throughout the life span.

Increasing recognition of the significance of such factors has implications for health care professionals (HCPs) at all levels. Nurses, who compose the largest group among health care HCPs and who interact with patients at multiple levels, are in a unique position to integrate genetic and genomic concepts into clinical practice areas, including screening and prevention, diagnostics, therapeutic interventions, and evaluation of outcomes. The clinical application of genetic and genomic knowledge has major implications for the entire nursing profession regardless of academic preparation, role, or practice setting.

What Is Genetics?

The field of **genetics** refers to the study of heredity, focused on patterns of inheritance of specific characteristics or traits, including variations of a trait within a population. Composed of deoxyribonucleic acid (DNA) sequences located in an individual's chromosomes, a **gene** is the basic functional unit of heredity found in the nucleus of every cell (Figure 30.2). DNA carries the genetic instructions that determine the development of physical and biologic characteristics. Ribonucleic acid (RNA), a nucleic acid present in all living cells, acts as a messenger carrying instructions from the DNA for controlling the synthesis of proteins. These instructions are coded in four amino acid chemical bases; adenine (A), guanine (G), cytosine (C), and thymine (T), which form a double-stranded helix held together by the hydrogen bonds of the base pairs of A paired with T, and C paired with G (Montgomery, 2021).

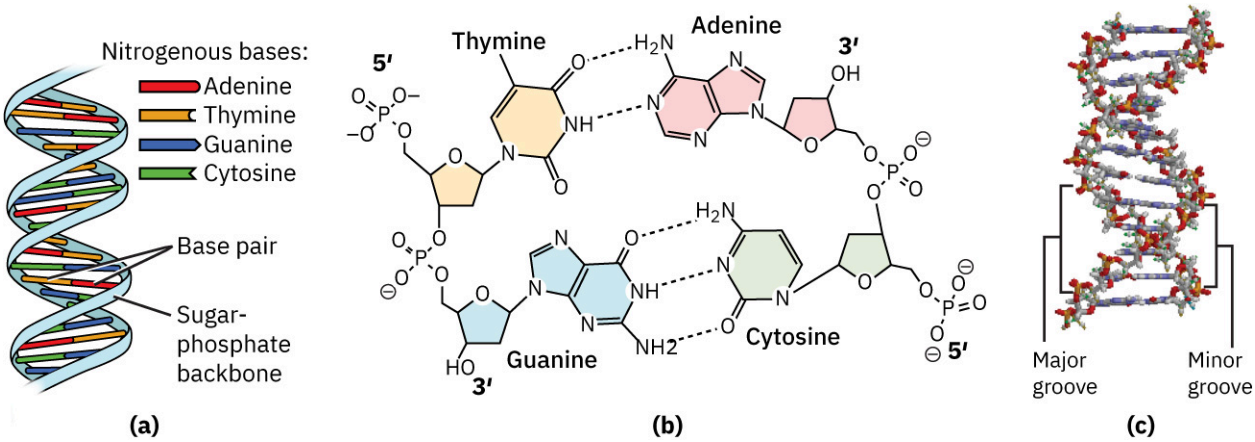

FIGURE 30.2 DNA has (a) a double helix structure and (b) phosphodiester bonds; the dotted lines between thymine and adenine, and between guanine and cytosine, represent hydrogen bonds. (c) The major and minor grooves are binding sites for DNA-binding proteins during processes such as transcription (the copying of ribonucleic acid [RNA] from DNA) and replication. (modification of work from *Biology* 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

The primary focus of genetics DNA research involves the structure and function of single genes as well as possible variations of a gene and its distribution among a population.

LINK TO LEARNING

Click here to watch a video further explaining the structure and components of DNA (https://openstax.org/r/77DNAstruct) molecules.

Genomics

The study of genes and how they interact with each other and the environment is called **genomics** (National Human Genome Research Institute [NHGRI], 2018). It includes the study of complex diseases such as heart disease, chronic obstructive pulmonary disease (COPD), diabetes, and cancer, disorders typically related more to a combination of environmental and genetic factors than to individual genes. A genomic approach to health care uses knowledge about genetic variation and environmental effects to augment the planning and provision of health care to individuals, families, and the community. This approach reveals opportunities for new diagnostic methods as well as new possible treatment modalities. Let's look at an example of how planning is augmented in a case of familial hypercholesterolemia (FH).

- Background: Familial hypercholesterolemia (FH) is a genetic condition characterized by high cholesterol levels, specifically low-density lipoprotein (LDL) cholesterol, which increases the risk of cardiovascular disease. Early detection and management are crucial to prevent severe health outcomes.
- Genomic approach in planning and provision of care:
  Risk assessment:
  - Genetic testing: Genetic testing can identify mutations in genes such as low-density lipoprotein receptor (LDLR), apolipoprotein B (APOB), and proprotein convertase subtilisin/kexin type 9 (PCSK9), which are known to cause FH. This testing allows for early identification of individuals who are at high risk, even before symptoms appear.
  - Family history: Collecting a detailed family history helps to identify other family members who might be at risk. This information is crucial for planning screening and preventive measures for relatives.

  Personalized care plan:
  - Tailored treatment: Based on genetic test results, a personalized treatment plan can be developed. For instance, individuals with certain genetic mutations may respond better to specific medications such as statins, PCSK9 inhibitors, or other lipid-lowering therapies.
  - Lifestyle modifications: Understanding how genetic variations interact with lifestyle factors allows nurses to provide personalized advice on diet, exercise, and other lifestyle changes to manage cholesterol levels effectively.

  Community and family interventions:
  - Family screening programs: Implementing family-based screening programs ensures that relatives of the affected individual are also tested and monitored. This proactive approach helps in early diagnosis and intervention, potentially reducing the overall burden of cardiovascular disease in the community.
  - Educational initiatives: Nurses can lead educational sessions for families and communities to raise awareness about FH, its genetic basis, and the importance of early detection and management.

  Ongoing monitoring and support:
  - Regular follow-ups: Establishing a schedule for regular follow-ups allows for continuous monitoring of cholesterol levels and adjustment of treatment plans as necessary. This ongoing care is tailored to the individual's genetic profile and response to treatment.

Human Genomic Variation

Although there is a considerable amount of genetic variation among humans, any two people's genomes are about 99.6 percent identical and about 0.4 percent different (NHGRI, 2023). These differences, or genomic variants, are what make individuals unique. External factors such as environment, diet, and lifestyle also contribute to uniqueness. Some genomic variations do not affect genome function, such as eye color, skin color, and height, whereas other variations can influence how a person responds to medications or influence development of certain conditions (NHGRI, 2023).

Genetic Conditions and Chromosomal Differences

A **genetic condition** is any condition caused by a single gene mutation. To take a quick step back, a **mutation** refers to a change in the DNA sequence of an organism's genetic material and can occur spontaneously during DNA replication or as a result of exposure to environmental factors such as radiation, chemicals, or viruses. Mutations can affect a single nucleotide (point mutation), a small segment of DNA, or large sections of chromosomes. Mutations can have various effects on an organism, depending on where they occur in the genome and the specific nature of the mutation. Some mutations may be harmless or have no noticeable effect, whereas others can lead to alterations in protein structure or function, potentially causing genetic disorders, diseases, or changes in an organism's traits.

Sickle cell disease is a genetic condition caused by production of an abnormal type of hemoglobin, called hemoglobin S, which delivers less oxygen to tissues and causes erythrocytes to assume a sickle (or crescent) shape, especially at low oxygen concentrations. These abnormally shaped cells can then become lodged in narrow capillaries because they are unable to fold in on themselves to squeeze through, blocking blood flow to tissues and causing a variety of serious problems including painful joints, delayed growth, and even blindness and cerebrovascular accidents (strokes).

A **chromosome** is a structure made of protein and a single molecule of DNA that carries genetic information in the form of genes. Sometimes a genetic disease is not caused by a mutation in a gene but by the presence of an incorrect structure or number of chromosomes. This is known as a **chromosomal condition**. For example, Down syndrome is caused by the presence of an extra copy of chromosome 21, a condition known as trisomy 21. The most common cause of trisomy 21 is chromosomal nondisjunction during meiosis, or simply an error in the distribution of chromosomes during meiosis. The frequency of nondisjunction events appears to increase with age, so the frequency of bearing a child with Down syndrome increases in females over the age of 36. The age of the male parent matters less because nondisjunction is much less likely to occur in a sperm than in an egg.

Whereas Down syndrome is caused by having three copies of a chromosome, Turner syndrome is caused by women having just one copy of the X chromosome. Women with Turner syndrome are sterile because their sexual organs do not mature.

Genomic Conditions

A disorder that is caused by the loss or gain of DNA material is called a **genomic condition**. Recall that genomics is the study of genes and how they react with each other and the environment. Complex diseases, such as asthma, diabetes mellitus, and heart disease, are characterized by a multifactorial etiology. This means that multiple genes, each with a small effect, interact with environmental and lifestyle factors to influence disease risk (NHGRI, 2018). In contrast, Mendelian diseases are typically caused by mutations in a single gene with a clear pattern of inheritance (dominant, recessive, etc.). For instance:

1. Asthma involves genetic predispositions (e.g., variations in genes related to immune system function) interacting with environmental triggers such as allergens, pollution, and respiratory infections.
2. Diabetes, particularly type 2, is influenced by genetic variants affecting insulin production and glucose metabolism, combined with factors such as diet, physical activity, and higher weight.
3. Heart disease encompasses various genetic components related to cholesterol metabolism, blood pressure regulation, and inflammatory responses, alongside lifestyle factors such as diet, smoking, and exercise.

Nursing Practice and the Genomic Framework

With greater understanding of genetics and genomic science has come a revolutionary reframing of our understanding of human health and disease, recognizing genomics as a central component of health, illness, risk for disease, and response to treatment. As a result, all health care disciplines, including nursing, have developed initiatives to promote the application of genomic knowledge into clinical practice. Nurses are uniquely positioned to incorporate genomic knowledge across all aspects of the health care system, enhancing the provision of health care across the life span, addressing the needs of the individual patient, the family, and the community.

Essential competencies for nursing practice, regardless of role or level of preparation include

- integrating and applying genetic/genomic knowledge;

- demonstrating an understanding of genetics as related to screening, health promotion, and illness prevention;
- obtaining a comprehensive family history and developing a three-generation pedigree (visual representation of a family's health history);
- analyzing findings to identify risk factors;
- identifying those who may benefit from genetic counseling services;
- making appropriate referrals for specialty care; and
- providing patient/family education and support.

Precision Health and Care

Precision health refers to the provision of personalized treatment based on individual needs. There can be a great deal of variability in the way different individuals respond to the same medication. Therapeutic response depends on a complex series of physiologic reactions; the medication is initially absorbed and distributed to the target tissue, where it is further metabolized, then finally excreted. Genetic variables have been found to account for 15 to 30 percent of the variability in drug response among different individuals. This percentage means that genetics explains a substantial portion of why people respond differently to the same drug. Luckily, genetic variables are not the sole factor (Anunobi, 2024).

Pharmacogenetics and Pharmacogenomics

Pharmacogenetics and *pharmacogenomics* are two very new terms in the realm of health care, which overall refer to an area of research examining how genes affect the response to medications. Although with similar meanings they may be seen used interchangeably, each has a specific distinguishing factor. The study of the variability of therapeutic responses to medications, as influenced by variations in single genes, is called **pharmacogenetics**. It examines factors such as specific drug receptors, and how drugs are metabolized and transported in the body, with the goal of developing individualized treatment based on the optimal choice of drug at the most effective dose.

The study of variations in multiple genes as associated with variable drug responses, rather than in single genes, is called **pharmacogenomics**. Pharmacogenomic studies investigate genetic variation among large population groups to ascertain differences in therapeutic responses for differing ethnic groups (NHGRI, 2018).

30.2 Patterns of Inheritance and Mutations

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Explain the pattern of inheritance
- Differentiate between autosomal and recessive patterns of inheritance
- Discuss the pathophysiology of genetic mutations
- Explain the varying types of genetic mutations
- Discuss the nurse's role in providing patient support through genetic diagnoses and care

Our contemporary understanding of genetics rests on the work of a nineteenth-century monk. Working in the mid-1800s, long before anyone knew about genes or chromosomes, Gregor Mendel discovered that garden peas transmit their physical characteristics to subsequent generations in a discrete and predictable fashion. When he mated, or crossed, two pure-breeding pea plants that differed by a certain characteristic, the first-generation offspring all looked like one of the parents. For instance, when he crossed tall and dwarf pure-breeding pea plants, all of the offspring were tall. Mendel called tallness dominant because it was expressed in offspring when it was present in a purebred parent. He called dwarfism recessive because it was masked in the offspring if one of the purebred parents possessed the dominant characteristic.

This section will explore the pattern of inheritance, as well as the different types and pathophysiology of genetic mutations, and how that translates into providing nursing care.

From Genotype to Phenotype

Each human body cell has a full complement of DNA stored in twenty-three pairs of chromosomes. Figure 30.3 shows the pairs in a systematic arrangement called a **karyotype**. Among these is one pair of chromosomes, called the **sex chromosomes**, that determines the sex of the individual (XX in females, XY in males). The remaining twenty-two chromosome pairs are called **autosomal chromosomes**. Each of these chromosomes carries hundreds or even

thousands of genes, each of which codes for the assembly of a particular protein—that is, genes are "expressed" as proteins. An individual's complete genetic makeup is referred to as their **genotype**. The characteristics that the genes express, whether they are physical, behavioral, or biochemical, are a person's **phenotype**.

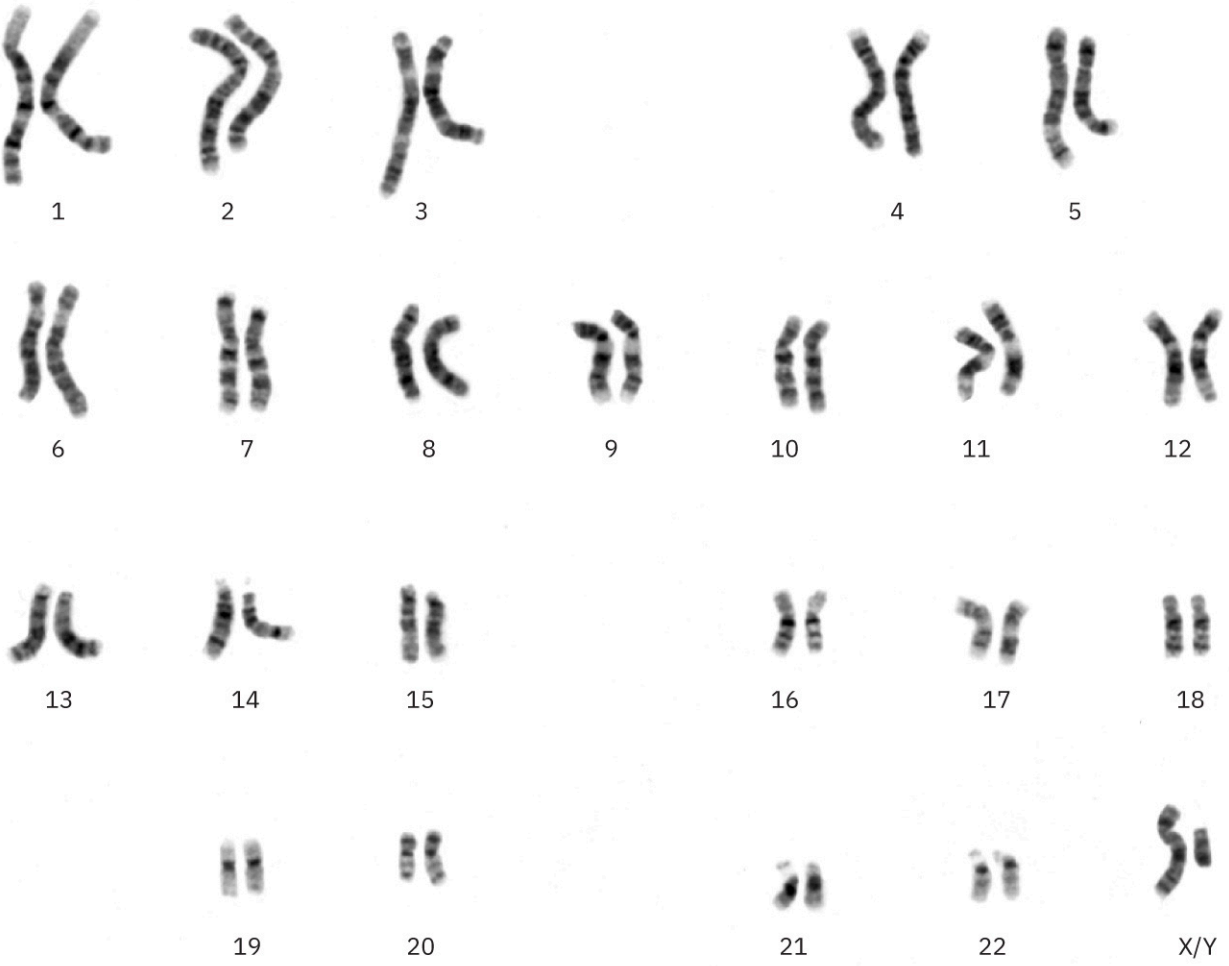

FIGURE 30.3 Each pair of chromosomes contains hundreds to thousands of genes. The banding patterns are nearly identical for the two chromosomes within each pair, indicating the same organization of genes. As is visible in this karyotype, the only exception to this is the XY sex chromosome pair in males. (credit: National Human Genome Research Institute, Public Domain)

In genetics and reproduction, *parent* is often used to describe the individual organisms that contribute genetic material to offspring, usually in the form of gamete, or sex, cells and their chromosomes. The concept of a genetic parent is distinct from social and legal concepts of parenthood, and may differ from those whom people consider their parents.

Individuals inherit one chromosome in each pair—a full complement of twenty-three—from each parent. This occurs when the sperm and oocyte combine at the moment of conception. Homologous chromosomes—those that make up a complementary pair—have genes for the same characteristics in the same location on the chromosome. Because one copy of a gene, an **allele**, is inherited from each parent, the alleles in these complementary pairs may vary. Take for example an allele that encodes for dimples. A child may inherit the allele encoding for dimples on the chromosome from the one parent and the allele that encodes for smooth skin (no dimples) on the chromosome from the other parent.

Although a person can have two identical alleles for a single gene (a **homozygous** state), it is also possible for a person to have two different alleles (a **heterozygous** state). The two alleles can interact in several different ways. The expression of an allele can be dominant, for which the activity of this gene will mask the expression of a nondominant, or recessive, allele. Sometimes dominance is complete; at other times, it is incomplete. In some

cases, both alleles are expressed at the same time in a form of expression known as codominance.

In the simplest scenario, a single pair of genes will determine a single heritable characteristic. However, it is quite common for multiple genes to interact to confer a feature. For instance, eight or more genes—each with their own alleles—determine eye color in humans. Moreover, although any one person can only have two alleles corresponding to a given gene, more than two alleles commonly exist in a population. This phenomenon is called multiple alleles. For example, there are three different alleles that encode ABO blood type; these are designated I^A, I^B, and i.

More than 100 years of theoretical and experimental genetics studies, and the more recent sequencing and annotation of the human genome, have helped scientists to develop a better understanding of how an individual's genotype is expressed as their phenotype. This body of knowledge can help scientists and medical professionals to predict, or at least estimate, some of the features that an offspring will inherit by examining the genotypes or phenotypes of the parents. One important application of this knowledge is to identify an individual's risk for certain heritable genetic disorders. However, most diseases have a multigenic pattern of inheritance and can also be affected by the environment, so examining the genotypes or phenotypes of a person's parents will provide only limited information about the risk of inheriting a disease. Only for a handful of single-gene disorders can genetic testing allow clinicians to calculate the probability with which a child born to the two parents tested may inherit a specific disease.

Pattern of Inheritance

As a result of a series of studies of the heredity of traits among pea plants, Gregor Mendel observed "units of inheritance," now referred to as genes. Mendel's research resulted in the development of the principles of inheritance, the "laws" defining how genetic traits are inherited and expressed (Table 30.1).

Law of Inheritance	Description
Law of segregation	Each inherited trait is defined by a gene pair. Offspring inherit one gene from each parent.
Law of independent assortment	Genes for different traits are sorted separately from one another. Inheritance of any specific trait is not dependent on the presence of any other.
Law of dominance	When there are alternate forms of a gene in a pair, offspring will express the dominant trait.

TABLE 30.1 Mendel's Principles of Inheritance

The pattern of inheritance describes the way certain conditions are passed from parent to offspring through a single gene. These include autosomal, X-linked, mitochondrial, Y-linked, and codominant patterns.

Autosomal Dominant

When the dominant allele is located on one of the twenty-two pairs of autosomes (non-sex chromosomes), we refer to its inheritance pattern as **autosomal dominant**. An example of an autosomal dominant disorder is neurofibromatosis type I, a disease that induces tumor formation within the nervous system that leads to skin and skeletal deformities. Consider a two individuals in a relationship in which one parent is heterozygous for this disorder (and who therefore has neurofibromatosis), *Nn*, and one parent is homozygous for the normal gene, *nn*. The heterozygous parent would have a 50 percent chance of passing the dominant allele for this disorder to their offspring, and the homozygous parent would always pass the normal allele. Therefore, four possible offspring genotypes are equally likely to occur: *Nn, Nn, nn*, and *nn*. That is, every child of this couple would have a 50 percent chance of inheriting neurofibromatosis.

Autosomal Recessive

When a genetic disorder is inherited in an **autosomal recessive** pattern, the disorder corresponds to the recessive phenotype. Heterozygous individuals will not display symptoms of this disorder, because their unaffected gene will

compensate. Such an individual is called a **carrier**. Carriers for an autosomal recessive disorder may never know their genotype unless they have a child with the disorder.

An example of an autosomal recessive disorder is cystic fibrosis (CF). CF is characterized by the chronic accumulation of a thick, tenacious mucus in the lungs and digestive tract. Decades ago, children with CF rarely lived to adulthood. With advances in medical technology, the average life span in developed countries has increased into middle adulthood. CF is a relatively common disorder that occurs in approximately 30,000 people in the United States. A child born to two CF carriers would have a 25 percent chance of inheriting the disease. This is the same 3:1 dominant: recessive ratio that Mendel observed in his pea plants, which applies here.

On the other hand, a child born to a CF carrier and someone with two unaffected alleles would have a 0 percent probability of inheriting CF but would have a 50 percent chance of being a carrier. Other examples of autosome recessive genetic illnesses include the blood disorder sickle cell disease, the fatal neurological disorder Tay-Sachs disease, and the metabolic disorder phenylketonuria.

X-linked Dominant or Recessive Inheritance

An **X-linked transmission** pattern of inheritance involves genes located on the X chromosome of the twenty-third pair. Recall that a male has one X and one Y chromosome. When a male parent transmits a Y chromosome, the child is male, and when a male parent transmits an X chromosome, the child is female. A female can transmit only an X chromosome, as both her sex chromosomes are X chromosomes.

X-linked Dominant

When an abnormal allele for a gene that occurs on the X chromosome is dominant over the normal allele, the pattern is described as **X-linked dominant**. This is the case with vitamin D–resistant rickets: an affected male would pass the disease gene to all of the female offspring, but none of the male offspring, because the male transmits only the Y chromosome to male offspring. If it is the female parent who is affected, all of the offspring—male or female—would have a 50 percent chance of inheriting the disorder because the female parent can only pass an X chromosome on to children. For an affected female, the inheritance pattern would be identical to that of an autosomal dominant inheritance pattern in which one parent is heterozygous and the other is homozygous for the normal gene (Figure 30.4).

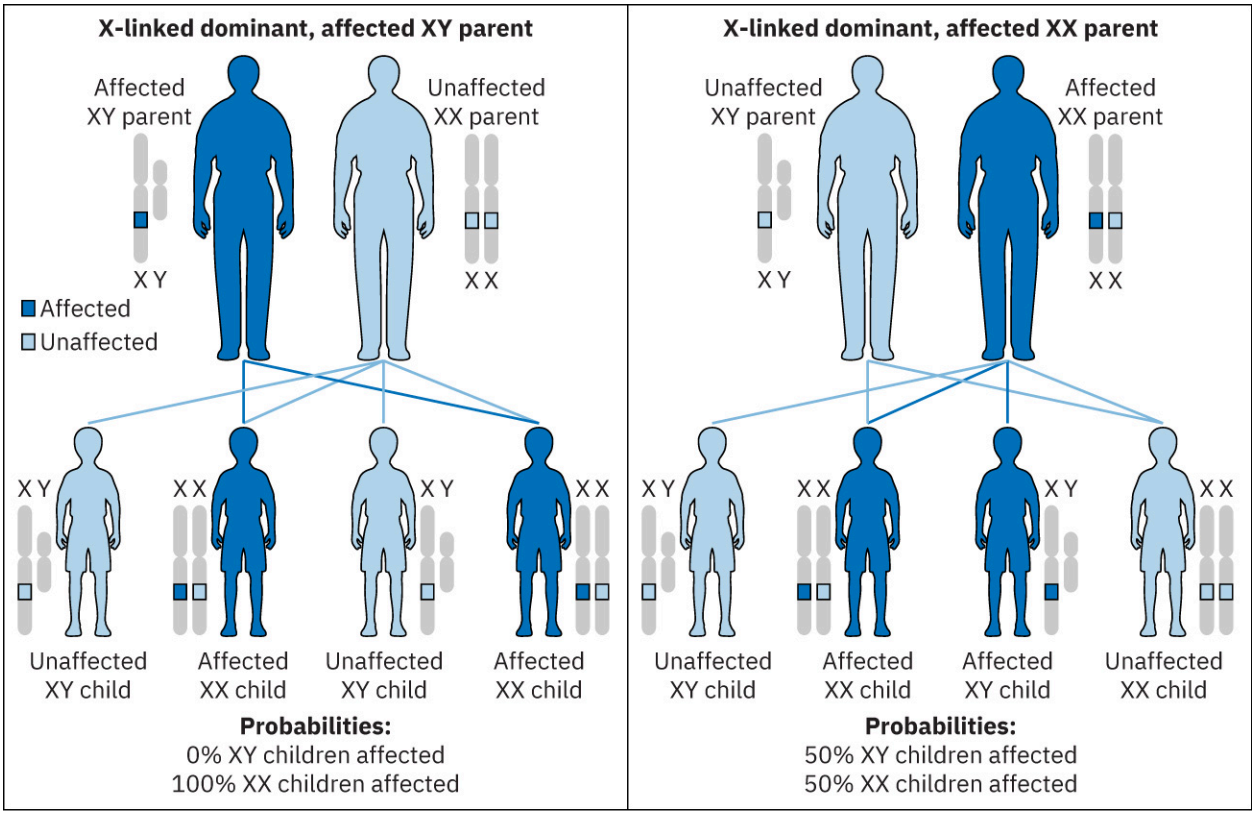

FIGURE 30.4 X-linked dominant inheritance patterns differ depending on which parent is affected with the disease. (a) When the XY parent is affected, 100% of XX children are also affected. (b) When the XX parent is affected, all children have a 50% chance of being affected. (credit: modification of work from U.S. National Library of Medicine, Public Domain)

X-Linked Recessive

X-linked recessive inheritance is much more common because females can be carriers of the disease yet still have a normal phenotype. Diseases transmitted by X-linked recessive inheritance include color blindness, the blood-clotting disorder hemophilia, and some forms of muscular dystrophy. For an example of X-linked recessive inheritance, consider parents in which the female is an unaffected carrier and the male is normal. None of the female offspring would have the disease because they receive a normal gene from their male parent. However, they have a 50 percent chance of receiving the disease gene from their female parent and becoming a carrier. In contrast, 50 percent of the male offspring would be affected (Figure 30.5).

With X-linked recessive diseases, males either have the disease or are genotypically normal—they cannot be carriers. Females, however, can be genotypically normal, a carrier who is phenotypically normal, or affected with the disease. A female can inherit the gene for an X-linked recessive illness when the female parent is a carrier or affected, or the male parent is affected. Female offspring will be affected by the disease only if they inherit an X-linked recessive gene from both parents. As you can imagine, X-linked recessive disorders affect many more males than females. For example, color blindness affects at least one in twenty males, but only about one in 400 females.

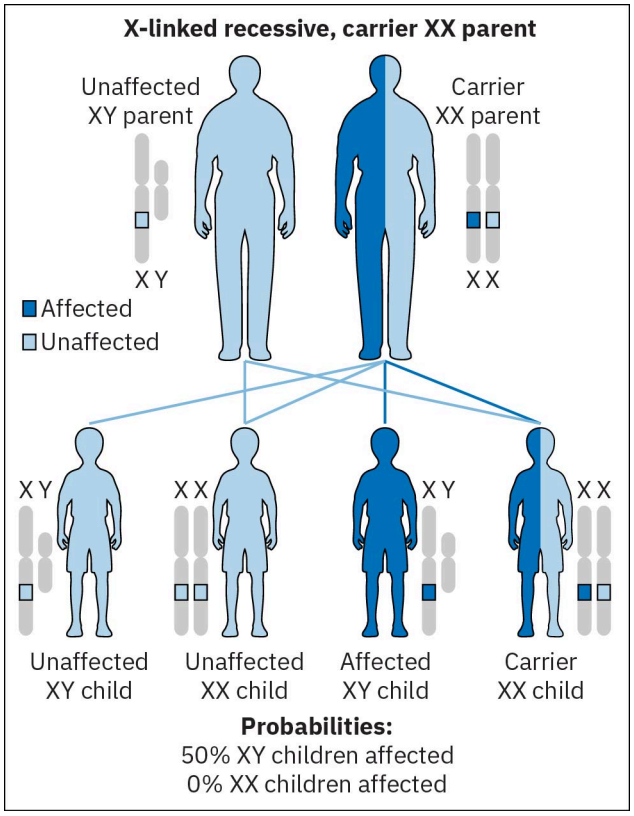

FIGURE 30.5 Given two parents in which the male is normal and the female is a carrier of an X-linked recessive disorder, a male offspring would have a 50 percent probability of being affected with the disorder, whereas female offspring would either be carriers or entirely unaffected. (credit: modification of work from U.S. National Library of Medicine, Public Domain)

Mitochondrial

A mitochondrion (plural = mitochondria) is a membranous, bean-shaped organelle that is the energy-conversion factory of the cell. The pattern of **mitochondrial inheritance** is transmitted only by mothers because mitochondrial genes are only inherited from the mother. Both male and female offspring can be affected, but only mothers can pass the pattern on to their children, whether or not they have any signs or symptoms. An example of mitochondrial inheritance is Leber hereditary optic neuropathy (LHON). LHON an inherited form of central vision loss that usually begins during the teens or twenties.

Y-linked Inheritance

A pattern of inheritance that comes from one of the Y chromosomes of the father is called **Y-linked inheritance**. Because Y chromosomes are only present in males, expression and transmission is exclusively from father to son (MedlinePlus, 2021). Examples include Y chromosome infertility, hypertrichosis of the ears (hairy ears), and retinitis pigmentosa.

Incomplete Dominance

Not all genetic disorders are inherited in a dominant–recessive pattern. In incomplete dominance, the offspring express a heterozygous phenotype that is intermediate between one parent's homozygous dominant trait and the other parent's homozygous recessive trait. An example of this can be seen in snapdragons when red-flowered plants and white-flowered plants are crossed to produce pink-flowered plants. In humans, incomplete dominance occurs with one of the genes for hair texture. When one parent passes a curly hair allele (the incompletely dominant allele) and the other parent passes a straight-hair allele, the effect on the offspring will be intermediate, resulting in hair that is wavy.

Codominant Inheritance

The equal, distinct, and simultaneous expression of both parents' different alleles is called **codominance**. A classic example of codominance in humans is ABO blood type. People are blood type A if they have an allele for an enzyme that facilitates the production of surface antigen A on their erythrocytes. This allele is designated I^A. In the same manner, people are blood type B if they express an enzyme for the production of surface antigen B. People who have

alleles for both enzymes (I^A and I^B) produce both surface antigens A and B. As a result, they are blood type AB. Because the effect of both alleles (or enzymes) is observed, we say that the I^A and I^B alleles are codominant. There is also a third allele that determines blood type. This allele (*i*) produces a nonfunctional enzyme. People who have two *i* alleles do not produce either A or B surface antigens: they have type O blood. If a person has I^A and *i* alleles, the person will have blood type A. Notice that it does not make any difference whether a person has two I^A alleles or one I^A and one *i* allele. In both cases, the person is blood type A. Because I^A masks *i*, we say that I^A is dominant to *i*. See Table 30.2 for a summary of the expression of blood type.

Blood Type	Genotype	Pattern of Inheritance
A	I^AI^A or I^Ai	I^A is dominant to *i*
B	I^BI^B or I^Bi	I^B is dominant to *i*
AB	I^AI^B	I^A is codominant to I^B
O	*ii*	Two recessive alleles

TABLE 30.2 Expression of Blood Types

Lethal Alleles

Certain combinations of alleles can be lethal, meaning they prevent the individual from developing in utero, or cause a shortened life span. In **recessive lethal inheritance** patterns, a child who is born to two heterozygous (carrier) parents and who inherited the faulty allele from both would not survive. An example of this is Tay-Sachs, a fatal disorder of the nervous system. In this disorder, parents with one copy of the allele for the disorder are carriers. If they both transmit their abnormal allele, their offspring will develop the disease and will die in childhood, usually before age 5.

In **dominant lethal inheritance** patterns, neither heterozygotes nor homozygotes survive; therefore, they are much rarer. Of course, dominant lethal alleles that arise naturally through mutation and cause miscarriages or stillbirths are never transmitted to subsequent generations. However, some dominant lethal alleles, such as the allele for Huntington disease, cause a shortened life span but may not be identified until after the person reaches reproductive age and has children. Huntington disease causes irreversible nerve cell degeneration and death in 100 percent of affected individuals, but it may not be expressed until the individual reaches middle age. In this way, dominant lethal alleles can be maintained in the human population. Individuals with a family history of Huntington disease are typically offered genetic counseling, which can help them decide whether or not they wish to be tested for the faulty gene.

Genetic Mutations

Mutations can arise spontaneously from errors during DNA replication, or they can result from environmental insults such as radiation, certain viruses, or exposure to tobacco smoke or other toxic chemicals. Because genes encode for the assembly of proteins, a mutation in the nucleotide sequence of a gene can change the amino acid sequence and, consequently, a protein's structure and function. Spontaneous mutations occurring during meiosis (creation of sperm and egg cells) are thought to account for many spontaneous abortions (miscarriages).

Beneficial and Harmful Mutations

Beneficial mutations help an organism to adapt to changes in the environment. As beneficial mutations increase an organism's chances of survival and thus increase the chance to reproduce, they are likely to become more prevalent over time. In recent years, scientific interest has been piqued by the discovery of a few individuals from northern Europe who are resistant to HIV infection. In 1998, American geneticist Stephen J. O'Brien at the National Institutes of Health (NIH) and colleagues published the results of their genetic analysis of more than four thousand individuals. These results indicated that many individuals of Eurasian descent (up to 14 percent in some ethnic groups) have a deletion mutation, called CCR5-delta 32, in the gene encoding CCR5 (O'Brien & Nelson, 2004). CCR5 is a coreceptor found on the surface of T cells that is necessary for many strains of the virus to enter the host cell. The mutation leads to the production of a receptor to which HIV cannot effectively bind and thus blocks viral entry.

People homozygous for this mutation have greatly reduced susceptibility to HIV infection, and those who are heterozygous have some protection from infection as well. Other examples include mutations that serve as protection against developing heart disease or diabetes, regardless of factors such as tobacco use or obesity.

In contrast, harmful mutations may result in harmful genetic disorders, such as cystic fibrosis, or a predisposition to develop cancer. Cancer is associated with mutations affecting genes that regulate the cell cycle during two main phases of this cycle, interphase and mitosis, allowing abnormal cells to proliferate into masses of cells. It is thought that a random change in DNA is more likely to result in a protein that does not function normally, or may not function at all, leading to a harmful effect (Mercadante & Kasi, 2023).

Types of Genetic Mutations

In genetic mutations, a change in the DNA sequence is conferred to mRNA through transcription, and may lead to an altered amino acid sequence in a protein on translation. Because proteins carry out the vast majority of cellular functions, a change in amino acid sequence in a protein may lead to an altered phenotype for the cell and organism. Mutations can be categorized in several ways. One that results from extraneous exposure is an **induced mutation**, and one that occurs due to processes within the body is a **spontaneous mutation**. Three major types of mutation are base substitutions, deletions, and insertions.

A base substitution, or **point mutation**, is when a single nucleotide in a DNA sequence is substituted by another nucleotide. Different types of point mutations include silent mutation, missense mutations, and nonsense mutations (Table 30.3).

Type of Mutation	Definition	Example
Silent mutation	One single nucleotide in a DNA sequence is substituted by another, but has *no effect* on the codon, amino acid sequence, or protein produced.	A DNA sequence is mutated from AGC to AGA, changing corresponding RNA from UCG to UCU. Because both codons translate to the same amino acid, the protein created remains the same.
Missense mutation	One single nucleotide in a DNA sequence is substituted by another. This changes the codon to encode for a different amino acid sequence that *may or may not* alter the protein produced.	In sickle cell disease, a single substitution in the beta-hemoglobin gene causes an alteration in the amino acid sequence and the protein produced, affecting the shape of red blood cells.
Nonsense mutation	One single nucleotide in a DNA sequence is substituted by another. This converts a codon encoding an amino acid into a stop codon (a nonsense codon), resulting in the synthesis of a protein that is typically not functional.	A nonsense mutation occurring in the gene that encodes the CFCR protein can lead to cystic fibrosis.

TABLE 30.3 Types of Point Mutations

Because codons are triplets of nucleotides, insertions or deletions in groups of three nucleotides may lead to the insertion or deletion of one or more amino acids and may not cause significant effects on the resulting protein's functionality. However, a **frameshift mutation**, caused by insertions or deletions of a number of nucleotides that are not a multiple of three are extremely problematic because they cause a shift in the reading frame. Because ribosomes read the mRNA in triplet codons, frameshift mutations can change every amino acid after the point of the mutation. The new reading frame may also include a stop codon before the end of the coding sequence. Consequently, proteins made from genes containing frameshift mutations are nearly always nonfunctional.

An example of a frameshift mutation is fragile X syndrome, where about two hundred CGC nucleotide repeats are inserted to the *FMR1* gene, making it nonfunctional. Another example is Prader-Willi syndrome, which is caused by the deletion of a portion of chromosome 15.

Germline Mutation

A **germline mutation** originates in the parent's reproductive cells (eggs or sperm) and is generally passed into every cell of the offspring's body. Germline mutation is implicated in the occurrence of genetically inherited predispositions for cancer. An example is Lynch syndrome, which is an inherited syndrome caused my germline mutations of the *MLH1* and *MSH2* genes; it is associated with colorectal cancer (Momma et al., 2019).

Somatic Mutation

A **somatic mutation** is any mutation that arises in cells at some point after fertilization and does not involve the germline. Somatic mutations are a normal part of the aging process, occurring throughout the life cycle. They may occur as spontaneous mutations or may be induced by environmental exposures, such as to ultraviolet radiation or toxic chemicals. Somatic mutations are associated with triggering the formation of cancer by affecting genes that have the potential to cause cancer, tumor-suppressor genes, and DNA repair mechanisms, therefore allowing tumor growth and survival (Miles & Tadi, 2023).

Nursing Practice Considerations

Competencies for nursing practice include nursing assessment and analysis of findings to identify risk factors. Steps in risk assessment can be summarized using the acronym RISK, beginning with the primary care nurse, as follows:

- Thoroughly assess collected data related to personal and three-generation family histories, including any related ancillary or laboratory information along with findings of the physical exam.
- Identify data to determine elements of risk.
  - Known genetic disorder in family
    - two affected immediate relatives (mother, father, siblings)
    - three or more affected parental relatives (grandparents, parents' siblings)
    - risk factors on both sides of the pedigree
  - Early onset of disease (< 50–60 years old)
    - breast, ovarian, endometrial cancers
    - colon cancer
    - prostate cancer
    - coronary artery disease
    - type 2 diabetes
    - dementia
  - Sudden unexpected cardiac death
  - Ethnic predisposition
    - Black and African American—sickle cell disease
    - Ashkenazi Jewish—Tay-Sachs disease
    - Southeast Asian—alpha thalassemia
- Select the level of probable risk of occurrence.
  - Average population risk
  - Moderate risk
  - High risk
- Keep the patient informed.
  - Risk communication; likelihood of disease occurrence
  - Management strategies
    - improve health
    - reduce risk
  - Referrals
    - genetic specialist

(Montgomery, 2021)

Patient Resources and Education

On completion and review of the assessment, results should be shared and appropriate referrals provided. If a risk for an inherited disorder is identified, referrals may include genetic counseling and/or genetic testing. A genetic counselor will provide information about the genetic disorder of concern and discuss genetic testing and

implications of positive results. Genetic testing may be used to determine whether there is a mutation present that may not occur until later in life, such as those related to *MLH1* mutation. It can assist in identifying measures that may reduce the risk of disorder occurrence, strategies for management of care, and appropriate therapeutic interventions (Montgomery, 2021).

30.3 Testing and Detection

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Identify parameters for genetic screening and testing
- Discuss legal implications for genetic screening and testing
- Review ethical and social concerns for genetic screening and testing

Genetic testing began in the 1950s when scientists discovered that the cause of Down syndrome was an additional copy of chromosome 21 (Snedden, 1999). In the 1960s, newborn screening for phenylketonuria was developed (National Association for Rare Disorders, 2021). Since then, genetic testing has evolved to be routine in identifying and treating diseases, and in preventative medicine. Nurses today encounter genetic testing in the inpatient, outpatient, and community settings. This section will describe parameters used for genetic testing and screening, as well as legal, ethical, and social considerations the nurse may encounter.

Genetic Testing

The process of **genetic testing** identifies mutations in a person's DNA, and it can provide guidance in the type of medical care a person receives. Reasons a person may have genetic testing include

- learning if a person has a genetic condition inherited by their parents;
- diagnosing a genetic condition based on signs and symptoms;
- discovering if a person has a genetic condition they may pass on to their children; and
- informing cancer screening or treatment.

Types of genetic testing include single-gene testing, panel testing, and large-scale genetic testing. Single-gene testing looks for variation in a specific gene and is often done when looking for a specific syndrome or condition based on symptoms, such as sickle cell disease. Panel testing evaluates a group of genes for variation, when the provider is evaluating nonspecific signs or symptoms, such as poor muscle tone. Large-scale genetic testing can be done to look at the entire DNA, all genes in the DNA, or genes related to medical conditions. This is done in people with complicated medical histories or for research purposes (Centers for Disease Control and Prevention, 2022).

Population Screening Tests

The process of **genetic screening** evaluates a person's risk of developing a genetic condition. The process of **population screening** refers to large-scale screening programs offering the general population testing for genomic disorders, such as hereditary breast and ovarian syndrome, Lynch syndrome, and familial hypercholesterolemia, that may be prevented or effectively mitigated with early detection.

Screening may be focused on identifying the presence of genetic mutations that may cause disease in the individual or that may be transferred to offspring. An example of the first type of screening is seen in the United States with newborn screenings for genetic disorders within forty-eight hours of birth. Genetic carrier screening identifies the risk for having a child with inherited disorders, such as cystic fibrosis or Tay-Sachs disease, and promotes informed decision-making regarding reproductive options (Montgomery, 2021).

Principles guiding genetic screening programs include characteristics of the disease, the test, and the health care system resources. The condition should be relatively common and considered a serious disorder to ensure that benefits warrant the costs. There should be an acceptable readily available treatment. The test should be valid and reliable, easy to perform, inexpensive, and acceptable to the population. The health care system must have the resources needed to offer further diagnosis and subsequent treatment of the disorder. A means for effective and efficient communication of results is a necessary component as well (Montgomery, 2021).

Diagnostic Genetic Testing

The purpose of **diagnostic genetic testing** is to confirm or rule out a specific genetic disorder using a DNA-based

test. Linkage analysis determines the presence of a chromosome associated with a specific disease gene, considered an indirect genetic diagnosis. The test requires typing of numerous family members, and the possibility of recombination is a source of diagnostic errors. Direct diagnosis, where the specific mutation causing the disease is detected, is the most commonly used approach for diagnosis. This test uses a sample of the individual's DNA and does not require additional family information. Although testing identifies the presence of a specific causative gene, it often does not determine disease severity or predict the age of onset. Examples include testing for cystic fibrosis and Huntington disease.

Nurse's Role in Testing and Screening for Adult-Onset Conditions

Nurses serve as educators, providing patients with comprehensive information about genetic testing, including its purpose, potential benefits, limitations, and implications for health management, as well as preparing and assisting patients during the testing process. They ensure that patients clearly understand the testing process, its potential outcomes, and any associated risks or ethical considerations. After testing, nurses are responsible for following up with patients to communicate test results. This may involve interpreting the results in collaboration with the health-care team, explaining the implications for the patient's health, and addressing any questions or concerns that arise. (Montgomery, 2021).

Health Assessment

The first step for assessing genetic/genomic risk involves collection of data through the personal and family health history, physical examination, and review of additional information, such as laboratory or radiology reports. Critical personal information includes race/ethnicity, age, significant therapies, present and past medications, medical and surgical history, history of any genetic testing, and reproductive history. If the personal history involves a cancer diagnosis, information to be obtained includes the type of cancer, age of onset, pathology reports, exposure to carcinogens, and medical or surgical treatment regimes. In the presence of high risk for cancer, information about any chemoprevention therapy or risk-reducing surgery should be included. Information about behavioral factors such as tobacco use, drug or alcohol use, and sexual history, and environmental factors such as radiation or toxin exposure, should also be addressed. The physical exam should include observations regarding anomalies or dysmorphic characteristics that may be associated with a genetic disorder (Montgomery, 2021).

The family history records the health and disease concerns experienced within the family over three generations. In conjunction with the personal history, the family history further enhances risk assessment, augments diagnosis, helps establish rapport to promote prevention and disease management, and facilitates effective decision-making. A three-generation pedigree can serve as a visual representation, revealing relationships and patterns that may indicate inherited disorders (Montgomery, 2021).

Upon completion of collection, the data should be reviewed to identify "red flags," factors that may be associated with risk for an inherited disease or a familial predisposition. This step facilitates identification of at-risk individuals, so that interventions to reduce risk can be implemented, as well as establishing the need for genetic testing or for preventative treatment regimes. Genetic red flags include known genetic disorders, sudden unexpected cardiac death, early onset of disease (under age 50), and ethnic predisposition for a genetic disorder (Montgomery, 2021).

Based on the red flags, the level of risk probability and empiric risk can be determined. The likelihood that an individual carries a genetic mutation predisposing the person for developing disease is their **risk probability**. The chance for the occurrence of a disease based on personal and family history and other data is the **empiric risk**. Thorough review of the data is important for determining whether the patient is at population, moderate, or high risk.

If the history reveals red flags related to risk for inherited disorders, a referral for genetic counseling is indicated. Provide the patient and family with information about testing, the types of tests, benefits or risks, and the reasons testing is needed. Many people may have a level of risk for noninherited disorders based on behavioral factors or environmental exposures. Such concerns warrant discussion of risk-reduction interventions such as preventative strategies, lifestyle modifications, and measures for early detection. As there is an element of risk for any individual regardless of history or physical exam findings, measure to reduce risks should be a routine component of practice, addressing topics such as healthy lifestyle behaviors, age-appropriate immunizations, smoking cessation or avoidance, and seat belt use, as well as promoting screening for early detection (e.g., colonoscopy, mammography) (Montgomery, 2021).

Ethical, Legal, and Social Concerns

The **ethical, legal, and social implications (ELSI)** associated with advances in genetic and genomic knowledge include informed decision-making, informed consent for genetic testing, consent related to genetic/genomic research, privacy and confidentiality, and discrimination prevention (Soleymani-Lehmann et al., 2022). The term ELSI has its origins in the Human Genome Project, and it has generated complex ethical and legal issues related to health care. Nurses are called upon to integrate genetic and genomic knowledge and principles into the scope of practice, including an understanding of ELSI concerns (Soleymani-Lehmann et al., 2022).

LINK TO LEARNING

The Human Genome Project (https://openstax.org/r/77GenomeProj) was a monumental international scientific research endeavor that aimed to unravel the mysteries of human DNA. It sought to identify, map, and sequence all the genes of the human genome, providing a comprehensive understanding of our genetic makeup from both a physical and functional perspective.

Ethical and Legal Considerations

Informed decision-making centers on assuring that individuals clearly understand the nature, risks, and benefits of any procedure and have given consent freely without any coercion. Nurses will be increasingly involved in discussing genetics-related issues involving informed decision-making, especially in the areas of gathering family history and obtaining medical information from patients and their family members. The nurse discusses the need for gathering family history data to obtain the patient's verbal consent for the process. Similarly, it may be necessary to obtain information directly from other family members, or from medical records, necessitating discussion with the family members and obtaining written consent.

Genetic testing procedures also require assuring that the patient clearly understands the purposes, benefits, and risks involved with testing, facilitating informed decision-making and consent (Soleymani-Lehmann et al., 2022). Genetic testing from preconception and throughout the life span presents unique issues related to informed consent. For example, an issue associated with newborn screening is that results also reveal information about family members. A newborn with a diagnosis of phenylketonuria (PKU) reveals that both parents are carriers. In turn, then, there is the risk for parents' siblings being carriers as well. A psychological/emotional effect may be in the form of parental guilt. A known diagnosis may affect the ability to obtain health insurance, and it may lead to future employment discrimination. It is essential that in-depth counseling assuring informed consent is a central aspect of genetic testing.

Genome-Wide Association Studies

An expanded area of research, referred to as **genome-wide association studies (GWAS)**, aims to identify common genetic factors that influence health and disease. To facilitate GWAS research, the NIH has developed policies regarding the sharing of GWAS-related data, including a central repository for such data. Informed consent, again, is a critical issue, ensuring that research participants have a full understanding regarding data sharing and its implications. Three levels of consent are under consideration. Traditional consent involves participants' consent to participate in the research study and for public release of their data. Binary consent allows participants to agree to participate in the study but choose not to allow release of their data. Tiered consent allows participants to be in the study and offers several options related to data sharing, giving them control over whether or not data are shared, how that is done, and with whom it is shared. Nurses must be aware of any changes in processes related to informed consent to be able to provide information for those considering participating in GWAS research (Uffelmann et al., 2022).

Privacy and Confidentiality

Maintaining privacy and confidentiality regarding genetic health information has the potential for presenting complex concerns for nursing practice. For example, the American Nurses Association (ANA) Code of Ethics defines *privacy* in terms of the individual's right to control their own personal information. It defines *confidentiality* as the nurse's obligation to protect that right and prohibits disclosure of information provided in confidence to another person. The potential for a dilemma arises in that genetic information for one person may also imply risks for others.

On one side, the nurse is obligated to protect the patient's rights. On the other, the nurse may feel the duty to warn others of their potential health risks. The nurse must be aware that there is no legal authority allowing the breach of confidentiality with disclosure of genetic information about one person with another.

Discrimination

Discrimination based on genetic information, primarily involving insurance and employment practices, was recognized early in the Human Genome Project. The concerns centered on the potential that insurance providers would limit or deny coverage based on genetic information, or that employers might use the information as a basis for hiring and firing. The **Genetic Information Nondiscrimination Act (GINA)** prohibits discrimination based on genetic information in both areas. Title I addresses health insurance, specifying that health insurers may not use genetic information to determine eligibility for coverage and may not request that individuals undergo genetic testing or provide genetic information. Title II addresses employment practices, prohibiting the use of genetic information in making employment decisions, and it restricts employers from requesting genetic testing and the disclosure of any genetic information (National Human Genome Research Institute, 2020).

LINK TO LEARNING

Learn more about how you can prevent genetic discrimination (https://openstax.org/r/77GenticNonDisc) through the Genetic Information Nondiscrimination Act of 2008.

Social and Spiritual Considerations

People of some religions are hesitant to receive genetic testing, especially during pregnancy. For example, some Christians, particularly those with conservative or traditionalist views, may hold beliefs that life begins at conception and, therefore, view selective abortion based on genetic abnormalities as morally unacceptable. Hesitancy around genetic testing in some cultures stems from a lack of understanding or education about the purpose and importance of genetic testing in certain situations.

CULTURAL CONTEXT

Availability of Genetic Services

A took aim at the ethical, social, and cultural issues associated with delivery of genetic services in low- and middle-income countries (LMICs) (Zhong et al., 2021). Nine themes emerged:

1. Genetic counseling has a tendency of being directive.
2. Genetic services have psychosocial consequences that require improved support.
3. Medical genetics training is inadequate.
4. Genetic services are difficult to access.
5. Social determinants affect uptake and understanding of genetic services.
6. Social stigma is often associated with genetic disease.
7. Family values are at risk of disruption by genetic services.
8. Religious principles pose barriers to acceptability and utilization of genetic services.
9. Cultural beliefs and practices influence uptake of information and understanding of genetic disease.

The World Health Organization (WHO) provides some guidance on the implementation of community genetic services in LMICs to prevent congenital disorders and genetic diseases. This review is an important step toward informing the development of evidence-based, ethical, and culturally appropriate genetic services in LMICs (Zhong et al., 2021).

Nursing Responsibilities

The ANA identified nursing competencies guiding professional practice in the realm of ethical issues related to genetics and genomic health care. Professional responsibilities include the following:

- recognizing when one's own attitudes and values may affect provision of care

- advocating for the rights of all patients to autonomous, informed decision-making and voluntary action
- identifying ethical issues, (ethnic, cultural, religious, legal, fiscal, and social) related to genomic information and technologies
- defining issues that compromise patients' rights for autonomous, informed decision-making and voluntary action
- providing accurate, relevant, and the most current information, resources, services, and technologies that promote informed decision-making

Summary

30.1 Genetic Disorders

- Genetics refers to the study of heredity, focused on patterns of inheritance of specific characteristics or traits, including variations of a trait within a population.
- Although there is a considerable amount of genetic variation among humans, any two people's genomes are about 0.4 percent different, and these genomic variants are what make individuals unique.
- Genetic conditions are conditions caused by a single gene mutation, such as sickle cell disease, whereas chromosomal conditions are caused by an incorrect number or structure of chromosomes, such as Down syndrome.
- Genomics is the study of genes and how they interact with each other and the environment.
- A genomic approach to health care uses knowledge about genetic variation and environmental effects to augment the planning and provision of health care to individuals, families, and the community.
- Essential nursing practice concepts in genomics include integrating knowledge, demonstrating understanding, obtaining a comprehensive patient and family history, making appropriate referrals, and providing patient education and support.
- *Pharmacogenetics* and *pharmacogenomics* are two very new terms in the realm of health care, which overall refer to an area of research examining how genes affect the response to medications.

30.2 Patterns of Inheritance and Mutations

- Each human body cell has a full complement of DNA stored in twenty-three pairs of chromosomes; each of these chromosomes carries up to thousands of genes, each of which codes for the assembly of a particular protein.
- An individual's complete genetic makeup is referred to as their genotype; the characteristics that the genes express, whether they are physical, behavioral, or biochemical, are a person's phenotype.
- The pattern of inheritance describes the way certain conditions are passed from parent to offspring through a single gene. These include autosomal, dominant, x-linked, mitochondrial, Y-linked, and codominant patterns.
- Certain combinations of alleles can be lethal, meaning they prevent the individual from developing in utero, or cause a shortened life span.
- Mutations can arise spontaneously from errors during DNA replication, or they can result from environmental insults such as radiation, certain viruses, or exposure to tobacco smoke or other toxic chemicals; mutations can also be beneficial and aid in survival in a changing environment.
- A point mutation is when a single nucleotide in a DNA sequence is substituted by another nucleotide; it may or may not have an effect on the expressed protein.
- Frameshift mutations, caused by insertions or deletions of a number of nucleotides that are not a multiple of three, are extremely problematic because they cause a shift in the reading frame.
- Nursing practice considerations include nursing assessment and analysis of findings to identify risk factors; on completion and review of the assessment, results should be shared, and appropriate referrals provided. If a risk for an inherited disorder is identified, referrals may include genetic counseling and/or genetic testing.

30.3 Testing and Detection

- Genetic testing identifies mutations in a person's DNA and can provide guidance in the type of medical care a person receives.
- The first step for assessing genetic/genomic risk involves collection of data through taking a thorough personal and family health history, physical examination, and review of additional information, such as laboratory or radiology reports.
- If the history reveals red flags related to risk for inherited disorders, a referral for genetic counseling is indicated.
- Advances in genetic and genomic knowledge have generated complex ethical and legal issues related to health care.
- An expanded area of research, referred to as genome-wide association studies (GWAS), aims to identify common genetic factors that influence health and disease.
- Nurses are called upon to integrate genetic and genomic knowledge and principles into the scope of practice,

including understanding of ELSI concerns: informed decision-making, informed consent for genetic testing, consent related to genetic/genomic research, privacy and confidentiality, discrimination prevention, and the addressing of cultural or religious considerations.

Key Terms

allele alternative form of a gene that occupies a specific locus on a specific gene
autosomal chromosome in humans, the twenty-two pairs of chromosomes that are not the sex chromosomes (XX or XY)
autosomal dominant pattern of dominant inheritance that corresponds to a gene on one of the twenty-two autosomal chromosomes
autosomal recessive pattern of recessive inheritance that corresponds to a gene on one of the twenty-two autosomal chromosomes
carrier heterozygous individual who does not display symptoms of a recessive genetic disorder but can transmit the disorder to their offspring
chromosomal condition condition related to changes in chromosome structure or number
chromosome structure made of protein and a single molecule of DNA that carries genetic information in the form of genes
codominance equal, distinct, and simultaneous expression of both parents' different alleles
diagnostic genetic testing testing performed to confirm or rule out a specific genetic disorder using a DNA-based test
dominant lethal inheritance inheritance pattern in which individuals with one or two copies of a lethal allele do not survive in utero or have a shortened life span
empiric risk chance for the occurrence of a disease based on personal and family history and other data
ethical, legal, and social implications (ELSI) concerns related to advances in genetic and genomic knowledge that include informed decision-making, informed consent for genetic testing, consent related to genetic/genomic research, privacy and confidentiality, and discrimination prevention
frameshift mutation mutation caused by insertions or deletions of a number of nucleotides that are not a multiple of three
gene basic functional unit of heredity found in the nucleus of every cell; composed of deoxyribonucleic acid (DNA) sequences located in an individual's chromosomes
genetic condition condition caused by a single gene mutation
Genetic Information Nondiscrimination Act (GINA) U.S. law that prohibits discrimination based on genetic information
genetic screening process that evaluates a person's risk of developing a genetic condition
genetic testing testing that identifies mutations in a person's DNA
genetics study of heredity focused on patterns of inheritance of specific characteristics or traits, including variations of a trait within a population
genome-wide association studies (GWAS) expanded area of research to identify common genetic factors that influence health and disease
genomic condition disorder caused by the loss or gain of DNA material
genomics study of genes and how they interact with each other and the environment
genotype complete genetic makeup of an individual
germline mutation mutation that originates in the parent's reproductive cells (eggs or sperm) and is generally passed into every cell of the offspring's body
heterozygous having two different alleles for a given gene
homozygous having two identical alleles for a given gene
induced mutation genetic mutation from an extraneous exposure
karyotype systematic arrangement of chromosome pairs
mitochondrial inheritance pattern of inheritance transmitted only by mothers
mutation change in the DNA sequence of an organism's genetic material
pharmacogenetics study of the variability of therapeutic responses to medications, as influenced by variations in single genes
pharmacogenomics study of variations in multiple genes as associated with variable drug responses

phenotype physical or biochemical manifestation of the genotype; expression of the alleles
point mutation mutation in which a single nucleotide in a DNA sequence is substituted by another nucleotide
population screening large-scale screening programs offering the general population testing for genomic disorders that may be prevented or effectively mitigated with early detection
recessive lethal inheritance pattern of inheritance in which individuals with two copies of a lethal allele do not survive in utero or have a shortened life span
risk probability likelihood that an individual carries a genetic mutation, predisposing the person for developing disease
sex chromosomes pair of chromosomes involved in sex determination; in males, the XY chromosomes, and in females, the XX chromosomes
somatic mutation mutation that arises in cells at some point after fertilization and does not involve the germline
spontaneous mutation genetic mutation that occurs due to processes within the body
X-linked dominant pattern of dominant inheritance that corresponds to a gene on the X chromosome of the twenty-third pair
X-linked recessive pattern of recessive inheritance that corresponds to a gene on the X chromosome of the twenty-third pair
X-linked transmission pattern of inheritance that involves genes located on the X chromosome of the twenty-third pair
Y-linked inheritance pattern of inheritance that comes from one of the Y chromosomes of the father

Assessments

Review Questions

1. What distinguishes the study of genomics from the study of genetics?
   a. Genomics considers the effects of environmental factors.
   b. Genomics examines variations in trait expression.
   c. Genomics involves the study of single genes.
   d. Genomics research concerns DNA.

2. Sickle cell disease is considered what kind of condition?
   a. chromosomal condition
   b. genetic condition
   c. condition of translocation
   d. condition of deletion

3. What characteristic differentiates pharmacogenetics and pharmacogenomics in the study of therapeutic drug response?
   a. Pharmacogenetics is the study of single gene variations; pharmacogenomics is the study of multiple genes.
   b. Pharmacogenetics is the study of multiple genes; pharmacogenomics is the study of a single gene.
   c. Pharmacogenetics is the study of a single chromosome; pharmacogenomics is the study of multiple chromosomes.
   d. Pharmacogenetics is the study of multiple chromosomes; pharmacogenomics is the study of a single chromosome.

4. What is a description of the affect of the genomics framework on patient care?
   a. It focuses solely on the treatment of rare genetic disorders.
   b. It primarily emphasizes the development of new medications.
   c. It incorporates genetic and genomic knowledge to enhance health care across all aspects of the system.
   d. It limits health care initiatives to research and development.

5. What is one of the essential competencies for nursing practice in the context of genomics?

a. prescribing genetic medications
b. integrating and applying genetic/genomic knowledge
c. conducting laboratory genetic tests
d. developing health care policies

6. Genetic testing reveals the presence of an X-linked recessive trait. With an affected male, what is the risk of transmission to offspring?
a. All female offspring will be affected.
b. All female offspring will be carriers.
c. All male offspring will be affected.
d. All male offspring will be carriers.

7. What is a defining characteristic of mitochondrial inheritance?
a. It affects only male offspring.
b. It is transmitted only by females.
c. Its expression follows a dominant pattern of inheritance.
d. Males can pass the trait to male offspring.

8. If a person inherits I^A and I^B alleles, what blood type will they have?
a. AB
b. O
c. B
d. A

9. In a point mutation, what happens to a single nucleotide in a DNA sequence?
a. It is deleted.
b. It is incomplete.
c. It is multiplied.
d. It is substituted.

10. What is an example of population screening?
a. newborn metabolic screen
b. Papanicolaou (Pap) tests
c. screening mammogram
d. screening colonoscopy

11. What is a characteristic of single-gene testing?
a. It determines disease severity.
b. It identifies a specific gene.
c. It predicts age of onset.
d. It requires testing of family members.

12. What is a description of tiered informed consent?
a. It allows public release of data.
b. It gives several options for data sharing.
c. It involves consent to participate in the study.
d. It restricts all release of data.

13. Which is a specific component of Title I of the Genetic Information Nondiscrimination Act (GINA)?
a. It allows for genetic testing to be requested.
b. It permits using genetic information for hiring.
c. It restricts using genetic testing for coverage eligibility.
d. It prevents disclosure of genetic information.

Check Your Understanding Questions

1. Explain ways that nurses can incorporate genomic knowledge into clinical practice.
2. Your 23-year-old patient just learned that they have Lynch syndrome. What are some things that you, as the nurse, would encourage the patient to do?

Reflection Questions

1. Based on your understanding of genomics, what types of factors do you think would be investigated in the study of COPD?
2. Describe the difference between germline and somatic mutations, and provide an example of each.
3. How would you describe the concept of inheritance to a patient, incorporating examples related to colon cancer and considering its effects on the patient's family?
4. What are the professional responsibilities of nurses regarding genetic testing?

What Should the Nurse Do?

Ms. Lewis, a 28-year-old female, visits the genetic counseling clinic for guidance regarding her family history of genetic conditions. She expresses concerns about the potential risk of passing on certain conditions to her future children. Ms. Lewis's medical history is unremarkable, but her family has a history of neurogenetic disorders, specifically Huntington disease. She reports experiencing anxiety about her reproductive decisions and is seeking information on genetic testing options. Ms. Lewis's maternal grandmother was diagnosed with Huntington disease, and her mother is currently undergoing genetic testing to determine if she carries the gene mutation. This family history has prompted Ms. Lewis to seek advice on family planning. Vital signs are within normal limits, with a blood pressure of 120/80 mm Hg, a heart rate of 76 bpm, a respiratory rate of 18 breaths per minute, and a body temperature of 98.6°F (37°C).

1. How does the family history of Huntington disease affect the analysis of potential genetic risks for Ms. Lewis, and what additional information or assessments might be helpful to further understand the implications for her reproductive decisions?
2. What interventions and strategies would you propose to support Ms. Lewis in her decision-making process regarding family planning, and how would you tailor these solutions to address her unique emotional and informational needs?

Mr. Dias, a 45-year-old male, presents at the genetics clinic concerned about his family's history of colon cancer. He reports that his father passed away from colon cancer, and his paternal grandmother also had a history of the disease. Mr. Dias has been experiencing occasional abdominal pain, changes in bowel habits, and noticeable weight loss. Given his family history, Mr. Dias is worried about his own risk and expresses interest in genetic testing for colon cancer susceptibility. Vital signs are stable, with a blood pressure of 120/80 mm Hg, a heart rate of 78 bpm, a respiratory rate of 18 breaths per minute, and a body temperature of 98.6°F (37°C).

3. How might Mr. Dias's family history and symptoms influence the analysis of potential genetic risks for colon cancer, and what additional information or assessments might be needed for a comprehensive understanding of his situation?
4. As the nurse, what immediate actions would you initiate to address Mr. Dias's current concerns and informational needs, and how would you collaborate with the genetic counseling team to ensure comprehensive support?

Mrs. Hernandez, a 28-year-old female, arrives at the genetics clinic seeking guidance on genetic screening and testing due to a family history of breast cancer. Her mother was diagnosed with breast cancer at the age of 40, prompting Mrs. Hernandez to proactively explore her own risk. She reports occasional breast tenderness and is concerned about the potential implications for her health. Mrs. Hernandez has no prior history of cancer. Vital signs are within normal ranges, with a blood pressure of 118/76 mm Hg, a heart rate of 82 bpm, a respiratory rate of 16 breaths per minute, and a body temperature of 98.7°F (37.1°C).

5. As the nurse, what immediate actions would you initiate to address Mrs. Hernandez's current concerns and informational needs, and how would you collaborate with the genetic counseling team to ensure comprehensive support?

6. After implementing interventions and providing support, how would you monitor and assess Mrs. Hernandez's progress in addressing her concerns about genetic screening, and what specific outcomes would indicate successful support and understanding?
7. Describe how you will engage Mrs. Hernandez in a discussion about the ethical and social concerns related to genetic screening. What strategies would you employ to ensure her values and beliefs are respected throughout the decision-making process?

Competency-Based Assessments

1. Given a family medical history, how would you identify potential genetic risks and recommend appropriate genetic testing or counseling for common conditions such as Down syndrome or cystic fibrosis?
2. Create a chart showing ways that genomics can be integrated into patient care. How does it affect treatment decisions and outcomes? How would you communicate this information to a patient?
3. Complete your own three-generation comprehensive family history. What are your findings? Did you identify any risk for inherited conditions?

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CHAPTER 31
Cancer

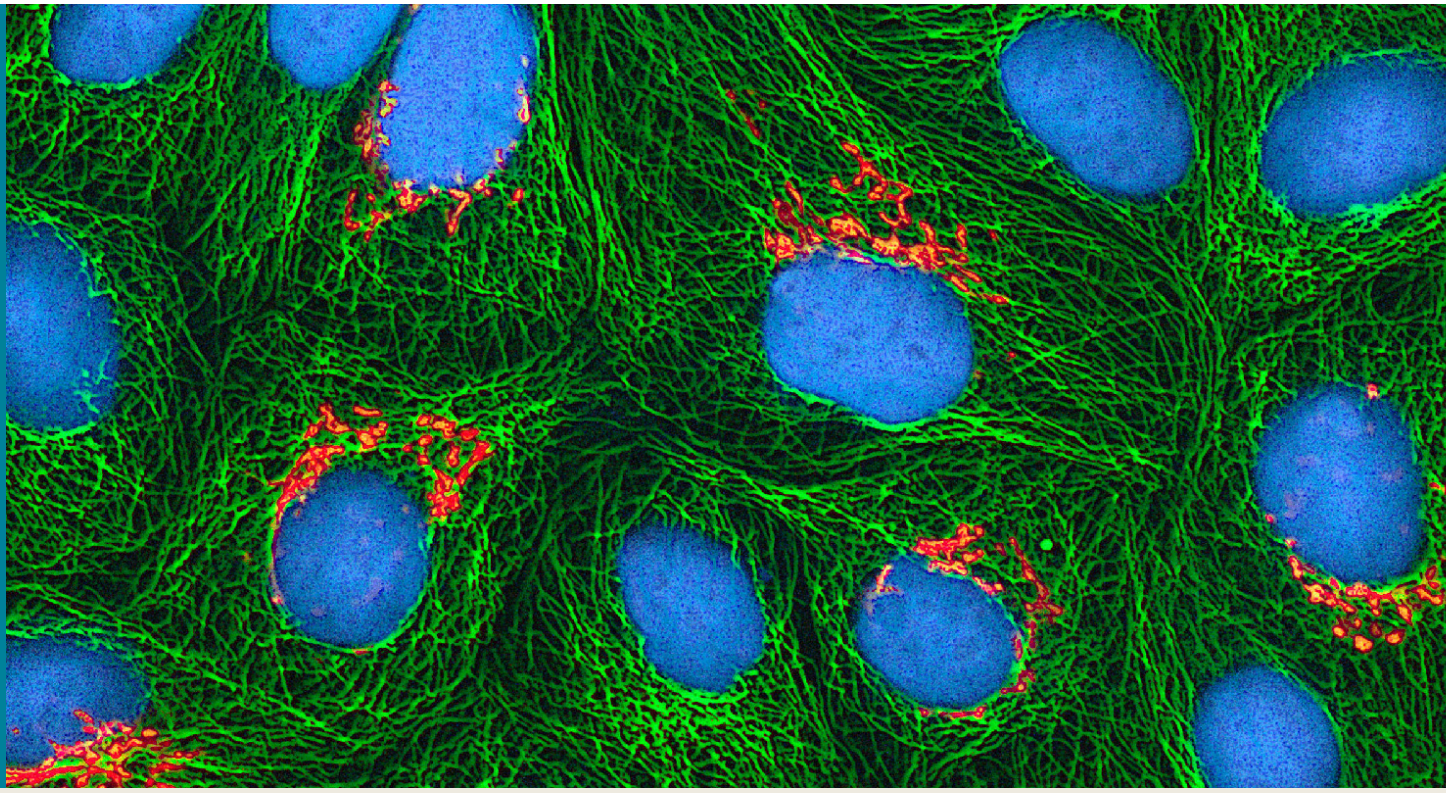

FIGURE 31.1 HeLa cells are a cell type in an immortal cell line used in scientific research. It is the oldest and most used human cell line. The line was derived from cervical cancer cells taken in 1951 from Henrietta Lacks, who eventually died of her cancer. (credit: "HeLa Cells" by NIH/National Cancer Institute, Public Domain)

CHAPTER OUTLINE

INTRODUCTION Nurses caring for individuals with cancer may work in hospital settings, clinics, research organizations, or in the home. Care often includes teaching about the diagnostic and disease process, supporting the individual through side effects of both cancer and treatment, and assisting with the delivery of chemotherapy or radiation therapy. The nurse empowers the individual to express their emotions and needs, guiding the decision-making process throughout the journey. Regardless of care setting, the nurse provides a caring and comforting presence while assisting with the navigation from diagnosis through survivorship or death.

31.1 Oncological Disorders

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiology, risk factors, and clinical manifestations of cancer
- Differentiate the major types of cancer

There are more than 200 types of **cancer**, all characterized by uncontrolled and abnormal cell growth (Cancer Research UK, 2023). This results in cells that are poorly differentiated and unable to perform their function within

the body. The primary effect of cancer is the disruption of typical body functions. The goal of treatment is to interrupt the uncontrolled growth of abnormal cells to manage the disease and restore normal function.

Cancer is thought to be caused by three main factors (National Cancer Institute [NCI], n.d.; Nationwide Children's, 2023; Stanford Medicine, n.d.):

1. Systemic issues—often due to immune dysfunction or chronic inflammation
2. Environmental exposures—chronically poor diet, pollution, certain viruses
3. Genetic determinants—inherited or acquired

These factors may intersect to increase the risk of cancer development.

Pathophysiology

A normal cell has deoxyribonucleic acid (DNA), which gives the cell correct instructions about its work in the body and when the cell should die. The process of normal cell death as part of a controlled and normal process is called apoptosis. To allow cancer to develop, a mutation must be initiated. Often, the initiation of a mutation is caused by repeated or prolonged insults to the cell's DNA, such as consistent skin tanning or repeated chemical exposure at work. In medical terms, an insult is the cause of some kind of physical injury. The DNA insult initiates a mutation and apoptosis is avoided. This is the beginning of most cancer types.

Smoking is a classic example of an insult as cigarettes contain many known carcinogens. **carcinogen** is a cancer-causing substance. The cell easily repairs damage from early exposure, but errors in the DNA and cell instructions become increasingly likely to occur. Recall that DNA contains the instructions needed for development, survival, and reproduction (National Human Genome Research Institute, 2020). If the DNA and its instructions are altered, the cells produced are not fully functional. Lung cells are damaged from inhaled carcinogens and the DNA instructions for the new lung cells are also damaged. This cycle continues, with each replication of lung cells exhibiting more damage and less expected functionality as part of the lung tissue. Eventually, this process creates cancerous cells. Then lung cells cannot serve the purpose of exchanging gases. Early symptoms of the cellular and tissue changes in lung cells include coughing or a change in breathing. The symptoms associated with disrupted function are usually what causes an individual to seek care.

The process the body uses to search for, identify, and destroy foreign pathogens and cancerous cells using cytotoxic T lymphocytes (or T cells), activated macrophages, and natural killer cells is called **immunosurveillance** (Figure 31.2). When enough cancerous cells have evaded immunosurveillance, a malignant, or cancerous, growth begins.

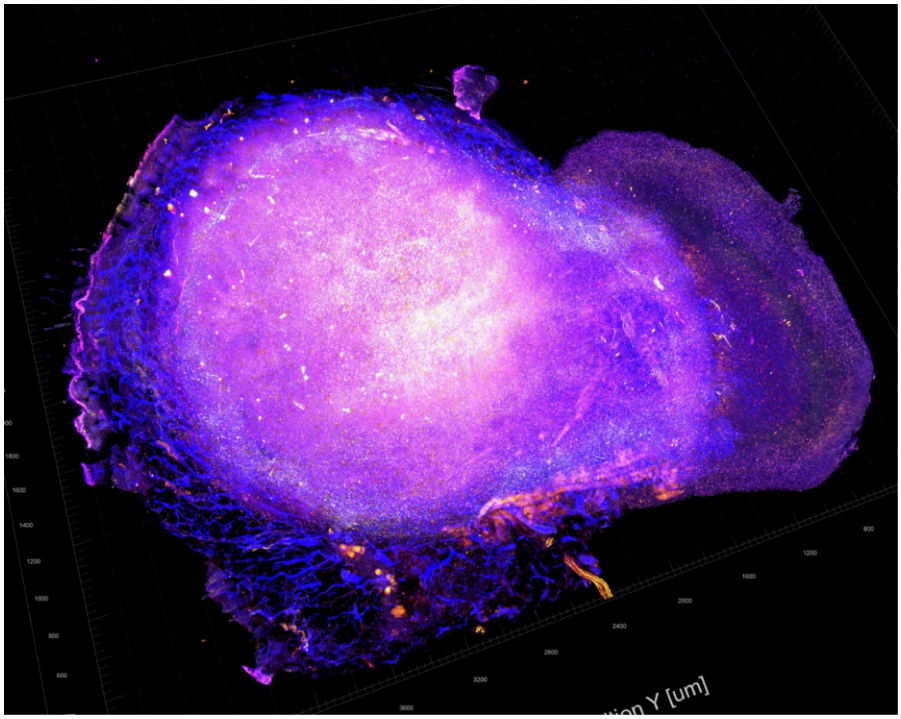

FIGURE 31.2 Transparent tumor tomography visualizes cytotoxic T cells (yellow, red, and blue) attacking the tumor after an antitumor immune response was initiated by a novel therapy. (credit: "Anti-Tumor Immune Response" by NIH/National Cancer Institute, Public Domain)

Tumors are malignant or benign. A malignant growth is cancerous, grows uncontrollably, and invades other areas of the body. They represent a threat to life, regardless of which part of the body is affected. A **benign** tumor grows slowly and does not spread. Whether they are a threat to life depends on their location and size. A benign tumor can grow and cause dysfunction by

- displacing tissues,
- pressing on nerves or vessels, or
- causing organ damage.

The hallmarks of a malignant growth are as follows:

- metastasis: cancerous cells can spread, usually via the bloodstream or lymphatic system (Figure 31.3)
- angiogenesis: cancerous cells can form their own network of blood vessels to obtain needed nutrients and oxygen and to allow tumor cells to leave the primary tumor site and metastasize to other parts of the body
- proliferation: cancerous cells have the ability to sustain their own growth without external stimuli
- evasion: cancerous cells can avoid growth suppression and apoptosis, or cell death
- immortality: cancerous cells have unlimited replication potential

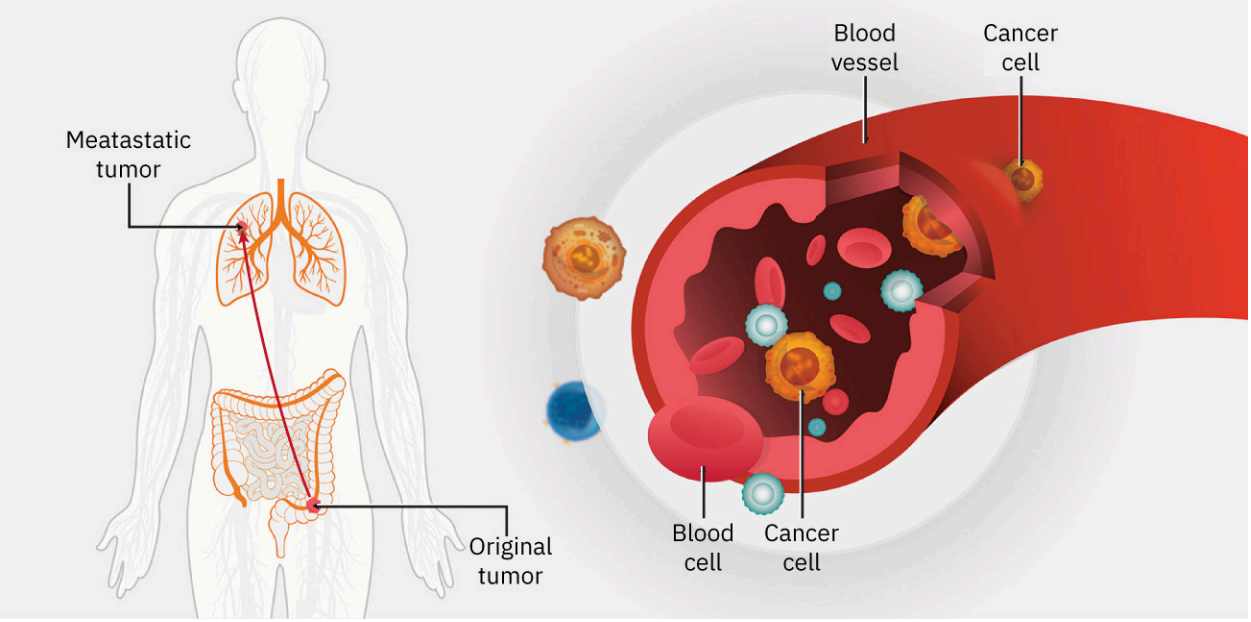

FIGURE 31.3 Cancer cells break away from the tumor of origin and travel in the body through blood vessels or the lymphatic system, creating additional tumor sites. (credit: "What is Metastasis?" by NIH/National Cancer Institute, Public Domain)

LINK TO LEARNING

Read about Henrietta Lacks and her immortal cells (https://openstax.org/r/77helacells) to see uncontrolled cell growth at work in medical research. Consider reading more about Henrietta Lacks and unethical research practices in *The Immortal Life of Henrietta Lacks* by Rebecca Skloot.

Risk Factors

Not all cancers can be attributed to known risk factors, and scientific researchers and clinicians may not be able to determine their origin. However, this does not mean there are not any risks that might be controlled or modified. Many cancers do have risk factors that can be managed.

Preventable causes of mutations that may lead to cancer include the following:

- smoking
- dietary fat intake
- alcohol consumption
- low fiber intake
- low intake of micronutrients (beta-carotene, vitamin A, vitamin C, vitamin E)
- passive smoking (second-hand exposure)
- prolonged exposure to sex hormones (early menarche, exogenous hormones)
- occupational exposures (asbestos, benzene, ionizing radiation, lead, sun exposure)
- viruses (hepatitis B, human papillomavirus [HPV], Epstein-Barr virus, human immunodeficiency virus [HIV])

An imbalanced diet is linked to cancer development (NCI, 2023a). Often, imbalanced diets contain too little anti-inflammatory food and too much pro-inflammatory food. Naturally protective, anti-inflammatory compounds are found in foods such as blueberries, apples, olive oil, kale, almonds, and salmon. Conversely, chronic inflammation is triggered by red meat (due to its chemical digestive by-products) and processed foods, which contain preservatives, dyes, and other substances that are not natural to the human body.

The use of tobacco, in any form, and alcohol are linked to multiple types of cancer (Figure 31.4). Inactivity for long periods of time and obesity are also attributable to multiple types of cancer. Many of these risks will coexist for an individual, compounding the risk of cancer development.

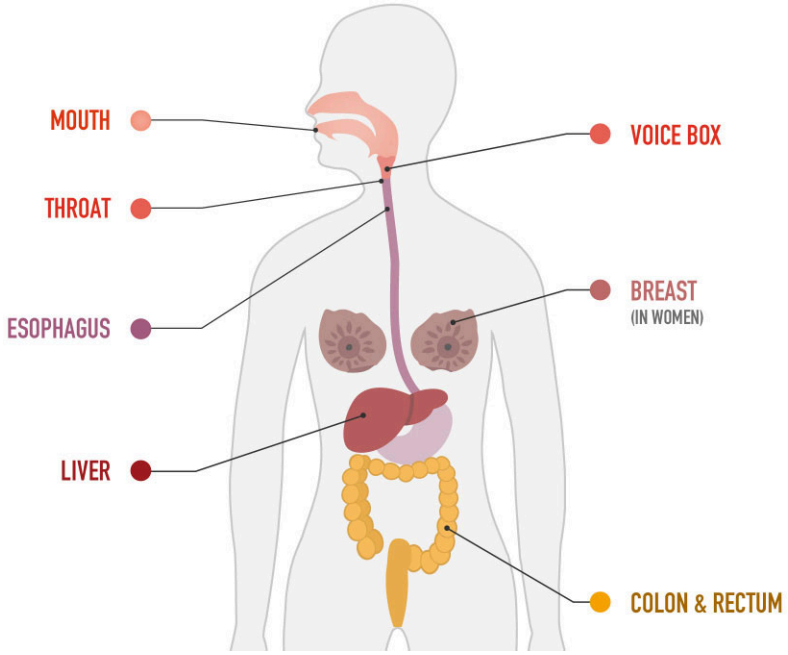

FIGURE 31.4 Alcohol use has a strong connection to multiple cancer types. The risk increases with higher volumes and consistency of use. (credit: "Cancers Associated with Drinking Alcohol" by NIH/National Cancer Institute, Public Domain)

Other factors that may initiate cell dysregulation include exposure to industrial chemicals or environmental pollution, prolonged time in the sun, infections such as hepatitis B and C or HPV, and hormone replacement or dysfunction.

Nonmodifiable causes of mutations that may lead to cancer include the following:

- age
- biological sex
- ethnicity
- genetic predisposition

Age is a risk factor that cannot be modified, but screenings for cancer are adjusted according to age and the established risk. With each year of age, mutations accumulate in DNA of cells. As they accumulate, it is more likely that a DNA change will occur that the body cannot control.

Genetics plays a significant role in cancer development. Genetic factors can be considered innate (being present during fetal development) or acquired (developed over time).

Innate Genetic Factors

Mutations that are inherited involve an **innate genetic factor**. This should be suspected if an individual has, or had, a close relative who developed cancer at a young age. For example, a patient may indicate that they have a first-degree relative who was diagnosed with breast cancer or colon cancer when the relative was in their 30s or 40s. The nurse recognizes the familial disposition of these specific cancer types and makes recommendations based on the appropriate high-risk guidelines.

A **tumor suppressor gene** normally regulates cell replication (Figure 31.5). Normally, these tumor suppressor genes produce tumor suppressor proteins that prevent cancer development by stabilizing the cell's genetic material. During the cell repair process, these genes provide instructions to prevent the replication of insulted or damaged cells, leading to the death of the damaged cell. When these genes are inactivated (or turned off), they cannot suppress cell proliferation or tumor growth. This loss of function allows cancer cells to grow even though their DNA is damaged and should trigger apoptosis in the cell cycle.

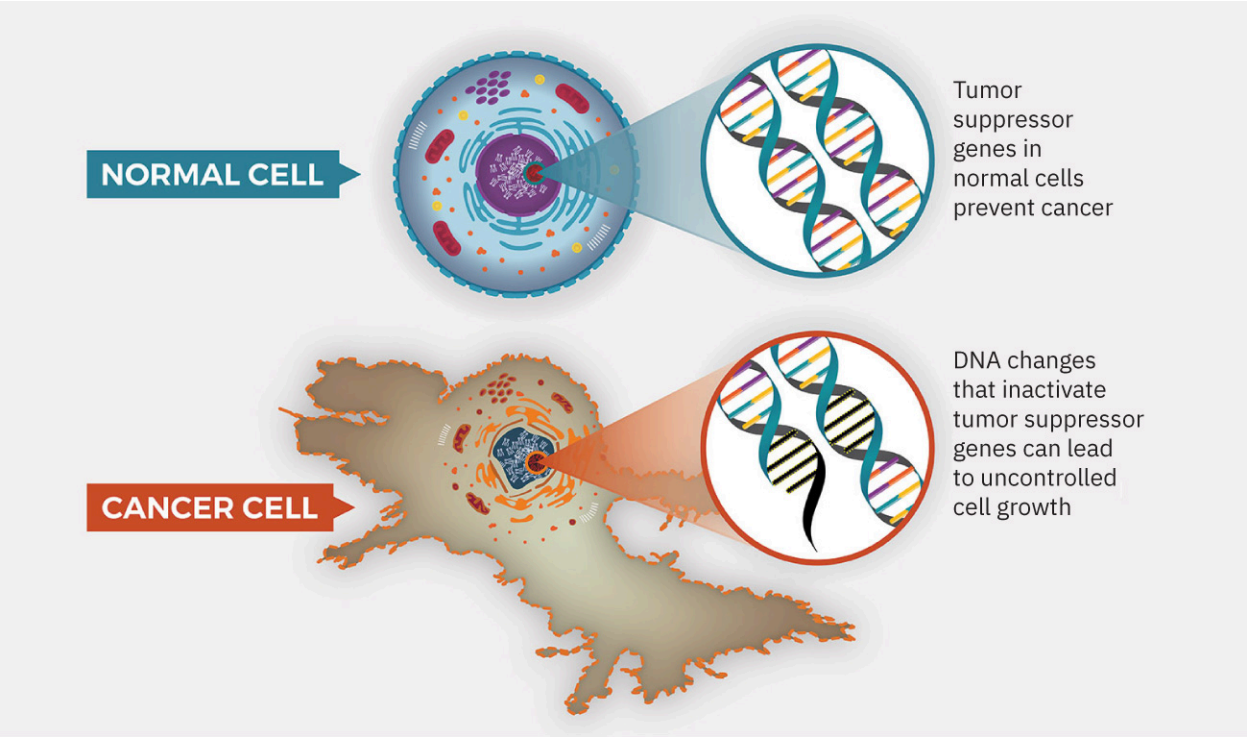

FIGURE 31.5 Functional tumor suppressor genes prevent or slow cancer growth. DNA changes inactivate these genes and the function to suppress cancer cell growth. (credit: "What Are Tumor Suppressor Genes?" by NIH/National Cancer Institute, Public Domain)

Well-known examples of innate genetic factors are the *BRCA1* and *BRCA2* genes (Figure 31.6). When these genes are mutated or inactive, the risk for development of breast, ovarian, prostate, and pancreatic cancer increases. Mutations in the *BRCA1* and *BRCA2* genes are inherited. If an individual knows the mutation is in their family or has been personally tested for its presence, they can control risk factors, increase screening vigilance, or request preventive treatment, such as surgical removal of the organ or tissue.

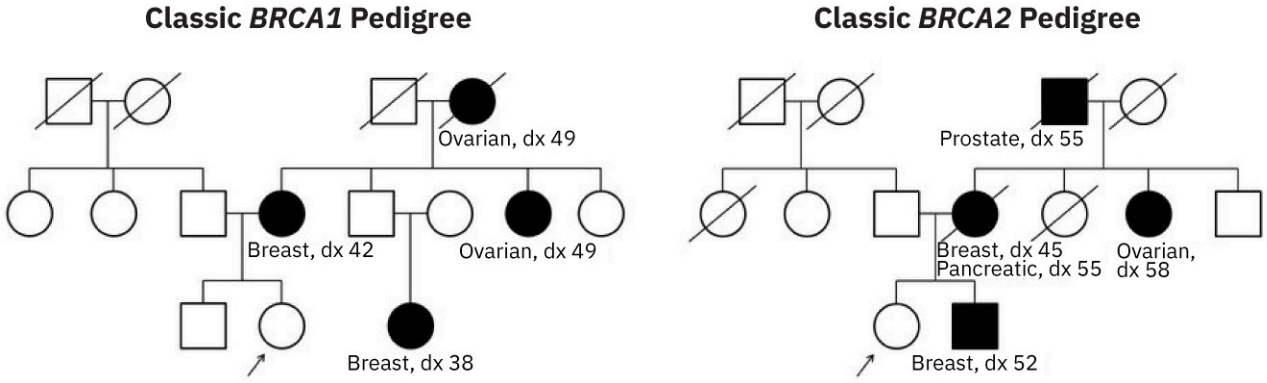

FIGURE 31.6 The *BRCA1* pedigree shows some classic familial features across three generations. The *BRCA2* pedigree shows classic features affecting family members with breast (including male), ovarian, pancreatic, and prostate cancers with young age of cancer onset. (credit a: "Classic BRCA1 Pedigree" by NIH/National Cancer Institute, Public Domain; credit b: "Classic BRCA2 Pedigree" by NIH/National Cancer Institute, Public Domain)

Lynch syndrome, also known as hereditary nonpolyposis colorectal cancer, is an inherited condition characterized by mutations in genes responsible for repairing DNA replication errors. This syndrome significantly increases the risk of developing colorectal and endometrial cancers. In individuals with Down syndrome, the presence of an extra chromosome 21 elevates the risk of leukemia, testicular cancer, and solid tumors. This increased risk is thought to be related to genetic factors that affect cell growth and division.

Acquired Genetic Factors

Changes that often develop from exposure to risk factors, such as unhealthy daily habits, exposure to toxins, or hormone disruptions, are an **acquired genetic factor**. A somatic mutation is one that occurs over an individual's

lifetime—insults accumulated from actions such as smoking or random failure of the DNA to replicate correctly while reproducing cells. Whenever cells are damaged, they move through the cell cycle faster than usual to try to repair the damage. This faster pace increases the chance of random replication errors. Genomic instability refers to the mutations that occur in the cell's DNA repair and replication systems. This instability leads to more changes in the genetic material and increases the likelihood of replication errors. A gene that becomes cancerous when activated or turned on is called an oncogene. Acquired mutations trigger oncogenes to be active and promote cell growth and division. Overactive cell replication mechanism signaling produces a pro-cancer effect, encouraging cancer cells to grow. Examples of oncogenes include the following:

- *HER2* (certain breast cancers)
- *KRAS* (colorectal or pancreatic cancer)
- *ABL1* (chronic myeloid leukemia)
- *EGFR* (lung cancer and glioblastoma)

Each of these oncogenes has its own path for causing cancer: improperly promoting cell division, activating cell growth pathways continuously, increasing cell proliferation, inhibiting cell death, or producing substances that drive uncontrolled cell growth. Identifying oncogenes and tumor suppressor genes gives clinicians new ways to predict the likelihood of a cancer developing or being present.

Clinical Manifestations

Signs and symptoms are unique to each type of cancer. There are a few manifestations that are common to most cancers; however, they are nonspecific and often lead to delays in diagnosis. Fatigue is the most frequently reported manifestation, affecting as many as 91 percent of patients (NCI, 2024b). The fatigue is persistent, not relieved by rest, and not proportional to the energy that the patient expended. This can be attributed to the systemic response to the cancer, its impact on normal physiological functions, or other cancer-related physiological changes such as sleep disturbances, nausea, infection, anorexia, dyspnea, or anemia.

Weight loss is a common manifestation of cancer. Unexplained weight loss, a common question on hospital admission paperwork, is sudden and unintentional. An example would be a 5 percent weight loss over the past three months. The reasons for this weight loss often align with the type of cancer and not just the body’s work in fighting the cancer.

Changes that are unique to a given cancer type and require diagnostic investigation include the following:

- Solid and site-specific tumors, usually have symptoms of
  - pain,
  - lumps,
  - swelling,
  - skin changes,
  - difficulty breathing,
  - difficulty swallowing,
  - changes in bowel or bladder habits,
  - the appearance of blood in stool or urine, or
  - persistent cough or voice changes.
- Blood and lymphatic cancers usually have symptoms of
  - fever and
  - unusual bruising.

Major Types of Cancers

Cancers are named and classified based on where they start in the body.

- A **carcinoma** is a cancer that creates solid tumors in epithelial tissue.
- A **sarcoma** is rare and is often related to bone cancers.
- A **lymphoma** applies to any cancer that begins in the lymphatic system.
- A **leukemia** refers to cancers of the blood-forming tissues, such as bone marrow.

Globally, cancer is the leading cause of death (World Health Organization [WHO], 2022). The most common types of cancer for males are prostate, lung, colorectal, and urinary bladder. For females, breast, lung, colorectal, and uterine

cancers are the most commonly occurring. Cancer of the lung and bronchus results in the most deaths, followed by colorectal cancer (American Cancer Society [ACS], 2024a).

Brain Cancer

Brain tumors are dangerous whether they are benign or malignant due to the constricted amount of space in the skull. Benign tumors may grow and cause dysfunction and symptoms related to their position in the brain and tumor size. Symptoms are related to the space the tumor occupies and its effect on the brain. Common symptoms are headaches, nausea or vomiting, seizures, changes in vision, problems with speech or balance, and cognitive changes.

Types of brain tumors include gliomas, astrocytomas, oligodendrogliomas, meningiomas, and medulloblastomas. The names refer to the specific cell or neuron type in the brain from which they develop. Brain tumors can originate in the brain, although metastatic brain growths are also common. Treatment, especially surgery, depends on the location and type of brain tumor. Prognosis and outcomes also vary widely depending on the location and type of tumor.

Bone Cancer

Primary bone cancer originates in the bone. Types include osteosarcoma, chondrosarcoma, and Ewing sarcoma. Benign tumors result in the same symptoms as malignant tumors because bones are a finite space and cannot accommodate the additional space-occupying mass. Symptoms include localized bone pain, swelling, and possible fractures without traumatic injury. Radiation treatment for other cancers increases the risk of developing cancer of the bone.

Treatment of primary bone cancer varies according to the type and location of the tumor. Metastatic bone cancer occurs when other cancers, such as breast, lung, or prostate, spread to the bone. In the case of bone metastasis, the treatment is usually still determined by the primary tumor type, but this depends on a variety of factors. Bone metastasis is more common than primary bone cancer (ACS, 2024b).

Breast Cancer

Cancer of the breast tissue cells is the most common cancer in females across the world (WHO, 2024). Campaigns for screening and early diagnosis continue to improve survival rates (Todor et al., 2024). Risk of breast cancer occurrence can often be mitigated across lifestyle factors such as hormone use, diet, alcohol consumption, and physical activity.

Types of breast cancer are classified by their

- occurrence in the lining of the breast duct (ductal),
- presence in the milk glands (lobular), and
- relationship to hormone receptors or specific tumor markers (e.g., triple-negative breast cancer).

Symptoms vary by type of cancer but encompass changes in the appearance of breast tissue and breast function. Treatment options include solitary therapies and combinations of therapy types, such as surgery, radiation, chemotherapy medications, hormone therapy, or targeted therapy.

Colon and Rectal Cancer

Colon cancer and rectal cancer begin in the large intestine, often starting as a polyp in the inner lining, or epithelium. Colonoscopies are an effective screening tool, assisting in early detection. Nonhereditary occurrence of colon cancer, like breast cancer, can often be reduced by addressing lifestyle factors such as activity level, alcohol use, smoking, and intake of red meats and processed foods. Early symptoms are changes in bowel habits or stool appearance and microscopic blood loss. Later symptoms can include visible bleeding, fatigue, or weight loss.

Lung Cancer

Cancer of the lung is one of the leading cause of cancer deaths across the world. There are two main types: non-small cell and small-cell. There are many types of non-small cell lung cancer, each named for the types of cells and their appearance. One example is adenocarcinoma, which forms in the alveoli lining. Small-cell lung cancer is heavily linked to smoking and is very aggressive in how it grows and spreads, contributing to the lethality.

Symptoms of lung cancer include weight loss, a chronic cough, shortness of breath, hoarse voice, and recurrent

respiratory infections. These symptoms are typically associated with smoking or chronic chemical exposure, which can result in delayed medical care that is ineffective for advanced cancer. Low-dose computed tomography (CT) scans should be used for regular screening.

Skin Cancer

Skin cancer is very common; one in five individuals in the United States will develop skin cancer (American Academy of Dermatology, 2024). The primary risk factor for its development is ultraviolet radiation exposure from the sun or from artificial sources such as tanning beds. Basal cell and squamous cell carcinomas are common and considered less lethal than melanoma, which metastasizes readily if not detected early (Figure 31.7). Melanoma can develop on the body in areas not typically exposed to the sun, such as between the toes as well as on genitals. Everyone, but particularly fair-skinned people, should pay close attention to changes in moles, lesions, and sores.

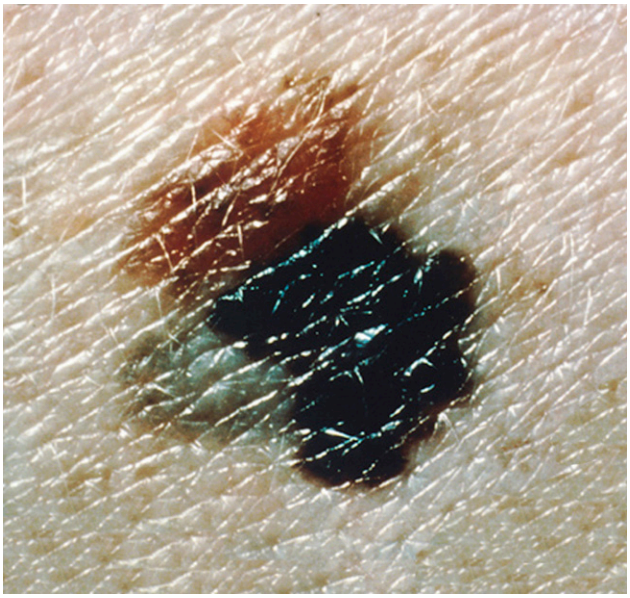

FIGURE 31.7 This invasive malignant melanoma shows a characteristic blue-black color and notched (irregular) border and surface. (credit: "Melanoma" by NIH/National Cancer Institute, Public Domain)

LINK TO LEARNING

The American Academy of Dermatology provides a body mole map (https://openstax.org/r/77bodymolemap) to educate people on the ABCDEs of detecting melanoma, how to perform a self-examination, and sun safety.

Blood Cancer

Stem cells differentiate into mature cells (Figure 31.8) as follows:

- Red blood cells—erythrocytes—transport oxygen to tissues.
- Platelets—thrombocytes—assist with coagulation to stop bleeding.
- White blood cells—lymphocytes—provide an immune response to infection and disease.

Hematologic cancers affect the bone marrow and can cause changes to how blood cells are produced and their ability to perform their necessary functions in the body.

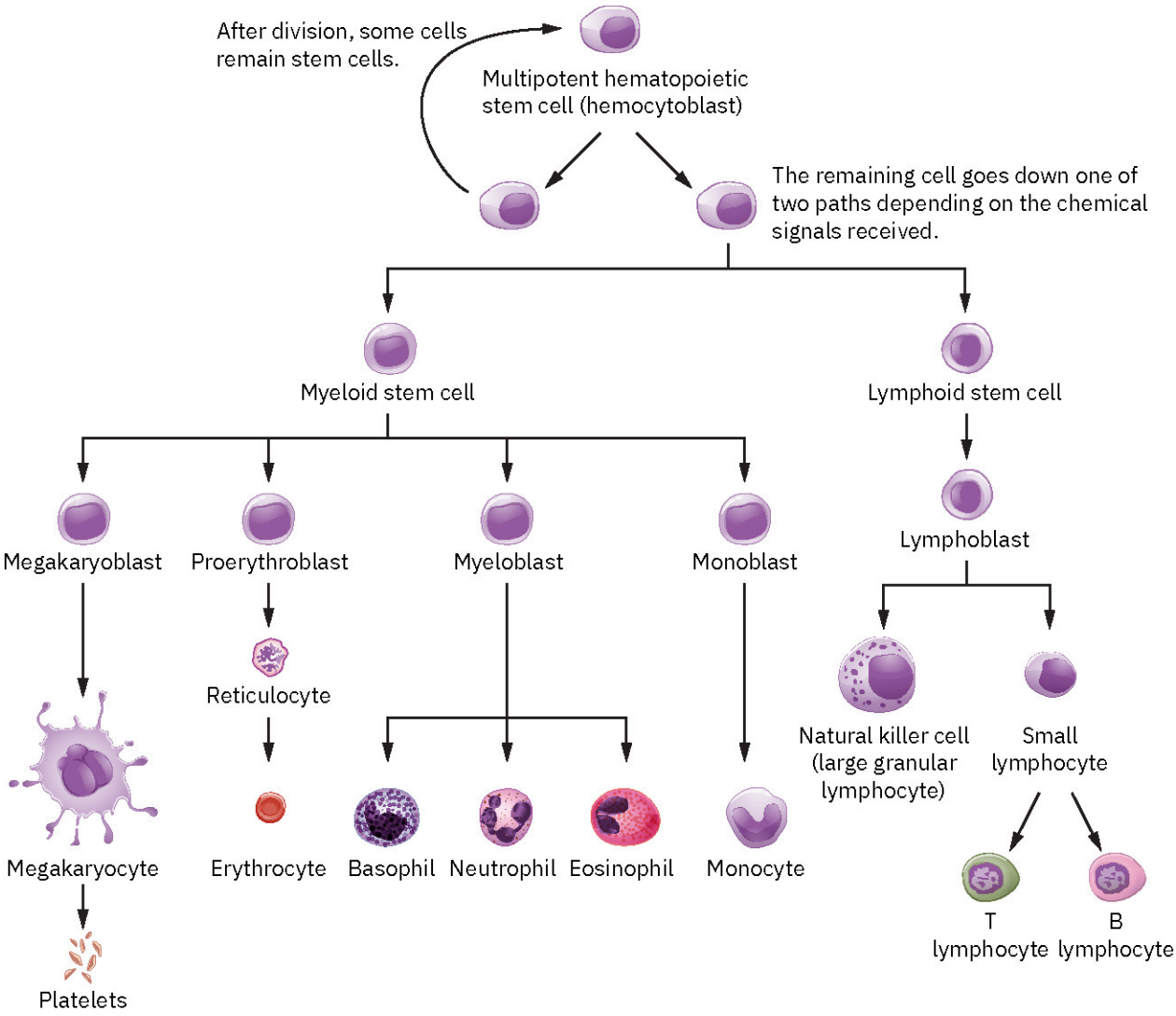

FIGURE 31.8 Stem cells differentiate to produce blood cells, such as erythrocytes, thrombocytes, and lymphocytes. (credit: modification of work from *Anatomy and Physiology*, 2e. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Initial symptoms of hematological cancers include fatigue and paleness due to reduced numbers of red blood cells (anemia), bruising or other abnormal bleeding due to low platelets (thrombocytopenia), and infections due to immature white blood cells (neutropenia). A reduced number of all blood cells (pancytopenia) is increasingly likely after treatment begins.

Blood cancers include leukemia, lymphoma, and myeloma. Leukemia is the profuse development of abnormal and immature white blood cells that are so numerous that they crowd out healthy cells. Lymphoma affects the lymphatic system, which changes how the lymph system functions as part of the immune system. Myeloma is a cancer that affects plasma cells, which are a type of white blood cell.

Therapies for hematological cancers include chemotherapy medications, targeted drug therapies, immunotherapy, radiation therapy to the bone marrow (often affecting the central nervous system), or a stem cell transplant to reestablish healthy bone marrow. Supportive therapies include transfusion of blood products and administration of colony-stimulating factors to induce the growth of white blood cells.

Leukemia

There are four main types of leukemia:

- acute lymphoblastic leukemia (ALL)
- acute myeloid leukemia (AML)
- chronic lymphocytic leukemia (CLL)

- chronic myeloid leukemia (CML)

Although leukemia is a disease of the white blood cells, pancytopenia is typical, sometimes at diagnosis and throughout treatment. Myeloblasts proliferate rapidly, crowding out the growth of healthy bone marrow components, affecting red blood cell count, platelet count, and the number of functioning white blood cells available.

REAL RN STORIES

Nurse: Katherine
Years in Practice: Five
Clinical Setting: Oncology
Geographic Location: Tennessee

A 23-year-old Hispanic patient was admitted with fatigue and laboratory tests indicating severe and untreated diabetes as well as acute myelogenous leukemia (AML). The levels of anemia and neutropenia were severe on admission. To add to this, the patient presented with a new and comorbid diagnosis of diabetes.

Once the patient's anemia and glucose levels were stable, the doctors began discussing treatment right away. Induction therapy for AML is aggressive and aimed at achieving remission. Induction therapy destroys most normal bone marrow cells as well as the leukemia cells. Chemotherapy commonly known as a 7 + 3 regimen, cytarabine is given continuously for seven days along with doses of anthracycline for the first three days. Close and continual monitoring is essential due to the many complications and side effects that are possible. Antibiotics, electrolyte replacements, and blood transfusions are common, and the required nursing care is intense.

After induction therapy was completed, the patient needed to undergo consolidation therapy called HiDAC. High-dose cytarabine is administered on a cycle over about one month. Inpatient hospitalization was an ongoing requirement while additional and more intensive therapies were administered to try to bring about a remission of the AML. During this time, the risk increases for side effects such as bleeding due to thrombocytopenia and infection related to neutropenia. Each shift is full of administering platelets, packed red blood cells, antibiotics, potassium, magnesium, and other supportive therapies. This continues until white blood cells, red blood cells, and platelets begin to recover in the postchemotherapy period and the effective protection is restored. Eventually the patient was safely discharged to continue any needed maintenance therapies on an outpatient basis.

Lymphoma

Lymphoma develops in the lymphatic system. Lymphomas are associated with certain infections, such as Epstein-Barr virus, HIV, certain strains of herpes virus, and hepatitis C seropositivity. There are two primary types of lymphoma: Hodgkin and non-Hodgkin. Both affect the lymphatic system and share similar risk factors, symptoms, diagnostics, and treatment options.

Reed-Sternberg cells are a defining feature of Hodgkin lymphoma (HL). HL tends to have a good prognosis. Non-Hodgkin lymphoma (NHL) is classified by subtypes of B-cell or T-cell, though there are more than forty major subtypes. It is the most common hematological malignancy worldwide, and is more common in males and those over the age of 65 years (Thandra et al., 2021).

In addition to typical hematologic cancer symptoms, patients may experience enlarged lymph nodes, night sweats, and fever. Treatment outcomes vary widely and depend on many factors, including how early treatment begins.

Myeloma

Multiple myeloma, also known simply as myeloma, is a type of blood cancer that affects plasma cells (Figure 31.9). A type of white blood cell, plasma cells produce antibodies; therefore, multiple myeloma—a condition in which abnormal plasma cells multiply uncontrollably within the bone marrow—leads to reduced immunity.

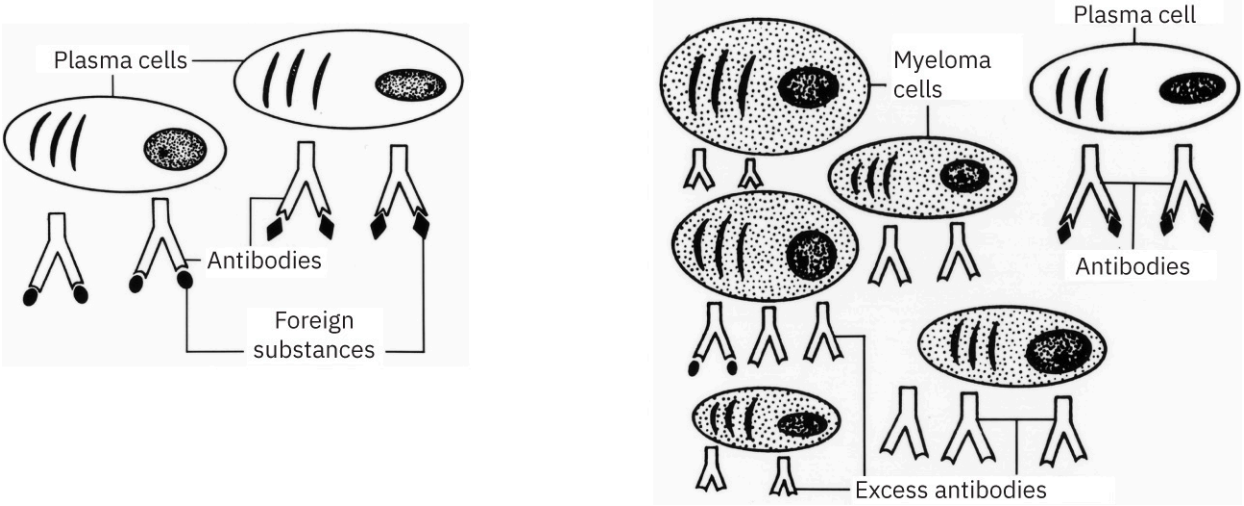

FIGURE 31.9 As the number of multiple myeloma cells increases, more antibodies are made. The result is thickened blood and a reduction in the ability of the bone marrow to make healthy cells. Multiple myeloma also weakens the bone. (credit: "Normal Plasma Cells and Myeloma Cells" by NIH/National Cancer Institute, Public Domain)

Bone pain and weight loss are common. Fatigue and increased infection risk also occur. Maintenance therapy and surveillance often continue for years after diagnosis with the goal of controlling the disease and relieving symptoms.

31.2 Detection and Prevention of Cancer

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Describe the diagnostics and laboratory values of select cancers
- Summarize systems of staging cancers and grading tumors
- Discuss strategies for cancer prevention

Diagnostics for cancer identification encompass imaging studies such as computed tomography (CT) scans and magnetic resonance imaging (MRI) that are classically used to detect alterations to organs and tissues along with identifying the presence of a malignant mass. Laboratory testing includes biomarkers specific to the presence of specific types of cancer. Biopsies are used to obtain a sample of suspected cancerous tissue and examine its properties under a microscope, evaluating cellular characteristics unique to cancerous change in cells.

Once detected and evaluated, a stage and grade are assigned to the cancerous cells. These assignments assist the provider in guiding treatment, predicting the outcome, understanding how quickly or aggressively the cancerous cells may grow and spread, and the likelihood of complications due to these factors.

Cancer prevention strategies center around risk reduction. A controllable and well-established primary prevention method for reducing risk is lifestyle modifications to include healthier diet options, routine physical activity, and avoiding carcinogens such as tobacco and alcohol. Vaccination against carcinogenic viruses, notably human papillomavirus (HPV) and hepatitis B (HBV), is another important primary prevention strategy. Secondary prevention, including early detection with screenings for cancers, is the next-best option to detect cancer early and limit its ability to grow and spread. Examples of secondary prevention include mammograms for breast cancer, colonoscopies for colorectal cancer, and the cotest for HPV and the Pap test for cervical cancer.

Detecting and Diagnosing Cancer

Detection and diagnosis involve a combination of screening tests at recommended intervals, imaging studies, and often a biopsy of the suspected malignancy. An example of this process is the use of mammography to detect breast cancer in females and males who are genetically at risk (Figure 31.10). Low-dose CT scanning helps detect lung cancer in individuals who are at greater risk due to long-term inhaled chemical exposure. Endoscopies, such as a colonoscopy for colorectal cancer, are performed to detect precancerous or cancerous polyps and lesions. Pathologists can examine biopsied cells for abnormalities, such as is done in a Pap test or Pap smear for cervical cancer. Physical assessment of the skin helps to detect skin cancer. Blood tests, such as the prostate-specific

antigen test for prostate cancer, help detect tumor markers. Genetic testing is used to screen for genetic mutations that affect development of certain cancer types, and when applicable, can also be used determine the best course of treatment.

FIGURE 31.10 An x-ray machine is used to take pictures of breast tissue as it is pressed between two plates. The technician will attempt to include any axillary breast tissue. (credit: "Mammogram" by NIH/National Cancer Institute, Public Domain)

Diagnostic Tests

X-rays are used to detect abnormalities that a tumor would create in soft tissues and bones. However, x-rays are not a recommended diagnostic tool for detection of other types of cancers, such as tumors of the lungs. For more detailed images of deeper structures and organs, CT scans can be performed. Even when they cannot precisely detect a tumor, a CT scan can often show abnormalities that lead to further testing or indicate the need for a biopsy. MRI also creates detailed images and is good for detecting abnormalities in soft tissues. Rather than being performed to initially detect cancer, MRI is a good diagnostic tool to gather additional imaging of suspected tumors. Ultrasound uses sound waves to create images from inside the body, making it useful for guiding biopsies by showing the tumor location and allowing precision when obtaining tissue samples.

Blood tests are useful to detect specific tumor markers, proteins, or substances that indicate the likely presence of cancer. Additionally, blood tests are often used to gauge the effectiveness of treatment or during periods of remission to determine recurrence.

A biopsy is the removal of a tissue or cell sample for the pathologist to examine for abnormal cells. The sample can be removed using a needle or during a surgical or endoscopic procedure. A biopsy is the most reliable method to confirm a cancer diagnosis.

Cancer Staging and Grading

Grading and staging systems standardize diagnosis, the likely prognosis, and the treatments to consider. The term

grading describes the cellular characteristics and aggressiveness of cancer cells and, by extension, how sensitive the cells will be to treatment. Tumor grading scales provide a grade from GX to G4, where GX denotes inability to assess the grade of the cells (Figure 31.11). Undifferentiated cells (G4), indicate that cells, when examined under a microscope, do not resemble the tissue cells from which they came.

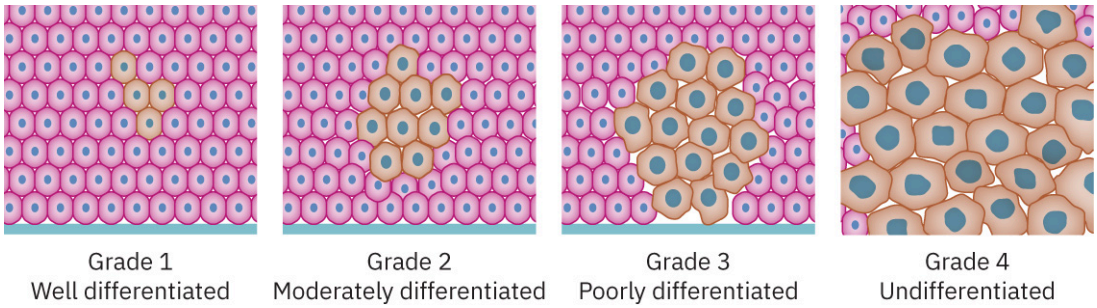

FIGURE 31.11 Cells are graded based on how abnormal they look under a microscope. This grading helps clinicians determine how quickly the cancer cells are likely to grow and spread. The higher the grade, the more abnormal the cells appear. The clinician expects poorly differentiated and undifferentiated cells to grow and spread rapidly. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Cell **differentiation** is the process cells undergo to become specialized in both structure and function. Specialized cell examples are muscle cells, nerve cells, and skin cells. This form and function allows the cells to form a group and perform as their designated tissue or organ should. If the pathologist examines a sample of healthy tissue that was biopsied from a lung, the tissue should be well differentiated. In this example, a well differentiated cell should look the same as any other sample of lung tissue. A healthy cell is matured. It is a specialized cell designed to function in the respiratory process. Even if the pathologist looked at biopsies obtained from many different lung sites, all lung cells should be very similar in appearance—e.g., uniform size, shape, and nucleus. Cancer cells, however, will have a different appearance than normal cells; pathologists use these differences to grade cancer in each patient.

The **staging** system is different for every type of cancer, but it generally refers to whether the tumor is confined to one space or has spread to other areas of the body. The basic **TNM system** (tumor, node, and metastasis) represents the anatomic extent of solid tumors, and it gauges the size and extent of tumor (T), lymph node involvement (N), and systemic involvement or metastasis (M) for prognostic implications. Tumor invasiveness is denoted with a number of 1 through 4 (T1, T2, T3, T4). The term **carcinoma in situ** indicates that abnormal cells have been found but have not spread (Figure 31.12).

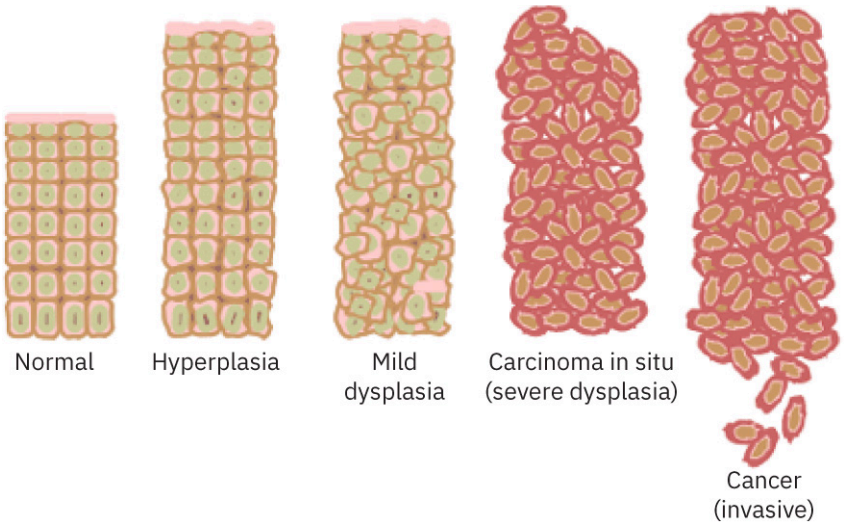

FIGURE 31.12 Carcinoma in situ are abnormal cells identified only in their place of origin. They can become cancerous. (credit: "Carcinoma in Situ" by NIH/National Cancer Institute, Public Domain)

The TMN system does not apply to leukemia because it is a blood cancer and not a cancer with a tumor. There are other staging systems that can also be applied to specific types of cancer, such as skin or colon cancer. When the tumor, lymph nodes, or metastasis cannot be assessed, this is denoted with an X (TX, NX, MX). An example of the

TMN system application is shown in Table 31.1. This system is then applied to determine the cancer stage.

Bladder Cancer (Transitional Cell Carcinoma)	Skin Cancer (Melanoma)
T1 N0 M0 Stage I	T2 N1 M0 Stage IIA
T1: the cancer has invaded the connective tissue of the bladder lining but has not reached the muscle layer N0: no regional lymph node involvement M0: no distant metastasis	T2: the melanoma is between 1.01 and 2.0 millimeters thick N1: cancer has spread to one nearby lymph node M0: no distant metastasis

TABLE 31.1 An Application of the TNM System

The TNM system is only one method for assessing cancer and is only a guideline for prognosis and treatment considerations. The application of the system varies according to each type of tumor, and the guidelines for staging are extensive.

LINK TO LEARNING

Nurses are responsible for understanding what the staging indicates but are not responsible for knowing the details for each type of cancer. Read more about cancer staging systems (https://openstax.org/r/77cancerstaging) developed by the American Joint Committee on Cancer (AJCC).

Cancer Prevention

Prevention focuses on reducing the risk of developing cancer. This involves lifestyle changes to reduce general cancer risk as well as specific interventions to reduce the risk of cancers known to affect certain populations. There are three levels of prevention: primary, secondary, and tertiary.

Primary Prevention

Avoiding known risk factors to prevent the development of disease is ideal. Primary prevention promotes healthy lifestyle choices. Moderate or eliminate tobacco exposure, alcohol intake, and the intake of fatty or processed foods (Figure 31.13). Engage in regular physical activity and attain or maintain an acceptable weight. Ensure all recommended vaccines are kept up to date. Consistently and frequently eat foods rich in antioxidants and fiber, including fruits and vegetables.

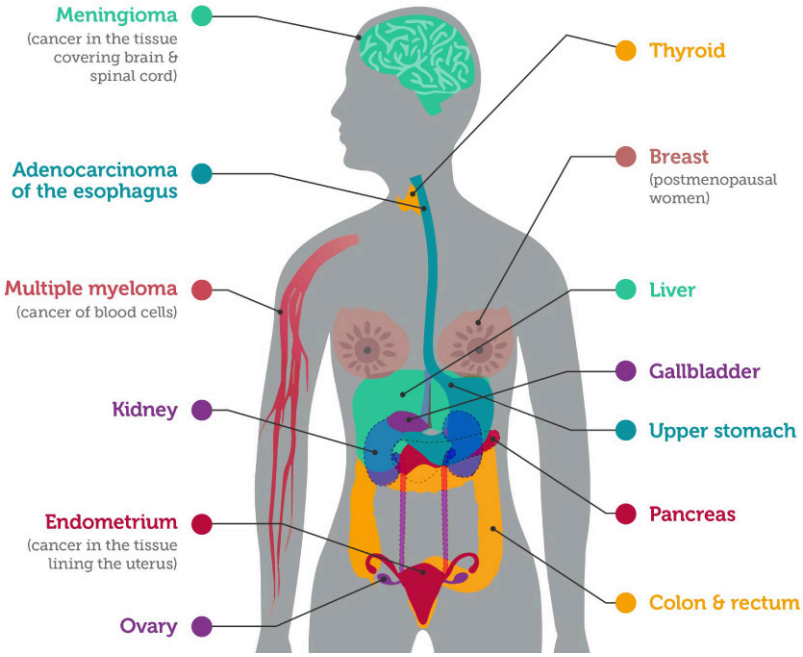

FIGURE 31.13 Obesity increases the risk of cancer by instigating hormonal and inflammatory changes in the body. (credit: "Obesity and Cancer" by NIH/National Cancer Institute, Public Domain)

Secondary Prevention

Secondary prevention involves detecting cancer when treatment has the best chance of a desired outcome. Awareness advertisements to bring attention to screening recommendations and annual consultation with a provider increase the likelihood of catching cancer early. Screening at suggested intervals and awareness of early cancer signs is the focus. These recommendations are reviewed frequently and new guidelines made available. Providers may choose which recommendations to follow when suggesting screening tests.

Some screenings are performed annually, such as mammograms and colonoscopies, even in those with no risk factors other than that of the corresponding population (biological sex, ethnicity, economic demographic, age). Testicular cancer screening is done by a provider at each annual screening, and individuals with testicles are advised to check monthly for lumps or changes. Skin cancer screening (in addition to self-surveillance) can also be done during the annual exam unless the patient has other risk factors.

REAL RN STORIES

Nurse: Jerry
Years in Practice: Twenty-three
Clinical Setting: Oncology infusion
Geographic Location: Urban hospital, southeastern United States

Joy was a boisterous, large, loud woman who was suddenly thrown into the world of acute myelogenous leukemia (AML) treatment. A new diagnosis of AML brings on a hard and fast slew of tests, specialists, intravenous lines, procedures, and an essentially foreign language of new medical terms.

The screening that brought her to us was her annual eye exam. During the eye exam, the optometrist noted petechiae in her eye. Neither she nor her husband would have noticed these tiny spots of bleeding inside her eyes. The fundoscopy procedure, looking at the back of the eye, examined the blood vessels of her eyes and discovered the issue. Her only reported symptom before that eye exam? A bit of fatigue. Participating in her regular annual exams was key to providing her treatment.

Screening is also based on individual needs such as family history, lifestyle risk factors, and relevant medical society guidelines. For example, liver cancer screening is possible, but would only be done in conjunction with risk factors

such as liver disease or hepatitis B or C infection. Lung cancer screening with low-dose CT scans is not routinely considered for individuals with no smoking or chemical exposure history. Colorectal cancer screening should be aggressive and early for individuals with a personal or familial history of Lynch syndrome.

Among medical society guidelines, there are different recommendations for cancer screenings. The organizations differ on the age to begin, age to cease screening, and length of intervals for screening; they conflict with each other in their published recommendations and supporting evidence. Organizations making recommendations vary by disease, but could include the American Cancer Society (ACS), World Health Organization (WHO), Centers for Disease Control and Prevention (CDC), United States Preventive Services Task Force (USPSTF), or the American College of Obstetricians and Gynecologists (ACOG).

Screening guidelines for common cancers are outlined in Table 31.2. It should be noted, however, that screening recommendations may differ by source and according to individual patient factors. Recommendations may be updated frequently. Ultimately, screenings to perform are chosen after a conversation between the clinician and the patient, accounting for variations between patients of average risk and those with individualized risk factors.

	Screening Test	Recommended Age/ Frequency	Notes
Breast cancer	Mammogram	Females ages 40–74: every two years (based on individual risk)	Females with high risk may require earlier or more frequent screenings.
	Clinical breast exam (CBE)	Not routinely recommended for females with average risk.	Not recommended as part of routine screening.
Cervical cancer	Pap smear (Pap test)	Females ages 21–29: every three years	Continue screening until age 65 with normal results.
	HPV test	Females ages 30–65: every five years (alone or in combination with Pap)	Pap plus HPV testing every five years; HPV testing alone every five years.
Colorectal cancer	Colonoscopy	Begin at age 45: every ten years	Alternatives include stool-based tests (e.g., FIT) or flexible sigmoidoscopy. Screening can be personalized based on patient risk factors.
	Fecal immunochemical test (FIT)	Annually for individuals with average risk	Alternative to colonoscopy for those who prefer or have contraindications.
Lung cancer	Low-dose CT scan	Adults ages 50–80 with a twenty pack-year smoking history: annually	Recommended for current or former smokers with a significant smoking history. Screening should be discontinued once a person has not smoked for fifteen years.

TABLE 31.2 Summary of U.S. Preventive Services Task Force Recommendations for Cancer Screenings

	Screening Test	Recommended Age/ Frequency	Notes
Prostate cancer	Prostate-specific antigen (PSA) test	Males ages 55–69: discuss with health-care provider	Screening decisions should be individualized, considering potential benefits and harms. Routine screening is not recommended for males under 55 or over 69.
Skin cancer	Visual skin examination	Regular self-exams and professional exams as needed	The USPSTF does not have a specific recommendation for routine skin exams; emphasis is on self-awareness and dermatologic evaluation if abnormalities are detected.

TABLE 31.2 Summary of U.S. Preventive Services Task Force Recommendations for Cancer Screenings

Tertiary Prevention

The focus of tertiary prevention is reduction of symptoms and complications related to the disease process. This includes accessing the correct treatments, symptom management, emotional and social supports, and maintaining or regaining physical and emotional health after treatment has ended. Nurses assist patients in making behavior changes to improve their condition, planning their care to support their desired quality of life, and reinforcing or elaborating on decisions surrounding their care.

31.3 Care of the Patient with Cancer

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss common complications faced by patients with cancer
- Apply nursing concepts and plan associated nursing care for the patient with cancer
- Evaluate the efficacy of nursing care of a patient with cancer
- Describe the medical therapies that apply to the care of the patient with cancer
- Explain the role of the health-care team as continued partners in coordinated health-care delivery

Cancer care requires a multifaceted approach to provide comprehensive care for patients. Nurses must apply tailored nursing care plans to address the complex needs of patients with cancer, ensuring evidence-based, patient-centered interventions. Evaluating the efficacy of nursing care is crucial for optimizing outcomes, as it involves continuous assessment and adjustment of care plans based on patient response and clinical indicators. Understanding and implementing appropriate medical therapies, including chemotherapy, radiation, and immunotherapy, is essential for effective cancer treatment. Central to this holistic approach is the role of the care team, which emphasizes the importance of collaboration, communication, and continuity of care to achieve coordinated health-care delivery. Together, these elements ensure that patients with cancer receive the highest quality of care throughout their treatment journey.

Common Complications of Cancer

Holistic assessment for a patient with cancer is the same as for any other patient; it includes the typical assessment activities of the physical examination, psychosocial assessment, and spiritual and cultural evaluation. Physical assessment includes evaluating the patient's overall appearance. Look for signs of cachexia and assess skin color to determine proper perfusion, good oxygenation, and any evidence of jaundice or bleeding. Additionally, be vigilant for other complications that may arise from cancer or its treatment.

Specific assessment will depend on the type of cancer and the patient's current treatment plan. For instance, multiple myeloma causes bone pain and can lead to fractured bones; the nurse assesses for these complications. Chemotherapeutic agents can also create complications for the patient. For example, the class of platins and taxanes can cause serious neurological toxicities and can affect a patient's ability to walk or function, reducing their quality of life.

Symptom Management and Palliation

To assist the patient in managing unpleasant symptoms, the nurse must evaluate physiological, psychological, and situational factors to determine what is worsening or alleviating the symptoms. Each symptom should also be assessed for the quality and intensity (e.g., acute, dull), duration (e.g., consistent with a certain event, intermittent, continuous), and degree of suffering it causes because people experience and tolerate unpleasant symptoms very differently.

Common side effects of cancer therapy include the following:

- Head and neck
  - memory and concentration problems
  - delirium
  - hair loss (alopecia)
  - mouth and throat issues (stomatitis, mucositis)
- Generalized
  - fatigue
  - flu-like symptoms
  - weight loss
- Hematologic
  - anemia
  - bleeding and bruising (thrombocytopenia)
  - infection (resulting from neutropenia)
- Gastrointestinal
  - appetite loss (anorexia)
  - nausea and vomiting
  - constipation or diarrhea
- Skin and nails
  - brittle nails
  - fragile skin
- Peripheral nervous system
  - peripheral neuropathy
- Lymphatic system
  - edema or lymphedema
- Genitourinary
  - urinary and bladder problems
- Reproductive system
  - sexual dysfunction
  - fertility issues

Fatigue and Pain

Fatigue is a nearly universal reported symptom among patients with cancer and patients undergoing treatment for cancer. Both the disease process and the therapies contribute to physical fatigue, and the fatigue is often profound and cumulative over the course of treatment. Reduced sleep in the hospital, anxiety over relationships and finances, along with physiological issues including pain, anemia, and inflammatory processes can significantly contribute to fatigue in patients. Regular physical activity is the only intervention with evidence to reduce fatigue, but safety should be a priority and activity must be balanced with rest periods.

Pain is a common issue and can come from a variety of sources. Medications can be one cause, including colony-stimulating factors that are administered to increase white blood cell growth but can also cause bone pain. Pain can also stem from the site of the tumor. Pain should be managed to the patient's desired comfort level, often necessitating multiple modalities and the off-label use of some medications to achieve relief. Medications such as narcotics require careful monitoring and management to minimize side effects. Ultimately, the goal of pain management is to enable the patient to participate in day-to-day activities and enjoy their desired quality of life.

Altered Gastrointestinal Function

The gastrointestinal tract is often affected by cancer treatments, from the oral cavity all the way through to the anus.

Cell death caused by chemotherapy can cause pain and alterations in the mucosal lining, called **mucositis**. Patients can often have **stomatitis**, which is mucositis specifically in the mouth. This condition results in pain with chewing; in the esophagus, there may be difficulty swallowing.

Ulcerations and infections occur more frequently as the mucosal surface is compromised. Having the patient gargle four times each day with a mixture of warm water, salt, and baking soda can help prevent these complications and can reduce the severity or aid in healing. The nurse can also offer a variety of soft food options that require little chewing, are easy to swallow, and are nutrient-rich. Yogurt, peanut butter milkshakes, and protein-rich supplements are useful. At the end of the gastrointestinal tract, rectal bleeding and infection risk are affected by factors such as mucosal alterations, constipation, thrombocytopenia, and neutropenia.

LINK TO LEARNING

Learn more about the interventions to treat oral mucositis (https://openstax.org/r/77oralmucositis) from the Oncology Nursing Society.

Nausea and vomiting are often caused by the action of chemotherapy in the **chemoreceptor trigger zone** of the brain but can also be caused by opiates, antibiotics, metabolic alterations, increased intracranial pressure, constipation, and anxiety about treatments (psychogenic response). To help limit patient nausea, remove the lids of food trays before entering the hospital room, as the steam from hot food can increase strong odors. Cold foods generally have milder smells than hot foods and are often a good choice for patients with stomatitis. Additionally, gastric ulcers can be prevented with the prophylactic use of a proton-pump inhibitor. Nausea and vomiting are treated aggressively, typically with multiple antiemetic medications (Table 31.3).

Medication Class	Medication Example
Prokinetic	Metoclopramide
Serotonin antagonists	Ondansetron
Neurokinin inhibitors	Aprepitant
Corticosteroids	Dexamethasone
Benzodiazepines	Lorazepam
Dopamine receptor antagonist	Haloperidol
Phenothiazines	Prochlorperazine
Cannabinoids	Dronabinol
Antihistamines	Diphenhydramine
Antimuscarinics	Scopolamine

TABLE 31.3 **Antinausea Medications for Patients with Cancer**

Altered Clotting and Immunity

Hematological complications can occur in patients with hematological cancer, but also in any patient receiving chemotherapy or radiation treatment. Anemia can be severe. The nurse will watch for changes in blood pressure but will also be alert for more subtle cues such as dizziness when changing positions. The goals of therapy should be lower-than-normal hematocrit and hemoglobin values with resolution of symptoms and prevention of complications.

There is a severe risk of bleeding if the platelet count drops below 50,000 platelets per microliter of blood (reference range: 150,000 to 450,000 platelets per microliter of blood). Below 10,000 platelets per microliter of blood, spontaneous bleeding is a serious concern. Monitor for petechiae, pinpoint spots of bleeding that look, at first glance, as a rash (Figure 31.14). Petechiae begin in areas with dependent fluid movement, such as the lower legs, but can occur anywhere. Petechiae are noted before frank bruising or bleeding. Platelet transfusions can be given, but the goal of this transfusion is only to prevent bleeding, not to achieve an acceptable reference range.

FIGURE 31.14 Petechiae are small and flat. They can be red, purple, or brown in appearance. They are nonblanching evidence of broken capillaries. The lower extremities are a common location for petechiae to first appear. (credit: Peter Rammstein/Wikipedia Commons, Public Domain)

Infection can be life-threatening for the patient with a decreased white blood cell and neutrophil count. Because the immune system is hampered, the nurse does not expect typical signs of infection or sepsis. Typical signs of infection require functional white blood cells and immune responses. A slight temperature elevation or a low temperature could be the only early alteration in vital signs. Cognitive changes are often noticed first, similar to the expected assessment results in the older adult patient.

Altered Nervous System Functions

Certain therapies can affect the brain and nerves, resulting in **neuropathy**. Nerve damage causes tingling, numbness, or pain in the hands or feet. This affects quality of life and can alter the ability to safely perform certain tasks. Balance and gait can be affected by certain other chemotherapeutic agents.

Cognitive changes, sometimes referred to as “chemo brain,” can result from any chemotherapy. These changes manifest as problems with memory and attention to tasks. Sometimes treatment-related cognitive changes are a safety issue, especially when driving or cooking, when attention to task is critical.

Social isolation can occur when an individual experiences difficulty recalling faces, events, and names. This impairment in memory can lead to a sense of disconnection and frustration, making social interactions challenging. As a result, the person may withdraw from social activities and relationships, further exacerbating feelings of loneliness and isolation. The inability to engage in meaningful conversations and maintain relationships can diminish a patient’s overall quality of life and contribute to emotional distress. Nurses help patients create a plan to address memory issues and provide support to help individuals stay connected with their social networks.

Skin Impairment

Skin and hair changes, such as alopecia, are typical. Nails can become brittle or discolored. Dry skin requires attention and care, because breaks in the skin barrier increase the risk of infection or bleeding. Patients often lose

body hair, eyebrows, and eyelashes as well as scalp hair. Losing hair is a distressing psychosocial event for many patients. Sometimes a cold cap is offered to reduce this occurrence. The cooling decreases the metabolic rate in the follicles and decreases medication uptake in the scalp. More long-term studies are needed to assess the risk of cutaneous scalp metastasis (Silva et al., 2020).

Oncological Emergencies

An **oncological emergency** is an acute issue that may cause mortality or morbidity. Early detection of an oncological emergency is critical. It is the result of either the cancer itself or the treatment regimen for the cancer. These conditions can develop over months or hours, but the results are devastating if they are not caught and treated emergently. These can be classified by how they occur.

Metabolic Emergencies

Metabolic emergencies include tumor lysis syndrome (TLS), hypercalcemia, and syndrome of inappropriate antidiuretic hormone (SIADH). TLS is more common in hematological malignancies such as acute leukemia and non-Hodgkin lymphoma. TLS is a dangerous complication of cancer treatment, characterized by the rapid breakdown of cancer cells leading to metabolic disturbances. It can result in electrolyte imbalances such as hyperkalemia, hyperphosphatemia, hypocalcemia, and hyperuricemia, which can lead to serious complications. The nurse monitors labs every four hours during therapy when this complication is likely. Intravenous hydration is very aggressive and urine output is strictly monitored.

Hypercalcemia is often associated with multiple myeloma due to bone destruction and an overproduction of a hormone that mimics the action of parathyroid hormone. Aside from calcium levels, the nurse assesses for manifestations of hypercalcemia, including mental functioning and muscle weakness. SIADH is usually associated with small-cell lung cancer and ectopic production of antidiuretic hormones by the tumor cells. The nurse assesses sodium levels and may note nausea, constipation, and muscle weakness. Sodium levels are corrected slowly and carefully with ongoing assessment.

Hematologic Emergencies

Hematologic emergencies encompass conditions such as febrile neutropenia (neutropenic fever) and **hyperviscosity syndrome**. Neutropenic fever, commonly seen in patients who have leukemia or are undergoing chemotherapy who have an absolute neutrophil count below 500 cells/ per mm^3 and a slightly elevated temperature (100.4°F, or 38°C), requires prompt management, including consultation with the infectious disease department. Failure to recognize and treat neutropenic fever can result in septic shock. Disseminated intravascular coagulation (DIC) can occur, especially in cases of sepsis or other cancer-related complications, leading to a dangerous cycle of simultaneous clotting and bleeding, often with lethal consequences.

Hyperviscosity syndrome is associated with conditions that overproduce proteins, such as multiple myeloma and certain types of leukemia. With multiple myeloma, abnormal plasma cells produce excessive amounts of a specific immunoglobulin, making the blood thicker and more prone to clotting. In certain types of leukemia, particularly chronic lymphocytic leukemia, the increased production of lymphocytes can also contribute to hyperviscosity. Symptoms include headache or dizziness, and the condition can lead to serious complications such as a cerebrovascular accident, myocardial infarction, or organ damage. Using plasmapheresis to filter out the excess proteins reduces symptoms.

Structural Emergencies

Structural emergencies are due to a tumor's encroachment on an organ or tissue. Examples include superior vena cava syndrome, spinal cord compression, and malignant pericardial or pleural effusion. Lung cancer is a common cause of structural emergencies, although many other types of cancer can impinge on structures and cause emergent issues. Superior vena cava syndrome results from obstruction of blood flow through the superior vena cava. Manifestations of this issue are a direct result of impaired blood flow: facial and neck edema, cough, and shortness of breath at rest. Spinal cord compression can cause back pain early in its course and can progress to disrupted functions related to compression on spinal nerves: difficulty urinating, constipation, and alterations in lower extremity sensation. If not treated, spinal cord compression results in paralysis. Pericardial and pleural effusions represent the accumulation of malignant fluid. Heart sounds or lung sounds may be muffled or absent. Systemic issues follow and are typical of what the nurse expects from decreased perfusion or decreased oxygenation findings.

Nursing Care of the Patient with Cancer

Nursing care for individuals with cancer addresses physical, psychosocial, cultural, and spiritual needs. Though the focus of much of this chapter is about managing physiologically based risks and complications, cancer care typically continues for weeks, months, and years. A holistic approach that keeps the patient's dignity at the forefront is essential. The nurse is frequently able to facilitate communication between the patient and loved ones and to advocate for the patient's needs with the providers and interdisciplinary team. Physical care involves symptom management, medication administration, and monitoring for side effects, complications, and therapeutic outcomes.

Recognizing Cues and Analyzing Cues

Nurses look for cues in abnormal test results, new symptoms, and changes in the patient's condition that indicate additional testing or intervention is needed. Nurses actively monitor abnormal test results, new symptoms, and changes in a patient's condition that may signal the need for further testing or intervention. They also assess and manage side effects of treatments such as radiation, chemotherapy, and immunotherapy, which can have diverse and potentially serious complications that require prompt recognition and intervention to ensure patient safety.

Planning care for patients with cancer necessitates ongoing clinical judgment to interpret cues effectively. The care plan addresses common issues in cancer treatment, such as electrolyte and fluid imbalances, as well as comfort-related concerns such as nausea, pain, and fatigue. Additionally, it considers alterations in the patient's overall quality of life, encompassing both psychosocial and physiological aspects. The nurse's care plan also anticipates potential oncological emergencies based on the patient's unique pathophysiology, type of cancer, treatment regimen, and individual responses.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

When the nurse knows how to interpret common clinical cues, it becomes quick work to determine which issue the patient may be experiencing, from common side effects to life-threatening complications.

For example, if a patient undergoing chemotherapy treatment has a low white blood cell count and a temperature that is trending upward, the nurse prioritizes the hypothesis that the patient likely has an infection. Initial solutions are aimed at controlling the immediate physiological risks and include monitoring pulse, blood pressure, and respirations to determine if additional interventions (e.g., administering fluids, oxygen therapy) are needed to maintain hemodynamic stability. Next, the nurse obtains cultures, such as blood and urine, followed by obtaining orders for antibiotics and other supportive therapies, such as antipyretics. This sequence of actions effectively and efficiently addresses the patient's needs and works to achieve the best possible outcomes (Table 31.4).

Clinical Cue/ Problem	Hypothesis	Solutions	Actions/Interventions
Fatigue	• Chemotherapy or radiation therapy side effect • Anemia	• Encourage rest balanced with activity.	• Monitor energy. • Adjust activity for level of intolerance. • Assess complete blood cell count.
Nausea or vomiting	• Chemotherapy side effect • Ileus or obstruction	• Antiemetic medication • Evaluate meals.	• Administer antiemetics. • Prevent dehydration. • Offer foods without strong odor.

TABLE 31.4 Managing Side Effects and Complications

Clinical Cue/ Problem	Hypothesis	Solutions	Actions/Interventions
Alopecia	• Chemotherapy side effect	• Provide support.	• Assist with scalp and hair care. • Offer support. • Provide information on wig services.
Constipation	• Side effect of opioids or chemotherapy • Ileus or obstruction	• Increase bowel motility. • Increase patient mobility.	• Assist with ambulation. • Provide frequent fluids. • Administer stool softeners or laxatives.
Confusion	• Infection • Brain metastasis • Medication side effects	• Ensure safety. • Look for data to support or refute each hypothesis.	• Put on bed alarm. • Discuss with bedside visitors. • Consult with other nursing staff. • Evaluate temperature and common infection sources. • Consult with provider about potential metastasis. • Examine medications for interactions or dose changes.
Petechiae	• Thrombocytopenia • Sepsis • Drug reaction • Disseminated intravascular coagulation (DIC)	• Ensure safety. • Look for evidence to support or refute each hypothesis.	• Discuss with the patient other sources of potential bleeding. • Instruct patient to avoid injury. • Assess lab values. • Evaluate medications for side effects. • Monitor vital signs.

TABLE 31.4 Managing Side Effects and Complications

Evaluating Outcomes

The nurse assesses often for the patient's understanding of their condition, treatment plan, and self-care instructions, adjusting whenever the patient's outcomes are not being met or when there are changes to the plan of care (Table 31.5). Evaluation of outcomes is ongoing because interventions that were effective before may not work in the future for the individual. Cancer care spans weeks, months, and years throughout diagnosis, treatment, remission, maintenance, and potential recurrence. Pain tolerance changes, food preferences change, and ongoing disability may change the individual's ability to cope.

Complication	Explanation	Intervention	Cue for Revision	Intervention
Infection	Patient is immunocompromised due to chemotherapy.	• Administer appropriate antibiotics. • Maintain infection control measures.	New pathogen	• Obtain new blood and urine cultures for recurrence of fever. • Alter therapy based on culture results and clinical response. • Consider cessation of cancer treatment until white blood cells recover.
Bleeding	Thrombocytopenia due to chemotherapy	Administer random donor platelets.	• Post-transfusion platelet count does not change. • Bleeding or petechiae continue.	Administer single donor platelets (HLA-matched platelets are difficult to obtain, but are an option).
Anemia	Patient is anemic due to chemotherapy's effect on the bone marrow.	• Iron supplements • Administer erythropoiesis-stimulating medications. • Blood transfusion	Hematocrit and hemoglobin do not resolve to necessary levels to maintain perfusion.	Look for sources of bleeding.

TABLE 31.5 Evaluating Outcomes and Revising Interventions

Encouraging nutritional intake can be a daily challenge for the patient. A favorite food may taste great on one day, only to be revolting to the patient on the next day. This can often develop into a frustrating and confusing experience. Protein-rich foods are needed, but patients are often too fatigued to chew their food, requiring the nurse to become creative with meeting revolving nutritional needs. Typical protein sources such as nuts or meat may not be good choices, depending on the patient's condition. If strong smells are offensive and result in nausea, the patient may not tolerate peanut butter. If the patient is experiencing a great deal of fatigue, they may not be able to eat steak or grilled chicken. When the patient has severe mucositis, foods that are coarse, salty, or sharp cause intense pain. The nurse determines the patient's comfort after interventions for pain and nausea, obtaining and administering additional doses or different medication as needed to meet the desired comfort level. Ideally, a dietitian is involved in the patient's care. A nutritional supplement is typically offered with each meal. Often, the

nurse assists the patient to determine what they can or cannot tolerate throughout each day. One modification to the nutritional supplement, such as the nurse adding ice cream to create a milkshake, can make the difference for the patient's caloric and nutrient intake.

CLINICAL JUDGMENT MEASUREMENT MODEL

Evaluate Outcomes: Did It Help?

The patient was admitted late Friday afternoon, just around the time of the scheduled shift change. The patient presented with difficulty voiding, constipation, and bilateral changes to sensation in her lower extremities. A new diagnosis of cancer with a spinal cord compression was diagnosed, and treatment was begun. Oncological emergencies must be treated quickly. The evening nurse reported on Saturday morning that the patient had not shown improvement in the roughly sixteen hours since she had been admitted, and high-dose radiation was being arranged to begin over the weekend. In comparing this situation to others, the oncoming nurse recognized that this is not the expected outcome or therapy and could represent a problem. Recognizing these cues, the nurse reenters the clinical judgment cycle.

During shift report, the nurses were required to review orders and chart information from the previous shift. The oncoming nurse asked about steroid doses because it was not evident in the chart, and this is a standard treatment for spinal cord compression. The off-going nurse stated that there were no steroid orders. Together, they examined the previous day's orders. It was a very long list and squeezed in with small handwriting at the bottom of the order sheet was the order for high-dose steroids to be administered every six hours. The error was caught because the nurse knew the way the patient should respond to standard therapy for the presenting condition. The error was corrected because the nurse evaluated the patient's outcomes, realized that they were not adequate or expected, and began to evaluate why and what else might need to occur.

Medical Therapies and Related Care

Treatment options vary widely based on individual patient factors, including age, overall health, type of cancer, and stage of progression. Medical therapies may include surgery to remove tumors or affected tissues, targeted therapies that attack specific molecules, hormone therapy for hormone-driven cancers, stem cell transplants to replace diseased bone marrow, and genetic profile-specific medicine. The most commonly used therapies are external or internal radiation, chemotherapy, and immunotherapy drugs.

Therapy-Specific Nursing Care

Each type of therapy requires specific nursing care. Nursing care for patients with cancer involves a comprehensive approach tailored to individual factors such as age, overall health, cancer type, and stage of progression. Nurses play a crucial role in preparing patients for surgery, providing preoperative and postoperative care, and monitoring for complications. For patients receiving targeted therapies, nurses monitor for side effects and educate patients on their specific treatment plan. Hormone therapy requires close monitoring for hormonal changes and potential side effects, with nurses providing education and support. Stem cell transplant patients require meticulous monitoring for signs of infection or graft-versus-host disease, with nurses providing supportive care. Additionally, nurses play a key role in administering radiation, chemotherapy, and immunotherapy drugs, monitoring for side effects, and managing symptoms to improve quality of life.

LINK TO LEARNING

Read a more detailed timeline of the progression (https://openstax.org/r/77cancerprog) of cancer treatments.

REAL RN STORIES

Nurse: Catherine, BSN
Years in Practice: One

Clinical Setting: Medical-oncology unit
Geographic Location: Metropolitan Nashville area

I was still a new nurse and was excited to finally be allowed to solely care for a patient with AML (acute myelogenous leukemia). Renette had been through a whirlwind for two days. Just like any patient with this diagnosis, her life had almost instantly gone from normal to having an acute illness and a required hospitalization marked by a blur of testing, medical professionals, and the business of learning new medical terminology. The bone marrow biopsy had been done, chemotherapy had started, and the requisite labs were being drawn every few hours. Every hour or two, something was being done for her. It was a storm of overwhelming new information and sensations.

Although she looked well, her labs certainly indicated that she was clearly critically ill. At about 5 p.m., one of her providers came by to order additional labs. He entered the room to explain the new addition to her treatment plan. I gathered supplies and entered the room to gather the urgent lab samples. Renette shoved her food tray at both of us and yelled, "Can you not leave me alone long enough to eat one meal!?" The doctor and I both stood back in shock.

That's when I realized that she didn't feel cared for. She felt these things were being done to her. I had failed to truly include her. We had failed to help her determine her boundaries. The only space she had where she might create some normalcy was that patient room that we were barging in and out of all day. I had allowed myself to get so caught up in her physiological needs, which were serious and many, that I had not addressed her very real need to be treated with respect, dignity, and compassion. The doctor finished what needed to be said, and I informed her I would have to be back within thirty minutes to complete the tasks.

This was Renette's remission induction phase of AML treatment. I remained her primary nurse for the many months that she needed leukemia treatment. We developed a terrific relationship, and more than twenty years later, I have a gift on my nightstand from her, a token to promote sleep. She still reminds me to take care of myself and to advocate for patients during their storms.

Radiation Therapy

There are many types of **radiation therapy** available, and their use depends on individualized factors. Radiation therapy is a cancer treatment that uses radiation to kill cancer cells or shrink tumors. Every effort is made to reduce the effects of radiation on healthy tissue. Radiation oncologists work closely with the patient to ensure the best outcome based on the treatment goals.

The most common is **external beam radiation**. This treatment uses a machine outside the body to deliver a radiation dose to the cancer site (Figure 31.15). External beam radiation therapy typically occurs on most days of the week for a set number of days. Initially, the patient needs teaching about the treatment, side effects, and issues to report to the provider. Fatigue is also a common side effect of radiation therapy.

FIGURE 31.15 Radiation therapy is delivered via a machine and doses are targeted to the cancer site. (credit: "Woman Prepared for Radiation Therapy" by NIH/National Cancer Institute, Public Domain)

As treatment days accrue, side effects accumulate and increase in severity. For example, the patient's skin may develop a reddened area at the irradiated site that worsens with each treatment. Radiation dermatitis requires special care, and the patient should

- avoid constricting garments,
- limit the use of lotions or creams to those approved by the radiation oncologist, and
- employ pain management for comfort.

Internal radiation therapy, or **brachytherapy**, is a type of radiation treatment in which a radioactive source is placed inside the body near the tumor (Figure 31.16). There are special precautions for nurses and visitors, depending on the type of brachytherapy in use (e.g., sealed, unsealed). The nurse will consider the principles of time, distance, and shielding. Care is grouped to reduce exposure time, and the nurse will work behind a lead shield while keeping as much distance as is reasonable for the required task.

FIGURE 31.16 Radioactive seeds are one type of internal radiation. They are placed in or near the tumor, minimizing damage to healthy cells. (credit: "Breast Cancer Treatment Using Iridium Seeds" by NIH/National Cancer Institute, Public Domain)

Other types of radiation are more specialized. Stereotactic radiosurgery delivers high radiation doses with a great degree of precision. Proton therapy uses protons to deliver radiation doses to the tumor (Figure 31.17). Intensity-modulated radiation therapy uses computer-controlled beams of radiation from multiple angles.

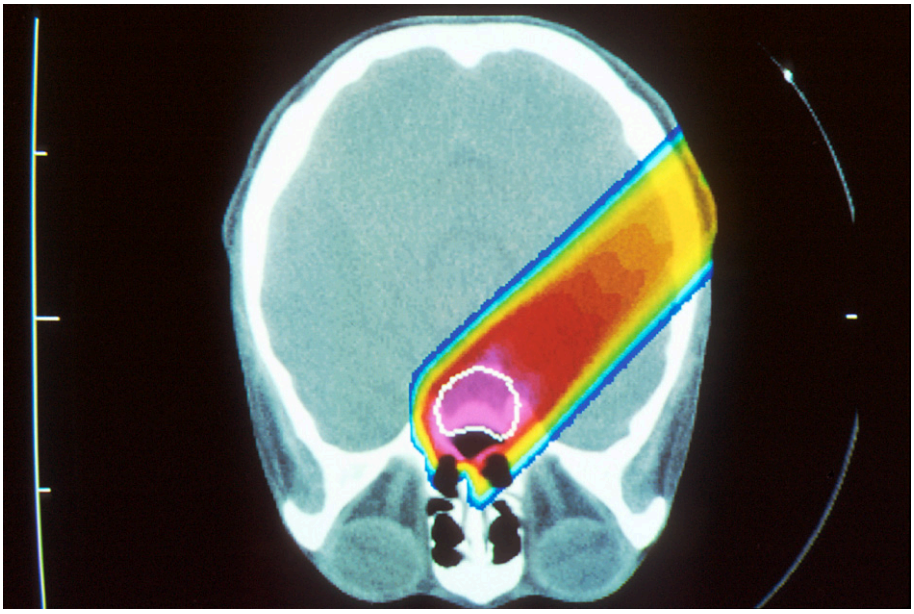

FIGURE 31.17 The tumor is noted in red with a proton beam noted by the yellow line. (credit: "Proton Beam Therapy" by NIH/National Cancer Institute, Public Domain)

CLINICAL SAFETY AND PROCEDURES (QSEN)

Safety: Radiation Therapy

Radiation enters body fluids and is eliminated in feces and urine, meaning that waste products are radioactive and should not be directly touched. Safety of the patient, visitors, and staff are always at the forefront of radiation care. The following precautions are taken with patients who have sealed radioactive implants:

- A sign is placed on the door to indicate radiation is present and that staff and visitors should not enter without

speaking to the nurse.
- Portable lead shields and/or lead-lined rooms are required.
- The door to the room should remain closed.
- Hospital policies to monitor and reduce exposure should be followed.
- Pregnant staff and those who are trying to become pregnant should not care for the patient.
- Visitation time should be limited. Other restrictions are usually related to age and pregnancy status.
- Radioactive source should never be touched with your hands. If it becomes dislodged, tongs are used to move it to a lead container in the room.
- Bed linens are saved in the room; meal trays are disposed. All trash and linen remains in the room until the radioactivity level is cleared by the radiation department.
- Equipment can either be dedicated to the room or it can be safely used between patients.
- Look for orders to include an indwelling urinary catheter and medications to cause constipation in some instances. This is an effort to contain waste materials and prevent dislodgment of the radiation source.

Chemotherapy

A class of drugs used to destroy cancer cells known as **chemotherapy** targets cells that are rapidly dividing, a hallmark of cancer cells. Chemotherapy can be used to induce remission of cancer, control its growth, or relieve complications such as a tissue or organ obstruction.

Nurses must be certified to deliver chemotherapy doses to a patient. Chemotherapeutic agents are also known as antineoplastic medications and require special handling when being prepared, administered, and discontinued. Institution protocols dictate requirements for personal protective equipment (PPE) that must be worn and certain cleanup techniques for spills, for example. These medications are marked with a bright yellow sticker to alert the nurse about the hazardous nature of the drug.

Teaching is unique to the drug regimen used in the patient's therapy. In general, chemotherapy destroys any rapidly dividing cells in the body, including blood cells and cells that make up the mucosal lining of the mouth and entire gastrointestinal tract. However, each class of chemotherapeutic medication has its own adverse effect profile. The unwanted effects of therapy are often severe, and the nurse is often responsible for interdisciplinary coordination to aggressively manage the unwanted effects.

Many therapy regimens begin with a course of pre-administration medications to prevent or reduce common side effects. To prevent or reduce nausea, medications such as lorazepam (a benzodiazepine) and ondansetron (a serotonin receptor antagonist) may be given. Chemotherapy is known for causing chills or fever, so one or more antihistamines may be used prior to each dose of the medication. The nurse also monitors the patient during intravenous chemotherapy infusions for any reactions.

LINK TO LEARNING

Cancer therapies have the potential for causing infusion reactions. Even though infusion reactions (https://openstax.org/r/77infusionreact) all involve the immune system, they are not all true allergic reactions.

Immunotherapy

A type of treatment that helps the immune system fight cancer is called **immunotherapy**. Immunotherapy enhances the ability of the immune system to recognize and destroy cancer cells. Common antitumor agents are listed in Table 31.6. The most essential nursing care for the patient receiving immunotherapy is often observing for flu-like reactions during intravenous infusions. Immune-mediated therapy induces the body's immune system to destroy cancer cells, leading to a high risk of a hypersensitivity reaction. Typical reactions can include urticaria, hypotension, angioedema, bronchospasm, rigors (sudden feeling of cold with severe shivering, and a sharp rise in body temperature), and body aches. Reactions can occur regardless of how often the patient has received this drug in the past. The protocol for administration of immunotherapy should include pre-administration medications, beginning infusion rates to test the patient's tolerance, and administration of medications such as intravenous steroids if certain reaction parameters are met.

Medication Class or Therapy	Mechanism of Action
Antimetabolites	• Interfere with DNA and RNA synthesis • Lead to cell death during S phase of cell cycle
Antitumor antibiotics	• Bind directly to DNA, disrupting function • Inhibit RNA synthesis; prevent cell replication
Antimitotics	• Interfere with microtubule function during cell division • Prevent mitosis; cause arrest of cell cycle
Alkylating agents	• Cause DNA cross-linking and strand breaks • Prevent DNA replication
Topoisomerase inhibitors	• Inhibit enzymes necessary for DNA replication
Targeted agents (not an all-inclusive list)	• Target specific molecules that cancer cells need
- Tyrosine kinase inhibitors	• Block tyrosine kinase enzyme • Inhibits cell proliferation
- Epidermal growth factors	• Block epidermal growth factor receptor • Prevent activation of signaling pathways
- Angiogenesis inhibitors	• Inhibit formation of new blood vessels (angiogenesis) • Starve tumor of nutrients and oxygen
- Vascular endothelial inhibitors	• Block vascular endothelial growth factor (VEGF) • Prevent formation of new blood vessels to supply the tumor
- Monoclonal antibodies	• Bind to specific antigens on cancer cell surface • Mark cancer cells for destruction by the immune system or block growth signals
Cancer vaccines	• Prevent cancer from developing • Treat cancer by strengthening natural immunity
CAR T-Cell therapy	• T cells are removed from patient and modified to produce chimeric antigen receptors. • After reinfusion into the patient, the immune system can better recognize cancer cells.

TABLE 31.6 Antitumor Agents

Coordination of Care

Cancer care requires a truly comprehensive coordination of care among interdisciplinary team members. The

complex and ongoing nature of cancer care often requires specialized providers that are unique to patients with cancer.

INTERDISCIPLINARY PLAN OF CARE

Care Providers Met throughout Cancer Treatment

1. Medical oncologists
    - Role: Determine overall treatment plan, prescribe chemotherapy, immunotherapy, or other systemic treatments.
    - Intervention: Request consults with other specialists as needed and adjust treatment plans based on patient response.
    - Coordination: Regularly communicate with the care team to ensure cohesive treatment and monitor progress.
2. Radiation oncologists
    - Role: Determine the type, dose, and schedule of radiation therapy.
    - Intervention: Administer radiation treatments, monitor for side effects, and adjust treatment as necessary.
    - Coordination: Work with the medical oncologist and other team members to integrate radiation therapy into the overall treatment plan.
3. Surgical oncologists
    - Role: Perform biopsies, stage cancer, and conduct supportive surgeries (e.g., placing ports).
    - Intervention: Reduce tumor burden, relieve obstructions, and improve quality of life through surgical interventions.
    - Coordination: Collaborate with oncologists and other specialists to plan surgical procedures and postoperative care.
4. Nurses
    - Role: Provide direct patient care, manage side effects, and offer education and support.
    - Intervention: Administer therapies, monitor for complications, teach patients about their condition and treatment, and provide emotional support.
    - Coordination: Communicate with other team members to ensure comprehensive care and early identification of emergencies.
5. Clinic nurses
    - Role: Manage outpatient care for patients not requiring twenty-four-hour support.
    - Intervention: Administer treatments, monitor for side effects, and provide patient education and support.
    - Coordination: Work with home health nurses and other team members to ensure continuity of care.
6. Home health and hospice nurses
    - Role: Provide in-home care and support, particularly for patients transitioning from hospital to home or those in hospice care.
    - Intervention: Monitor patient health, manage symptoms, and ensure adequate in-home support.
    - Coordination: Work with the health-care team to address urgent needs and provide comfort care.
7. Palliative care nurses
    - Role: Manage symptoms and provide supportive care for serious illnesses.
    - Intervention: Offer interventions to relieve symptoms, improve quality of life, and support both curative and noncurative treatment goals.
    - Coordination: Collaborate with other team members to integrate palliative care into the overall treatment plan.
8. Research nurses
    - Role: Manage patients participating in clinical trials.
    - Intervention: Document care, assess patient trends, and ensure adherence to research protocols.
    - Coordination: Work closely with the research team and other health-care providers to support trial requirements.
9. Patient navigators

- Role: Assist patients and families in navigating the health-care system.
- Intervention: Coordinate care, access resources, and address service gaps.
- Coordination: Communicate with all team members to ensure the patient receives comprehensive support.

10. Social workers/case managers
    - Role: Support patients with logistical, financial, and emotional needs.
    - Intervention: Provide counseling, financial assistance, and referrals to outside support services.
    - Coordination: Collaborate with the health-care team to address holistic patient needs.
11. Pharmacists
    - Role: Manage medication regimens and monitor for interactions and side effects.
    - Intervention: Provide medication counseling, manage prescriptions, and assist with obtaining financial assistance for medications.
    - Coordination: Work with oncologists and nurses to ensure safe and effective medication use.
12. Dietitians
    - Role: Provide dietary guidance and manage nutritional needs.
    - Intervention: Develop nutrition plans, address limitations to chewing or swallowing, and offer creative dietary solutions.
    - Coordination: Collaborate with the health-care team to ensure nutritional needs are met in both hospital and home settings.
13. Physical and occupational therapists
    - Role: Support physical functioning and activities of daily living (ADLs).
    - Intervention: Develop exercise programs, provide adaptive techniques, and address in-home obstacles.
    - Coordination: Work with the health-care team to support patient mobility and independence.
14. Mental health providers
    - Role: Provide emotional and psychological support.
    - Intervention: Offer counseling, support groups, and psychiatric care.
    - Coordination: Collaborate with the health-care team to address the psychosocial aspects of cancer care.
15. Plan implementation
    - Initial meeting: All disciplines meet to discuss the patient's case and create an initial care plan.
    - Regular updates: Weekly or biweekly interdisciplinary meetings to update the plan based on patient progress and new assessments.
    - Communication: Utilize a shared electronic health record (EHR) system for real-time updates and communication among team members.
    - Patient and family involvement: Include the patient and family in care planning meetings to ensure their preferences and concerns are addressed.
    - Education: Provide ongoing education to the patient and family about the disease process, treatment options, and available support services.

Many of the roles on the care team can be filled by nurses, including case managers, patient navigators, infusion nurses, and oncology nurse specialists. The Oncology Nursing Society (ONS) is a professional organization dedicated to advancing the field of oncology nursing. The ONS provides educational resources, certification programs, and practice guidelines to support oncology nurses in delivering high-quality care. The organization also advocates for policies that benefit patients with cancer and the nursing profession.

In each of these roles, nurses are integral to delivering holistic, patient-centered care. Their diverse expertise and dedication ensure that patients with cancer receive the support they need throughout their treatment journey, from diagnosis to survivorship or end-of-life care.

31.4 Survivorship

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Define *cancer survivor* and discuss components of survivorship care
- Describe the physical and emotional impact of cancer recurrence and secondary cancers
- Discuss the role of the health-care team for patients who have experienced cancer in improving their quality of life
- Identify strategies to improve coordination of survivorship care

Survivorship

Cancer treatments, as with all medicine, have changed greatly over the past 300 years. In the 1700s and 1800s, scientists discovered connections between environmental factors, such as chimney soot, and the occurrence of certain cancers, such as squamous cell carcinoma. In the 1800s and 1900s, the use of radiation, tissue-sparing surgical techniques, genetic differences, bone marrow and stem cell transplantation, and medications such as combination chemotherapy, monoclonal antibodies, and hormone therapy expanded cancer treatment options. In the 2000s, the creation of vaccines against known cancer-causing viruses and the introduction of immunotherapy in cancer treatment have improved patient outcomes (McAleer, 2022).

LINK TO LEARNING

Read a more detailed timeline of the history (https://openstax.org/r/77cancerhistory) of cancer treatments.

Cancer, in general, is now largely considered a chronic condition to be managed, according to the ACS (2024). Disease can be controlled or described as stable. About 18.1 million people in the United States are cancer survivors, and that number is expected to climb to 26 million by 2040 (Tonorezos et al., 2024). Consider, also, that 67 percent of individuals are age 65 or older at the time of diagnosis. The term **survivorship** embraces the reality of individuals living beyond the cancer diagnosis. Some survivors are completely cancer-free whereas others are living with cancer. Anyone with a history of cancer is considered to be in survivorship (NCI, 2024a).

LINK TO LEARNING

This article outlines developing a national standard of care for cancer survivorship (https://openstax.org/r/77cancersurvcare) with a goal to enhance delivery of survivorship care across the nation.

Challenges for health-care providers include understanding the complexity of chronic management, implementing ongoing surveillance and follow-up care, providing support, ensuring care access, and maintaining good communication with the individual and the care team. To help providers and their patients, there are still many opportunities to enhance availability and quality of health-related services for survivors and to empower individuals to advocate for themselves and use community support services.

Challenges faced by cancer survivors may be psychological, social, emotional, spiritual, or physical. Psychosocial needs include issues with insurance and financial assistance, memory loss, parenting and work guidance, and emotional health. Physical concerns include fatigue, physical functioning, weight changes, chemotherapy-induced peripheral neuropathy, cardiomyopathy, and fertility and sexuality concerns.

Physiological Effects

A delayed effect, or **late effect,** of cancer treatment is one that arises months or years after diagnosis and treatment. The American Society of Clinical Oncology and the Oncology Nursing Society are among the organizations guiding physicians and nurses in how best to navigate these challenges with patients. These late effects vary somewhat according to the type of cancer, its stage, surgical procedures performed, the chemotherapy medications used, radiation therapy and site, use of hormonal or other systemic therapies, and genetic components.

Psychosocial Effects

The emotional burden of a cancer diagnosis is significant, often accompanied by a pervasive fear of recurrence. The uncertainty and waiting associated with regular diagnostics can exacerbate this fear, leading to heightened levels of anxiety, depression, and trauma-related stress. Patients may experience a sense of helplessness, especially during watchful waiting periods, where they are tasked with monitoring symptoms and alerting their health-care team to any changes. This constant vigilance can be mentally exhausting, adding to the overall psychological strain of the diagnosis.

Cancer diagnosis and treatment can also have profound effects on personal relationships. Familial dynamics may shift as roles and responsibilities within the family unit are redefined. Partners, spouses, and significant others often face unique challenges as they navigate providing support while dealing with their own fears and emotions. Intimate relationships may undergo strain as the focus shifts to managing the physical and emotional demands of the illness, potentially altering the dynamics of the relationship.

Parent-child interactions can be deeply affected by a cancer diagnosis, with parents grappling with feelings of guilt or worrying about the impact of their illness on their children. Children, in turn, may experience fear, confusion, and anxiety about their parent's health and the changes occurring within the family dynamic. Siblings, too, may experience a range of emotions as they navigate their own responses to the family's new reality, from fear and sadness to resentment or guilt.

Maintaining social connections outside of the immediate family can be challenging for individuals with cancer. Friends and acquaintances may struggle to offer support, and unintentionally hurtful comments or actions can lead to feelings of isolation and loneliness. Despite these challenges, many individuals find that their relationships become more meaningful and resilient in the face of adversity. Shared experiences of facing cancer can create bonds of empathy and understanding that strengthen personal relationships and provide much-needed support during a difficult time.

A cancer diagnosis not only affects the individual's physical health but also has far-reaching effects on their emotional well-being and personal relationships. It is essential for health-care providers to address these emotional and relational aspects of cancer care, providing support and resources to help patients and their loved ones cope with the challenges they face.

Sexual Health and Fertility Effects

Fatigue is a significant obstacle to maintaining healthy sexual intimacy. Teaching for the patient and the partner is crucial; this includes setting expectations around thoughts of returning to prediagnosis libido. Shortness of breath may result from physical changes or surgeries, scarring from radiation, or prolonged inactivity during treatment. Other physical changes might include hormonal changes. In women, this can lead to vaginal dryness and discomfort. If radiation or surgery was performed in the pelvic or genital areas, sexual tissues and organs may not respond effectively to arousal. Changes in body image can have a significant mental impact and create possible embarrassment. Depending on the diagnosis, physical changes could include loss of a breast, reconstruction of the labia, or partial removal of the penis, all of which could affect sexual performance and satisfaction. Alternative sexual positions or acts may be a viable solution for the individual or couple involved.

Effective communication is vital for survivors of cervical cancer and their partners as they navigate the impact of the disease and its treatment on their sexual health and intimacy. Survivors should be empowered with language and information to express their feelings and concerns openly. Nurses can facilitate this by providing education on the physical and emotional effects of cervical cancer and its treatment, as well as strategies for communicating about these issues. For example, a nurse may encourage a survivor to use “I” statements to express their feelings and needs, such as saying, “I feel anxious about intimacy” or “I need reassurance and understanding.” This approach can help the survivor communicate their emotions without placing blame on their partner, fostering a supportive and empathetic dialogue.

Additionally, partners of survivors may struggle to express their desires or concerns about sexual intimacy. Nurses can offer guidance on how partners can support their loved ones while also expressing their own needs and feelings. This may include encouraging partners to listen actively, validate their partner’s feelings, and openly share their own emotions and concerns.

Nurses can also emphasize the importance of emotional connection and intimacy in maintaining a healthy sexual relationship. By reinforcing that sexual intimacy is based on more than just physical attraction, nurses can help survivors and their partners prioritize emotional connection and communication in their relationship.

Overall, effective communication can help survivors of cervical cancer and their partners navigate the challenges of sexual intimacy after treatment. Nurses play a crucial role in empowering survivors to communicate their needs and feelings and supporting partners in understanding and responding to these needs.

LIFE-STAGE CONTEXT

Effect of Cancer on Females of Childbearing Age

Cervical cancer can significantly affect family planning decisions for women of reproductive age, often requiring an interdisciplinary approach involving nurses. The diagnosis may lead to concerns about fertility preservation and the ability to have children in the future, prompting women to seek guidance from health-care providers, including nurses.

For females yet to complete their family planning, the diagnosis can be distressing. Treatments such as radical hysterectomy, radiation therapy, and chemotherapy can affect fertility, necessitating discussions about fertility preservation options. Nurses play a crucial role in educating patients about these options, coordinating care, and providing emotional support throughout the decision-making process.

The emotional and psychological toll of cervical cancer and its treatment can also strain relationships and affect decision-making about family planning. Nurses, through their ongoing care and support, help patients and their partners navigate these challenges, offering counseling and resources to address the emotional aspects of the diagnosis and treatment.

In some cases, women may choose to delay cancer treatment to pursue fertility preservation options, highlighting the need for a coordinated approach involving nurses, oncologists, and fertility specialists. Nurses help patients weigh the risks and benefits of such decisions, ensuring they receive comprehensive care that considers their fertility goals alongside their cancer treatment needs.

Cancer Recurrence and Secondary Cancers

Cancer is a complex disease that often defies a definitive cure. Instead, treatments aim to achieve **remission** or control over the disease. Remission signifies a period when cancer is not detectable or actively growing, whereas control involves managing the disease to prevent its progression or symptoms. However, cancer can return after a period of remission, which is known as **recurrence**. Recurrence indicates that the cancer has resurfaced and is no longer under control or stable.

Secondary cancer can arise in two primary ways. First, factors that contributed to the initial cancer, such as tobacco use, alcohol consumption, or an unhealthy diet and environment, can increase the risk of developing a different type of cancer. Second, cancer survivors may develop a new cancer because of previous cancer treatments. For example, childhood cancer survivors treated with radiation may develop thyroid cancer years later due to radiation-induced cellular damage.

It is important to note that cancer is always named based on its original site of origin. For instance, if small-cell lung cancer spreads to the bone, the malignant bone lesions are still classified as small-cell lung cancer. Despite successful treatment for one type of cancer, individuals can develop a completely different type of cancer. This phenomenon is exemplified by sports analyst Dick Vitale, who faced separate battles with melanoma, lymphoma, and vocal cord cancer, each requiring its own treatment and management (ESPN, 2023).

Additionally, the risk of cancer tends to increase with age, irrespective of an individual's cancer history. This means that even without a prior cancer diagnosis, the likelihood of developing cancer later in life is higher. Therefore, promoting overall health and well-being remains crucial throughout survivorship to mitigate the risk of developing new cancers or other health complications. The risk of cancer increases as a person ages, regardless of their history, and an unrelated cancer can develop and appear later in life. This is one reason why health promotion continues to

be a high priority throughout survivorship.

The Nurse's Role in Survivorship Care

The primary responsibilities of the nurse in survivorship care are health promotion and symptom management. Ways to improve sleep, nutrition, and activity levels are important to discuss. Cessation of tobacco or alcohol use reduces inflammation and reduces the risk of cancer recurrence. Complementary therapies such as acupuncture, physical therapy, and massage are used by many patients to address symptoms, such as ongoing pain or nausea. In multiple studies, exercise has been demonstrated to be the only intervention that consistently and effectively reduces fatigue and improves overall energy (Campbell et al., 2019; Fabi et al., 2020).

LINK TO LEARNING

The National Comprehensive Cancer Network (NCCN) has published the NCCN Guidelines for Patients (https://openstax.org/r/77nccnguidelines) to provide information that can be shared as part of patient teaching about fatigue management.

It is essential that the nurse reinforces teaching about follow-up appointments, diagnostic testing for surveillance of ongoing remission or recurrence, medication adherence, side effect management, and when to seek medical attention. Additional teaching is often needed regarding manifestations that indicate cancer has recurred or progressed. These teaching points are determined by the type of cancer and subsequent treatments.

Coordination of Survivorship Care

As with active cancer management, survivorship care requires coordination between oncologists, physical therapists, psychologists, or other specialties and services that are involved in a patient's ongoing care. This can include consultations with dietitians who can assist with appetite loss or protein calorie malnutrition; counseling services to assist with any needs that arise from navigating relationship changes or from psychiatric medication management; and financial assistance programs for people struggling with hospital bills, paying for prescriptions, or returning to work. The nurse may need to refer the patient to support groups or other programs that allow survivors the opportunity to share personal experiences, seek additional information, make connections with others, and develop coping strategies.

INTERDISCIPLINARY PLAN OF CARE

Working Together for Cancer Survivors

In the heart of a southern state, a camp designed exclusively for cancer survivors is a beacon of hope and healing. Twice a year, nurses, social workers, and oncology educators unite to create a nurturing environment for adult cancer survivors, including those during treatment. There, participants can openly share their journeys, finding solace in the understanding of others who have walked a similar path.

A nurse's role extends beyond giving medical assistance to providing emotional support and facilitating therapeutic activities. Survivors discuss the impact of their surgeries on their intimate relationships, sharing vulnerabilities and coping strategies. These interactions are invaluable, offering a safe space for emotional release and healing. Hearing these stories and the advice that helps patients assists the care team members in learning how to better help other patients in the future.

The impact of this camp is not one-sided. Although the focus is on supporting survivors, the camp health-care staff—nurses, social workers, and oncology educators—benefit greatly from this experience. Working in the often-intense environment of inpatient settings, they witness immense suffering and loss. The camp allows them to rejuvenate and to celebrate life with individuals who embody resilience and gratitude. It serves as a reminder of why they chose their professions and a source of inspiration to continue providing compassionate care to those in need.

Summary

31.1 Oncological Disorders

- Cancer is thought to be caused by systemic issues, environmental exposures, and genetic determinants.
- Cancer is characterized by uncontrolled and abnormal cell growth, which typically develops over years due to repeated insults to the cell's genetic material.
- Tumors are malignant or benign. Malignant growths are cancerous, grow uncontrollably, and invade other areas of the body. Benign tumors grow slowly and do not spread.
- Preventable causes of mutations that may lead to cancer include smoking, alcohol consumption, poor nutrition, and viruses. Nonmodifiable causes of mutations that may lead to cancer include age, biological sex, ethnicity, and genetics.
- Signs and symptoms are unique to each type of cancer, but fatigue and unexplained weight loss are the most commonly reported clinical manifestations.
- Cancers are named and classified based on where they start in the body. A carcinoma is a cancer that creates solid tumors in epithelial tissue. A sarcoma is rare and is often related to bone cancers. A lymphoma applies to any cancer that begins in the lymphatic system. A leukemia refers to cancers of the blood-forming tissues, such as bone marrow.
- The major types of cancers are brain cancer, bone cancer, breast cancer, colon and rectal cancer, lung cancer, skin cancer, and blood cancer.

31.2 Detection and Prevention of Cancer

- Detection and diagnosis involve a combination of screening tests at recommended intervals; imaging studies, such as x-ray, MRI, or CT scans; and biopsies. Blood tests are useful to detect specific tumor markers, proteins, or substances that indicate the likely presence of cancer. They also help gauge the effectiveness of treatment or check for recurrence during periods of remission.
- Grading and staging systems standardize diagnosis, the likely prognosis, and the treatments to consider. Grading describes the cellular characteristics and aggressiveness of cancer cells and, by extension, how sensitive the cells will be to treatment. The higher the grade, the more abnormal the cells appear.
- The staging system is different for every type of cancer, but it generally refers to whether the tumor is confined to one space or has spread to other areas of the body. The basic TNM system represents the anatomic extent of solid tumors and gauges the size and extent of tumor (T), lymph node involvement (N), and systemic involvement or metastasis (M) for prognostic implications. There are other staging systems that can also be applied to specific types of cancer, such as blood, skin, or colon cancer.
- Prevention focuses on reducing the risk of developing cancer. There are three levels of prevention: primary, secondary, and tertiary. Primary prevention promotes healthy lifestyle choices. Secondary prevention involves detecting cancer with screenings when treatment has the best chance of a desired outcome. The focus of tertiary prevention is reduction of symptoms and complications related to the disease process including getting the correct treatments, symptom management, emotional and social supports, and maintaining or regaining physical and emotional health after treatment has ended.

31.3 Care of the Patient with Cancer

- To assist the patient in managing complications, the nurse must evaluate physiological, psychological, and situational factors. Holistic assessment is required. Specific assessment will depend on the type of cancer and the patient's current treatment plan. Generally, the nurse will look for signs of cachexia, and assess skin color to determine proper perfusion, good oxygenation, and any evidence of jaundice or bleeding. Treat fatigue, pain, gastrointestinal issues, hematological complications, altered nervous system functions, and any skin impairments.
- An oncological emergency, which includes metabolic emergencies, hematologic emergencies, and structural emergencies, is an acute issue that may cause mortality or morbidity.
- Nursing care for individuals with cancer addresses physical, psychosocial, cultural, and spiritual needs. Nurses look for cues in abnormal test results, new symptoms, and changes in the patient's condition that indicate additional testing or intervention is needed. Nurses must also manage side effects and complications. To evaluate outcomes, nurses assess often for the patient's understanding of their condition, treatment plan,

and self-care instructions, adjusting whenever the patient's outcomes are not being met or when there are changes to the plan of care.

- Treatment options vary widely based on individual patient factors, including age, overall health, type of cancer, and stage of progression. Medical therapies may include surgery to remove tumors or affected tissues, targeted therapies that attack specific molecules, hormone therapy for hormone-driven cancers, stem cell transplants to replace diseased bone marrow, and genetic profile-specific medicine. The most commonly used therapies are external or internal radiation, chemotherapy, and immunotherapy drugs. Nurses play a key role in administering radiation, chemotherapy, and immunotherapy drugs, monitoring for side effects, and managing symptoms to improve quality of life.
- Cancer care requires a truly comprehensive coordination of care among interdisciplinary team members. The complex and ongoing nature of cancer care often requires specialized providers that are unique to patients with cancer.

31.4 Survivorship

- Survivorship in cancer care recognizes that many individuals continue to live after their initial diagnosis and treatment. Some survivors are completely cancer-free whereas others are living with cancer. Anyone with a history of cancer is considered to be in survivorship. Challenges faced by cancer survivors may be psychological, social, emotional, spiritual, or physical.
- Remission signifies a period when cancer is not detectable or actively growing. Recurrence indicates that the cancer has resurfaced and is no longer under control or stable. Secondary cancer can arise from factors that contributed to the initial cancer or develop because of previous cancer treatments. The risk of cancer tends to increase with age, irrespective of an individual's cancer history.
- The primary responsibilities of the nurse in survivorship care are health promotion and symptom management. The nurse also reinforces teaching about follow-up appointments, diagnostic testing for surveillance of ongoing remission or recurrence, medication adherence, side effect management, and when to seek medical attention.
- Providing a range of support options in collaboration with health-care providers, services, and support groups is crucial for comprehensive survivorship care.

Key Terms

acquired genetic factor change that develops from exposure to risk factors
apoptosis cell death
brachytherapy type of radiation treatment in which a radioactive source is placed in or near a tumor; it can be a wire, seed, disc, capsule, or implant
cancer disease caused by uncontrolled division of abnormal cells
carcinogen substance or agent that can cause cancer
carcinoma cancer that creates solid tumors
carcinoma in situ cancer confined to the layer of cells where it began and has not spread to surrounding tissues
chemoreceptor trigger zone area of the brain that detects toxins in the blood and cerebrospinal fluid and sends signals to the vomiting center of the brain
chemotherapy cancer treatment that uses drugs to kill cancer cells or stop them from growing and dividing
differentiation how mature or immature cancer cells look and behave compared to normal cells
external beam radiation noninvasive method using high-energy radiation beams to destroy cancer cells
grading process used to classify cancer cells based on how abnormal they appear when examined under a microscope
hyperviscosity syndrome oncologic emergency in which the blood is so thick it will not flow properly
immunosurveillance body's monitoring process by which cells of the immune system detect and destroy premalignant of malignant cells
immunotherapy type of cancer treatment that uses the body's immune system to fight cancer; involves stimulating the immune system to attack cancer cells or using antibodies to target specific cancer cells
innate genetic factor mutation that is inherited
late effect health problem that occurs months of years after treatment of cancer was completed
leukemia cancer of the blood-forming tissues

lymphoma cancer that begins in the lymphatic system
mucositis inflammation and ulceration of the mucous membranes lining the digestive tract; common side effect of chemotherapy and radiation therapy
neuropathy condition characterized by damage to the nerves, often causing pain, numbness, tingling, or weakness
neutropenia condition in which there is a low count of immature white blood cells called neutrophils
oncological emergency serious and often life-threatening complication of cancer or its treatment that requires immediate medical attention
radiation therapy (also, radiotherapy) cancer treatment that uses radiation to kill cancer cells or shrink tumors
recurrence new occurrence of something (cancer diagnosis) that has occurred, happened, or appeared in the past
remission period when an illness is less severe, or manifestations of the illness are not actively affecting the person
sarcoma malignancy of connective or nonepithelial tissue
staging system used to describe the extent and spread of cancer in the body
stomatitis inflammation and ulceration of the mouth and lips; common side effect of chemotherapy and radiation therapy
survivorship state of surviving something that might have resulted in death; it applies to an individual from the time a cancer diagnosis is made throughout the remainder of their life
TNM system method used for staging to describe the extent and spread of cancer based on the size of the tumor, whether or not the cancer has spread to nearby lymph nodes, and whether or not there is metastasis to distant organs or tissues
tumor suppressor gene type of gene that normally inhibits cell growth and division, helping to prevent the development of cancer

Assessments

Review Questions

1. What characteristic best defines a cell as cancerous?
   a. demonstrates uncontrolled growth
   b. alters all cell metabolism
   c. results in fatigue and weight loss
   d. produces special hormones

2. What type of cancer affects the lymph nodes, spleen, and bone marrow?
   a. sarcoma
   b. carcinoma
   c. leukemia
   d. lymphoma

3. What diagnostic test is used to assess the presence of a tumor?
   a. electroencephalogram
   b. magnetic resonance imaging
   c. complete blood cell count
   d. ultrasound guided biopsy

4. What does tumor grading assess?
   a. the size of the tumor
   b. the extent of the metastasis
   c. the degree of tumor cell differentiation
   d. the number of lymph nodes involved

5. What is an example of secondary prevention of cancer?
   a. mammography
   b. smoking cessation

c. maintaining a healthy weight
d. HPV vaccination

6. A patient with cancer is experiencing chemotherapy-induced nausea and vomiting. What nursing intervention is most appropriate?
   a. Administer an antiemetic such as ondansetron.
   b. Provide foods that are soft and warm.
   c. Ask the patient to eat more at the next meal.
   d. Limit fluid intake until the nausea has passed.

7. A patient with cancer is at risk for impaired skin integrity due to radiation therapy. What action does the nurse include?
   a. Apply lotion to the skin before radiation therapy.
   b. Use only paper tape on the patient's skin.
   c. Inspect the skin before each radiation treatment.
   d. Take measures to keep the radiation site dry.

8. How can a nurse evaluate the effectiveness of pain management?
   a. Assess the patient's vital signs.
   b. Monitor the patient's sedation level.
   c. Observe the patient performing activities.
   d. Ask the patient about their pain.

9. What therapy is commonly used to treat cancer?
   a. nutritional therapy
   b. chemotherapy
   c. psychotherapy
   d. acupuncture

10. What is the primary focus of survivorship care?
    a. early cancer detection
    b. constant surveillance
    c. health promotion
    d. palliative care

11. What is the definition of a cancer survivor?
    a. anyone who has received a cancer diagnosis
    b. someone who was screened for cancer occurrence
    c. individuals who have achieved a cancer cure
    d. a person scheduling a prophylactic mastectomy

Check Your Understanding Questions

1. What risk factors are related to increased development of malignancy?
2. Name three risk factors for cancer occurrence that are considered modifiable.
3. Describe ways to support someone who is at high risk of recurrence.
4. Explain how cancer recurrence and secondary cancers might affect a survivor.
5. Outline strategies to improve coordination of survivorship care.

Reflection Questions

1. Reflect on a situation where you were part of interdisciplinary care team. Imagine that the patient had a cancer diagnosis. How would the collaboration among different health-care professionals (e.g., nurses,

doctors, social workers, pharmacists) affect the patient's care and outcome?

2. What teaching might you include when discussing fatigue with a patient?
3. Reflect on a time when you were part of a team providing care. How could that team focus on improving the quality of life for cancer survivors?

What Should the Nurse Do?

Sarah completed her treatment for lung cancer. She underwent surgical removal of the diseased lung followed by chemotherapy and radiation treatment. Sarah requires teaching and support for the next phase of survivorship.

1. What guidance should you give Sarah about sexual health and physical intimacy?
2. What specific emotional assessments would you prioritize during Sarah's follow-up visits?
3. How would you teach Sarah about recognizing and reporting late effects of lung cancer and treatment?

Competency-Based Assessments

1. Provide examples of how cancer survivorship applies to experiences beyond diagnosis and completion of cancer treatment.
2. Role-play a teaching session that is unique to someone who had a solid tumor of any kind you choose, surgery to remove the tumor, and chemotherapy treatment.

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CHAPTER 32
Palliative Care

FIGURE 32.1 It can be a privilege to care for patients as they approach the end of life. Alongside a special team of health-care professionals, the nurse provides the compassion and knowledge to aid the patient and their family. During this special time, the nurse might use the art of music, playing soothing melodies that offer comfort and solace. This act of blending the art and science of nursing demonstrates a deep empathy, providing a serene and supportive environment as the patient transitions. (credit: Bart Harris/National Guard, Public Domain)

CHAPTER OUTLINE

INTRODUCTION Palliative care is an essential and evolving field within nursing practice that focuses on providing compassionate, holistic care to individuals with life-limiting illnesses. This chapter serves as a resource for nurses to deepen their understanding of palliative care and develop the skills necessary to deliver high-quality end-of-life care. By combining evidence-based practices, clinical expertise, and a patient-centered approach, this chapter aims to equip nurses with the knowledge and tools needed to address the physical, emotional, and spiritual needs of patients and their families during this delicate phase of life.

The practice of palliative care embodies the values of comfort, dignity, and respect, recognizing that every person's end-of-life journey is unique and should be approached with sensitivity and empathy. Nurses play a pivotal role in facilitating the provision of comprehensive palliative care, serving as advocates, educators, and caregivers. This chapter offers a comprehensive overview of the principles, theories, and practical considerations in palliative care, with a particular emphasis on the nursing perspective. From symptom management and communication strategies to ethical dilemmas and grief support, nurses should be empowered to deliver compassionate care and support

patients in achieving the highest possible quality of life until the end of life.

32.1 Palliation

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Define palliative care
- Identify settings where palliative care is provided
- Discuss the importance of collaborative teamwork in palliative care
- Differentiate between do-not-resuscitate (DNR) and do-not-intubate (DNI)

A critical concept in health-care, **palliation** centers on alleviating suffering and enhancing quality of life for patients with serious, often progressive, illnesses. Unlike curative treatments that aim to eradicate disease, palliative care embraces a holistic approach, prioritizing relief from symptoms, pain, and stress. It acknowledges the profound intersection of physical, emotional, and spiritual needs that arise as patients navigate the complexities of their conditions.

Understanding palliation and its core principles is essential for delivering compassionate and effective care. Grasping what palliation entails ensures that health-care providers are dedicated to relieving suffering and improving patient quality of life. Recognizing the various settings where palliation is offered—such as hospitals, hospices, and home environments—allows for the adaptation of care to fit the specific resources and challenges of each context. Effective palliation often depends on a interdisciplinary approach, with health-care professionals collaborating to meet the multifaceted needs of patients and their families. Additionally, understanding critical decisions and distinctions—for example, between do-not-resuscitate (DNR) and do-not-intubate (DNI) orders—is vital for aligning care with patients' wishes and goals. This section aims to highlight how palliation provides comfort and dignity during challenging times, emphasizing its integral role in supporting patients through their illness and end-of-life journey.

Palliative Care

Person- and family-focused care to relieve or reduce symptoms associated with terminal illnesses or diseases that are no longer responding to treatment is considered **palliative care**. This type of care is meant to bridge the gap between curative care and **hospice care**, which is care provided when a patient is approaching the end of life. The goal is to provide the patient with the greatest quality of life while maintaining their dignity as the disease progresses.

Evolution of Palliative Care

Palliative care evolved from the hospice movement in the late 1960s, which focused on end-of-life care, and has developed worldwide in a variety of cultures. However, Roman Catholic traditions dating back to the eleventh century recognized the concept of “hospice” as a place of hospitality for the sick and dying. These early hospices are believed to have been established during the Crusades. While hospices were widespread in the Middle Ages, their prevalence decreased as religious orders became more widespread.

The modern usage of hospice as part of the philosophy of end-of-life care originated with the work of Dame Cicely Saunders, who began working with terminally ill patients in London around 1948. Saunders began her work as a nurse but acquired a medical degree in 1957. While working at Yale University in 1963, Saunders discussed the idea of specialized care for the dying, centering on palliative care; she also shared pictures that showed remarkable differences in patients who were receiving palliative care. For instance, patients in hospice care appeared more relaxed and content, often surrounded by family and engaged in meaningful activities, whereas those in traditional hospital settings often looked distressed and isolated. Saunders’s efforts led to a broader discussion in the United States about the need for specialized hospice care at the end of life, emphasizing the importance of providing a supportive and compassionate environment for patients as they approach their final stages. In 1967, Saunders founded the first hospice for terminally ill patients in the United Kingdom, known as St. Christopher’s Hospice (Hospice of Holland, 2023).

Two years later, Elizabeth Kübler-Ross published a book, *On Death and Dying*, which contained over 500 interviews with dying patients (Kübler-Ross, 1969). Kübler-Ross discussed how everyone deserves the right to make their own

decisions related to their end-of-life care. Kübler-Ross testified in 1972 before the U.S. Senate Special Committee on Aging to declare that dying with dignity included one's right to make their own decisions, including the right to die at home. Kübler-Ross's findings, combined with Saunders's earlier work, led to the founding of the first hospice in the United States, in Branford, Connecticut, in 1974. In 1982, Congress created a provision for a Medicare hospice benefit, and in 1986 the Medicare Hospice Benefit was enacted, giving states the option to include hospice services in their Medicaid programs.

LINK TO LEARNING

Today, many cultures view quality palliative care as a human right. The World Health Organization (WHO) discusses how palliative care (https://openstax.org/r/77Palliativecare) relieves suffering and improves the quality of life for patients.

Settings for Palliative Care

Utilizing an interdisciplinary team of health-care professionals to manage symptoms, palliative care can be provided in a variety of settings, such as hospitals, nursing homes, and specialized clinics; often, it is performed within the patient's home. The location of treatment is dependent on the patient's desires, the acuity of care that is needed, and health insurance coverage.

Institution-Based

Palliative care can be institution-based when a patient requires a high level of care. This could include a patient in the intensive care unit, oncology unit, or medical-surgical unit of a hospital. Palliative care can also be utilized in long-term care facilities for a population of patients who are too ill to return home and require skilled care outside of the hospital setting.

Outpatient-Based

Palliative care can also be provided on an outpatient basis for patients who are well enough to remain at home but who may need skilled care in certain settings, such as clinics or a provider's office. Examples of outpatient-based care might include treatments for pain management, radiation, or infusions.

Community-Based

Palliative care can also be received in the patient's home from a home health agency. Other examples of community-based care might include intravenous infusion therapy or peritoneal dialysis treatment, with patients receiving IV fluids, medications, or feeding tubes at home. As the goal is not curative, chemotherapy treatments may be discontinued, but nutrition and hydration may be continued.

Palliative Care Team Members

Palliative care requires collaboration. The palliative care team is made up of several different health-care professionals who work closely with the patient and their family and provider (Table 32.1). Typically, the team includes palliative care providers, nurses, social workers, nutritionists, and chaplains. However, the team members may vary based on the patient's level of care and needs. Consider a patient with chronic obstructive pulmonary disease (COPD) who needs help performing their activities of daily living (ADLs), maintaining their mobility, and managing their pain. Which health-care professionals would likely be on this patient's interdisciplinary team for palliative care?

Provider	Role in Palliative Care
Primary Care Provider (PCP) Advanced Practice Registered Nurse (APRN) Nurse Practitioner (NP) Physician Assistant (PA)	• Provides orders for the patient to receive services through home care or home health agency. • Refers the patient to a pain management clinic. • Receives updates from the interdisciplinary team to provide optimal patient care.
Pain Management Clinic	• Treats and manages the patient's pain. • Communicates with the PCP to collaboratively provide patient-centered care.
Home Care Agency	• Provides a health aid to help the patient with their ADLs such as bathing, dressing, grooming, light housekeeping, preparing a meal, and running errands. • The frequency of the aid visits will vary depending on the patient's needs: ◦ Example 1: A patient with early-onset COPD who has experienced a slight decrease in endurance but who requires no assistive device for mobility may need only two visits per week. ◦ Example 2: A patient with advanced COPD who has experienced a significant decline in endurance and who uses a walker for ambulation and supplemental oxygen during the day and night may need three to five visits per week. • Patient care is supervised by a nurse who writes a plan of care and directs the health aides' delivery of care to meet the patient's needs. • The nurse also advocates for the patient and communicates with each provider to discuss changes in condition and obtain new orders as needed to promote continuity of care.
Home Health Agency	• Assesses the home for any specialized equipment or community needs, including resources that may assist with care. • Provides physical therapy to help the patient maintain strength and mobility. • Offers occupational therapy, dietary consultations, social work services, chaplains, and speech therapy as needed. • Provides updates to the interdisciplinary team to report the patient's progress for continuity of care.

TABLE 32.1 The Palliative Care Interdisciplinary Team

Nursing Management

Nursing management is a key component of patient care. With palliative care, the nurse may take on the role of case manager and become the hub of communication. As case manager, the nurse is on the front line, speaking with patients and their families to determine the efficacy of care, coordinating care, and updating the plan of care. When communicating with patients and their families, the nurse should always:

- allow the patient and family adequate time to reflect and provide an answer to each question.
- avoid the impulse to fill in the silence during the communication process; it is more appropriate to simply pause and listen than to interject during the "empty space."
- be sensitive and ask if more time is needed to think about a specific topic or question.
- avoid the impulse to give advice.
- ask questions, including open-ended questions.
- assess understanding by restating, summarizing, or reviewing what was said, both for yourself and the patient. When family members are participating in the patient's care, have them re-demonstrate with a verbal walkthrough of the specific care.

An example of effective nursing management can be seen in the following example. A patient in a skilled nursing facility is receiving palliative care for the pain associated with cancer; the nurse observes several things during assessments:

- The patient is having difficulty swallowing pills and may need an order for crushed or liquid medications.
- The pain medication that is currently prescribed lasts only four hours instead of six hours.
- A certain position creates more pain for the patient compared to an alternative position.
- The patient has difficulty participating in physical therapy when the pain medication is not administered thirty minutes to an hour before the therapy session.

As the hub of communication, the nurse has taken on a role managing the patient's case and should communicate all these issues to the specific providers involved in the patient's care. For this case, the nurse may obtain a new order from the provider to administer the pain medication every four hours, increase the medication's strength, change its delivery method, or switch to a different medication. The nurse should communicate to the nurses on opposite shifts as well as the physical therapy team that the pain medication needs to be administered before a physical therapy session, and should ensure the other nurses, nursing assistants, and members of the physical therapy team are aware that certain positions cause more pain for the patient. These items should be well documented as well as communicated to each service line for quality care and patient safety. It is important to note that while this example relates to a skilled nursing facility, the nurse's role would be similar if this example pertained to a patient receiving palliative care through a home health agency with physical therapy in their home.

Communication in Palliative Care

Communication skills are essential to providing continuity of care. Frequent communication is key to ensuring that the palliative care team remains informed. Often, this is achieved through regularly scheduled interdisciplinary team meetings, which may also include the patient and their family. It is equally important to listen to the patient and their family to understand their expectations, family dynamics, and communication style, all of which will help create a comprehensive plan of care.

Table 32.2 gives an example of an interdisciplinary team meeting to discuss a patient who had a stroke several months ago and was recently hospitalized for an exacerbation related to congestive heart failure (CHF); the patient is now scheduled for discharge to home, where he lives with his wife.

Team Member	Role in Palliative Care
Primary Care Provider (PCP) Advanced Practice Registered Nurse (APRN) Nurse Practitioner (NP) Physician Assistant (PA)	• Actively listens for changes in condition. • Asks questions for clarification. • Obtains data related to the patient's inpatient needs as well as upcoming needs related to the discharge. • Writes the orders needed to address the items discussed by the team. • Ideally, provides comprehensive documentation for the patient's primary care provider (PCP), which will likely be obtained through a record request from the PCP's office, to ensure continuity of care after discharge.

TABLE 32.2 Communication within the Palliative Care Team

Team Member	Role in Palliative Care
Nurse	• Notices the patient has experienced difficulty swallowing and asks the provider for an order to obtain a swallow study prior to discharge to prevent choking and aspiration of fluids or food into the lungs. • Explains to the dietitian that the patient has experienced difficulty chewing and is in need of a soft diet, while also asking the provider for an order for a soft diet. • Discusses the need for new orders for crushed or liquid medications. • Explains the need to obtain services from a home care agency to help the patient at home with their ADLs, which will also help with patient safety at home. • Will continue to follow the outcome of the patient's swallow study to ensure the patient's dietary needs are met. • Reinforces with the family the dietitian's suggestions to prevent weight loss by providing frequent, smaller meals. • Will update the plan of care as needed. • Is available to answer the patient's and family's questions as the discharge date approaches. • Provides updates to the interdisciplinary team related to changes in condition, responds to patient and family questions or concerns, and obtains new orders as necessary. • Discusses the patient's medications, including possible side effects observed, to educate the family and ensure continuity of medication administration after discharge. ◦ For example, Seroquel could cause dizziness or weakness, which could contribute to a fall. The nurse educates the family about warning signs to look for and asks the provider if the medication needs to be decreased in strength, administered less frequently, or even discontinued. • Reinforces the physical therapist's explanation of decreased endurance and the need for frequent rest periods with both the patient and family. • Educates the patient and family about the patient's increased risk of falls, suggests interventions that could prevent falls, and advises that activities such as bathing, dressing, and grooming be performed during peak times when the patient has more energy. • Educates the family to weigh the patient regularly to monitor for fluid overload related to the CHF and reinforce the treatment plan when this should occur. • Discusses the discharge instructions and medications with the patient and family on the date of discharge to ensure that the patient has prescriptions for the prescribed medications and that everyone understands the patient's needs and agrees with the plan of care.
Physical Therapist (PT)	• Discusses the increased weakness related to the CHF, including how it impacts the patient's ability to meet their ADLs. • Discusses the patient's continued right-sided weakness, which impairs his mobility and increases the risk of falls. • Explains the benefits of continued physical therapy after discharge with a home health agency of the patient's choice, and asks the provider for an order. • Explains to the family what decreased endurance is and why the patient may need frequent rest periods to recover from activity.

TABLE 32.2 Communication within the Palliative Care Team

Team Member	Role in Palliative Care
Occupational Therapist (OT)	• Confirms with the social worker and family that the patient has adaptive utensils to feed themselves after discharge. • Discusses with the social worker and family the need for the following durable medical equipment (DME) at home due to the patient's increased weakness and impaired mobility: a shower chair and a wheelchair for medical visits. • Ensures everyone is aware that the patient has a walker that was used prior to admission for ambulation in the home and explains why, for safety reasons, the patient should always use the walker when ambulating. • Actively follow the results of the patient's swallow study to collaborate with the dietitian for the patient's dietary needs.
Social Worker	• Actively listens to determine the patient's anticipated needs at home. • Coordinates the DME services to ensure a shower chair and wheelchair is ordered for the patient to use at home. • Educates the family about community services that would be beneficial: ◦ Example 1: Adult day care can promote socialization and provide some rest for the patient's primary caregiver in the home. ◦ Example 2: A Meals on Wheels program can deliver meals to the patient's home during the day, while the patient's wife is working outside the home.
Dietitian	• Actively listens to determine the patient's needs. • Follows up on the patient's swallow study in the event thickened liquids need to be ordered. • Collaborates to ensure an order for a soft diet is obtained. • Explains to the patient and family that the patient's CHF and increased weakness can make eating a major task that requires a lot of energy, which could result in difficulty consuming large meals. • Discusses how smaller, more frequent meals may benefit the patient. • Educates the patient and family about the importance and components of a proper diet.
Family Members (Wife and Daughter)	• Actively listens to the team's observations. • Ideally, asks questions related to things they do not understand. • The inclusivity of being a part of the team provides education for the family to understand how their loved one's diagnosis affects daily living and patient outcomes. • The meeting provides the family with the opportunity to participate in and coordinate the care that their family member needs before and after discharge.
Chaplain	• Provides emotional and spiritual support to the patient and family. • Addresses any spiritual or existential concerns related to illness or end-of-life issues. • Facilitates discussions on advanced care planning and patient's wishes. • Coordinates with the team to address any specific spiritual needs or requests.

TABLE 32.2 Communication within the Palliative Care Team

Medical Management

In a hospital-based setting or skilled nursing facility, serious situations may arise that require the use of cardiopulmonary resuscitation (CPR) or mechanical ventilation to sustain life. It is crucial to discuss with the patient and their family the options of CPR and mechanical ventilation, including what each procedure involves and under

what circumstances it might be used. This discussion is a key component of patient-centered care, ensuring that patients and their families fully understand and can make informed decisions about these life-sustaining interventions. This conversation is important regardless of the patient's stage in their end-of-life journey.

In addition to understanding the procedures themselves, patients and their families should be aware of specific medical orders that outline their preferences for end-of-life care. A **do-not-resuscitate (DNR)** order indicates that a patient does not want CPR to be conducted if their heart stops. A **do-not-intubate (DNI)** order indicates that a patient does not want to be placed on a ventilator if they are unable to breathe independently. If a patient does not wish to have life-saving interventions, it is important to have them sign a DNR or DNI order and place it in their file.

Medical Orders for Life-Sustaining Treatment (MOLST) is a program with a goal of improving quality of care for patients at the end of life (Basset Healthcare Network, 2024); some states refer to this program as **Physician Orders for Life-Sustaining Treatment (POLST)**. While the intent of these programs is the same, the applicable forms vary from state to state. Regardless, completing the forms helps patients specify their goals and preferences for their end-of-life care, including:

- resuscitation instructions when there is no pulse
- intubation and ventilation instructions when breathing has stopped
- instructions for hospitalization and transfer
- comfort care expectations
- treatment guidelines
- preferences for the use of antibiotics

The benefit of using a MOLST or POLST form is that it is transferrable among all care settings such as hospitals, nursing homes, and community settings.

The type of medications used in palliative care depends on the patient's diagnoses and associated symptoms. One of the most common symptoms is pain. The severity and type of pain determine the appropriate medication needed. For mild to moderate pain, acetaminophen is often prescribed. For moderate to severe pain, providers may add narcotics such as codeine to acetaminophen to manage pain. For pain associated with inflammation, such as arthritis, a nonsteroidal anti-inflammatory drug (NSAID) such as ibuprofen or naproxen might be appropriate.

There are many other difficult decisions that a patient and their family will face during their end-of-life care. The nurse should be prepared to offer advice and answer a variety of questions, including:

- What is the most effective method of pain management?
- When is the right time to begin morphine administration?
- Do the benefits of morphine administration outweigh the disadvantages?
- Should a feeding tube be ordered when the patient can no longer eat?
- Will the use of a feeding tube prolong life and prevent suffering or merely prolong the patient's suffering?
- Should intravenous fluids be provided when a patient can no longer drink and appears dehydrated?
- Will the use of intravenous fluids prolong life and prevent suffering or merely prolong the patient's suffering?

Ultimately, for any decision involving palliative care, the key question is how it will impact the patient's quality of life and relieve their suffering.

32.2 End-of-Life Care

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Describe the differences between hospice care and palliative care
- Identify the nurse's role in hospice care
- Discuss the importance of communication during end-of-life care
- Analyze the impact and implications of medically assisted dying as an end-of-life care option

End-of-life care is designed to provide relief of symptoms for someone who has received a terminal or incurable diagnosis and has chosen not to receive treatment for the condition. It is not necessary to wait until hours, days, or even weeks prior to a person's passing to implement this care. In fact, the sooner end-of-life care begins, the more opportunities there are to provide physical, spiritual, and emotional comfort for both the patient and their

family—processes that may happen over many months.

End-of-Life Care

End-of-life care encompasses the time frame leading up to a person's death. It is compassionate care designed to assist both the family and patient during this major season of life. Palliative care is introduced when a patient's disease is no longer responding to treatment and focuses on the person's physical comfort. In contrast, hospice care is utilized when a person is nearing the end of life (fewer than six months to live) and focuses not only on comfort care but also on the physical, psychological, emotional, and spiritual needs of both the patient and their family (American Psychological Association, 2024).

Hospice

Hospice care can be provided in the patient's home, enabling the patient to die at home if they choose; however, some patients may prefer to seek hospice care in a hospital or specialized facility until the very end. Regardless of the setting, the goal of hospice is to provide comfort versus curative care. Hospice services are intended to bring comfort to the patient through physical, psychological, emotional, and spiritual care, as well as provide supportive services for the family during the dying and bereavement processes.

Hospice Team Members

Hospice care is provided by an interdisciplinary team, typically consisting of a provider, nurse, certified nursing assistant, social worker, and chaplain, who work together to provide a comprehensive plan of care (Table 32.3). Each team member holds a piece of the puzzle for the patient's care plan; thus, it is vital that the team communicates frequently.

Team Member	Role in Hospice Care
Primary Care Provider (PCP) Advanced Practice Registered Nurse (APRN) Nurse Practitioner (NP) Physician Assistant (PA)	• Oversees the patient's care. • Writes the orders for the care team to follow. • Provides prescriptions and medication orders for the patient. • Communicates within the interdisciplinary team to promote optimal patient outcomes.
Nurse	• Is the front-line provider for the patient's care. • Conducts assessment of the patient's condition each visit. • Communicates changes in condition to the provider. • Writes the plan of care and revises as needed. • Coordinates the patient's care within the interdisciplinary hospice team. • Coordinates care with the medical equipment provider. • Coordinates prescription needs with the pharmacy. • Communicates pertinent information to the CNA, social worker, and chaplain throughout the patient's care. • Supervises patient- and family-centered care to promote patient safety and optimal outcomes.
Certified Nursing Assistant (CNA)	• Helps the patient with ADLs such as bathing, dressing, and grooming. • Maintains cleanliness in the patient's environment. • Ensures needed items are within the patient's reach. • Prepares small meals such as breakfast, lunch, or snacks. • Communicates within the interdisciplinary team to promote continuity of care.

TABLE 32.3 The Interdisciplinary Hospice Care Team

Team Member	Role in Hospice Care
Social Worker (SW)	• Provides counseling for the patient and family. • Assists with education needs. • Provides assistance with paperwork. • Assesses challenges and risks for the patient, coordinating solutions for each. • Connects patients with services. • Communicates within the interdisciplinary team to promote continuity of care.
Chaplain	• Visits and socializes with the patient. • Meets spiritual and emotional needs. • Communicates within the interdisciplinary team to promote continuity of care. • Continues to visit the family after the patient's death.

TABLE 32.3 The Interdisciplinary Hospice Care Team

Settings of Care

Hospice care is commonly provided in the patient's home. However, hospice care can also be provided in hospital settings, independent facilities, and long-term care facilities. The setting of the patient's care is dependent on the patient's wishes, facility policies, the geographic location of independent facilities, and health insurance coverage. The health of the caregiver and their ability to care for the patient as their illness progresses may also dictate the setting of care.

Hospice agencies typically also have **respite care** arrangements with skilled nursing facilities. Respite care provides short-term relief or some time off for the person providing care.

The hospice nurse will coordinate the arrangements to provide the caregiver with a temporary rest period during which the patient will briefly reside in a nursing facility, and then return home.

LINK TO LEARNING

Review this page of resources and fact sheets about palliative and end-of-life care (https://openstax.org/r/77APAEndofLife) from the American Psychological Association.

Nursing Management

The nurse takes on the role of case manager to coordinate care, advocate for their patient, and teach the family how to provide care as their loved one dies. The nurse typically visits the patient in their home to assess for any changes or worsening of condition, as well as to monitor for any necessary medication and treatment changes. The visits will likely increase each week as the patient's condition deteriorates. As the patient advocate, it is important that the nurse communicates their assessment findings to each team member to ensure the patient's needs are being met effectively; it is especially important to communicate with the provider to determine if new orders are needed for the patient's care.

LINK TO LEARNING

The End-of-Life Nursing Education Consortium (ELNEC) (https://openstax.org/r/77ELNEC) project is a national and international education initiative to improve palliative care.

Communication in End-of-Life Care

Communication can be difficult during end-of-life care. During this time, there are a variety of sensitive topics that many people do not feel comfortable discussing; however, it is important to engage in these conversations to ensure the patient's wishes are followed.

The nurse should plan to answer many questions from the patient and their family while discussing the patient's needs and terminal diagnosis, conversations that will happen multiple times throughout the care process. It is as important to actively listen as to provide information. The nurse who listens empathetically with compassion and remains sensitive and nonjudgmental is a source of emotional support and an invaluable asset for the patient and family during this difficult time.

When end-of-life care begins, it is important to discuss with the patient and family the necessity of having essential legal documents, such as an advance directive and durable power of attorney. An advance directive enables the patient to outline their wishes for their end-of-life care while they are still of sound mind and able to make these kinds of decisions. A **durable power of attorney (DPOA)** enables the patient to list specific individuals whom they entrust to make financial and health-care decisions when they are no longer able to do so. If the patient desires to address only health-care matters during end-of-life care, they can choose to utilize a durable power of attorney for health care only.

One of the most difficult conversations to have with a hospice patient concerns their DNR/DNI status. This conversation is typically brought up during the admission to hospice. The patient and family may want to defer this decision until a later time; however, it is vital to establish the patient's desire regarding this matter at the beginning of their end-of-life care. Once they have confirmed their decision, the patient will sign the DNR/DNI order, or the MOLST/POLST form, to be placed in their record. There are some hospice organizations that do not require their patients to have a DNR status, while others make DNR status a requirement.

Along with securing the patient's overall wishes for their end-of-life care, it is equally important to discuss the patient's needs and wishes with each member of the medical team on a regular basis. This will ensure the comprehensive plan of care is revised and updated accordingly, which will ultimately keep the team functioning in unison with the patient's needs and desires.

Medical Management

The goal of medical management during end-of-life care, especially hospice care, is symptom management. When a patient's symptoms cannot be relieved completely, it is important to decrease them to a tolerable level and maintain comfort. Symptoms may be related to the terminal diagnosis or to other chronic illnesses or comorbidities. The treatment methods during end-of-life care are both pharmacological and nonpharmacological. While some symptoms may require medications, other symptoms may require interventions such as positioning, guided relaxation, or the use of DME such as a CPAP, BIPAP, or supplemental oxygen.

Common symptoms to be addressed during end-of-life care include pain, shortness of breath, nausea and vomiting, anxiety, weakness, decreased appetite, dehydration, and incontinence. A list of key symptoms in different stages of dying can be found in Table 32.4. Oxygen is often used to relieve shortness of breath and its associated symptoms, such as anxiety, weakness, and confusion. When oral medications become ineffective for pain relief, sublingual or subcutaneous morphine is typically prescribed; morphine is also effective in relieving shortness of breath and associated anxiety. It is important to educate the family to expect symptoms such as weight loss, decreased appetite, cognitive decline, and decreased urinary output; doing so can help prevent excessive worry or panic during end-of-life care.

Stage	Symptoms	Management Tips
Early	• Decreased appetite • Increased fatigue • Changes in sleep patterns • Decreased interest in surroundings	• Offer small, frequent meals or favorite foods • Ensure comfort with appropriate bedding • Provide a calm, quiet environment
Mid	• Weakness and increased sleep • Decreased urine output • Cool and mottled skin • Changes in breathing patterns (e.g., irregular, shallow)	• Maintain warmth with blankets • Use skin moisturizers to prevent dryness • Monitor and adjust position frequently for comfort
Late	• Cheyne-Stokes breathing (alternating between slow, heavy breaths and periods of apnea) • Possible "death rattle" (noisy breathing) • Unresponsiveness	• Position the patient for optimal comfort and breathing • Consider medications to reduce noisy breathing • Ensure a supportive environment for the family
Final	• Marked decrease in consciousness • Unresponsiveness to stimuli • Irregular heart rate • Final cessation of breathing and heartbeat	• Provide emotional support and comfort care • Reassure and support the family • Contact hospice care team for final arrangements

TABLE 32.4 **Key Symptoms in Different Stages of Dying**

The hospice agency may provide the patient's caregiver with a comfort care kit to address and relieve the common symptoms associated with end-of-life care. Common medications found in the kit will vary, but typically include an antiemetic for nausea and vomiting, an antidiarrheal, a stool softener for constipation, acetaminophen for breakthrough pain and fever, and morphine for pain and symptoms associated with shortness of breath.

As the patient nears death, they will not be able to clear respiratory secretions, resulting in a change in breathing pattern. Suctioning or atropine will be utilized to minimize the excess secretions and decrease the noisy, gurgling type of breathing. It is important to discuss this with the family before it occurs to prevent panic and alarm at the onset of this change. At this point, the patient is typically unresponsive and unaware of the change, but the family often has difficulty believing the patient is not in distress. Providing reassurance for the family is essential.

It is noteworthy to mention discharge from hospice care. Some patients improve while receiving hospice care, at which time they are discharged. This can be a joyous experience, as it gives the family more time with their loved one. During this time, the hospice team will periodically check in on the patient. When the patient has a recurring decline and is again eligible due to physical needs, they can be readmitted into hospice.

Ethics and End-of-Life Care

It is the nurse's responsibility to provide care that is in alignment with the patient's moral principles, values, and spiritual and cultural beliefs, while also maintaining professional and ethical standards of care, especially as the patient's condition deteriorates. One of the most difficult decisions during end-of-life care is whether to withhold or withdraw medical interventions. This is why advance directives are critical during end-of-life care; difficult decision-making should be avoided during this time.

Medically Assisted Dying

A patient with terminal illness or severe chronic condition may seek to end their life in order to prevent pain and suffering, due to loss of autonomy, or for similar reasons. While certain terms and methods are often considered to be the same, there are deep distinctions between them. A **provider-assisted death** typically involves a provider providing a written prescription for a lethal dose of medication for the patient to administer themselves to end their life. This practice is designed for patients with terminal illnesses who are experiencing unbearable suffering, allowing them to control the timing and manner of their death. Currently, provider-assisted death is legally permitted in several U.S. states and jurisdictions, including California, Colorado, Hawaii, Maine, Montana, New Jersey, New Mexico, Oregon, Vermont, Washington State, and Washington, DC. In contrast, **euthanasia** involves an act by a separate individual to cause death (e.g., directly administering the medication); it is illegal throughout the United States. A nurse is ethically prohibited from administering medical aid in dying, but they must be informed and comfortable supporting patients and families in end-of-life situations.

The choice to pursue medically assisted dying generates a spectrum of emotions and ethical dilemmas. It offers a way for individuals to avoid prolonged suffering and assert control over their end-of-life experience. With patients legally having autonomy to control all other end-of-life decisions, it is reasonable to ask why the decision to choose medically assisted dying should be any different. However, it also conflicts with traditional medical ethics, as health-care providers are trained to preserve life rather than end it. This creates a challenging dynamic for health-care providers, who must balance their professional duties with personal beliefs about the morality of ending life. It is crucial for healthcare professionals to conduct self-assessments, maintain professional objectivity, and respect patients' autonomy and decisions, whatever their personal views.

REAL RN STORIES

Nurse: Laura, RN
Years in Practice: Fifteen
Clinical Setting: Home care
Geographic Location: Georgia

I had been caring for Mr. Hampton when he experienced a significant decline in kidney function. Mr. Hampton's provider informed him that he needed to begin dialysis treatment to maintain his quality of life. However, Mr. Hampton, being 75 years of age, felt he had lived a good life and did not want to pursue dialysis.

During one of my home care visits, Mr. Hampton shared the details of his last office visit with his provider and the provider's recommendations to begin dialysis. I had been caring for Mr. Hampton for quite some time and had developed a trusting, nurturing relationship with him. I listened empathetically to Mr. Hampton, presenting a professional, nonjudgmental demeanor, as he explained that he had chosen not to pursue dialysis.

Mr. Hampton lived with his daughter after losing much of his mobility, but his cognitive abilities remained intact. I knew that without dialysis, Mr. Hampton's physical condition and sharp cognition would deteriorate in a short amount of time. While I respected Mr. Hampton's decision, I knew I needed to inform Mr. Hampton and his daughter about what to expect moving forward to ensure that a well-informed decision was being made.

I proceeded to help Mr. Hampton and his daughter with additional end-of-life care decisions, including completing an advance directive and durable power of attorney, to ensure that Mr. Hampton's needs and desires would be carried out. I assisted them with their admission to hospice care. I remained attentive to their needs, provided emotional support, and continued to coordinate Mr. Hampton's care until his passing. For several weeks afterward, my agency remained in contact with Mr. Hampton's daughter to ensure she received emotional support as she transitioned through the bereavement process. The importance of end-of-life care was personified as Mr. Hampton passed with his dignity intact, and his daughter was emotionally supported throughout the entire process.

32.3 Assessment

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Describe the purpose of assessment during end-of-life care
- Identify expected physiological changes with end-of-life care
- Discuss the parameters for identifying the time of death for a patient

Assessment is the first part of the nursing process; it includes collecting objective data and a thorough medical history. It enables the nurse to obtain a holistic view of the patient to identify their needs and formulate an individualized plan of care. The initial assessment provides the patient's baseline information, which is then utilized to monitor for changes, worsening of a condition, or periods of exacerbation. Regular assessments are vital to ensure that the patient receives the right care, at the right time, and in the right setting, and that care aligns with the patient's desires.

Assessment for End-of-Life Care

The initial assessment for a new patient is a vital component of ensuring the patient's directives are followed during their end-of-life care. Not only is the nurse conducting a physical assessment, but they are also assessing the patient's final wishes and the family's dynamics and communication style. Including the family during end-of-life conversations is crucial so they are also aware of their loved one's wishes. The nurse must be observant and detail-oriented and initiate open-ended questions to formulate an individualized plan of care aligned with the patient's directives.

Each assessment is different, and the process of gathering information needed for the patient's comprehensive plan of care will be ongoing. With each follow-up visit, the nurse will continue to gather additional information that will likely necessitate changes to the initial plan of care. Topics of conversation with the patient and family during the initial assessment can be found in Table 32.5.

Category	Consideration	Examples
Disclosure	How does the family discuss very sensitive information?	• Are there any topics that the patient and family are uncomfortable discussing? • Who is the point of contact to disclose critical information to? • What kind of information can be disclosed to the children? To the family or extended family?
Decision-Making Style	How are decisions made in the family?	• Who is the primary decision maker? • Are decisions individual, family-centered, or completely provider-based? • Is there a designated **health-care proxy** who will make decisions when the patient is no longer able to decide?

TABLE 32.5 Topics to Discuss During an Initial Assessment

Category	Consideration	Examples
Symptom Management	How does the patient want their physical symptoms managed?	• How is a specific symptom affecting the patient's life (e.g., physical functioning, mobility, comfort)? • What makes the symptoms worse or better? Are the symptoms worse at a particular time of day? • Which medications are acceptable for relief of symptoms? • What are the patient's and family's expectations or goals for managing the symptoms? How is the patient coping with the symptoms? • What are the patient's beliefs regarding their care? • To what degree does the patient desire their care to be managed?
Life-Sustaining Treatment	Has the patient thought about the care they want as the end of life draws near?	• Do they have an advance directive or durable power of attorney? • What are their desires for nutrition and hydration? • Does the patient want to receive CPR or be connected to a ventilator? • Are antibiotics acceptable if an infection develops? • Would the patient want dialysis if their kidneys begin to fail?
Desired Location of Dying	Does the patient want to pass at home, or is there a preference for an alternate location?	• Who does the patient want as their primary caregiver? • Is the patient more comfortable with a female or male caregiver?
Spiritual/ Religious/ Cultural Practices	Is there anything specific that the patient needs the care team to know regarding their beliefs?	• Are there any practices that need to be observed as death nears? • Is there anything specific the care team needs to know about the care of the patient's body after death? • How does the family express grief? • Are there expected beliefs or practices that are important to the family during the grief/ mourning process?

TABLE 32.5 Topics to Discuss During an Initial Assessment

Expected Physiological Changes

Physiological changes will vary in a palliative care patient compared to a hospice patient with an anticipated life expectancy of six months or less. However, both palliative care and hospice patients seek end-of-life care to reduce or relieve their symptoms and maintain their quality of life and dignity. The care provided is dependent on which stage of the end-of-life process each patient is in.

Not everyone who is nearing death experiences pain, but it is a common symptom of both patients receiving

palliative care and hospice care. Pain can be draining and cause irritability, making it difficult to communicate with the patient. For a patient experiencing confusion, dementia, or a decreased level of consciousness, it may be difficult for them to express their pain level. Clues to watch for may include moaning, difficulty sleeping, or increased agitation or crying; patients in pain may also guard a specific site or extremity. It is also important to note that it is easier to treat pain at the initial onset, before it becomes extreme.

Another symptom that may be common in both populations of patients is shortness of breath or a feeling of breathlessness. The discomfort of not being able to catch one's breath may also lead to increased anxiety and agitation. Interventions that may help reduce shortness of breath include elevating the patient's head, opening a window, or using a fan to circulate air in the room. Patients with a respiratory diagnosis may have prescribed medications or therapies, such as an inhaler, nebulizer breathing treatments, or supplemental oxygen.

CLINICAL SAFETY AND PROCEDURES (QSEN)

Palliative Nursing Interventions for Shortness of Breath

Decrease anxiety

- Administer medication prescribed for anxiety or panic related to shortness of breath.
- Suggest relaxation techniques.
- Assist patient with a means to call for assistance, such as a call bell.

Treat underlying pathology

- Administer prescribed medications such as inhalers or nebulized breathing treatments.
- Administer prescribed diuretics and monitor fluid balance.

Alter perception of breathlessness

- Administer prescribed oxygen.
- Administer oral, low-dose opioid, such as morphine.
- Utilize a fan to provide air movement in the patient's environment.

Reduce respiratory demand

- Utilize energy conservation techniques, such as pursed-lip breathing, frequent rest periods, or attempting difficult tasks during the mornings when the patient has more energy.
- Ensure needed items are within the patient's reach, such as the phone, television remote, fluids, and snacks. (For hospitalizations or skilled facilities, ensure the call bell is within reach.)
- Utilize medical equipment such as a bedside table/tray, bedside commode, shower chair, or hospital bed to elevate the patient's head.

As a person nears death, their breathing pattern will eventually change to Cheyne-Stokes breathing. This is a breathing pattern that may alternate between slow, heavy breathing and shallow, rapid breathing, with possible intermittent delays (apnea) between each breath. The patient may also develop a noisy type of breathing sometimes called a "death rattle." While this may be alarming to the family, it usually is not upsetting to the patient. However, repositioning the patient will sometimes help, as will administering certain medications.

LINK TO LEARNING

Watch this video to hear an example of Cheyne-Stokes breathing (https://openstax.org/r/77CheyneStokes) and a description of its causes and treatment.

Digestive problems can become a common issue for both palliative care and hospice patients. Constipation is quite common for patients with decreased fluid intake; it is also an associated side effect of pain medications. Nausea, vomiting, and loss of appetite are also common at the end of life, and treatments will vary depending on the cause. For patients with decreased appetite, it might be helpful to offer favorite foods or serve frequent, small meals rather

than three large meals each day. Offering a high-calorie drink with a meal, such as brand names Boost or Ensure, may also be helpful. If the patient is weak or tired, the caregiver might find the patient is willing to eat if they feed them. It is important to note that a dying patient should not be forced to eat. Going without food and water can be unsettling to the family, but it is not painful for a dying patient.

LINK TO LEARNING

Specifics will vary with each patient, but knowing the signs and symptoms to watch for as well as the interventions for each situation (https://openstax.org/r/77ELNECSupp) will ensure you are prepared for a patient who is actively dying.

Time of Death

Often family members will ask how much time their loved one has left. It can be difficult to answer this question because each patient and the associated disease processes are different. However, as the end of life draws closer, symptoms such as decreased appetite, decreased fluid intake, decreased urine output, decreased level of consciousness, increased temperature, and changes in breathing pattern will be observed. It is important to discuss these changes with the family so that they are not alarmed when they occur. Education by the nurse can truly make a difference in decreasing the panic experienced by a family as they watch their loved one go through the stages of dying.

Additionally, it is important to prepare the family in advance for what they need to do if their loved one passes without a hospice caregiver present, especially if the patient has elected to pass at home. While family members may instinctively want to call 911, they should instead immediately call the on-call number of their hospice agency so that the nurse can come to their home to conduct the pronouncement of death, assist the family with the funeral home process, and provide comfort, compassion, and support.

LINK TO LEARNING

This article reviews common end-of-life signs (https://openstax.org/r/77WebMDEOL) for family members with a loved one approaching death.

Nurses are an invaluable support for the family of a deceased person. Simply being available to listen to the family is a crucial part of healthy grieving and coping. The nurse will answer questions or concerns about the circumstances surrounding the death and preparations for viewing the body, as well as assist in helping to contact support people such as the coroner, clergy, or relatives. There may also be times when the nurse assists the family with decision-making regarding a funeral home, transportation, and removal of a loved one's personal belongings. Utilizing sensitive, interpersonal skills at this time is essential.

LINK TO LEARNING

Patients and families may wish to review these resources for experiencing palliative care (https://openstax.org/r/77PallCareRs) from the Palliative Care Resource Center.

32.4 Psychosocial Support

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Identify the role of hope in end-of-life care
- Examine grief, mourning, and bereavement as part of the end-of-life process
- Discuss ways to provide culturally competent care during the end-of-life process
- Examine resources available to support culturally and spiritually competent care

Patients suffer needlessly when they do not receive adequate care for symptoms associated with their serious illness. Not only is care needed for their physical problems, but it is also important to give attention to a patient's psychosocial and spiritual needs. This will enable the nurse to have a more comprehensive understanding of how the patient and their family have been impacted by their illness, while also ensuring that the nurse develops a holistic plan of care to meet everyone's psychosocial and spiritual needs.

Providing Psychosocial Care at the End of Life

Psychosocial care involves providing psychological and social support. This requires the nurse to use sensitivity and compassion to understand the patient's feelings, thoughts, behavior, health, well-being, and quality of life. Often this can involve discussing difficult topics. Nurses have a responsibility to discuss the possibilities and probabilities related to a patient's diagnosis and its impact on quality of life. The nurse also provides support as the patient reviews their life, values, and treatment decisions and seeks end-of-life closure. Simultaneously, nurses need to be culturally aware and exercise cultural competence when discussing death with patients and their families. The nurse must set aside their own prejudices or personal preferences to explore the type and amount of disclosure that will be most beneficial for the patient and family within their unique belief systems.

CULTURAL CONTEXT

Culture, Religion, and End of Life

Cultural and religious beliefs significantly shape an individual's perspectives on death and their end-of-life practices. Recognizing these diverse beliefs is essential for providing respectful and empathetic care. Each religion or cultural group has its own unique practices and principles surrounding death, which can impact medical decisions, funeral arrangements, and grieving processes. Table 32.6 summarizes how major religions around the world view death.

Religion	Major Beliefs about Death
Catholicism	• Beliefs: The soul of the deceased is believed to spend eternity in heaven, hell, or purgatory. Dying individuals should receive sacraments administered by a church leader. • Practices: Autopsies, organ donations, and cremation (post-1963) are permissible. A vigil is held before the funeral mass, which includes the Eucharist and can be led by a priest or deacon. Internment requires a rite of committal. • Nursing Implications: Nurses should ensure that sacraments and last rites are arranged if requested and learn the family's preferences for autopsy and organ donation.
Protestantism	• Beliefs: Various denominations believe in an afterlife. Beliefs about death and the afterlife can vary significantly across denominations. • Practices: Autopsies, organ donations, and cremation are generally allowed. Funerals may be led by a minister or chaplain. • Nursing Implications: Nurses should respect the family's wishes regarding funeral arrangements and be prepared to coordinate with clergy if needed.

Note: Beliefs may vary within each religion, and the information here represents general beliefs of each religion.
TABLE 32.6 **Religious Beliefs about Death** (Lowey, n.d.)

Religion	Major Beliefs about Death
Judaism	• Beliefs: Life is highly valued, though death is not seen as tragic. Beliefs about the afterlife vary among denominations. • Practices: Autopsies, embalming, and open caskets are not permitted. Funerals are held as soon as possible after death, excluding Sabbath or festival days. Mourners wear dark clothing and observe mourning periods, including shiva for the first seven days. • Nursing Implications: Nurses should facilitate timely funeral arrangements and adhere to practices around autopsies and caskets. Support for mourners during the grieving process may also be needed.
Buddhism	• Beliefs: The goal is a peaceful death within the cycle of life, death, and rebirth. A statue of Buddha may be present at the bedside. • Practices: Organ donation is not allowed. The room may be scented with incense, and the body is prepared by the family. Cremation is common; if buried, the body is dressed in regular daily clothes. Chanting by monks may occur at the funeral. • Nursing Implications: Nurses should be aware of the need for incense and body preparation and the family's preference for cremation or burial. Coordination with monks for chanting may be requested.
American Indian	• Beliefs: Beliefs and practices vary widely among communities. Death is often seen as a journey, with ancestors guiding the deceased. Sickness may signify an imbalance with nature. • Practices: Each community has distinct beliefs and customs. Family members may prepare the body, even if they were not present at the time of death. Organ donation is generally not supported, and natural burials are preferred. Healers and medicine persons may play a significant role, conducting ceremonies to honor the deceased and guide their spirit on its journey. These ceremonies can include prayers, songs, and rituals meant to restore balance and provide spiritual support to the community. • Nursing Implications: Nurses should respect community traditions and practices regarding body preparation, burial, and ceremonies led by healers or medicine men. Understanding and facilitating these practices helps to provide culturally sensitive care and honor the family's spiritual needs.

Note: Beliefs may vary within each religion, and the information here represents general beliefs of each religion.
TABLE 32.6 Religious Beliefs about Death (Lowey, n.d.)

Religion	Major Beliefs about Death
Hinduism	• Beliefs: Reincarnation and karma are central beliefs. Peaceful dying and death are desired. • Practices: Organ donation and autopsies are permitted. The body must be bathed daily after death and attended at all times until cremation (which should occur within twenty-four hours). Ashes are traditionally scattered in sacred rivers. • Nursing Implications: Nurses should facilitate body care and attend to religious practices surrounding cremation and the handling of ashes.
Islam	• Beliefs: Belief in an afterlife is central. The soul is considered freed after burial, which must occur promptly. • Practices: Embalming and cremation are not permitted; autopsies may be performed for medical or legal reasons. The body is shrouded and positioned to face Mecca (or the East). A person of the same gender should prepare the body, and there is separate seating for men and women at the funeral, with minimal flowers and mourning. • Nursing Implications: Nurses should facilitate timely burial and respect practices related to body preparation and gender-specific care. Awareness of cultural sensitivities related to mourning and funeral arrangements is also crucial.

Note: Beliefs may vary within each religion, and the information here represents general beliefs of each religion.

TABLE 32.6 Religious Beliefs about Death (Lowey, n.d.)

Understanding and respecting these diverse beliefs and practices is fundamental for nurses to provide compassionate, culturally competent care. Tailoring care to accommodate these needs ensures that patients and their families experience dignity and respect during the end-of-life process.

Hope

Hope is as much an integral part of end-of-life care as it is a part of curative care. In the medical community, hope is usually associated with finding a cure. However, in end-of-life care, hope is equated with prolonging life and maintaining one's quality of life and dignity. Patients receiving end-of-life care still have hope for things they want to accomplish.

According to psychologist C. R. Snyder (1994), there are three conditions for hope to thrive: goals, pathways, and agency. A goal is a desire, and a pathway is the means to obtain the goal. Agency refers to the beliefs that motivate us to strive for our goals. Agency can also be uplifted by the love, care, and support provided by those around us. While serious illnesses can easily make us feel hopeless, it is important for nurses to be a support network for patients and families, helping them navigate the pathways and nurture the agency necessary to achieve their goals during end-of-life care.

CLINICAL SAFETY AND PROCEDURES (QSEN)

Patient-Centered Care: Fostering Hope

It is important for a nurse to foster hope. Here are some methods a nurse can use:

- Make time to listen.
- Encourage patients to share their feelings.
- Provide accurate feedback and information.
- Support patient control over their circumstances, choices, and environment.
- Assist the patient in finding meaning in their life.
- Encourage realistic goals.
- Facilitate communication within the family.

- Assist with creating and developing networks within the family or community.
- Follow up with the social worker and chaplain to coordinate visits for the patient.

Grief, Mourning, and Bereavement

The emotions that a person feels internally after the loss of a loved one is called **grief**, while the outward expression of grief, such as wearing black, conducting a funeral or memorial, or journaling, is called **mourning**. The time frame following the loss, in which grief is experienced and mourning is expressed, is called **bereavement**. In 1969, Elisabeth Kübler-Ross categorized five stages of grief, as seen in Table 32.7. It is important to note that everyone grieves differently and at their own pace. Thus, the five stages of grief are cycles that may be repeated for an indefinite amount of time. A patient will also experience these various stages as coping mechanisms at the end of their life.

Stage	Description
Denial	The person may have difficulty accepting the circumstances are true. They may experience feelings of isolation or seek another health-care professional's opinion.
Anger	The person may wonder, "Why me?" They may feel resentment, rage, or envy directed at family members, health-care professionals, caregivers, or God.
Bargaining	The person may bargain for the patient to see a specific event, like a grandchild's birth or graduation, or plead for more time to reach a specific goal. This process might include making promises to God.
Depression	The person may feel a deep sadness about the loss. The patient may fear that a loved will struggle to get along after their passing.
Acceptance	The person is no longer angry or depressed and can acknowledge that the patient has lived a good life.

TABLE 32.7 Stages of Grief (Kübler-Ross, 1969)

LINK TO LEARNING

Watch this humorous video to see the Kübler-Ross stages of grief (https://openstax.org/r/77KRGrief) in action.

Patient and Family Concerns

Families may feel powerless or experience increased guilt related to their feeling of powerlessness. A helpful intervention is to involve the family in the patient's treatment and care. Families may also have learning deficits or inadequate coping mechanisms or communication skills; they may feel off balance with the impending death of their loved one. Nurses are exemplary teachers who quickly find themselves in a case manager role, coordinating and implementing the patient's plan of care and becoming the patient's and family's most utilized resource during end-of-life care.

It is also important to note that the family's method of coping may not coincide with the values and beliefs of the nurse or other members of the interdisciplinary team. Regardless, it is imperative that the patient's and family's wishes be respected to the greatest extent possible. The nurse's role throughout is to help the family members obtain the knowledge and tools they need to care for their loved one and process their death. This help could be as simple as teaching the family techniques for conserving their energy. Knowledge deficits can also relate to:

- a lack of understanding related to the patient's diagnoses, treatment regimen, or plan of care.
- an inability to anticipate a medical crisis.
- inexperience with end-of-life care and the protocol to follow for emergent care outside of the hospital.

However they are needed, nurses provide a strong foundation of support as they help and guide the patient and family through the end-of-life period.

Providing Culturally Competent Care

A portion of the nurse's role during assessment is to gather information related to the values, preferences, and practices of each patient. Sharing the patient's and family's cultural beliefs and practices with the care team is essential. This information, including the details of the patient's end-of-life care, preparation for death, and after-death rituals, should be included in the plan of care.

An important component of providing culturally competent care within the family is to use discretion as to the appropriate time and setting for sensitive conversations to be conducted. For example, in some cultures a designated family member speaks for the patient regarding treatment decisions. Several conversations during several patient visits may be necessary to ascertain the full context of the patient's end-of-life beliefs, preferences, and practices; this can give the nurse time to formulate appropriate questions for the next visit.

Providing context for these discussions is also helpful. For example, the nurse might preface a conversation by saying: "We want to ensure that we provide care that best addresses your needs. Honoring and supporting your wishes is of the utmost importance to us. We welcome any feedback that you may have as to how we are doing and what we could do better. If you do not mind, I would like to ask you a few questions to help me better understand and support what is most important to you. You don't have to answer anything that might make you feel uncomfortable, or if you need to time to think about your answer to share during our next visit, that is fine too."

As a new nurse, discussing sensitive information of this nature might feel uncomfortable at first, but it will become easier with time. Partnering with an experienced nurse for the first few assessments can be helpful. The bottom line is that patients and families will appreciate and respect the nurse for being forthright in initiating conversations that prioritize them, especially their cultural beliefs and practices.

Spiritual Care

When nearing the end of life, spiritual needs can become as important to a patient as physical concerns. While spiritual assessment is a key component for a terminally ill patient, spirituality is much broader than a patient's religious preference, affiliation, or beliefs. Spiritual needs may include the presence or absence of a sense of peace, purpose in life, or harmony with loved ones; it may require making amends with someone to resolve unsettled issues or offering reassurance that certain items will be taken care of (Swihart, Yarrarapu, & Martin, 2023).

Patients will often express their questions or concerns to a nurse before openly discussing them with their provider or family. However, the social worker and chaplain on the care team are also instrumental in helping with the patient's and family's spiritual care. It is important to sharpen your listening skills to bridge the communication gap within the family, helping to begin difficult conversations. Active listening and a heart of compassion go a long way in end-of-life care.

Some patients find solace in their faith and will ask to read a religious text or listen to religious music; other patients may derive equally spiritual benefits from reading secular texts or listening to secular music. Spiritual comfort can also be found when family and friends talk with their loved one about the importance of their relationship or when they reminisce about fond memories and good times. However it happens, optimal spiritual care provides holistic healing for a patient and their family.

LINK TO LEARNING

The Library for Spirituality and Healthcare (https://openstax.org/r/77SpiritHealth) provides an opportunity to expand your learning on a variety of topics related to spirituality and its influence on the delivery of health care and patient outcomes.

Resources to Support Cultural and Spiritually Competent Care

Many communities are culturally diverse. To ensure cultural and religious competence in clinical practice, it is important to have an understanding of various religions and their beliefs associated with clinical issues, death, and

dying. Palliative and end-of-life care should always consider why culture is important, how culture influences end-of-life care, what barriers to effective communication exist, and what role the family should play. To provide the best care to patients, the nurse should utilize cultural resources and examine their own personal cultural beliefs to better understand the effects of culture on nursing care.

LINK TO LEARNING

The 2023 article "Cultural Religious Competence in Clinical Practice" (https://openstax.org/r/77NBK493216) by Diana L. Swihart, Siva Naga S. Yarrarapu, and Romaine L. Martin provides an overview of key tenets of major religions the nurse may encounter in patient care.

32.5 Special Considerations

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Analyze how caring for the dying patient affects the health-care provider
- Evaluate the health-care provider's attitudes toward death and dying
- Discuss options to support the caregiver during the end-of-life process

To develop a level of comfort with patients who are seriously ill, the nurse and other clinicians should consider their own experiences and values related to illness and death. Taking time to reflect, read, and talk with others is helpful when examining one's own beliefs about death and dying. Talking with individuals with different cultural beliefs will give nurses greater insight and ability to see things "through a different lens," making them more sensitive to other cultures' death-related beliefs. Finally, talking with other nurses and colleagues can help the nurse to gain a broader perspective on the diverse values shared by other health-care workers and the patients in their care.

Special Considerations for the Health-Care Team

Nurses and their health-care teams encounter death and loss daily, making grief a common experience. This can result in unresolved sadness, which Smith-Stoner and Frost have referred to as **shadow grief**. Everyone may possess a bit of shadow grief, but health-care providers tend to have a great deal. If left unresolved, the negative impacts of working with the dying—and the associated grief, unresolved anxiety, or denial—can lead to illness and burnout.

It is important to face our emotions, to stop pretending that we do not experience grief and the associated suffering of caring for the dying. Common defenses to avoid confronting our grief include suffering in silence, remaining "strong," staying busy, and taking care of others. Talking with other members of the care team is important for processing the intense emotions associated with caregiving of the dying (Smith-Stoner & Frost, 1998).

The Nurse's Attitudes Toward Death and Dying

The nurse's attitude toward death and dying can be a barrier to providing **holistic care** during end-of-life care. Holistic care includes the care of the whole person—their body, mind, spirit, and emotions. While death and dying tend to be difficult conversations for both health-care providers and patients, such conversations may be welcomed by the patient. In fact, as nurses enter the patient's world to discuss death and dying, the nurse can find healing through the patient's struggles and strengths. Conversations of this nature also help the patient find acceptance, enabling them to let go of related anger or depression. Communication can be healing for everyone involved, especially when the topic is a difficult one.

LIFE-STAGE CONTEXT

Children and Hospice

Death and dying do not discriminate by age. As difficult as it may be to accept, children die, too. To come to terms with this reality, you may need to accept the child's medical condition in your mind before you can accept it in your heart.

Dying children need our honesty. Protecting a child from the truth will likely result in them feeling alone and isolated. Children can cope only with what they know, making it crucial to create open, honest communication. Follow the child's prompting to determine what they do or do not want to know. Do not be surprised if they wax and wane between these two things. If you do not know the answer to a question, admit this to the child. Simply reassure them that together you will find out.

It is important to use language the child will understand as they slowly come to terms with the fact that they are dying. A young child may never fully comprehend the circumstances, but being honest with them will enable the child to think through the situation to formulate questions and develop more understanding. Never try to protect children by lying. It will lead to confusion, frustration, and anger because they will notice the emotions of their loved ones do not fit with the story they have been told.

While we should encourage communication, we should not force it. Children will process the reality of their situation in small doses over time as they are able to cope with it. Only answer what the child asks. Be careful not to overrespond.

Be mindful that children tend to make statements rather than directly articulate their thoughts or feelings. Be observant of cues or behaviors that may reflect unspoken needs and give insights into the child's awareness of things. Allow children to experience their feelings. Do not try to help them get over their feelings; instead, help with validating them.

Understand that despite the situation, children still want to live as happily as possible, laughing and playing as much as they can. Do not deviate from normal routines, as they help children to remain comfortable, in control, and protected. However, it is also appropriate to create special moments as you help the child make each day count to its fullest.

Handling difficult situations such as a child dying will always have better results and outcomes when honesty, love, and respect are utilized during all communications among the child, family, caregivers, and friends.

Caring for the Caregiver

Providing comfort care at the end of life can be physically and emotionally draining. The nurse may notice that the primary caregiver is exhausted. Encourage the caregiver to ask for help and assist them in obtaining it. Often other people want to help but simply do not know what to do. Help could be as simple as allowing a visiting relative or friend to pick up a portion of the load so the primary caregiver can rest for a bit.

Small gestures can go a long way when helping a caregiver. For example, offering to sit with their loved one for an hour or two, volunteering to walk the dog, asking if they need something from the store, offering to watch any children, delivering a meal, or coordinating efforts among a small group of helpers are all ways to support a person who is in a caregiving role. Share this with the caregiver, encourage them to accept help, and remind them that it is equally important to care for themselves so they can provide ongoing, compassionate care for their loved one.

Effective support to help caregivers cope includes:

- Simply being available to listen.
- Answering questions and providing information related to the patient's care, disease, and dying process.
- Formulating plans for after the patient dies.
- Helping the caregiver understand that it is all right to ask for help and to accept help when it is offered, and suggesting how to request or recommend help from others.

Ultimately, nurses, health-care professionals, families, and caregivers must make self-care a priority to provide quality, ongoing, compassionate care for dying patients.

Professional Caregiver

A professional caregiver, such as a certified nursing assistant or home health aide, is an excellent resource for primary caregivers. Having the help of a professional caregiver will free up time for the primary caregiver, often a family member, to attend to personal business or needs, spend time with their family, or simply rest. Working together with tasks such as bathing, dressing, and grooming can help decrease physical demands. There is no

shame in admitting that we are human and need time to rest, replenish, and nurture ourselves. The caregiver may find that their loved one welcomes spending time with other people, making this a win-win for everyone.

Supporting Health-Care Colleagues and Ourselves

To cope with one's own grief, effectively process the death and dying of patients, and deal with the anxiety of working with grieving patients and families, health-care professionals need support, education, and assistance. This should include a focus on ways to seek support and provide support for coworkers. Suggested ways to cope include:

- Taking time to cry with and for patients.
- Doing something physical such as walking, running, riding a bike, or hiking.
- Being outside in nature.
- Asking for help from the team. Do not try to shoulder everything on your own.
- Participating in employee-provided self-care resources, counseling, or classes.
- Visiting a place of worship and praying.
- Turning small pleasures into sources of joy in your personal and professional life.
- Remembering that laughter is also good medicine and healing.
- Creating a support group or small circle of friends to meet with.
- Journaling or listening to music.

LINK TO LEARNING

Providing resources to help caregivers (https://openstax.org/r/77NIAFamily) is a simple way to provide patient and family education. Caregiving is a stressful job, but introducing topics such as how to share caregiving responsibilities, what strengths and weaknesses caregivers should consider, how to support a long-distance caregiver, and how to help a parent who is a primary caregiver can help relieve caregiver stress.

Summary

32.1 Palliation

- Palliation and palliative care are designed to reduce or relieve symptoms for patients with serious illnesses that are no longer responding to treatment.
- Curative care or life-prolonging treatments can be continued along with palliative care.
- Palliative care is performed in a variety of settings, including hospitals, long-term nursing facilities, specialized clinics, and home environments.
- Collaborative care by a team of health-care providers—such as primary care providers, nurses, social workers, dietitians, and social workers—is part of safe and effective palliative care.
- Frequent communication among the team members ensures continuity of care as well as quality care.
- As a case manager, a nurse should follow up on the efficacy of treatment, coordinate care with the interdisciplinary team, and regularly update the patient's plan of care.
- A do-not-resuscitate (DNR) order means the patient does not want CPR as a life-saving measure; a do-not-intubate (DNI) order means the patient does not want to be placed on a ventilator.

32.2 End-of-Life Care

- End-of-life care includes palliative care, which relieves or reduces symptoms related to a serious illness to preserve a patient's quality of life, and hospice care, which provides comfort measures during the last six months of life.
- The nurse often takes on the role of a case manager to coordinate with the patient, family, and the care team to provide safe and effective end-of-life care. Communication is essential to ensure the patient and their family are supported and informed through the entire process.
- Provider-assisted dying is legal in some states and jurisdictions; it involves a provider prescribing a lethal dose of medication for the patient to use to end their life.
- Euthanasia involves an act by a separate individual to cause death; it is illegal in the United States.
- Providers may find the use of medically assisted dying to present an ethical or moral dilemma. The nurse should conduct their own self-assessment to separate their personal beliefs from the care they provide to a patient in this situation.

32.3 Assessment

- An end-of-life assessment is an important time for the nurse to talk with the patient and family, while also observing and collecting physiological information, reviewing the treatment plan and directives, noting the family dynamics and conversation styles, determining the decision makers and caregivers, and ensuring spiritual, religious, and cultural beliefs are respected.
- Palliative care and hospice care patients may have pain, shortness of breath, fatigue, constipation, nausea, vomiting, loss of appetite, loss of cognition, and decreased level of consciousness (LOC).
- As death draws near, the nurse should observe for additional physiological changes and ensure the family understands what the changes signify and what to expect after the end of life.

32.4 Psychosocial Support

- Hope is an integral part of end-of-life care; it prolongs life and maintains quality of life, as patients still have hope for things they want to accomplish.
- According to psychologist C. R. Snyder, there are three conditions for hope to thrive: goals, pathways, and agency.
- Grief is the emotional state that follows the loss of a loved one, while mourning is the outward expression of grief. Bereavement is the time frame following the loss in which grief is experienced and mourning is expressed.
- The five stages of grief are denial, anger, bargaining, depression, and acceptance. However, everyone grieves differently and at their own pace.
- Families may also have learning deficits, inadequate coping mechanisms, and gaps in communication skills that cause them to feel off balance with the impending death of their loved one.
- The family's method of coping with death may not coincide with the values and beliefs of the nurse and the

care team, but it is imperative that the patient's and family's wishes be respected to the greatest extent possible.
- An important component in providing culturally competent care within the family is to use discretion about the appropriate time and setting for sensitive conversations to be conducted. It is also important to provide context for the discussion.
- Spiritual assessment is a key component for a terminally ill patient. A patient's spirituality encompasses much more than their religious preference, affiliation, or beliefs.
- The nurse's role is to teach the family members and assist them with obtaining the knowledge and resources they need to care for their loved one.

32.5 Special Considerations

- Nurses and other members of the health-care team encounter death and loss daily, making shadow grief and related anxiety common experiences.
- The negative impacts of working with the dying—such as associated grief, unresolved anxiety, and denial—can lead to illness and burnout among health-care workers, as well as create a barrier to effective patient care.
- Caregiver support is an essential part of end-of-life care, and nurses must encourage self-care measures for the primary caregiver so they can better provide effective and compassionate patient care and manage their own feelings about the patient's end of life.
- Health-care professionals need support, education, and assistance to deal with the anxiety of working with grieving patients and families as well as to effectively process the death and dying of patients in their care.

Key Terms

bereavement period of time when one mourns a loss
do-not-intubate (DNI) order stating the patient does not want to be placed on a ventilator if they are unable to breathe independently
do-not-resuscitate (DNR) order stating the patient does not want CPR conducted if their heart stops
durable power of attorney (DPOA) document enabling the patient to list a specific individual whom they entrust to make financial and health-care decisions when they are no longer able to do so
euthanasia act by an individual to cause death, such as directly administering a lethal dose of a medication; illegal throughout the United States
grief emotional state that follows a loss
health-care proxy person designated in a durable power of attorney document to make health-related decisions for a patient who is no longer able to make their own decisions
holistic care care for the whole person, including body, mind, spirit, and emotions
hospice care specific type of palliative care for patients nearing the end of life, encompassing physical, psychological, emotional, and spiritual needs and desires
Medical Orders for Life-Sustaining Treatment (MOLST) program with a goal of improving quality of care for patients at the end of life by enabling them to specify their goals and preferences via a transferrable form; known in some states as POLST
mourning external actions taken to express one's grief, such as wearing black
palliation effort to alleviate suffering and enhance quality of life for patients with serious, often progressive, illnesses
palliative care comfort care provided when a serious illness is no longer responding to treatment
Physician Orders for Life-Sustaining Treatment (POLST) program with a goal of improving quality of care for patients at the end of life by enabling them to specify their goals and preferences; known in some states as MOLST
provider-assisted death use of pharmacological agents prescribed by a health-care provider to hasten death; legal in certain US states and jurisdictions
respite care period of rest for a caregiver in which the patient temporarily resides in a skilled nursing facility before returning home
shadow grief unresolved sadness

Assessments

Review Questions

1. After discussing the terms DNR/DNI with a patient, the patient has expressed they do not want to receive CPR or be placed on a ventilator. What is the nurse's top priority to ensure the patient's desires are honored?
    a. Share this information with the patient's family.
    b. Have the patient sign a DNR/DNI or MOLST/POLST form to be placed in their record.
    c. Post a sign in the patient's room of their DNR status so that all health-care providers will honor the patient's wishes.
    d. Have the patient tell their provider directly.

2. Once a patient confirms they do not wish to receive life-saving measures when their heart stops, the nurse should direct them to sign what document?
    a. advance directive
    b. power of attorney
    c. do-not-resuscitate order
    d. last will and testament

3. Mr. Smith's illness is no longer responding to treatment. His prognosis is poor, with fewer than six months to live. What course of care should the nurse recommend to Mr. Smith?
    a. hospice care
    b. palliative care
    c. respite care
    d. end-of-life care

4. What legal document outlines the specific health-care decisions for a patient when they can no longer make decisions for themselves?
    a. advance directive
    b. durable power of attorney
    c. do-not-resuscitate order
    d. informed consent

5. What legal document designates the trusted individual who can make health-care decisions for a patient when they can no longer make decisions for themselves?
    a. informed consent
    b. durable power of attorney
    c. advance directive
    d. living will

6. The nurse is discussing palliative care with a patient who has metastatic lung cancer. The patient has indicated that they wish to continue their cancer treatment. What is an appropriate response from the nurse?
    a. "You can continue your cancer treatment while receiving palliative care."
    b. "Palliative care is utilized when a patient's illness is no longer responding to treatment."
    c. "Do you not understand that your cancer has spread?"
    d. "I will let the doctor know that you do not wish to receive palliative care."

7. A palliative care patient with Alzheimer disease has lost a significant amount of weight during the last few weeks. The family member asks the nurse about nutritional shakes. What is an appropriate response by the nurse?
    a. "Prescribed nutritional supplements can be used to replace meals."
    b. "Prescribed nutritional supplements are wasted calories and not helpful."
    c. "Offering a prescribed nutritional supplement with a meal could be helpful."
    d. "Prescribed nutritional supplements help with weight loss."

8. What distress symptom is most common when a patient is nearing death?
    a. anxiety
    b. depression
    c. pain
    d. withdrawal

9. The hospice nurse visits a patient dying of lung cancer. During the visit, the patient says, "If I could live long enough to see my grandson graduate from college, I'd be ready to die." What phase of coping is the patient expressing?
    a. bargaining
    b. anger
    c. denial
    d. acceptance

10. The nurse is caring for a terminally ill teenager who is receiving palliative care. The nurse explains the purpose of palliative care to the teen's mother. The need for additional instruction is recognized by the nurse when the mother makes which statement?
    a. "Palliative care will provide relief or reduction of symptoms."
    b. "Palliative care will include pain management."
    c. "My child will die sooner by receiving only palliative care."
    d. "Optimal functioning will occur while receiving palliative care."

11. A family member of a terminally ill patient steps out of their loved one's room in tears. They tell the nurse, "I don't know how I will make it when Momma is gone." What is the nurse's best response?
    a. "Don't worry, everything will be all right."
    b. "Things will get easier with time."
    c. "This must be very hard for you."
    d. "You need to stay strong and not cry."

Check Your Understanding Questions

1. What is the goal of palliative care?
2. Can a patient continue to receive curative care or life-prolonging treatment while receiving palliative care?
3. Who can receive palliative care?
4. List some common symptoms associated with end-of-life care.
5. What is meant by medically assisted dying?
6. List the common physiological changes for palliative care and hospice patients.
7. Explain the terms grief, mourning, and bereavement.
8. What are three strategies you can use to help a caregiver manage their stress and exhaustion while providing end-of-life care?

Reflection Questions

1. Why is it necessary to have an interdisciplinary team to provide hospice services?
2. Why is important for the hospice patient to have an advance directive and durable power of attorney?
3. List different topics that a nurse might discuss during the initial assessment with the patient and family.
4. How can a nurse incorporate cultural sensitivity when discussing end-of-life care with patients and families?
5. Take time to reflect on your personal attitudes toward death and dying.

What Should the Nurse Do?

1. Charles, an 80-year-old patient with congestive heart failure, has been a home care patient for six months; during this time, a personal care assistant has helped Charles with bathing, dressing, and grooming. This care enables Charles to live at home independently. However, several months ago Charles had a stroke, and he still has not regained use of his dominant right hand and arm. Recently, he has been experiencing severe pain in his right arm and shoulder, as well as decreased endurance and shortness of breath. The provider has informed Charles that his pain will likely not improve and in fact might worsen due to the decreased mobility in his right arm and hand. Notwithstanding his recent decline, Charles still believes that he has several good years left and looks forward to seeing his grandson graduate from college.

   What type of care would be most appropriate for Charles's nurse to recommend at this time? Where would this care be provided?

Chris, a palliative care patient, has recently had a second stroke, leaving him unable to walk. He has not recovered the use of his right arm and hand from his first stroke last year. Chris's congestive heart failure has worsened, resulting in a significant decline with a poor prognosis. Chris has a documented ejection fracture of less than 20%, is symptomatic at rest, and has uncontrolled edema that has resulted in a total inability to complete his ADLs independently. Due to his significant decline, Chris will be discharged to a long-term care facility.

2. With Chris's decline and poor prognosis related to his congestive heart failure, what type of care would be most appropriate for him at this time?
3. Due to Chris's present health status, what types of legal documents should his nurse suggest Chris complete to ensure that his health-care directives are followed?
4. At this juncture in Chris's care, while discussing his end-of-life care and directives, what is another very important item that Chris needs to decide?

Charles has been in a nursing home for a few months following two strokes and worsening congestive heart failure that have significantly impaired his mobility. Now, he is unresponsive and can no longer communicate his wishes. The family has been informed that medical tests, physical therapy, and vital signs monitoring will be stopped as they are no longer providing a benefit to Charles's comfort or health status. Most recently, Charles has developed pneumonia. His family is asking about having him admitted to the hospital.

5. What is the best response for the nurse to provide to his family?
6. The family asks the nurse when Charles will die. How should the nurse respond?
7. Mimi was diagnosed with pneumonia a few days ago. Her family has been vigilant since her recent diagnosis, visiting frequently and ensuring that she is not left alone. What are some things the nurse can do to ensure the family is also cared for during this time?
8. You are working with a team that includes members with varying attitudes toward death and dying. How would you foster a collaborative environment that respects diverse perspectives and supports effective communication about end-of-life issues?

Competency-Based Assessments

1. Create a patient handout that explains the differences between palliative care and hospice care.
2. Create a patient handout that can be used to teach patients and their families about the expected physiological changes during end-of-life care, as well as supportive interventions that can be used to provide comfort.
3. You are a nurse working in a hospice setting, and you are assigned to care for Mrs. Patel, a terminally ill patient from a South Asian background. Mrs. Patel's family is highly involved in her care decisions, as it is a significant cultural value for them to make collective decisions regarding her treatment and end-of-life care. The family practices Hinduism, which includes specific rituals and preferences regarding death and dying. Outline how you would ensure that the family's preferences and cultural practices are respected while coordinating the patient's care.

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CHAPTER 33
Emergency Care

FIGURE 33.1 An interdisciplinary team cares for a newly admitted patient with traumatic injuries after an accident. (credit: Brooke Army Medical Center Public Affairs/Joint Base San Antonio, Public Domain)

CHAPTER OUTLINE

INTRODUCTION Consider a nurse triaging a patient who was in a car accident involving alcohol; the patient has sustained multiple traumatic injuries. As the nurse is receiving a report from the emergency medical services, the patient becomes unresponsive. What should be the nurse's next steps in caring for this patient? A triage nurse should follow the airway, breathing, circulation, disability, and exposure (ABCDE) triage assessment method and provide continuing support and care for such patients. This systematic approach ensures that life-threatening conditions are identified and addressed promptly, maximizing the patient's chances of survival. For the nurse, this could involve monitoring and maintaining the patient's airway, controlling bleeding, assessing neurological status, and ensuring that a patient can be closely examined from head to toe for any less obvious injuries. Throughout this process, the nurse should remain aware of the need to protect the patient's privacy and dignity. The nurse must also maintain an awareness of the possibility that the patient could decompensate and thus should be on the alert for signs of decline or complications. To prevent these outcomes, the nurse may need to perform specific stabilizing tasks, such as administering fluids or blood products.

There are many avenues to becoming an experienced emergency department (ED) nurse. Some examples include specialized certifications, workshops, and continuing education in trauma care. This chapter discusses the steps to

take during emergency situations.

33.1 Triage and Assessment

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Define triage and the nursing responsibility related to triage
- Discuss the ABCDE assessments utilized in triage
- Use prioritization findings to guide nursing care
- Define components of effective documentation in the emergency department
- Explain patient consent in the event of an emergent event

Nurses should be prepared to respond to an emergency at any time. Most emergent conditions are treated by emergency department nurses in the hospital's emergency rooms. In addition to working in a fast-paced, ever-changing environment, ED nurses need exceptional assessment, prioritization, and critical thinking skills. The Joint Commission (2023) seeks to increase the quality of patient care in the ED and improve patient outcomes. This is achieved through accurately assessing and triaging patients, which reduces time spent waiting and being treated in the ED.

CLINICAL JUDGMENT MEASUREMENT MODEL

Recognizing Cues in a Patient in the ED

The nurse in a busy ED is assessing a fifty-six-year-old male patient who reports chest pain radiating to the left arm. The nurse asks the patient to rate the pain on the numerical pain scale, documenting a rating of 8/10. The nurse also notes that the patient is diaphoretic and appears anxious. The nurse records the patient's vitals at intake: BP: 148/90; HR: 111 bpm; RR: 23; and O_2 sat: 96 percent on RA. It is important for the nurse to identify the cues from the patient assessment, such as the chest pain, BP, and HR, that indicate there is a problem and then analyze those cues to determine the next steps.

Triage

The term **triage** refers to the process of assessing and prioritizing patients' care based on initial assessment findings. Nurses must be able to effectively and efficiently triage patients, especially in emergency situations. For example, a person who has chest pain would be prioritized before a patient with an ankle injury. Nurses understand that chest pain could be indicative of a myocardial infarction (MI) or heart attack, and while an ankle fracture is painful, it is not as life threatening as an MI. Triage occurs during initial intake phase, whenever there is a change in a patient's condition, and during situations with mass casualties.

During the triage phase, the nurse has several responsibilities. The first is to complete an assessment to determine immediate concerns. This involves asking questions, using clinical judgment to recognize cues, analyzing cues, and prioritizing findings. The nurse will also review the patient's medical history, if possible, to determine if any current concerns are related to previously identified conditions or comorbidities. Based on the severity of findings, the nurse will then prioritize care and take action, implementing interventions to address any identified concerns. The nurse will also follow any provider orders, such as administering medications or collecting blood samples for diagnostic testing. While conducting triage, the nurse should remember to ensure that the patient's privacy is protected.

CULTURAL CONTEXT

Respecting Modesty and Privacy

When undergoing a comprehensive assessment in the emergency department, the patient will need to have their clothing removed. The ED nurse will need to be respectful of the privacy and modesty of all patients, whether they are conscious or unconscious. In addition, the nurse should always be aware that modesty can have an important role in many religions and cultures. For example, modesty is greatly emphasized in the Muslim religion. A Muslim patient may prefer to be treated by a provider of the same sex, when possible (Attum et al., 2023). In an emergency

situation, it may not be possible to accommodate provider preference. In this case, the nurse can advocate for the patient by ensuring that a same-sex staff member or, if possible, a family member, is present during the exam. If the patient's clothing must be removed and modesty cannot be maintained, providers should try to expose as little of the patient's body as possible and restore coverage as soon as possible.

Additional steps that the nurse can take to preserve the modesty and privacy of all patients include closing patient curtains and doors before removing any clothing. If the patient is unconscious or unable to respond, politely ask anyone other than health-care staff to leave the room before assessing the patient. If the patient is alert and can respond appropriately, ask if they feel comfortable disrobing with others present in the room. When performing the assessment, provide a gown, drape, or blanket to cover private areas when the patient is not being assessed. Emergency departments tend to be very busy, and sometimes simple gestures such as these get lost in the shuffle. Before anything else, nurses are patient advocates, and they need to make sure respect is always a priority.

Airway, Breathing, Circulation, Disability, and Exposure (ABCDE)

One of the most utilized method for triaging patients in emergency situations is the **airway, breathing, circulation, disability, and exposure (ABCDE) triage assessment** (Althobity et al., 2024). Each letter represents a step of the assessment, performed in alphabetical order:

- A: Airway
- B: Breathing
- C: Circulation
- D: Disability
- E: Exposure

When using the ABCDE triage method, the airway is assessed first regardless of underlying cause or patient age (Althobity et al., 2024). Emergency airway conditions are always treated first before moving to other areas or body systems.

Airway

The airway is the most important system, because without an adequate airway, the patient's lungs cannot supply vital oxygen to the rest of the body (Althobity et al., 2024). To be skillful at airway management, the nurse must first understand the structural, physical, and pathological aspects related to the airway (Avva et al., 2024). When assessing the airway, the nurse first checks for patency. This can be done by asking the patient questions and listening to their response. If their voice sounds normal, without obstruction, their airway is patent. If their voice sounds muffled or crackled, there may be an obstruction. In some cases, a decline in level of consciousness can lead to airway obstruction caused by the tongue. The easiest way to open the airway for an unconscious patient is to use the head-tilt and chin-lift method (Figure 33.2). Determining airway patency enables the nurse to either move on to breathing or request the provider initiate an artificial airway.

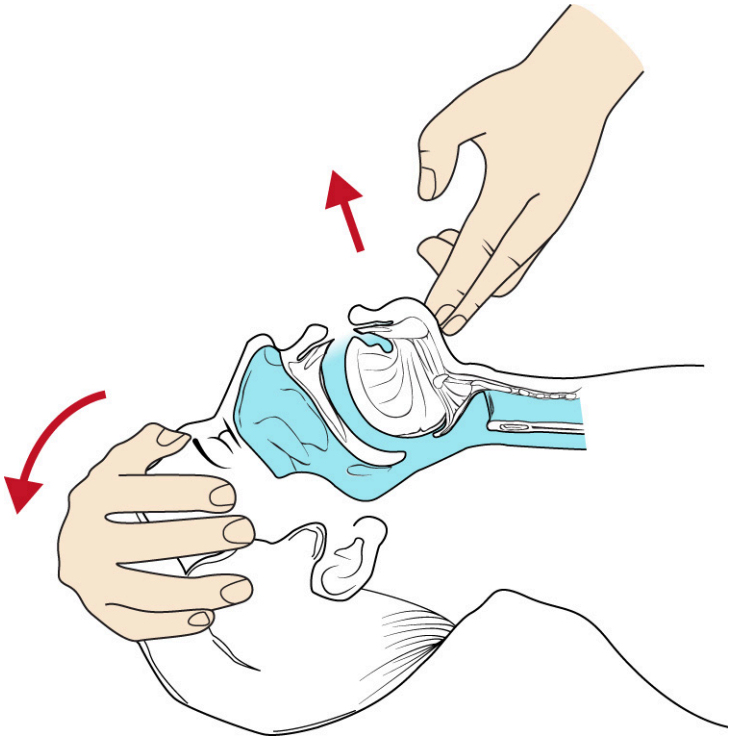

FIGURE 33.2 The head-tilt and chin-lift maneuver is the easiest way to open a patient's airway. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Breathing

The next step in the ABCDE triage assessment is to assess the patient's breathing. This can be achieved by counting the patient's respiratory rate. The nurse should assess whether the patient's chest rises symmetrically and whether the trachea is midline. The nurse will also determine how much effort it takes for the patient to breathe. This means noting if the patient is using accessory muscles or is displaying pursed lip breathing. Recognizing signs of respiratory distress is critical when assessing breathing status (Avva et al., 2024).

Next, the nurse will auscultate the lungs and apply a pulse oximeter to measure oxygen saturation. If the patient is in respiratory distress, the nurse will utilize emergency equipment, such as a crash cart, bag-mask for ventilation, suction, and an emergency intubation kit, to help stabilize the patient's breathing. Recommendations for compromised breathing include positioning the patient, providing supplemental oxygenation, and implementing an artificial airway, such as an endotracheal tube for airway management (Raveendra et al., 2020).

Circulation

The third step in the ABCDE triage assessment is circulation. Once the patient's airway and breathing are stable, assessing for circulation to determine adequate perfusion is critical. First, the nurse should confirm the patient's apical pulse with a stethoscope. Then, the nurse should check capillary refill time and for any signs of cyanosis or color change of the skin. Systemically assessing all pulse points will help identify any differences among the extremities. The nurse will also collect data, such as the patient's blood pressure, assessing for hypotension or hypertension. The patient is also placed on an electrocardiogram monitor to assess their cardiac rhythm. At this stage of the triage, intravenous (IV) line access is usually placed if the patient does not already have one. In emergency situations, choose a larger gauge IV in case the need arises for fluid boluses or blood replacements (Verhoeff et al., 2018).

LINK TO LEARNING

Often, the emergency room nurse places a patient's first IV. Watch this video for an overview of different IV gauges (https://openstax.org/r/77IVgauge) and their most common uses.

Disability

The next phase of the ABCDE triage assessment is to assess for disability. In this triage method, disability refers to a patient's level of consciousness. The Glasgow Coma Scale (GCS) is the most widely used assessment tool for assessing level of consciousness in emergency cases. The GSC assesses eye-opening, verbal, and motor responses to stimuli and provides a range of possible responses to help providers assess neurological deficits (see Table 15.4). There are many factors that can cause a decreased level of consciousness, and the health-care team will need to rule these out before attempting to treat the disability. A few such causes include decreased oxygenation to the brain or hyperventilation from pain, which can result in decreased oxygenation to the central nervous system; too much perfusion to the brain, as in the case of internal hemorrhaging; or a recent administration of analgesics, including prescribed and nonprescribed medications.

Exposure

The final step in the ABCDE triage assessment involves assessing for exposure. Being exposed in this instance can refer to being vulnerable to elements in the environment (such as extreme temperatures) or to harmful substances (chemicals, smoke inhalation, or drugs). The first step is assessing the patient's body temperature. An extreme hyper or hypo body temperature can be a sign of shock or infection. The nurse needs to assess for signs of underlying bleeding or trauma and skin abnormalities. Make sure to inspect the whole body, including the back and groin for any injuries or rashes. The nurse should initiate any cooling or warming measures if indicated.

Prioritizing Findings of the Triage Assessment

After the recognizing and analyzing of cues has taken place, it is time for the nurse to prioritize the findings. Prioritization can be achieved through many simple steps. The nurse will use a process of elimination—sort of like an algorithm—with each finding of the triage assessment. The following are the basic steps for prioritizing which findings must be addressed first:

- Airway, breathing, circulation (ABC): A patient's airway, breathing, and circulation must be assessed and prioritized before any other interventions.
- Acute versus chronic signs or symptoms: Acute symptoms (those that are current/recent) take precedence over chronic, long-term symptoms or health conditions. However, the nurse will remain aware of how chronic conditions could affect the patient's acute problem.
- Expected versus unexpected findings: The nurse needs to assess for expected findings on an exam but also monitor and pay attention to any unexpected findings—particularly if they could be harbingers of complications.
- Does this finding need further assessment, or can an intervention be applied?: The nurse needs to be able to assess whether a finding needs to be explored more or if it's appropriate to provide an intervention.
- Maslow's hierarchy of needs: The nurse should be aware of how a patient's needs, according to Maslow's hierarchy, influence care. At the most basic level, all patients need to have their physiological needs for food, water, and pain relief met. At the same time, emotional needs, like feeling safe, are also an integral part of patient-centered care.

Any identified immediate needs will be discussed with the provider for collaboration on next steps. After addressing the patients' immediate needs, the registered nurse will complete a more in-depth, comprehensive assessment.

Components of Effective Documentation

Documentation in the emergency department or during an emergency situation can be challenging. Despite this, it is still crucial for nurses to abide by documentation standards to validate the providing of timely, accurate, and quality care. Documentation involves recording assessment findings. Symptoms, or **subjective assessment findings**, are those findings that the nurse does not directly observe and are only reported by the patient. These findings can include how the patient feels. By contrast, **objective assessment findings**, or signs, are aspects that the nurse directly observes and that can be measured. Examples include vital signs, diagnostic tests, physical findings, and the patient's mental state.

In addition to featuring assessment findings, effective documentation includes past medical and social history, medications, a review of systems, and order acknowledgment. Nurses should also document any communication of the health-care team with the patient or family members, such as nursing education provided, discussion of

advance directives, language preference, and performance of medication reconciliation. Nurses must also document plans of care, along with their assessment and evaluation of nursing interventions performed, implementation, and responses and outcomes to patient care.

Documenting timely, accurate, and complete assessments ensures that the information shared among health-care professionals is factual. Many decisions among the interdisciplinary team are based on documentation of every patient encounter. Information written in the patient's chart should clearly convey the encounter and leave no gaps for assumptions (Lorenzetti et al., 2018). Documentation should also be organized, meaning that the timing of documentation should be in order and be completed as close as possible to the real time of the encounter.

Consent in an Emergency

When patients come into the emergency room and are able to sign documents, the first document they sign is a **consent**, which gives medical professionals the authority to treat the patient with the most competent and highest quality of care. If a patient is brought to the emergency room and is unable to sign at that time, life-sustaining measures are still provided under **implied consent**, which means approval is presumed though not obtained during an emergent situation due to the life-threatening nature of the situation.

Treating Minors

Minors, or those under eighteen years of age, are often brought in by parents or legal guardians to be seen in the emergency department. The Emergency Treatment and Labor Act requires that all minors and patients receive a medical screening (American College of Family Physicians, 2023). This law was enacted to determine if a minor's condition is life-threatening and whether they need emergency care even if they were brought in by a relative or friend instead of a parent or legal guardian. During an emergency, verbal consent from the parent or guardian via the telephone may be obtained. Two witnesses must be listening simultaneously and will sign the consent form, indicating that consent was received via telephone. If the minor needs immediate medical attention and the provider cannot obtain consent from a parent or legal guardian, then they can proceed with treatment. Health-care professionals should be knowledgeable about their individual state laws for treating minors in the emergency department.

LIFE-STAGE CONTEXT

Exceptions to Parental Consent

In some states, a mature minor may give consent for certain medical treatments. The provider can make a determination that the adolescent (usually over fifteen years of age) is suitably mature enough and has the appropriate intelligence to make the decision for treatment. The provider will also weigh the severity of the treatment, the risks and benefits of completing the procedure now versus waiting before obtaining consent from a mature minor.

An example of this situation might involve a family taking their child's sixteen-year-old friend on vacation with them. Suppose the friend trips while ice skating and gets hurt. The parents take the sixteen-year-old minor to the local emergency room for treatment. The minor's parents are at work and unable to be reached via phone. The health-care team has determined the minor has sustained a broken arm that requires the application of a cast. The minor can give consent on their own behalf for the cast if the provider has deemed the minor mature and knowledgeable enough to provide consent.

33.2 Types of Emergency Care

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Recognize types of traumas often seen in the emergency department
- Discuss forms of abuse often seen in the emergency department
- Identify psychiatric emergencies often seen in the emergency department
- Explain substance use disorders often seen in the emergency department

Many different types of traumas are seen daily in the emergency department. It is important for nurses to

understand that not all traumas are treated the same way. Nurses must work within the interdisciplinary team to provide timely, competent care for each unique situation. Most emergency departments throughout the United States are staffed with a wide range of specialists that are able to treat any situation that might be encountered.

Types of Traumas

Before arriving at the hospital, emergency medical services (EMS) call ahead to inform the ED staff about the patient's initial condition and any life-threatening injuries. The ED nurse then works with the health-care team to anticipate the patient's needs by setting up any equipment, gathering supplies, and preparing the patient's room. After the patient arrives at the hospital, the nurse performs the initial assessment. At this point, EMS gives a more in-depth hand-off report. The gold standard for report hand-off involves using the ISBAR method (Dalky et.al., 2020).

CLINICAL SAFETY AND PROCEDURES (QSEN)

QSEN Competency: Maintaining Quality and Safety During an Emergency

Disclaimer: Always follow the health-care facility's policy for triaging during an emergency.

Definition: Maintain safety and quality care to patients during an emergent response.

Knowledge: The nurse will assess and triage patients using the ABCDE triage method and appropriately prioritize care, escalating care to the appropriate facility when necessary.

Skill: Demonstrate effective triage strategies. The nurse will:

- Utilize the ABCDE triage method when assessing trauma patients.
- Escalate patient care to the appropriate level of care during the trauma event.
- Stabilize the patient before transport.
- Complete a secondary survey of the patient after they have been stabilized.
- Utilize the SBAR communication tool during handoff.

Attitude**:** The nurse will adhere to the ABCDE triage method and use the SBAR handoff tool for effective communication when transferring care.

(QSEN Institute, n.d.)

After the patient is stabilized, the nurse performs a secondary, more comprehensive assessment. If additional diagnostic testing is indicated, it is performed at this stage as well. If the current facility lacks the specialized care needed by the patient, they will be transferred to another facility to meet the identified needs. Some specialty facilities include burn units, stroke centers, or mother-baby care. Many kinds of trauma come through the emergency room, regardless of whether it is a small rural facility or a big metropolitan emergency room.

Crush Injuries

Emergency department nurses often encounter patients with crush injuries resulting from motor vehicle accidents or other catastrophic events. A **crush injury** occurs from prolonged pressure to an area of the body. Many crush injuries result in the loss of a limb or even patient death. Nurses must understand the potential health complications that can develop and recognize any cues of early and/or late deterioration. While these injuries most often occur with a traumatic event, they can also result from prolonged immobilization or anesthesia. Pressure sustained can block the return of the blood to the affected body area causing swelling and damage to muscle tissue and nerves. The muscles then release myoglobin into the bloodstream, along with other cellular components like potassium, magnesium, phosphates, and other chemicals, which can accumulate in toxic levels in the bloodstream. Crush injuries often result in life-threatening diagnoses like compartment syndrome, rhabdomyolysis, and other serious health conditions (Usuda et al., 2023).

Upon initial assessment, the nurse should assess the patient's skin color, especially the area distal to where the crush injury occurred. The nurse should observe the skin for signs of cyanosis and palpate pulses distal to the area of injury. If pulses are not palpable, the nurse can use a Doppler ultrasound to locate the patient's pulse. The nurse

should also check the patient's capillary refill time, which should ideally be less than three seconds. In addition, the nurse should ask the patient to move the affected body area, if possible, and ask the patient what they feel when the nurse applies sensation to the affected area (Long et al., 2023).

Nurses should perform neurovascular checks frequently on patients with crush injuries. If there are any notable deviations, this may indicate a worsening of the patient's condition. The nurse must immediately notify the health-care provider.

Rhabdomyolysis

One potential complication of crush injuries is rhabdomyolysis, the breakdown of skeletal muscle tissue that is often the result of sustained pressure or crushing of the muscles. Nurses will assess for early symptoms of this condition, which include pain, muscle weakness, and tea- or dark red–colored urine (myoglobinuria). The hallmark sign of rhabdomyolysis is significantly elevated CPK levels in the blood. Late symptoms include confusion, malaise, vomiting, and fever (Stanley et al., 2023). If any symptoms of rhabdomyolysis begin to develop, the nurse must alert the health-care provider immediately. In addition, nurses must continuously monitor the patient's diagnostic labs, such as CPK, CRP, and ESR.

Compartment Syndrome

Compartment syndrome leads to sustained pressure within a muscle compartment. Pressure increases within the muscle compartments to the point that circulation and oxygenation are restricted, and this results in muscle anoxia and necrosis. Permanent functions could be lost if this condition persists for longer than six hours (Torlincasi et al., 2023). The frequency of acute compartment syndrome is estimated to be 7.3 per 100,000 in males and 0.7 per 100,000 in females, with the majority of cases occurring after a crushing trauma (Torlincasi et al., 2023). Diligent and frequent assessment of the patient's neurovascular system, ideally every 30 minutes, can reduce the occurrence of compartment syndrome. Neurovascular assessment includes checking the patient's circulation, ability to move extremities, and loss of sensation.

Nursing Care for Crush Injuries

Crush injuries can result in severe complications, such as cardiac arrhythmia, compartment syndrome, internal hemorrhaging, and rhabdomyolysis. Fluid and electrolyte imbalances (e.g., hyperkalemia, hypocalcemia, hypovolemia) are common with crush injuries. It is vital that the nurse recognizes that rapid fluid resuscitation is key to improved outcomes. Recognizing cues for decline in status, prioritizing care, and taking swift action are the keys to providing competent, quality patient care. Nurses will need to perform frequent focused assessments such as the following (Long et al., 2023):

- Neurovascular checks that involve looking for cues, such as severe pain, pallor, decreased or absent pulses, numbness or tingling, and decreased sensation
- Monitor diagnostics, such as CPK, EKG, and urine samples, that involve looking for signs of improved vascularization in the affected area
- Monitoring of intake and output levels to check for balances or shifts

READ THE ELECTRONIC HEALTH RECORD

Caring for the Patient with a Crush Injury

A nurse is caring for a patient admitted to the surgical intensive care unit after receiving an open reduction and fixation of the right femur (ORIF) following a car accident. Review the patient's electronic medical record and answer the questions that follow.

Nurse's note (0247):

- Patient brought to SICU from OR following ORIF of right lower leg after being ejected from car, un-restrained.

Vital signs (0250):

- BP: 88/62
- O_2 saturation: 95 percent, sedated and ventilated
- HR: 110

- Temp: 99.5°F
- RR: 16

Nursing Assessment:

- Gen/Neuro: Sedated, multiple ecchymotic areas on face, right lower leg, and chest
- CV/Pulm: S1S2, RRR, tachycardic, lungs diminished throughout
- Skin: Cool to touch

1. What information in the EHR is the most concerning?
2. What other assessments should the nurse perform?
3. What action by the nurse would you anticipate?
4. What complications is this patient at risk for?

Poisoning

In 2021, more than two million calls to Poison Control were made in the United States (NCPC, 2023). This translates to approximately one call of reported exposure every fifteen minutes. In the emergency department, nurses are required to stay up to date on current poisoning protocols, as well as be responsible for understanding diagnostic testing related to **poisoning**, which refers to exposure to substances, drugs, or chemicals. They will also need to implement medical therapies to reverse poisoning, while providing appropriate nursing care and preventing further complications.

Specifically, **accidental poisoning** occurs when a person unintentionally exposes themselves to a substance that is harmful, while **intentional poisoning** can be caused by a person purposely exposing themselves to toxic substances or another person intending harm. Poisoning can occur through inhalation, ingestion, or absorption through the skin. It can happen through any form of a substance, whether a solid, liquid, or gas. Many chemicals around the household, such as fertilizers and cleaning supplies, can cause poisoning. Poisoning can also occur at the workplace. A common non-drug poisoning is from carbon monoxide, a poisonous gas that is inhaled (Centers for Disease Control and Prevention [CDC], 2018a).

The provider will order diagnostic testing as soon as possible if they suspect or confirm poisoning. Typically, this involves the nurse collecting bloodwork, such as CBC, CMP, ABGs, LFTs, and serum blood levels. Toxicology screening and urine samples may also be ordered to identify the substance. When a patient enters the emergency department with suspected or confirmed poisoning, the nurse is obligated to notify Poison Control (Mukherji et al., 2023).

LINK TO LEARNING

Poison Control is a valuable resource that nurses can use. It has a national number, 1-800-222-1222, that enables callers to speak with a representative that can provide guidance about conditions to watch for and even offer treatment recommendations for patients with acute poisoning. Explore Poison Control (https://openstax.org/r/77poisoncon) for additional information.

Depending on the poisoning substance and mechanism of action, different reversal agents or antidotes can be administered. For most poisonings, activated charcoal. For opioid overdoses, naloxone is administered, and for benzodiazepines, flumazenil. N-acetylcysteine (NAC) is another common reversal agent, and it is used for salicylate or acetaminophen poisoning (Chacko & Peter, 2019). Nurses can utilize Poison Control as a resource for information about the correct reversal agents to choose. Additional medical therapies include fluid resuscitation, the administering of anti-epileptic medications, and the facilitating of other supportive measures, such as inducing vomiting.

Nurses use the ABCDE triage assessment for assessing patients with potential or confirmed poisoning. Depending on the severity of the poisoning and the status of the patient, mechanical ventilation, supplemental oxygen, and/or medical sedation may be necessary. The patient should be placed on cardiac monitoring. Frequent assessment of

the patient's vital signs is also needed to recognize hypotension, hypertension, bradycardia, or tachycardia. Fluid resuscitation will be dependent on the patient's condition. The nurse assesses the patient's neurological status and may administer anti-epileptic medications, if they are prescribed, to prevent or control seizure activity (Chandran & Krishna, 2019). Depending on the substance, nurses should ensure the use of proper personal protective equipment (PPE) to protect against potential cross-contamination.

LINK TO LEARNING

The CDC published a resource for PPE use (https://openstax.org/r/77PPE) that includes types of PPE as well as proper use and disposal.

Nurses should also monitor bloodwork for electrolyte imbalances and administer appropriate electrolytes, as ordered. If the patient is hyperthermic, the nurse can apply a cooling blanket and administer antipyretics, as indicated. The nurse should administer any antidotes or reversal agents to the patient and provide frequent updates to the Poison Control Center. In addition, the nurse may employ elimination techniques, which include urine alkalinization, hemodialysis, or continuous renal replacement therapy as outlined in Chapter 20 Genitourinary and Reproductive Systems (Chandran & Krishna, 2019). Nurses will also provide supportive care for the patient and family.

Abuse

Abuse, neglect, and maltreatment can happen to anyone, anytime, and at any age. Often, the emergency department is the place of discovery. It is important for an ED nurse to be able to recognize cues of abuse and be prepared to take action for appropriate reporting and education on available resources. The nurse must understand the different types of abuse that can occur and the appropriate nursing interventions for each type. Nurses are legal mandatory reporters of abuse (Einboden et al., 2019). Every practicing nurse should follow their state and federal guidelines on reporting abuse.

The term **maltreatment** refers to the poor quality of care an individual receives. Neglect and abuse are types of maltreatment. The term **abuse** means harming another person physically, sexually, or emotionally. The term **neglect** means failing to supply a person with basic needs, such as food, shelter, or clothing. This can also pertain to emotional needs or failure to seek medical treatment. There are different types of abuse that can occur, such as a child, elder, sexual, and domestic partner abuse. Abuse can be emotional, physical, neglect, substance, and others.

Child Abuse

Nurses must be able to recognize potential cues of child abuse. Abuse should be suspected when there are unexplained injuries or injuries that do not match the described situation. For example, a spiral fracture of a child's wrist may indicate they were forcefully grabbed. A child may also exhibit aggressive or disruptive behavior, or alternatively, be withdrawn or emotionless. Upon discharge, an abused child may express fear of returning to the home with the abuser (Einboden et al., 2019). A nurse should recognize injuries on both sides of the head or around both eyes, unexplained bruising, bite marks, limping, or burn marks, as these can potentially indicate abuse. In the case of neglect, the victim may appear unkempt and have clothing or shoes that are beyond normal wear and tear. They may also show signs of malnutrition or have developmental delays (Adigun et al., 2023). Nurses should immediately report suspicions of abuse through the proper channels, like state departments and health-care organization protocols.

REAL RN STORIES

Nurse: Amanda, MSN
Years in Practice: Four
Clinical Setting: Emergency department
Geographic Location: Atlanta metropolitan area

In Atlanta, we serve a very diverse patient population and care for patients of all ages and backgrounds. One day, a

father brought his daughter into the emergency department for left arm injury and pain. He reported that his six-year-old daughter had fallen while rollerblading at home earlier that day. The girl was very withdrawn and shy when I was admitting her, not speaking much. After a while, she lightened up when I brought her warm blankets and stickers. When the physician came into the room to examine her, the father told the provider the same story. This time, however, the daughter mentioned in the middle of his story how she "hurt all last night but my dad wouldn't listen to me."

It seemed a little odd at first since the timeline of the story didn't match what the father said about being injured earlier that day. My red flags didn't go up at first, but then the x-ray came back showing she has a spiral fracture of her left humerus. I sensed something was off with the timeline of events. I notified the physician of my concerns, and he went and spoke to the father again, but this time confronting him more about the story. He again said it was from his daughter falling while rollerblading. This time his daughter interrupted to say that her arm didn't hurt until he pulled her up from the ground.

The provider and I both stepped out of the room. Together, we decided to report this to Child Protective Services. The girl interjecting her dad's story and her story not matching, and the spiral fracture was concerning. I called Child Protective Services and notified them of our concerns and findings. To my surprise, they were able to show up quickly while we were casting the patient. CPS called the mother of the child, who was actually separated from the child's father. So, CPS was able to interview the father and daughter separately. We learned later that the father had actually injured the daughter by yanking her off the ground when he was mad. The child's mother mentioned this wasn't the first "outburst" he's had. This was a lesson learned by me to listen carefully to your patients, including children, because you never know what they might say that can change your course of action.

Older-Adult Abuse

Older-adult abuse is maltreatment of a person who is over sixty years old. The term *older-adult abuse* encompasses neglect, physical, financial, sexual, or psychological abuse (CDC, 2021). Signs of abuse can include the person who provides care showing frustration or hostility. They can even have a lack of awareness about the older person's care. The older adult may be disengaged, fearful, and have a different account of events than the caregiver. There may be a lack of adherence with medications and treatments or multiple visits to the emergency department. Sometimes there are unexplained or frequent injuries or a lack of proper medical attention (Rosen et al., 2018).

Sexual Abuse

Signs of sexual abuse in children can present as nonspecific medical complaints or symptoms (e.g., incontinence), or the signs may be more obvious (e.g., genital bruising and bleeding). Children may exhibit inappropriate sexual behavior or language that is not age-appropriate, or have personality changes (Adigun et al., 2023). Signs of sexual abuse in older adults may look a little different. They may have recently received a diagnosis of a sexually transmitted disease. Physical examination may reveal genital or rectal bruising or redness (Rosen et al., 2018). If abuse is reported, a SANE nurse (discussed further in Forensic Nursing) examines these patients.

Domestic Partner Abuse

Domestic partner abuse is also called intimate partner abuse. In cases of physical abuse, the patient often will cover injuries by wearing clothing over the injury sites. They may have wounds or burns on their hands and forearms (Huecker, 2023). Some victims of abuse exhibit psychological symptoms, such as fear or poor self-esteem (Rosen et al., 2018). Others may have anxiety or depression or present with chest pain, complaints of painful intercourse, or even nonspecific symptoms. The nurse should attempt to talk to the patient privately and provide safety. If violence or assault is suspected, ask for a forensic nurse to participate in the care of the patient.

Nursing Responsibilities for Abuse

If abuse is suspected, a comprehensive history and assessment are required. This should be conducted away from the abuser if possible. The nurse should document the patient's general posture, demeanor, affect, and mental status. During the physical examination, the nurse should look for signs of poor hygiene, previous trauma, current injuries, or pressure injuries. Potential signs of injuries sustained from abuse include burn marks, broken jaw bones or teeth, lacerations, or bruising. If a genital assessment needs to be performed for suspected sexual assault, ensure a chaperone is present and recruit a specialized SANE nurse. Nurses should initiate a referral for a social worker to ensure the provision of proper follow-up care. The nurse should document findings thoroughly, and notify

the appropriate authority of the potential abuse (Adigun et al., 2023).

Psychiatric Emergencies

A psychiatric emergency occurs when a patient's behavior is or can become harmful to themselves or others. These incidents are sometimes referred to as mental health crises. There are different types of psychiatric emergencies; examples include suicide attempts, acute psychosis, intoxication, and delirium episodes. Consequently, some psychiatric emergencies are induced by the treatment plan for the patient's condition or diagnosis. Serotonin syndrome and neuroleptic malignant syndrome can result from to high levels of the prescribed psychiatric medication (Maktabi et al., 2024). The nurse should be knowledgeable about different types of psychiatric emergencies and be familiar with interventions for each.

When a patient is at risk for harming themselves or others, the provider will order a psychiatric hold, also called involuntary hold. A **psychiatric hold** is when a patient is involuntarily admitted to a health-care facility under law. These types of mandates do not require patient consent and are usually 72 hours in length (Morris, 2020). Each state has its own laws regarding psychiatric hold guidelines.

When assessing a patient with a psychiatric emergency, there are several factors the nurse must consider. First, the nurse must make safety a priority for themselves, the patient, and the other members of the health-care team. The nurse should remove any unnecessary items from the patient's surroundings and have the patient change into a gown, if possible. Please note that some patients may require sedation before they are able to be assessed. If the patient is having a medical emergency in addition to psychiatric emergency, the nurse should follow the ABCDE triage assessment method when performing the initial assessment. The nurse should ensure that the patient is medically stable before proceeding to the neurological assessment. The nurse should then check the reaction time of the patient's pupils and assess the patient's mental status. As part of the neurological assessment, the nurse should verify the patient's orientation to person, place, and time, and check their reasoning, memory, and attention (Newman, 2020). All assessment details should be thoroughly documented in the patient's chart.

In addition, the nurse should use evidence-based suicide and violence risk screening tools to evaluate the patient. The nurse should document a thorough health history, including any past violent behaviors or acts. If unsure of the patient's psychiatric status or if there are any concerns, the nurse should always request an order for referral for a psychiatric evaluation.

In some cases, a urine drug screen is ordered, so the nurse should anticipate completing this as soon as possible (Stellpflug et al., 2020). Not all psychiatric emergencies are caused by substances or mental health conditions. Organic causes, such as encephalopathy, electrolyte imbalance, or infection, can also cause psychiatric symptoms. In these cases, the nurse should anticipate additional bloodwork and diagnostic tests to discover the primary cause.

Safety is the nurse's top priority when caring for a patient with a psychiatric emergency. When speaking with the patient, the nurse should set clear boundaries and permit choices when possible. The nurse should utilize de-escalation techniques, and only use restraints as a last resort with a provider's order. If restraints are required, the nurse must follow all legal and institutional guidelines, and the patient should be continuously monitored.

Substance Abuse

According to the Centers for Disease Control and Prevention, in 2016, around one in five emergency department visits was associated with misuse of prescription drugs or alcohol. Additionally, in 2021, it was reported over 100,000 drug overdose deaths occurred in the United States (CDC, 2022a). Considering these alarming statistics, nurses in the emergency department will encounter many substance abuse cases over the course of their careers. It is critical for nurses to know the different types of substance abuse, intoxication, and withdrawal symptoms. Nurses must also be able to perform rapid nursing assessments and implement appropriate interventions while caring for patients with substance abuse disorders. According to the 2021 Substance Abuse and Mental Health Services Administer (SAMHSA) report, the most common drug-related emergency department visits were caused by the use of opioids, alcohol, methamphetamine, cocaine, and marijuana (Substance Abuse and Mental Health Services Administer, 2022).

High-Risk Intoxication and Withdrawal

It is critical that ED nurses recognize cues of high-risk intoxication, potential overdose, and withdrawal. Opioid and

heroin abuse cause respiratory and nervous system depression and can potentially lead to patient death if not reversed. Patients abusing these drugs often present as lethargic, dysphoric, and unable to answer questions. Their respirations may be shallow, and their respiratory rate is low. Because opioids release histamine, urticaria is another common finding. The same drugs can also have opposite neuropsychiatric effects, like agitation and violent behaviors in some patients. Pupil dilation, hypotension, and seizure activity are also common signs (Schiller et al., 2023).

Patients will also present to the ED with symptoms of alcohol withdrawal. If a patient has long-term alcohol dependence, withdrawal symptoms will occur if the substance is abruptly stopped. Symptoms range from mild to severe, depending on the length of alcohol use and the average amount consumed. Mild symptoms include elevated blood pressure, anxiety, and hyperreflexes, while hallucinations and seizures are more moderate symptoms. The most severe stage of alcohol withdrawal is called **delirium tremens**, which entails seizures and hallucinations, along with tachycardia, hypertension, and hyperthermia (Newman et al., 2022).

LINK TO LEARNING

Nurses use the Clinical Institute Withdrawal Assessment for Alcohol (CIWA) tool (https://openstax.org/r/77CIWA) to assess symptoms of alcohol withdrawal in patients.

Nursing Responsibilities for Substance Abuse

When assessing patients with substance abuse disorders, it is important to obtain a thorough history, including what drug was taken and the time the patient last took the substance. If the patient is having trouble breathing or is unconscious, the nurse should follow the ABCDE triage assessment method to do an initial assessment of the patient's respiratory, cardiovascular, and neurological systems. The nurse should then administer any reversal medications, if indicated, for the determined substance and follow the appropriate protocols. If the patient has an opioid overdose, administer naloxone to the patient (Schiller et al., 2023). If the patient is having alcohol withdrawal symptoms, use the Clinical Institute Withdrawal Assessment for Alcohol (CIWA) to assess the severity of symptoms. Alcohol withdrawal symptoms can become severe, and the nurse's role is to prevent the worsening of these symptoms. Benzodiazepines, such as diazepam and lorazepam, are administered to alcohol withdrawal patients to control their symptoms and progression. The nurse should also prepare to administer medications such as phenytoin for seizures and chlordiazepoxide for withdrawal symptom prevention (Newman et al., 2022).

INTERDISCIPLINARY PLAN OF CARE

Interdisciplinary Care for Patients with Alcohol Abuse Disorder

Nurses work with an interdisciplinary team and coordinate care for patients with alcohol abuse disorders. The following professionals may be part of the team:

- Neurologist: Patients with severe withdrawal symptoms, or delirium tremens, may have seizures and require referral to a neurologist.
- Pulmonologist and critical care intensivist: These providers may be necessary if withdrawal is so severe that the patient requires sedation and intubation to maintain their airway.
- Physical and occupational therapist: Once the patient is able to come off ventilator support, physical and occupational therapy will need to be ordered, ensuring the patient is able to complete the activities of daily living.
- Psychiatrist: Patients with alcohol use disorders often have underlying mental health conditions.
- Case manager: These professionals coordinate outpatient rehab facility care or other options once the patient is able to be discharged.

When caring for a patient with opiate withdrawal, nurses commonly utilize the Clinical Opiate Withdrawal Scale (COWS). This scale assigns points for a patient's symptoms by each body system, with scores totaling five or more, indicating withdrawal symptoms are present (National Institute on Drug Abuse, 2015). Nurses must also manage the patient's hydration status by administering IV fluids and electrolytes as ordered (Baandrup et al., 2017). They

will also administer anti-emetic medications, such as promethazine, to control nausea and/or vomiting. To help with withdrawal from opioids, methadone or buprenorphine can be administered and dosage titrated. Because opioid use is linked to psychiatric disorders, the nurse should collaborate with the health-care provider and request a psychiatric referral for inpatient and outpatient services (Shah et al., 2023).

LINK TO LEARNING

The Clinical Opiate Withdrawal Scale (COWS) (https://openstax.org/r/77COWS) is a useful tool for assessing signs and symptoms of opiate withdrawal and monitoring these symptoms over time.

33.3 Managing Risk Exposure

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the risk assessment tools and recognize potential violence in an emergency department patient
- Identify the common health risks and risks of exposure encountered in the emergency department
- Identify strategies for stress management for nurses working in the emergency department

While violence can occur at any workplace, health-care workers and nurses are particularly at risk for acts of violence (Stafford et.al., 2022). A recent study of emergency department nurses concluded that 89.9 percent had experienced at least one form of workplace violence in the previous year (Li et al., 2019). According to the Emergency Nurses Association, 56 percent of emergency nurses indicated that they had been verbally assaulted, threatened with violence, or physically assaulted within the last three years (Emergency Nurses Association, 2024). To help with violence prevention, nurses must receive training to recognize potentially violent behaviors, use proper screening tools, and employ de-escalation strategies.

Risk Assessment Tools and Strategies to Mitigate Violence

There are many available risk assessment tools that nurses can use to determine the likelihood of a patient becoming violent or dangerous (Kim et al., 2022). One commonly used evidence-based tool is the Triage Tool. The **Triage Tool** assesses a patient's potential for becoming violent to others or harming themselves. This is a five-question survey where the patient answers questions about any history of violence and thoughts of hurting themselves or others. Another commonly utilized evidence-based tool is the **Danger Assessment Tool**, a reliable tool providing a baseline score to assess an emergent situation. The Danger Assessment Tool is a scale from one to five and helps nurses assess the risk of a potentially violent patient or a patient who is in a violent situation (National Institute for Occupational Safety and Health, 2020). The Danger Assessment Tool is easy to use and provides immediate results to help nurses determine the next course of action.

LINK TO LEARNING

The Centers for Disease Control and Prevention has several tools, such as the Danger Assessment Tool (https://openstax.org/r/77DAT), that can be used to screen for violent behaviors.

It is imperative that nurses recognize potentially violent behaviors to prevent harm or violent acts. Potential behavioral cues include making inappropriate statements, verbal or written threats, and asking about hospital security. Some behaviors a nurse may witness include pacing, restlessness, and jaw clenching, all of which can indicate future potentially violent behavior (Cybersecurity & Infrastructure Security Agency, 2021). The Centers for Disease Control and Prevention (CDC) recommends utilizing the **STAMP method**, a quick, focused assessment for identifying signs of immediate potential violence (CDC, 2024a). STAMP stands for:

- (ST) staring/eye contact
- (T) tone and volume of voice
- (A) anxiety
- (M) mumbling

- (P) pacing.

LINK TO LEARNING

The Centers for Disease Control and Prevention has created an indicator for violent behavior tool (https://openstax.org/r/77violentbehav) called the STAMP method.

An important strategy for mitigating violence begins with understanding the factors that contribute to it. Workplace violence can come from patients, staff members, or visitors. Nurses should create a culture of respect and honesty and work to implement a zero-tolerance policy that prohibits any act of workplace violence. To report acts of violence, organizations should set up a framework for easy reporting to ensure accountability. Metrics need to be tracked and a complete risk analysis report created to evaluate strengths and opportunities for improvement. Nursing leadership should focus on providing violence prevention training, including recognition techniques, screening tools, and de-escalation strategies to all staff (American Organization for Nursing Leadership, 2022).

LINK TO LEARNING

The Joint Commission outlines steps to use when there is an active shooter present (https://openstax.org/r/77activeshoot) in its Quick Safety Guide.

If a violent situation does occur, there are many strategies nurses can utilize to de-escalate the scenario. One effective strategy, according to The Joint Commission (2019). is verbal de-escalation, a method that involves the following:

- Use clear, calm, and nonconfrontational communication.
- Ensure you are not using medical jargon.
- When a patient expresses concerns, be supportive.
- Respond in an appropriate tone and offer explanations.
- Use nonthreatening body language, such as avoiding crossing arms.
- Set clear expectations and limits with patients upfront.

Nurses can implement other safety interventions to protect themselves and others against violence. They should always be aware of their surroundings, have a clear exit path from the room, and keep their back towards the door and not the patient. If a violent situation arises, nurses should know how to call for help and where a safe room is located. To promote a calming environment in the patient's room, minimize lighting and noise as much as possible. Nurses need to dress for safety by always wearing their name badges and by not carrying items that can become weapons like keys, lanyards, or jewelry (Occupational Safety and Health Administration, 2016).

Common Health Risk Exposure

According to the Centers for Disease Control and Prevention (2024), there are over 22 million health-care workers in the United States. The health-care industry poses its own health risks, where nurses can be exposed to a variety of potential hazards, including diseases and workplace injuries. As a nurse, it's important to understand these hazards and learn ways to avoid them. Due to the fast-paced environment of the ED and because ED nurses are oftentimes the first line of patient care, they are particularly at risk for exposure.

Exposure risks can occur anytime during patient care, but there is an increased risk in the emergency department because ED nurses often encounter a patient before a diagnosis has been made. It is uncommon for a patient's contagious illness to not be identified for 24 to 48 hours after they arrive at the emergency department (Liang et al., 2018). In this period, ED nurses could potentially be exposed to illnesses such as viral meningitis, tuberculosis, COVID-19, and hepatitis. Thus, it is important for nurses to use infection control prevention techniques with every patient encounter. For instance, they must wear **personal protective equipment (PPE)**, which includes gloves, masks, gowns, and face shields, during all encounters with patients with a suspected illness (CDC, 2024b).

CLINICAL SAFETY AND PROCEDURES (QSEN)

Nursing Interventions: Safety

When caring for any patient, nurses must wear the proper personal protective equipment (PPE) to prevent disease and bloodborne pathogen transmission. Never enter a patient's room without wearing the PPE that is appropriate for the patient's confirmed diagnosis, even in an emergency. If a patient is placed on precautions, ensure that there is a sign outside of their room and document this in their chart. Patients can be on multiple precautions, such as contact and airborne, so pay attention before entering a patient's room. If unsure, follow the Centers for Disease Control and Prevention PPE guidelines.

Wearing the correct personal protective equipment is the best way to prevent exposure to chemicals, drugs, and communicable diseases. When utilizing liquid chemicals or handling medications that can splash, it is important to wear safety goggles, a mask, and a face shield to prevent the liquid from getting on the face, mouth, or eyes. However, there are still cases when exposure occurs, and nurses must understand the appropriate next steps. If any liquid enters the eyes, the nurse should not rub their eyes and should use the eye wash station immediately to flush the eyes. They should remove any contact lenses and seek additional medical attention.

Nursing Stress Management

Stress can be harmful to nurses and take a toll on their physical and mental well-being. Exposure to high-paced emergency situations over and over in particular can be stressful. It is important for nurses to be able to recognize and manage their own stress. Symptoms of stress can vary with each individual but can sometimes present as fatigue, exhaustion, or anxiety. Many health-care systems promote self-care activities like exercising, walking outside during breaks, meditation, and wellness routines within the workplace. Most health-care facilities have a culture of safety and offer employee assistance or workplace assistance programs. It is crucial for nurses to be able to self-reflect and assess themselves for signs of burnout. Talking about stress with fellow nurses or health-care professionals is another coping mechanism.

LINK TO LEARNING

Studies have found that mindfulness exercises can help reduce workplace stress or nurse burnout (Mayo Clinic, 2023). Explore mindfulness exercises (https://openstax.org/r/77mindful) to learn new techniques for how to incorporate mindfulness into your daily habits.

33.4 Forensic Nursing

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the role of the forensic nurse
- Examine methods for evidence preservation and collection in the emergency department
- Define the role of a sexual assault nurse examiner (SANE)

According to the Centers for Disease Control and Prevention (2022), more than 1.5 million people were treated for assault-related injuries in the emergency department in 2021. Violent crimes occur daily, so ED nurses must ensure that the proper protocols are followed when a patient who is a victim of violence enters the emergency department. Post-licensure certifications are available in specialty fields that focus on such situations. The roles and responsibilities of these nurses are crucial to preserving evidence for law enforcement and civil and criminal cases. This section will discuss the specialty field of forensic nursing.

Role of the Forensic Nurse

The specialty of forensic nursing trains nurses in health concerns and conditions related to acts of violence or abuse. A **forensic nurse** can work in many fields and handle various types of cases, including child abuse, sexual assault, and maltreatment of older adults. Continuing education beyond the NCLEX exam is required to become a forensic

nurse. These professionals receive training in evidence collection, chain of command for evidence, and emotional support for victims of violence. They provide compassionate care to survivors of violence while performing the physical exams required to collect forensic evidence. Given this background, the forensic nurse may be called upon to provide testimonies and expert opinions for civil and criminal cases relative to their nursing practice.

Methods for Evidence Preservation

Forensic nurses must be able to properly preserve evidence from survivors of violence and prevent any cross-contamination. They are trained to collect all types of evidence, such as biological specimens, and to document injuries. In addition, forensic nurses search for trace evidence, such as dirt and gravel, on clothing or the patient's body. When collecting, preserving, and documenting evidence, forensic nurses abide by set protocols. They must begin by documenting and taking photographs of the patient, clothing, and injuries. They must place the trace evidence, clothing, and specimens they collect into individual envelopes or the proper collection containers. Forensic nurses should carefully change their gloves between collecting each specimen and avoid coughing or sneezing to prevent contamination. When collecting biological specimens, they should always use the appropriate collection tools and separate every sample to prevent contamination. Swabs should be allowed to dry completely and should not be placed in plastic to preserve the specimen as much as possible (SAFE TA, 2024).

After sealing the individual items of evidence, nurses need to label each item with the patient's information and then sign, date, and time the envelope. Then they must complete a chain of custody form, which identifies any person who has come into contact with the evidence until it is released to law enforcement (Kleypas & Badiye, 2023).

Sexual Assault Nurse Examiner Nurse

A **sexual assault nurse examiners (SANE)** is a forensic nurse specifically trained in evidence collection and examination of victims of sexual assault. They typically work in emergency departments, but can also work in other facilities, like OB-GYN offices. SANE nurses abide by set protocols for collecting evidence, completing consent forms, and utilizing the Sexual Assault Evidence Collection Kit (SAECK) (Figure 33.3). They gather a detailed history from the patient about the assault and collect DNA evidence with swabs, hair combings, fingernail scrapings, etc. After examining the patient's entire body for additional injuries or evidence, they complete the required SAECK forms and seal all evidence. An examination by a SANE nurse can take upwards of six hours, and the examination should, as a standard, be completed within 72 hours of the sexual assault (Ladd & Seda, 2023).

FIGURE 33.3 The SAECK kit is used by SANE nurses to collect evidence from sexual assault victims. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

LINK TO LEARNING

The International Association of Forensic Nurses (https://openstax.org/r/77SANE) is a great resource to learn more about the process of becoming a Sexual Assault Nurse Examiner (SANE).

33.5 Transferring from the Emergency Department

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Describe the framework for optimal discharge planning from the emergency department
- Discuss components for effective patient education and hand-off communication for discharge planning
- Identify care coordination of the services needed by the patient being discharged from the emergency department

According to the Centers for Disease Control and Prevention, a survey across the United States revealed that more than 35 million people are discharged yearly from emergency departments. Emergency department nurses can discharge or transfer several patients a day. With nurses delivering the majority of discharge instructions and educating patients and families, it is imperative that they communicate effectively and provide comprehensive teaching. To avoid long wait times and diversions, health-care organizations must implement strategies to improve patient transfer and develop effective handoff communication (Institute for Health Improvement, 2023). Nurses

should abide by a framework, understand the components for effective patient education, and identify any areas of need with respect to care coordination.

Framework for Discharge from the Emergency Department

One of the measures implemented by the Centers for Medicare & Medicaid Services is to track 30-day hospital readmission rates. Some patients return to the ED due to a lack of adherence or a lack of available resources after discharge. Following an optimal framework for discharge planning can potentially help reduce hospital readmission rates. Discharge planning should begin upon initial assessment, where the nurse utilizes screening tools that apply to the patient. For example, some patients may need to be screened for fall risk before discharge. Regardless of the patient's time in the hospital, coordination of care should begin after initial assessment and should be an ongoing process. Nurses and health-care providers must continuously assess patient discharge readiness, available resources, and follow-up appointments. Post-discharge follow-up calls by the nurse are an integral part of the discharge framework as well (Yam et al., 2012).

Reducing Transfer Time

By implementing effective strategies, nurses and health-care team members can also work to reduce the transfer times to other departments within the same health-care system. Strategies should be implemented on a daily basis and across the facility to maximize patient flow. A few suggestions for reducing transfer time include the following:

- Evaluation of patient flow processes, from the moment of entry at the front desk, through registration, and into discharge.
- Properly triage patients according to the acuity assigned to them upon arrival to ED. The term **acuity** represents how the health-care team determines the severity of a patient's status (Managed Healthcare Executive, 2020).
- Admission decisions should be identified in a timely manner to allow for quicker placement into the appropriate unit.

Nursing Responsibilities for Transfer from ED

Under the Emergency Medical Treatment and Labor Act (EMTLA), patients must be stable prior to being transferred to any other unit or health-care facility. In an emergency, the health-care team must work diligently to stabilize the patient prior to any transfer. When initializing and stabilizing the patient, nurses should follow the ABCDE triage assessment method. Prior to transfer, the nurse should confirm that all vital signs are stable, and all provider orders have been implemented. This includes administering any medication, starting continuous IV infusions, and emergent diagnostic testing. When completing patient transfers, the nurse must communicate any outstanding orders or patient care concerns to the nurse taking over the patient's care.

Effective Communication between Departments

The gold standard for reporting hand-off is using the SBAR method (Dalky et.al., 2020). SBAR stands for Situation, Background, Assessment, and Recommendations. When the SBAR communication handoff tool is implemented, nurses communicate using a standard set of objectives related to the patient's condition. When reconsidering information about the situation, the nurse first details the patient's current medical condition or identified problem. Next, the nurse discusses background information relevant to the situation. This includes information about any comorbidities, past surgeries, or treatments for the same condition. The nurse then reports any related or significant assessment findings about the patient. For example, the nurse may recognize cues, such as bilateral coarse breath sounds, for the patient who is being admitted to the intensive care unit for pneumonia. Lastly, the nurse provides any recommendations for care, such as future interventions, testing, or care coordination needed (Shahid and Thomas, 2018). SBAR communication will look different at each point in the patient's transfer process. For instance, if the nurse is communicating with the MRI technician, the SBAR report will include more information about the provider's orders and the problem that was identified. If the nurse is transferring the patient to another inpatient unit within the same facility, however, the SBAR report will be more comprehensive, including items, such as past medical history, drains, lines, and other information.

LINK TO LEARNING

Johns Hopkins Medicine provides a great SBAR tool (https://openstax.org/r/77SBAR) with examples nurses can use when communicating amongst health-care team members.

Patient Education and Communication

When discharging a patient, nurses should provide education to patients and their families. Health-care education can be difficult to comprehend at times. Nurses need to ensure discharge information is conveyed in a clear, concise, easily understood format, keeping in mind the patient's preferred language and educational level. The nurse should use an interpreter for patients who do not speak the same native language. Nurses should review information, such as diagnoses, completed and pending diagnostics tests, referrals, medications with timing of future dosages, and the dates and times for follow-up appointments. If the patient has a new diagnosis, the nurse should print out and review any information relevant to the new condition. Additionally, the nurse should review any new medications, along with potential side effects, dosages, timing, and compliance. Signs and symptoms of a worsening condition and when to return to the emergency department should be reviewed as well. If possible, ensure that follow-up appointments or additional diagnostic tests are scheduled prior to discharge. Moreover, if a patient has received sedation, aftercare activities are reviewed with a companion to safely discharge the patient.

Care Coordination with Providers and Services

Care coordination is a vital component of patient care in any setting but can be especially important (and challenging) in fast-paced acute care settings. Effective coordination starts as soon as the patient arrives and continues with the end goal of ensuring the patient experiences a seamless transition through different phases of care and is, ultimately, able to leave the facility safely.

Care coordination should begin as soon as possible to ensure a seamless discharge, whether the patient is going home or to another facility. Assessment of readiness is a team effort by all providers involved in a patient's care, making communication of the utmost importance. This exchange of information should be efficient and accurate and may take the form of shared notes in an electronic record, phone consultations, or other means of communication. Nurses and providers will verify patient readiness and decide whether additional care at another facility, such as long-term care or rehabilitation, is needed or if the patient can be discharged home.

Coordinating with providers who will be receiving the patient at another facility or those in the community who will be supporting the patient when they are recovering at home is critical to ensuring the best possible outcomes and preventing any important information for follow-up from "falling through the cracks."

Before a patient leaves, education about what will happen next needs to be provided and the nurse must confirm that the patient understands and feels ready for the next step. It is also key to assess the patient's support system and ensure that they will have the resources they need upon discharge. The nurse will document these steps in the patient's discharge plan and ensure that they have a clear path forward once they leave the facility.

LINK TO LEARNING

Read this report detailing factors that can affect the discharge process (https://openstax.org/r/77discharge) from the Agency for Healthcare Quality and Research.

Summary

33.1 Triage and Assessment

- The ACBDE assessment method is utilized to triage patients. The patient's airway is assessed first, then breathing, circulation, neurological disability, and exposure.
- Emergency department nurses use triaging to guide the implementation of care for their patients. ED nurses must triage and stabilize patients with the most life-threatening conditions first.
- Components of effective documentation include assessment findings, medical histories, and communication with patients, families, and other members of the health-care team. Nurses should also document medications appropriately and provide updates to the patient's plan of care and outcomes.
- Subjective assessment findings, or symptoms, are those aspects of the patient's condition that the patient feels or tells the nurse about and that cannot be directly observed or measured.
- Objective assessment findings, or signs, are those conditions that the nurse can directly observe or measure.
- In the event of a life-threatening emergency where the patient is unconscious or unable to communicate, implied consent is warranted.
- Minors who come to the emergency department must receive an initial medical screening for emergency conditions. If there is a life-threatening injury, then the health-care team may proceed with care. It should, however, first exhaust all efforts to obtain consent from the minor's parents or legal guardian.

33.2 Types of Emergency Care

- The ABCDE triage assessment is best practice when performing an initial assessment on trauma patients.
- Crush injuries occur from prolonged pressure to an area and can either be traumatic or nontraumatic. Subsequent muscle injury releases myoglobin and other components into the bloodstream causing health complications.
- Rapid fluid resuscitation is key with crush injuries to prevent complications, such as rhabdomyolysis, shock, and acute kidney injury. Nurses must promote outcomes, such as improving revascularization, treating electrolyte disturbances, and maintaining patient stability.
- Accidental poisoning occurs when a person accidentally exposes themselves to toxic levels of a substance. Intentional poisoning can be caused by a person intentionally exposing themselves to toxic substances or by another person intending harm.
- Nurses provide support care, such as monitoring vital signs and promoting hemodynamic stability. They administer antidotes and anti-epileptic medications as ordered.
- Maltreatment is poor treatment or care of an individual and encompasses abuse and neglect.
- Types of abuse include child, elder, sexual, and domestic partner abuse.
- Nurses must perform a complete history and physical assessment when abuse is confirmed or suspected, thoroughly documenting findings and reporting to the appropriate channels immediately.
- As mandated reporters, nurses are required by law to report suspected or confirmed abuse of any type or to any person.
- Examples of psychiatric emergencies range from suicide attempts to acute psychosis, and from intoxication and drug overdose to delirium tremens.
- When a patient is involuntarily admitted to a health-care facility under law, this is a psychiatric hold. State laws governing psychiatric holds vary.
- Safety is a nurse's top priority when caring for patients with psychiatric emergencies.
- Examples of drugs frequently encountered in the emergency department include opioids, alcohol, methamphetamine, cocaine, and marijuana.
- Opioid and heroin overdoses cause respiratory and nervous system depression and potentially lead to death.
- Patients withdrawing from alcohol can develop delirium tremens, a severe condition that can present with seizures, and can sometimes lead to death.
- The CIWA scale is used for alcohol withdrawal and the COWS is for opioid withdrawal. Nurses provide supportive measures to control withdrawal symptoms, prevent dehydration, and collaborate with psychiatric care.

33.3 Managing Risk Exposure

- Nurses utilize risk assessment tools, such as the Triage Tool or Danger Assessment Tool, to readily identify potential violent patient behaviors.
- Methods for mitigating violence include establishing a workplace culture of respect, receiving violence prevention training, implementing zero-violence workplace policies, and developing a framework for outcome reporting.
- Some safety actions nurses can take include dressing safely, always being aware of their surroundings, and following de-escalation techniques, like establishing a calm environment or not using medical jargon when they speak.
- Wearing proper personal protective equipment when there is potential exposure to chemicals, drugs, or communicable disease is the first step to preventing disease and bloodborne pathogen transmission.
- Stress management strategies include promoting self-care and safety and seeking support from others or employee assistance programs.

33.4 Forensic Nursing

- Forensic nurses often work in the emergency department and are specifically trained to examine patients who are victims of acts of violence or abuse.
- A forensic nurse follows set protocols for collecting and preserving evidence.
- Evidence collection involves collecting a thorough history, taking photographs, gathering samples, and completing the required documentation and a chain of custody form.
- A SANE nurse is a forensic nurse who is trained in sexual assault examinations and gathering evidence and uses a SAECK to collect evidence samples from the patient.

33.5 Transferring from the Emergency Department

- The framework for optimal discharge planning is an ongoing process, including initial screening, care coordination, and post-discharge follow-up.
- Health-care organizations must continuously re-evaluate their best practices for patient transfers. ED team members and nurses must appropriately triage patients and assign their acuity level.
- Nurses must ensure that patients are stable prior to transfer. Vital signs should be stable, orders and diagnostic tests should be completed, medications should be administered, and continuous infusions and drains/lines should be inserted, as needed.
- The SBAR tool is the recommended tool for nurses to utilize during patient transfer to communicate effectively and concisely.
- Nurses should review follow-up instructions with patients about their discharge care and signs and symptoms of worsening conditions.
- Determining the patient's social determinants of health that can affect the patient's care after discharge.

Key Terms

abuse harming another person physically, sexually, or emotionally
accidental poisoning when a person accidentally exposes themselves to a substance that is harmful
acuity represents how the health-care team determines the severity of a patient's status
airway, breathing, circulation, disability, and exposure (ABCDE) triage assessment method patients in emergency situations
consent gives medical professionals the authority to treat the patient, providing them with the most competent and highest quality of care
crush injury prolonged pressure to an area of the body
Danger Assessment Tool reliable assessment tool that provides a baseline score to assess an emergent situation
delirium tremens seizures and hallucinations, along with tachycardia, hypertension, and hyperthermia
Emergency Medical Treatment and Labor Act (EMTLA) federal law enforcing that patients must be stable prior to transferring to any other unit or health-care facility
forensic nurse nurse trained in health concerns and conditions related to acts of violence or abuse
implied consent approval is presumed and not obtained during an emergent situation due to the life-threatening

nature of the situation

intentional poisoning can be caused by a person intentionally exposing themselves to toxic substances or by another person intending harm

maltreatment poor quality of care an individual receives

neglect when a person or caregiver fails to supply a person's needs, such as food, shelter, clothing, or emotional support

objective assessment findings (also: *signs*) aspects of the patient's condition that the nurse directly observes and can be measured

personal protective equipment (PPE) includes gloves, masks, gowns, and face shields

poisoning exposure to substances, drugs, or chemicals

psychiatric hold when a patient is involuntarily admitted to a health-care facility under law

sexual assault nurse examiner (SANE) forensic nurse who receives specialized training in performing examinations and collecting evidence from victims of sexual assault

STAMP method method used for identifying signs of danger such as staring or eye contact, tone and volume of voice, anxiety, mumbling, and pacing

subjective assessment findings (also: *symptoms*) aspects of the patient's condition that the nurse does not directly observe and are only reported by the patient

triage process of prioritizing patients' care based on initial assessment findings; life-threatening conditions are prioritized over less severe or non–life-threatening conditions

Triage Tool evidence-based assessment of a patient's potential to become violent to others or harm themselves

Assessments

Review Questions

1. A nurse is assessing a patient's neurological status using the ABCDE triage assessment. What area is the nurse assessing?

a. airway
b. breathing
c. circulation
d. disability
e. exposure

2. When is implied consent obtained?

a. when a minor is seeking treatment
b. during an emergency situation that can lead to potential harm
c. during an emergency situation that is life-threatening
d. before a surgical procedure is performed

3. What is the hallmark sign that a patient has developed rhabdomyolysis from a crush injury?

a. elevated CRPB
b. elevated ESR
c. elevated CPK
d. elevated WBC

4. A patient is in the emergency department with intentional acetaminophen poisoning. What medication would the nurse plan to administer?

a. naloxone
b. flumazenil
c. N-acetylcysteine
d. There is no reversal agent.

5. What substance abuse disorder is commonly encountered in the emergency department? Select all that apply.

a. opioids
b. alcohol
c. suboxone
d. benzodiazepine
e. dextromethorphan

6. For how long is a psychiatric hold generally valid?
a. 24 hours
b. 48 hours
c. 72 hours
d. 96 hours

7. What term refers to poor treatment or care of an individual and encompasses the other terms?
a. abuse
b. maltreatment
c. neglect
d. violence

8. What is an example of a behavior that is not assessed in the STAMP risk assessment tool for recognizing violence?
a. soft tone of voice
b. pacing
c. mumbling
d. staring.

9. What is an example of a way to mitigate workplace stress?
a. walking outside during an assigned break
b. volunteering to eat lunch later in the shift
c. volunteering for extra work shifts
d. skipping a meal to help a coworker

10. What is the optimal timeframe for completing a sexual assault examination?
a. 24 hours
b. 36 hours
c. 48 hours
d. 72 hours

11. When collecting evidence, nurses should do what to swabs to preserve specimens as much as possible?
a. Place them in plastic.
b. Let them dry completely.
c. Store them together.
d. Soak them in water.

12. A nurse is giving a report on a patient who is being transferred to the surgical unit. The nurse tells the surgical nurse that the patient is scheduled for left hip surgery in the morning. What portion of the ISBAR communication is this?
a. situation
b. background
c. assessment
d. recommendation

13. What is an adequate method for delivering patient discharge education? Select all that apply.
a. verbalizing new information

b. providing written medication side effects
c. providing pamphlets with additional instructions
d. instructing the patient to use the internet to search for new information
e. using an interpreter if the patient speaks a different language

Check Your Understanding Questions

1. When caring for a patient who is under eighteen years old in the emergency department, what are the consent protocols, and what elements must the nurse document in the EMR?
2. Explain the triage process, and detail the method used when triaging patients.
3. What cellular changes occur during a crush injury?
4. What are examples of older-adult abuse?
5. Which methods could a nurse employ to mitigate violence?
6. Describe ways you can incorporate mindfulness into your daily routines.
7. Describe appropriate steps involved in the transfer of patients from the emergency department to an inpatient unit within the same facility.

Reflection Questions

1. Consider and discuss how the concept of triage contributes to efficient emergency department operations.
2. Give examples of some specific situations where the ABCDE triage assessment might be particularly crucial and explain why.
3. What trends would the nurse assess in the patient's clinical condition to see a resolution of rhabdomyolysis?
4. You are caring for a pediatric patient and notice bruise marks around their wrists and cuts on their forearms. What is your role as a nurse?
5. A nurse is caring for a patient with a psychiatric emergency. What types of psychiatric emergencies are there, and which measures should you implement when caring for this patient?
6. A nurse in an emergency room was assaulted by an intoxicated patient. During incontinence care, the patient grabs the nurse's stethoscope and attempts to strangle the nurse. The ED staff assisted the nurse, freeing her from the patient. What are some debriefing activities the nurse manager can take to mitigate the risk? Reflect on what the nurse could have done differently.
7. When caring for a patient with a history of violent outbursts who begins pacing the room and acting agitated, what are some effective verbal de-escalation strategies you can use? When would you need to place this patient in restraints? What strategies can you implement to ensure your safety while caring for this patient?
8. Describe the differences between a forensic nurse and a SANE nurse.
9. You are discharging a seventy-year-old patient who has bilateral wrist fractures because of a fall. What would you anticipate needing to consider to design an optimal discharge and care coordination plan before this patient goes home?
10. Describe potential challenges in implementing an effective discharge plan for patients from diverse cultural backgrounds. How would you address these challenges?
11. A patient arrived in the emergency department with a complex medical history and limited understanding of their conditions. How would you ensure effective communication and education during the discharge planning process?

What Should the Nurse Do?

1. A trauma patient in the emergency department was in a motor vehicle accident. They are unconscious and have a crush injury to the chest. Their vital signs are BP: 98/55; HR: 121; RR: 35; SpO_2: 84 percent, and

temperature: 95.9°F. How would the nurse assess this patient, and in what order would they address the patient's vital signs?

2. A sixteen-year-old female patient enters the emergency department. The patient is having abdominal pain and fever, but she is alert and not disoriented. She is diagnosed with an ectopic pregnancy requiring an emergency D&C. How should the nurse obtain consent for this procedure? What elements are subjective and objective?

Jay K. arrives by ambulance to the emergency room complaining of nausea, vomiting, and abdominal pain. He works as a construction worker and mentions that he was exposed to various chemicals at a worksite earlier today. He reports no significant medical history other than occasional episodes of acid reflux. Vital signs are as follows: BP: 140/90 mm Hg; HR: 100 bpm, RR: 20 breaths/min; and temperature 99.2°F (37.3°C). John appears pale and diaphoretic. He expresses concern about the possibility of serious chemical exposure and is anxious about his health and ability to continue working.

3. What physical examination findings might indicate potential chemical exposure in this case?
4. What immediate interventions would you implement to address both the patient's symptoms and concerns about potential chemical exposure?

5. A nurse goes into an emergency room bay to assess a patient who experienced a fall down the basement stairs. The patient is seen sitting in the chair, guarding her arm, with her partner standing in the corner, pacing. He is staring at her and does not maintain eye contact.
   The nurse suspects domestic partner abuse. What should the nurse do?

Tonya W., a thirty-two-year-old female, arrives at the emergency department after being brought in by law enforcement due to concerns about her safety and the safety of others. She presents with agitation, disorganized speech, and paranoid delusions, expressing the belief that she is being followed by unknown individuals. Tonya W. has a history of schizophrenia and noncompliance with medication. On assessment, her vital signs are as follows: temperature: 98.6°F (37°C); BP: 140/90 mm Hg; HR: 110 bpm; RR: 20 breaths per minute; and oxygen saturation: 98 percent on room air. The nursing staff recognizes the potential for violence given Tonya W.'s behavior and history and implements measures for her safety and the safety of others in the emergency department.

6. What behavioral cues suggest that Tonya W. may pose a risk of violence in the emergency department?
7. How would you prioritize the interventions needed to address Tonya W.'s safety and the safety of others in the emergency department?

Competency-Based Assessments

1. Develop a presentation for your peers that considers some potential consequences of inadequate documentation in the emergency department.

2. Develop a pamphlet describing a scenario where implied consent may be ethically justified, and explain why.

3. Research current treatment protocols for common crushing injuries. Develop a 10-minute presentation for your peers that covers the nursing interventions, assessments, and outcomes they might come across when caring for a patient with a crush injury.

4. Develop guidelines identifying how a nurse might differentiate between accidental ingestion of a toxic substance and intentional self-poisoning in the emergency department based on a patient's history and presentation.

5. Create a pamphlet explaining how nurses can ensure the safe and effective administration of antidotes to patients who have experienced poisoning while minimizing the risk of adverse reactions or medication errors.

6. Create three slides presenting the interventions and assessment tools a nurse can use when caring for a patient with alcohol withdrawal.

7. Conduct a search of recent nursing literature and identify a current article that discusses stress management strategies for nurses who cared for patients during the COVID-19 pandemic.

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CHAPTER 34
Disaster and Recovery

FIGURE 34.1 Environmental disasters, like the destruction of a tornado, can be devastating. Nurses need to be aware of the role they play in disaster response. (credit: "Picking up the pieces" by Staff Sgt. Mike Meares/U.S. Air Force, Public Domain)

CHAPTER OUTLINE

INTRODUCTION In any profession, in any walk of life, the environment and the way it behaves affects all people. Environmental disasters can cause unimaginable damage to life and property. As a nurse, it is important to understand these disasters, how they come about, how they affect individuals and communities, and how to respond to of them. Whether a disaster is meteorological (from the atmosphere), geological (from within the earth), or water-related, it can cause significant devastation and loss of life. Nurses are an integral part of disaster response. They must be prepared to protect their current patients from the disaster and handle an influx of new patients in the immediate aftermath. Knowledge of these disasters and how to respond to them is essential to all nurses.

34.1 Environmental Disasters

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Describe examples of environmental water disasters
- Describe examples of environmental land disasters
- Summarize the roles and responsibilities of the nurse during environmental disasters

Water Disasters: Storms, Snow, Floods, and Tsunamis

Disasters involving water are some of the deadliest and most widespread disasters that can devastate the human race (Puryear & Gnugnoli, 2023). As nurses, the level of preparedness and understanding must be high in order to carry out duties properly. According to the **National Weather Service (NWS),** flash floods are the second-highest cause of death from meteorological disasters in recent years (NWS, 2022). Understanding how these disasters occur and what areas are most prone to them is paramount. For example, in Virginia, where heat-related ailments can be common in the summertime, 400 additional outpatient visits are required to care for heat-related illness along with seven thousand additional emergency department visits and two thousand hospital admissions each summer due to heat (Center for American Progress, 2023). Virginia hospitals use this information to ensure additional resources are ready each summer.

Thunderstorms are especially common in the United States. The United States experiences more thunderstorms than many other regions due to its unique geography (Borenstein, 2023). The country's geography channels warm, moist air from the Gulf of Mexico to collide with cool, dry air from the Rocky Mountains, creating unstable atmospheric conditions that are conducive to thunderstorms. The geography also serves as a mechanism to lift unstable air and cause thunderstorms to form. The entire United States can experience thunderstorms and the hazards that come with them, such as lightning, torrential rain, flash flooding, hail, damaging winds, and tornadoes. An important aspect of being prepared for such threats is listening to the information and guidance from the NWS and local meteorologists. Understanding the threat level on a given day and what can come with it is the first step in planning a response to such an event. This information is readily available on cell phones and on the NWS websites, such as the Storm Prediction Center. A battery-operated weather radio is essential for staying informed during severe weather. This information could be placed on a board so nurses have an idea what the threat is for the day on a regional level, and a television can be left on the local news.

Knowing when an area is under a watch or a warning for a particular hazard is also important. The difference between a watch and a warning is whether the hazard is imminent. For example, a **tornado watch** would be issued if the environmental conditions are favorable for tornadic development throughout the time period the watch is in place. A tornado warning would be issued if there is a storm with radar-indicated rotation or an observed tornado moving its way into the area.

Tropical storms and hurricanes can also cause immense and widespread problems. These storms not only have extremely strong winds and rain but can also spawn tornadoes and cause floods due to both heavy rain and **storm surge**, which is when water from the ocean is pushed ashore by heavy winds.

Snow and floods are similar in that the NWS and its partner agencies provide guidance and often establish command centers to coordinate communication for areas at risk from these hazards. Large amounts of snow can cause roadways to be blocked, making travel impossible. When the snow melts, there will be added risk because all the water can now cause flooding. Heeding expert advice and professional guidance is the best way to prepare for such disasters.

Floods can be caused by a multitude of factors. Floods can come in the **flash flood** variety, which is typically caused by an excessive amount of rain in a short time frame. Flash floods are dangerous due to how fast they come about (Roudbari et al., 2024). Floods can also come from a lot of precipitation being funneled into an area by high terrain. Understanding the terrain and susceptibility of the area to floods is another factor in being prepared. Floods can also be caused by geologic hazards such as landslides and tsunamis. Nurses in these areas should be prepared for the need to move patients to higher floors and to protect electrical equipment.

A **tsunami** is a geologic hazard that usually comes from shallow underwater earthquakes. Even weak earthquakes can cause devastating tsunamis. Knowing the course of action in an earthquake-prone area near a coast, such as the

American West Coast, is paramount to keep people as safe as possible. Tsunamis can also be caused in smaller bodies of water by landslides. The largest theorized tsunami came from a landslide triggered by a massive earthquake, causing the face of a mountain to plunge into a lake, displacing a massive amount of water and forming a massive wave.

Weather disasters severely disrupt access to hospitals and can be life-threatening for at-risk community members. Hospitals may sustain physical damage that limits their ability to provide care, and facilities can become inaccessible due to blocked roads. Nurses should be aware of potential emergency staffing needs. This means the need to ensure coverage for all shifts, which may mean sheltering in place at the hospital. Staff are often trying to work under overwhelming resource strain, including loss of crucial resources like electrical power. People with pre-existing medical conditions can be in grave danger if their necessary medications, equipment, or home care are interrupted during a disaster. Patients should be educated on preparing a "grab-and-go" emergency kit for such situations.

Nurses should be aware of their organization's emergency plan, including evacuation routes and shelter locations, and ensure windows and doors are secured (Puryear & Gnugnoli, 2023). Evacuation can be challenging for people with limited mobility. Even if people who are immobile are moved, many shelters are not able to accommodate complex medical needs. Evacuation drills are required by the Occupational Safety and Health Administration (OSHA) primarily for fire emergencies and other workplace hazards. States may have additional requirements for evacuation drills related to various emergencies, including severe weather and hazardous material spills, but these state-specific rules can vary.

Communication breakdowns further isolate the people who are in most need of help during a disaster, and the disruptions may have serious long-term consequences. Delayed care can lead to severe medical complications or even death. All of these effects and consequences will be amplified in populations with lower incomes and in medically underserved areas. Roads can be blocked or completely swept away, especially in these underserved areas where road quality may already be diminished. Food supplies can be tainted and leave communities at risk for starvation and the people affected can be hampered long term with emotional health problems and economic crises.

Land Disasters: Earthquakes, Landslides, and Wildfires

Earthquakes, landslides, and wildfires pose significant threats to life and property, often resulting in widespread damage. An **earthquake** is a geological disaster caused by collisions of tectonic plates. There are several regions of the world that are prone to earthquakes; however, they can happen anywhere. Earthquakes are very hard to predict, so it is difficult to predict when an area may be under threat. Understanding the regional threat of earthquakes determines the preparedness level required. Having an established disaster plan in place is one way to be prepared at all times for an earthquake. Being indoors in a sturdy building can mitigate any harm. When an earthquake occurs, a subsequent smaller and often weaker earthquake, called an **aftershock**, often happen.

Preparedness any time after the initial earthquake is crucial. Sometimes, earthquakes can trigger large landslides that can sweep away small buildings, trees, and large rocks into a running "river" of earth. If an area with high terrain experiences an earthquake, it is very likely that the shaking will dislodge rocks and create a **landslide**. The course of action when there is a landslide is to get to higher ground as quickly as possible. When an earthquake occurs or if heavy rainfall is forecasted, a landslide could be possible, and preparations should take place.

Wildfires can cause some of the most widespread damage of any natural disaster. A **wildfire** is most common in areas of drought and dry conditions where vegetation is present. Wildfires flourish in very dry and windy conditions; for example, in Alaska, the valleys of California, the Texas panhandle, and parts of the Southeast (Insurance Information Institute, 2020). The drier the vegetation is, the more likely it is for fire to start and spread. Windy conditions exponentially increase how fast and how far the fire spreads. Wildfires can spread hundreds to thousands of square miles in very short periods of time. Evacuation is the only way to escape these fires. The best way to be prepared is to listen for guidance from the NWS and local news agencies and be aware of a particular area's risk for wildfires. In case of fire, nurses should be prepared for any evacuation orders and the course of action to protect patients.

LINK TO LEARNING

The National Weather Service continuously keeps track of weather-related fatalities (https://openstax.org/r/77weathrdeath) in the United States.

Nursing Roles and Responsibilities

Nurses have many responsibilities when natural disasters strike, and must play a pivotal role in mitigating the impact on individuals and communities. Nurses are integral in disaster preparedness efforts. Nurses collaborate with interdisciplinary teams to develop and refine emergency response plans tailored to the specific risks posed by natural disasters. They assess community vulnerabilities, identify at-risk populations, and devise strategies to ensure swift and effective action when disaster strikes.

During the acute phase of an environmental disaster, nurses serve as frontline responders, providing immediate medical care and triage services. They possess the clinical expertise to assess and prioritize injuries, administer life-saving treatments, and stabilize patients for evacuation or transfer to higher levels of care. Nurses also fulfill critical roles in establishing and managing temporary medical shelters. They set up triage areas, organize medical supplies, and coordinate with other health-care professionals and emergency responders to streamline patient care, providing continuous monitoring, treatment, and emotional support to patients, and addressing the physical injuries, psychological trauma, and emotional distress that often accompany environmental disasters.

In the aftermath of an environmental disaster, nurses continue to play a vital role in long-term recovery efforts. Nurses collaborate with public health agencies, community organizations, and government entities to assess the health needs of affected populations and implement targeted interventions. Nurses advocate for at-risk groups, ensuring equitable access to health-care services, medications, and support systems. They also contribute to ongoing surveillance and monitoring efforts to detect and mitigate potential health threats arising from environmental hazards, such as contaminated water sources or infectious disease outbreaks. Importantly, nurses need to be aware of their own needs and make sure they take care of their mental health during an environmental disaster. Nurses can deal with trauma and burnout from these disaster events and it is important they take care of themselves so that they can take care of patients as effectively as possible. From proactive preparedness initiatives to hands-on clinical care and community advocacy, nurses' unwavering commitment to serving humanity during times of environmental disaster embodies the core values of the nursing profession and underscores the indispensable contributions of nurses to public health and safety.

REAL RN STORIES

Nurse: Nicole, RN
Years in Practice: Two
Clinical Setting: Medical ICU
Geographic Location: Joplin, Missouri

The tornado that struck Joplin, Missouri on May 22, 2011, was one of the deadliest tornadoes in U.S. history. As the ominous clouds darkened the sky over Joplin, I felt a sense of unease. Tornado warnings had been issued, and the atmosphere was tense. Little did I know, the hospital was about to face one of the most challenging days in its history.

When the tornado sirens began to wail, my coworkers and I sprang into action. Nurses hurriedly moved patients away from windows and into interior rooms, following the hospital's established tornado protocols. Some patients were too ill or immobile to move, so nurses stayed by their sides, shielding them from potential harm.

As the tornado descended upon the city with ferocious power, the hospital shook from the force of the winds. Windows shattered, debris flew, and the sound of destruction filled the air. Despite the chaos, we remained calm, and focused on our duty to protect and care for our patients.

In the aftermath of the tornado, we emerged as a beacon of hope amid the devastation. Despite suffering damage to parts of the facility, the hospital continued to operate, providing lifesaving care to those in need. We worked tirelessly, treating injuries, comforting survivors, and supporting our colleagues in the face of overwhelming adversity.

34.2 Biological and Technological Disasters

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Describe examples of biological disasters
- Describe examples of technological disasters
- Summarize the roles and responsibilities of the nurse during biological and technological disasters

In the field of nursing, preparedness and an understanding of biological and technological disasters is important. The intersection of health care and disaster management presents unique challenges that demand specialized knowledge and skills. From infectious disease outbreaks to technological failures like computer hacking to electrical malfunctions of machines, nurses play a crucial role in both the prevention and response to these events. This section explores the intricacies of biological and technological disasters, exploring their causes, manifestations, and the nursing interventions necessary to mitigate their impact on individuals, communities, and health-care systems.

Biological Disasters

Biological disasters pose significant challenges to the field of nursing, requiring a multifaceted approach to prevention, mitigation, and response. A **biological disaster** encompasses a wide range of events, such as an infectious disease outbreak, a pandemic (widespread epidemic of infectious disease), and a **bioterrorism** incident (deliberate release of harmful biological agents with the intent to cause illness or death). Throughout history, there have been many notable biological disasters ranging from deadly disease outbreaks to acts of terrorism. Some examples include:

- The influenza pandemic of 1918–1920, which killed more than 50 million people around the world, is one of the most devastating infectious disease outbreaks in modern history (Britannica, 2024).
- The 2001 anthrax attacks in the United States were an act of bioterrorism that took place at a particularly sensitive period of American history, just after the terrorist attacks of September 11 (Federal Bureau of Investigation [FBI], n.d.).
- The COVID-19 pandemic, starting in late 2019, has had profound global impacts, leading to millions of deaths, overwhelming health-care systems, and causing significant social and economic disruptions worldwide (World Health Organization, 2024).

Nurses were among the key players in response to these disasters and managing their aftermath. Nurses play a critical role in identifying early warning signs, implementing infection control measures, and providing care to affected individuals. In the face of biological disasters, nurses must be equipped with knowledge of epidemiology, pathophysiology, and public health principles to effectively assess, triage, and treat patients. Additionally, they serve as educators, helping communities understand the importance of vaccination, hygiene practices, and other preventive measures. By working collaboratively with interdisciplinary teams and remaining vigilant in monitoring for emerging threats, nurses can help mitigate the impact of biological disasters and safeguard the health and well-being of populations worldwide.

Influenza

Commonly referred to as the flu, **influenza** remains a significant public health concern globally, affecting millions of individuals each year (Gaitonde et al., 2019). This highly contagious respiratory illness is caused by influenza viruses that infect the nose, throat, and sometimes the lungs. Influenza viruses are notorious for their ability to mutate rapidly, leading to the emergence of new strains and seasonal outbreaks. Nurses play a vital role in influenza prevention, diagnosis, and treatment, particularly during flu season. They advocate for vaccination, educate the public on hygiene practices to reduce transmission, and provide care to those who become ill from the virus.

In health-care settings, nurses implement infection control measures to prevent the spread of influenza among patients, staff, and visitors. Additionally, they closely monitor patients with influenza-like symptoms, administer

antiviral medications when appropriate, and offer supportive care to alleviate symptoms and prevent further complications. The most important intervention is handwashing. Through their expertise in infection prevention and patient care, nurses contribute significantly to reducing the burden of influenza and safeguarding public health.

LIFE-STAGE CONTEXT

Considerations for Older Adults with Influenza

When considering older adults and their exposure to influenza, there are important factors to take into account due to their increased vulnerability to severe complications from the virus. Older adults are at higher risk of developing complications from influenza, such as pneumonia, exacerbation of chronic medical conditions (e.g., heart disease, diabetes), and hospitalization. Health-care providers should closely monitor older patients with influenza for signs of complications and provide appropriate treatment promptly (National Foundations for Infectious Disease, 2023).

The **H1N1 influenza virus**, commonly known as swine flu, emerged as a global health concern in 2009, triggering a pandemic that swept across continents. A subtype of the influenza virus, H1N1 was characterized by its rapid spread and ability to infect individuals of all ages. H1N1 presented unique challenges to health-care systems worldwide. The virus caused severe respiratory illness and, in some cases, led to fatal complications, particularly among at-risk populations (Centers for Disease Control and Prevention [CDC], 2019). The high morbidity and mortality associated with H1N1 underscores the devastating and lasting effect that biological disasters can have on public health.

Nurses play a pivotal role in response efforts, providing care to affected individuals while implementing stringent infection control measures to limit transmission. The H1N1 pandemic highlighted the importance of preparedness, collaboration, and adaptability in the face of emerging infectious diseases. Nurses were at the forefront of vaccination campaigns, community outreach initiatives, and patient education efforts, helping to mitigate the impact of H1N1 and protect at-risk populations. Through their expertise in epidemiology, patient care, and public health, nurses continue to play a crucial role in monitoring for potential outbreaks, advocating for vaccination, and ensuring swift and effective responses to infectious disease threats like H1N1.

Anthrax

Caused by the bacterium *Bacillus anthracis*, **anthrax** is a rare but potentially deadly infectious disease that can affect humans and animals. While naturally occurring anthrax infections in humans are uncommon, the bacterium has been weaponized in bioterrorism attacks, leading to heightened concerns about its potential use as a biological weapon. Anthrax can infect humans through inhalation, ingestion, or direct contact with infected animals or contaminated animal products. Common animal vectors (carriers) for anthrax include livestock such as cattle, sheep, goats, and horses, as well as wild animals like deer and other herbivores. Inhaled anthrax, the most lethal form, presents with flu-like symptoms initially but can rapidly progress to severe respiratory distress and systemic illness. The average fatality rate of the different forms of anthrax is approximately 44.75 percent (Manish et al., 2020). Nurses collaborate with public health authorities to educate communities on recognizing the signs and symptoms of anthrax, implementing appropriate infection control measures, and administering prophylactic antibiotics or vaccines when indicated. Nurse should educate the community on vaccines and therapeutic antibodies as the most crucial components of anthrax prophylaxis (pre- and post-exposure) and treatment (Manish et al., 2020). Signs and symptoms of anthrax include:

- Cutaneous anthrax
  - Painless skin sore with a black center, often appearing after the blisters or bumps
  - Small blisters or bumps that may itch
  - Swelling around the sore
- Inhalation anthrax
  - Body aches
  - Chest pain
  - Cough
  - Extreme fatigue
  - Fever and chills

    - Headache
    - Nausea and vomiting
    - Shortness of breath
    - Sweating (usually drenching)
- Gastrointestinal anthrax
    - Diarrhea or bloody diarrhea
    - Fever and chills
    - Hoarseness
    - Nausea and vomiting, especially bloody vomiting
    - Painful swallowing
    - Sore throat
    - Stomach pain
    - Swelling of neck, neck glands, and/or abdomen (stomach)
- Injection anthrax
    - Fever and chills
    - Itchy blisters or bumps where the drug was injected
    - Skin sore and/or abscess with swelling and a black center, appearing after the blisters or bumps

In the event of a bioterrorism attack involving anthrax, nurses are on the front lines of emergency response efforts, triaging and treating affected individuals while coordinating with interdisciplinary teams to contain the spread of the disease. Through their expertise in infection control, emergency preparedness, and patient care, nurses play a vital role in mitigating the impact of anthrax and protecting public health.

Nursing Roles and Responsibilities

Nurses play indispensable roles in biological disaster preparedness, response, and recovery efforts. With their diverse skill sets and frontline presence, they are integral to the health-care system's ability to effectively address the complexities of such crises. In the preparatory phase, nurses contribute to developing and implementing emergency response plans, conducting drills, and ensuring health-care facilities are equipped with the necessary supplies and protocols. These supplies include personal protective equipment (PPE) such as masks, gloves, gowns, and face shields; medical supplies such as bandages, antiseptics, and medications; emergency medical equipment such as defibrillators, ventilators, and first aid kits; and logistical supplies including communication devices, backup power sources, and sufficient stock of essential medicines and medical consumables.

Nurses need to remember cultural diversity impacts disaster preparedness and response efforts by influencing communication styles, belief systems, and help-seeking behaviors within communities. Having a strong understanding of the community's cultural norms and values is essential for developing culturally sensitive plans and interventions that effectively reach and support diverse populations.

During a biological disaster, nurses are often among the first responders, providing immediate medical care, triaging patients, and implementing infection control measures to prevent further transmission. They play key roles in surveillance, rapidly identifying and reporting cases to public health authorities to facilitate early intervention. In the aftermath of a biological disaster, nurses continue to support recovery efforts, offering ongoing medical care, psychological support, and community health services. Their resilience, adaptability, and commitment to patient-centered care are essential in navigating the challenges posed by biological disasters and ensuring the well-being of affected individuals and communities.

Technological Disasters

A **technological disaster** encompasses a broad range of events, with far-reaching implications for public health and safety. Examples include an industrial accident, a transportation incident, an infrastructure failure, and a **cyberattack**, defined as deliberate, malicious attempts to disrupt, damage, or gain unauthorized access to computer systems, networks, or electronic devices. Chemical, radiological, and nuclear disasters also fall under the broader category of technological disasters. Throughout history, there have been many notable technological disasters. Some examples include:

- The Minamata disease outbreak in the 1950s in Japan, caused by industrial mercury poisoning, led to severe neurological damage in thousands of people, raising awareness about industrial pollution and its impacts on

human health (National Institute for Minamata Disease, 2024).
- The Chernobyl nuclear accident in 1986 and the Bhopal gas tragedy in 1984 were chemical disasters that had both short- and long-term consequences (Britannica, 2024; World Nuclear Association, 2024).
- The Flint water crisis, beginning in 2014, exposed thousands of residents to lead-contaminated water, causing widespread public health concerns and highlighting issues of environmental injustice (EPA, 2024).

Chemical Hazards

A **chemical hazard** encompasses a diverse array of substances that can pose risks to human health and the environment. Toxic chemicals include substances such as pesticides, heavy metals, and industrial solvents. Exposure to toxic chemicals can lead to acute or chronic health effects, ranging from irritation and respiratory problems to neurological damage and cancer (such as mesothelioma, which is commonly caused by chemical exposure) (CDC, 2023).

Another category of chemical hazards are corrosive chemicals, which have the potential to cause severe damage to skin, eyes, and respiratory tissues upon contact. Examples include strong acids, alkalis, and oxidizing agents commonly found in industrial settings. Additionally, there are flammable and combustible chemicals, which pose fire and explosion risks if mishandled or improperly stored. These substances include fuels, solvents, and gases that can ignite when exposed to heat, sparks, or open flames.

Finally, there are reactive chemicals, which can undergo spontaneous reactions or produce hazardous byproducts when exposed to other substances or conditions. Examples include peroxides, oxidizers, and unstable compounds commonly used in laboratory and manufacturing processes. Understanding the characteristics and hazards associated with these types of chemicals is essential for effective risk assessment, mitigation, and emergency response efforts.

Radiation Emergencies

Radiation emergencies include several types radioactive exposure, which vary by source and damage. A **radiological disaster** encompasses a range of events involving the release of radioactive materials into the environment, posing risks to human health and the ecosystem. These disasters can be categorized into several types based on their sources and impacts. First, there are nuclear accidents, which involve the release of radioactive materials from nuclear power plants or research facilities due to equipment malfunctions, human error, or natural disasters. Examples include the Chernobyl disaster in 1986 and the Fukushima Daiichi nuclear disaster in 2011. Second, radiological terrorism involves deliberate acts to release radioactive materials with the intent to cause harm or create fear. This may include the use of radioactive sources in explosive devices or dispersal devices such as "dirty bombs." Third, radiological incidents can occur in health-care settings, such as accidental exposure to radiation during medical procedures or the mishandling of radioactive materials in laboratories during x-rays, radiation therapy, chemotherapy, and radioactive medication creation. Finally, environmental contamination from historical activities such as mining, waste disposal, or military testing can lead to long-term radiological hazards in communities. Ecosystems that support human society can experience devastating contamination, as radioactive particles can permeate soil, water, and food chains. When animals and plants are exposed to radiation, they become rendered unsafe for human consumption, which can have negative effects on agriculture and food supplies (Obrador et al., 2022).

Although the effects are not always readily or immediately visible, radiological disasters can pose significant harm to the environment and human health. The effects of radiological disasters are also not just an immediate concern, as they are often felt for decades. In terms of morbidity and mortality, radiation can penetrate the body, damaging cells and DNA, leading to acute conditions such as radiation sickness (characterized by nausea, vomiting, skin burns, and even death in severe cases). There are also long-term risks associated with exposure, including increased cancer rates (e.g., leukemia, thyroid cancer), genetic mutations, and birth defects in future generations (CDC, 2018).

A **nuclear disaster** (or nuclear incident) refers to the catastrophic release of radioactive materials, typically the result of a detonation or explosion. The most dangerous type of nuclear disaster is nuclear weapons detonation, involving the deliberate use of atomic bombs or other nuclear devices, resulting in devastating immediate and long-term consequences, as seen in the atomic bombings of Hiroshima and Nagasaki during World War II. Nuclear terrorism poses a significant threat, with the potential for malicious actors to acquire or construct improvised nuclear devices or dirty bombs, dispersing radioactive materials to cause harm and instill fear.

Nursing Roles and Responsibilities

In these crises, nurses play critical roles in both immediate response efforts and long-term recovery. During the acute phase of a technological disaster, nurses are often among the first health-care providers to arrive at the scene, triaging and providing emergency medical care. They collaborate with interdisciplinary teams to coordinate evacuations, manage mass casualties, and address environmental hazards. Nurses also play key roles in communicating with affected populations, providing reassurance and guidance on protective measures. In the aftermath of a technological disaster, nurses continue to provide essential health-care services, addressing both physical and psychological needs. They contribute to assessing and treating injuries, monitoring for potential health effects from exposure to hazardous materials, and supporting individuals and communities as they rebuild and recover. Through their expertise in emergency response, disaster management, and compassionate care, nurses serve as pillars of strength and support in times of technological crisis, helping to mitigate harm and promote resilience in affected populations. If the cyberattack happens to a facility, the nurse must assist with immediately shutting down any computer or electronic patient charts. This action can help mitigate a data breach.

Radiological disasters require coordinated response efforts to mitigate exposure risks, provide medical care to affected individuals, and minimize environmental contamination. Effective preparedness, training, and collaboration among health-care professionals, emergency responders, and government agencies are essential to effectively manage the complexities of radiological disasters and protect public health.

Nuclear disasters require comprehensive emergency response strategies, including evacuation, decontamination, medical treatment for radiation exposure, and environmental remediation efforts. In a health-care setting, this plays out as follows:

- Preparedness and training: Health-care facilities must ensure that staff are well-trained in radiation emergency protocols, including the use of personal protective equipment (PPE) and decontamination procedures.
- Triage and treatment: Hospitals and clinics must be prepared to triage and treat patients with radiation exposure. This includes having the necessary medical supplies, such as potassium iodide tablets, and equipment to monitor radiation levels.
- Evacuation plans: Clear evacuation plans should be in place for both patients and staff to ensure safe and orderly movement in the event of a radiation emergency.
- Decontamination units: Establishing decontamination units within or near health-care facilities to treat individuals exposed to radiation before they enter the main health-care environment.
- Communication systems: Robust communication systems are essential to coordinate with emergency services, public health authorities, and other health-care providers to ensure a unified response.
- Psychological support: Providing mental health support for both patients and health-care workers affected by the trauma and stress of a nuclear disaster.
- Public education: Educating the public on the signs and symptoms of radiation exposure and the importance of following evacuation and decontamination instructions.
- Resource allocation: Ensuring that adequate resources, including staff, medical supplies, and equipment, are available and can be rapidly deployed in response to a nuclear disaster.

By implementing these strategies, health-care settings can effectively manage the complex challenges posed by nuclear disasters and minimize the impact on human health. Effective international cooperation, stringent safety regulations, and ongoing research are also crucial in mitigating the risks associated with nuclear disasters and ensuring the safety and well-being of populations worldwide.

34.3 Epidemics and Pandemics

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Define the terms *epidemic* and *pandemic*
- Describe the example of the Ebola epidemic
- Describe the example of the COVID pandemic
- Summarize the roles and responsibilities of the nurse during an epidemic and a pandemic

Epidemics and pandemics represent profound challenges to global health and health-care systems, having significant effects on individuals, communities, and societies worldwide. Infectious disease outbreaks, which are characterized by the rapid spread of pathogens across geographic regions and populations, demand heightened vigilance, preparedness, and coordinated response efforts from health-care professionals.

In the field of nursing, understanding the dynamics of epidemics and pandemics is a crucial foundation for taking action, as nurses are at the forefront of care delivery, infection prevention, and public health promotion. This chapter explores the complexities of epidemics and pandemics, investigating their causes, transmission dynamics, clinical manifestations, and the essential nursing interventions necessary to mitigate their impact. By examining historical outbreaks and emerging infectious diseases, nurses can gain insights into the evolving landscape of epidemic and pandemic response, equipping themselves with the knowledge and skills needed to effectively address these formidable challenges and safeguard the health and well-being of individuals and communities.

Epidemic

An **epidemic** is the occurrence of a disease in a population or geographical area at a higher frequency than expected. It often refers to a sudden and significant increase in the number of cases of a particular illness within a defined period. Epidemics can be caused by infectious agents such as bacteria, viruses, or parasites, as well as non-infectious factors like environmental toxins. There are several types of epidemics, each characterized by distinct patterns of disease transmission and spread. Common types include a **point source epidemic**, where a large number of individuals are exposed to the infectious agent at the same time and develop symptoms within a relatively short period. A **propagated epidemic** occurs when the disease is transmitted from person to person over an extended period, leading to sustained transmission within the population. A **mixed epidemic** involves a combination of both point source and propagated transmission patterns. Understanding the different types of epidemics is critical for health-care professionals, as it informs strategies for disease surveillance, outbreak investigation, and control measures to mitigate the spread of illness and protect public health.

Ebola

Ebola virus disease (EVD), commonly known as Ebola, is a severe and often deadly illness caused by infection with the Ebola virus. Originally transmitted from wild animals to people, Ebola spreads through human-to-human transmission, and first appeared in two simultaneous outbreaks in 1976 in Nzara, Sudan, and Yambuku, Democratic Republic of Congo. The latter occurred in a village situated near the Ebola River, for which the disease was named. Since then, several outbreaks have occurred in Central and West African countries, with varying degrees of severity.

Ebola virus disease is characterized by symptoms such as fever, severe headache, muscle pain, weakness, diarrhea, vomiting, abdominal pain, and unexplained bleeding or bruising. The disease has a high mortality rate, with up to 90 percent of infected individuals dying from the illness (Whitmer et al., 2018). Health-care workers, family members caring for sick individuals, and people who have direct contact with the bodies of people who have died from Ebola are at the highest risk of infection.

Nurses play a crucial role in the prevention, detection, and management of Ebola outbreaks. Infection control techniques such as using gloves, gowns, N95 respirators, and face shields are critical to stopping the spread of the virus. Nurses provide care to infected patients while implementing strict infection control measures, such as avid handwashing and isolation of suspected patients to prevent further transmission. Nurses also play key roles in community education and outreach efforts to raise awareness about Ebola prevention strategies and promote early detection of cases. This can be achieved by hosting community health fairs and educational workshops. Through their expertise in infection control, patient care, and public health, nurses contribute significantly to containing Ebola outbreaks and protecting the health and well-being of affected communities.

Nursing Roles and Responsibilities

Nurses play indispensable roles in the response to epidemics, leveraging their expertise in infection prevention, patient care, and public health to mitigate the spread of infectious diseases and safeguard the well-being of individuals and communities. In the preparatory phase, nurses contribute to the development and implementation of epidemic preparedness plans, ensuring health-care facilities are equipped with necessary supplies, protocols, and training to effectively respond to outbreaks. During an epidemic, nurses are often among the first health-care providers to assess and treat affected individuals, implementing infection control measures to prevent further transmission. They play pivotal roles in triaging patients, conducting screenings, and providing care to those

infected, while also offering support and guidance to worried individuals seeking information and assistance. Additionally, nurses play critical roles in community outreach and education efforts, disseminating accurate information about the disease, promoting preventive measures such as vaccination and hygiene practices, and addressing misconceptions and fears. Nurses also collaborate with interdisciplinary teams to track and monitor disease transmission, identify emerging hotspots, and implement containment strategies. Furthermore, nurses provide essential care and support to at-risk populations, including older adults, children, and those with underlying health conditions, who may be at increased risk during epidemics. Through their dedication, expertise, and compassion, nurses serve as frontline heroes, working tirelessly to protect public health and mitigate the impact of infectious disease outbreaks on individuals and society as a whole.

Pandemic

A **pandemic**, a global outbreak of infectious disease, represents some of the most challenging public health crises. Unlike epidemics, which are localized outbreaks, pandemics spread across international borders, affecting populations worldwide. These events, often caused by novel viruses or pathogens to which humans have little to no immunity, can result in widespread illness, death, and societal disruption. Throughout history, pandemics such as the influenza pandemic of 1918, the HIV pandemic, and more recently, the COVID-19 pandemic, have shaped societies, economies, and health-care systems. Pandemics highlight the interconnectedness of our world and the importance of coordinated global responses. Nurses are at the forefront of pandemic response efforts, providing essential care to those affected, implementing infection control measures, and supporting public health initiatives.

COVID-19

COVID-19, caused by the novel coronavirus SARS-CoV-2, rapidly emerged as one of the most significant global health crises in modern history. Since its identification in December 2019 in Wuhan, China, the virus has spread rapidly across continents, leading to millions of infections and significant loss of life. COVID-19 presents with a wide range of symptoms, from mild respiratory illness to severe pneumonia, acute respiratory distress syndrome (ARDS), and multi-organ failure, particularly affecting older adults and those with underlying health conditions. The pandemic has profoundly affected societies, economies, and health-care systems worldwide, leading to widespread disruption, lockdowns, and social distancing measures to mitigate transmission.

LINK TO LEARNING

Read more to understand the impact COVID-19 had on nurses around the world (https://openstax.org/r/77COVIDimpact).

Nursing Roles and Responsibilities

Nurses have been on the frontlines of the pandemic response, working to provide care, implement infection control measures, and support overwhelmed health-care systems. They have demonstrated extraordinary resilience, adaptability, and compassion in the face of unprecedented challenges, risking their own health and well-being to save lives and alleviate suffering. As frontline health-care providers, nurses have played multifaceted roles in caring for COVID-19 patients, providing essential medical care, and implementing infection prevention and control measures to mitigate transmission. They have been responsible for assessing and managing the symptoms of COVID-19 patients, administering treatments, and monitoring their progress. Since COVID-19 can be transmitted through both airborne droplets and contact with contaminated surfaces, nurses must be vigilant in infection control management, such as handwashing and isolation precautions. Additionally, nurses have been instrumental in supporting overwhelmed health-care systems by triaging patients, coordinating care, and collaborating with interdisciplinary teams to ensure optimal patient outcomes (Figure 34.2).

FIGURE 34.2 A nurse cares for a COVID-19 patient in proper protective equipment. (credit: "COVID-19 Nurse" by Specialist 2nd Class Sara Eshleman/U.S. Navy, Public Domain)

Beyond direct patient care, nurses have been leaders in public health promotion and education, disseminating accurate information about COVID-19 prevention measures, the administration of investigational antiviral therapies, and vaccination efforts. Nurses have played crucial roles in COVID-19 testing, conducting screenings, collecting samples, and providing education on quarantine and isolation protocols. Nurses have played critical roles in administering COVID-19 vaccines, providing education and support to patients and communities, and advocating for equitable access to health-care resources. They have served as advocates for patient rights and equitable access to care, particularly for at-risk populations disproportionately affected by the pandemic. Throughout the COVID-19 crisis, nurses have exhibited extraordinary professionalism, adaptability, compassion, and embodied the core values of the nursing profession and making invaluable contributions to the global effort to combat the virus.

34.4 Community Response to Disaster

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Define the phases of community response to disaster
- Describe a culture of preparedness
- Summarize the roles and responsibilities of the nurse during a community response to disaster

In times of disaster, communities often emerge as resilient and cohesive entities, rallying together to address the challenges that result from natural or human-made crises. Whether facing the aftermath of a hurricane, wildfire, pandemic, or other emergencies, the collective response of community members plays a pivotal role in mitigating the effects of disasters and facilitating recovery efforts. This section explores the dynamics of community response to disasters, examining the diverse ways in which individuals, organizations, and local authorities collaborate to provide assistance, support, and resources to those affected. From volunteer efforts and mutual aid networks to emergency shelters and community-based organizations, communities mobilize their strengths and resources to meet the needs of their members and rebuild in the aftermath of devastation.

Phases of Community Response to Disaster

Disaster response includes several phases through which the nurse will progress along with colleagues to ensure effective action in response to a disaster. The phases exist as part of a continuous cycle:

- Mitigation includes actions taken to reduce potential harm before a disaster occurs.

- Preparedness focuses on shoring up capacity and developing response plans.
- Response is how immediate needs are addressed during a disaster.
- Recovery encompasses the long-term process of rebuilding communities and restoring normalcy or working together toward a "new normal."

Nurses contribute their unique skills and knowledge at every phase to protect patients, manage crises, and promote resilience.

Mitigation

During the **mitigation phase** of community response to disaster, the focus is on proactively reducing the risk and effects of future disasters. This phase involves comprehensive planning, implementation of strategies, and ongoing efforts to mitigate potential hazards and vulnerabilities within the community.

Community leaders, emergency management agencies, and other interested and impacted groups collaborate to identify and prioritize areas of concern, such as flood zones, earthquake-prone areas, or wildfire risk areas. Mitigation measures may include land-use planning, building codes and regulations, infrastructure improvements, ecosystem restoration, and public education initiatives. By investing in mitigation efforts, communities can minimize the loss of life, property damage, and economic disruption caused by disasters.

Moreover, mitigation activities help to enhance community resilience and sustainability, ensuring that the community is better prepared to withstand and recover from future disasters. Through proactive mitigation measures, communities can significantly reduce the human, social, and economic costs associated with disasters, ultimately fostering safer and more resilient communities for current and future generations.

Preparedness

The **preparedness phase** of community response to disaster is a crucial period characterized by proactive planning, coordination, and training to enhance readiness for potential emergencies. During this phase, community members, emergency responders, and local authorities collaborate to develop comprehensive emergency plans tailored to the specific hazards and risks facing the community. These plans outline roles and responsibilities, communication protocols, evacuation procedures, and resource allocation strategies to ensure an effective response in the event of a disaster.

Community members are encouraged to participate in preparedness activities, such as disaster drills, first aid training, and emergency supply kits, to enhance their ability to respond effectively during emergencies. Additionally, partnerships with neighboring communities, government agencies, nonprofit organizations, and private sector entities are forged to facilitate coordinated response efforts and resource sharing.

By investing in preparedness measures, communities can reduce the impact of disasters, protect lives and property, and enhance overall resilience in the face of adversity. The preparedness phase serves as a foundation for effective disaster response and recovery, empowering communities to mitigate risks and better withstand the challenges posed by natural or human-made emergencies.

Response

The **response phase** of community response to disaster is a critical period characterized by immediate actions in response to the event and ensuring the safety and well-being of affected individuals by establishing a command center, to coordinate communication for areas at risk from these hazards. During this phase, emergency responders, including firefighters, law enforcement, medical personnel, and volunteers, mobilize rapidly to provide lifesaving assistance, evacuate at-risk populations, and stabilize the situation. Communication networks are activated to disseminate timely information and instructions to the public, while emergency shelters are established to provide temporary housing and support for individuals who are displaced.

Coordination among local, state, and federal agencies, as well as community organizations and private sector partners, is essential to effectively manage resources, deploy personnel, and prioritize response efforts. Community members also play a crucial role in the response phase, aiding neighbors, providing first aid, and supporting emergency operations.

As the initial chaos subsides, responders shift their focus to performing damage assessments, conducting search and rescue operations, and addressing immediate needs such as food, water, and medical care. The response phase

is characterized by rapid decision-making, flexibility, and collaboration, as communities work together to mitigate the impacts of the disaster and begin the process of recovery.

Recovery

The **recovery phase** of community response to disaster marks the transition from immediate response efforts to long-term recovery and rebuilding. During this phase, communities focus on restoring essential services, infrastructure, and social networks to pre-disaster conditions, as well as addressing the physical, emotional, and economic effects of the event.

Recovery efforts are guided by comprehensive plans and involve collaboration among government agencies, non-profit organizations, businesses, and community members. The recovery process may include debris removal, infrastructure repairs, housing assistance, financial support for affected individuals and businesses, and psychosocial support services to address trauma and mental health needs.

Community resilience and social cohesion are key factors in successful recovery, as individuals come together to support one another, share resources, and rebuild stronger communities. The recovery phase is often a prolonged and challenging process, requiring patience, perseverance, and ongoing commitment from all parties. By investing in recovery efforts and leveraging lessons learned from past disasters, communities can emerge stronger and more prepared to withstand future challenges.

LINK TO LEARNING

The Federal Emergency Management Agency (FEMA) (https://openstax.org/r/77FEMA) is responsible for organizing the nation's efforts to prepare for, respond to, and recover from the effects of natural disasters and terrorist attacks.

Culture of Preparedness

A **culture of preparedness** in community response to disaster refers to the recognition and integration of cultural considerations into emergency planning, response, and recovery efforts. It involves understanding the diverse cultural backgrounds, beliefs, values, and practices within a community and incorporating this knowledge into disaster preparedness strategies.

Culturally competent emergency planning ensures that response efforts are inclusive, respectful, and effective for all members of the community, regardless of their cultural backgrounds. This may include translating emergency communications into multiple languages, accommodating dietary restrictions in emergency shelters, respecting cultural practices related to mourning and burial, and engaging community leaders and cultural organizations in disaster preparedness activities.

By incorporating cultural considerations into emergency planning, communities can foster trust, cooperation, and resilience among diverse populations, ensuring that everyone receives the support and assistance they need during times of crisis. Additionally, cultural preparedness creates a sense of belonging and empowerment within communities, enabling individuals to actively participate in disaster response and recovery efforts and contribute their unique knowledge and skills to the collective response.

Nursing Roles and Responsibilities

In community response to disasters, nurses play indispensable roles in providing essential health-care services, promoting public health measures, and supporting the overall well-being of individuals and communities. Nurses are often among the first responders during disasters, offering immediate medical care to those affected, triaging patients based on severity of injuries or illnesses, and facilitating evacuation efforts when necessary. They also collaborate with other health-care professionals and emergency responders to establish and operate emergency medical shelters, providing care for displaced individuals and addressing their health-care needs. Additionally, nurses play key roles in disease surveillance and control, monitoring for outbreaks of infectious diseases, implementing infection control measures, and administering vaccinations to prevent the spread of illness. Facilitating culturally competent preparedness is a crucial aspect of nursing during disasters. Nurses must be aware of and sensitive to the diverse cultural beliefs, practices, and communication styles of their communities.

34.5 Hospital Preparedness for Disasters

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Describe methods of training and evaluating hospital employees for disaster preparedness
- Discuss examples of emergency policies and procedures hospitals implement for preparation for disasters
- Identify examples of how hospitals administer disaster preparedness drills
- Summarize the roles and responsibilities of the nurse for hospital preparedness for disasters

Hospital preparedness for disasters is a critical component of emergency management, ensuring that health-care facilities are equipped to respond effectively to a wide range of emergencies, including natural disasters, infectious disease outbreaks, mass casualty incidents, and terrorist attacks. In times of crisis, hospitals serve as the frontline of medical response, providing lifesaving care to those injured or affected by the disaster. This section explores the essential elements of hospital preparedness, including emergency planning, surge capacity, resource management, communication systems, and staff training. By examining best practices and lessons learned from past disasters, health-care providers can enhance their readiness to effectively manage the challenges posed by disasters and safeguard the health and safety of patients, staff, and the community. Through comprehensive preparedness efforts, hospitals can ensure continuity of care, mitigate the impact of disasters, and contribute to the resilience and recovery of communities in times of crisis.

Training and Evaluation

Training and evaluation of hospital employees during disaster preparedness are essential components of ensuring a robust and effective response to emergencies. Regulatory agencies such as Occupational Safety and Health Administration (OSHA) and The Joint Commission (TJC) require all hospitals to use yearly practice drills to ensure emergency preparedness and response (FEMA, 2022). Hospital staff undergo comprehensive training programs to familiarize themselves with emergency protocols, procedures, and roles during disasters. These training programs often include tabletop exercises, simulation drills, and hands-on workshops to simulate real-life scenarios and enhance preparedness. Through these exercises, employees practice critical skills such as patient triage, communication, and resource management, allowing them to become proficient in responding to various types of emergencies. Additionally, ongoing education and refresher courses are provided to keep staff updated on best practices and changes in protocols.

Evaluation of hospital employees during disaster preparedness involves assessing their performance and competency in executing emergency procedures. After training exercises and drills, debriefings are conducted to review the response, identify strengths and areas for improvement, and lessons learned. Performance assessments, such as competency checklists and skills evaluations, provide objective feedback on individual and team proficiency in disaster response tasks. Feedback mechanisms, such as surveys and focus groups, allow employees to provide input on training effectiveness and suggest areas for enhancement.

By systematically training and evaluating hospital employees during disaster preparedness, hospitals can ensure that staff are well-prepared and competent to respond effectively to emergencies. These efforts help to enhance the overall readiness of the hospital and contribute to the delivery of high-quality care to patients during times of crisis.

Emergency Policies and Procedures

Emergency policies and procedures are crucial components of hospital disaster preparedness, providing a structured framework for responding to emergencies and ensuring the safety and well-being of patients, staff, and visitors. These policies outline protocols and guidelines for various aspects of emergency management, including incident command, patient care, communication, resource allocation, and staff responsibilities, which are created by committees of providers, nurses, and others. For example, hospitals establish an **incident command system (ICS)** to provide a standardized framework for coordinating emergency response efforts and facilitating communication among key parties. Within the ICS, roles and responsibilities are clearly defined, ensuring efficient decision-making and resource allocation during emergencies.

A critical component of disaster response is **mass casualty triage**, which is a systematic way of prioritizing patients

by survivability. The system enables health-care providers to effectively prioritize care and allocate resources in situations where the number of patients exceeds the available capacity. During mass casualty incidents, such as natural disasters, terrorist attacks, or mass shootings, health-care facilities may become overwhelmed with large numbers of injured individuals requiring immediate medical attention. Mass casualty triage systems help to quickly assess and categorize patients based on the severity of their injuries and the likelihood of survival, ensuring that those with the greatest need receive timely treatment and resources.

Various triage systems, such as the Simple Triage and Rapid Treatment (START) system or the JumpSTART system for pediatric patients, provide standardized algorithms for rapid assessment and classification of patients. A **triage tag**, color-coded based on the severity of injury, is often used to quickly identify and prioritize patients for treatment (Figure 34.3). A **red tag** is assigned to patients with life-threatening injuries requiring immediate intervention, a **yellow tag** for those with significant injuries but a stable condition, a **green tag** for patients with minor injuries or nonurgent medical needs, and a **black tag** for those who are deceased or beyond help.

FIGURE 34.3 Patient triage in action. Each tag represents a critical assessment to prioritize care during emergencies. (credit: "633rd Medical Group prepares for air show" by Airman 1st Class Kaylee Dubois/U.S. Air Force, Public Domain)

Health-care providers, including nurses, play crucial roles in mass casualty triage by conducting rapid assessments, assigning triage tags, and initiating life-saving interventions for critically injured patients. Effective communication and teamwork are essential for coordinating triage efforts and ensuring that patients are directed to the appropriate level of care. Additionally, ongoing training and drills help to ensure that health-care providers are prepared to assess patients, make triage decisions under pressure, and adapt to rapidly changing circumstances during mass casualty incidents quickly and accurately (Table 34.1).

Triage Under Usual Conditions	Triage Under Mass Casualty Conditions
Emergent An immediate threat to life	Emergent or class I: Red tag Immediate threat to life
Urgent Major injuries that require immediate treatment	Urgent or class II: Yellow tag Major injuries that require treatment

TABLE 34.1 Triage Under Usual Conditions versus Mass Casualty Conditions

Triage Under Usual Conditions	Triage Under Mass Casualty Conditions
Nonurgent Minor injuries that do not require immediate treatment	Nonurgent or class III: Green tag Minor injuries that do not require immediate treatment
Does not apply	Expectant or class IV: Black tag Expected and allowed to die

TABLE 34.1 Triage Under Usual Conditions versus Mass Casualty Conditions

Black-tagged patients might have spinal cord injuries, head traumas, or extensive body burns. While the decision to label a patient as a black tag is very difficult, the limited resources available during a disaster must be allocated to save as many lives as possible, rather than using more resources to save only a few.

In this system of triage, The Joint Commission recommends red-tagged patients have immediate life-threatening conditions that require immediate attention, such as shock or an airway obstruction. Patients with major injuries such as open fractures or large wounds that need treatment within 30 minutes to two hours would be yellow-tagged. Patients with minor injuries that can be managed after a delay, generally more than two hours, such as closed fractures, sprains, abrasions, or contusions would be green-tagged (The Joint Commission, 2023).

Green-tagged patients who are able to ambulate are often referred to as the "walking wounded" because they can leave the scene of the mass casualty on their own and seek their own medical assistance. In multi-casualty disasters, green-tagged patients usually make up the greatest number of patients (TJC, 2023). However, green-tagged patients who leave the scene may unknowingly carry contaminants from a nuclear, biological, or chemical incident into another environment with potentially disastrous consequences. Hospitals devise emergency response plans, including appropriate decontamination measures, to anticipate these kinds of needs during a disaster. By implementing systematic mass casualty triage protocols and training health-care providers in their use, hospitals can enhance their ability to effectively manage large-scale emergencies, prioritize care, and maximize the chances of survival for patients in times of crisis (TJC, 2023).

Additionally, hospitals develop surge capacity plans to expand capacity and accommodate an influx of patients during pandemics and disasters. Surge capacity means the hospital can take a larger than usual number of patients in a crisis. These plans outline procedures for opening additional patient care areas, mobilizing supplemental staffing, and reallocating resources to meet increased demand for medical services. Infection control policies are also critical for preventing the spread of infectious diseases within health-care facilities. These policies include guidelines for isolation precautions, personal protective equipment (PPE) use, environmental cleaning, and patient cohorting to minimize the risk of transmission among patients, staff, and visitors.

Furthermore, hospitals establish communication policies and procedures to facilitate timely and accurate communication during emergencies. These policies include protocols for internal communication among hospital staff, as well as external communication with patients, families, emergency responders, and community partners. By implementing comprehensive emergency policies and procedures, hospitals can enhance their readiness to effectively manage disasters and ensure the safety and well-being of all individuals within their care.

Hospital Emergency Preparedness Drills

Hospital emergency preparedness drills ensure that health-care facilities are ready to respond effectively to various emergencies. These drills simulate real-life scenarios and provide an opportunity for hospital staff to practice their roles and responsibilities in a controlled environment. One type of drill commonly conducted is tabletop exercises, which involve scenario-based discussions and decision-making exercises among FEMA and key stakeholders. During tabletop exercises, participants review emergency plans, identify potential challenges, and discuss strategies for addressing them.

Another type of drill is functional exercises, which simulate specific response actions, such as patient triage, decontamination procedures, or mass casualty management. These drills provide hands-on experience for staff to practice skills and procedures in a realistic setting. Full-scale exercises are also conducted, which simulate a

comprehensive response to a simulated disaster scenario from start to finish. These exercises involve multiple agencies, resources, and response elements and are designed to test coordination, communication, and decision-making across all levels of the organization. By conducting a variety of drills and exercises, hospitals can evaluate their preparedness, identify areas for improvement, and enhance their ability to respond effectively to a wide range of emergencies.

Nursing Roles and Responsibilities

Nurses play vital roles in hospital disaster preparedness by ensuring effective response and care delivery during emergencies. Their responsibilities span various stages of preparedness, response, and recovery. In the preparedness phase, nurses contribute by participating in training sessions, drills, and simulations to familiarize themselves with emergency protocols and procedures. They also play key roles in developing and updating disaster plans, ensuring that patient care considerations, such as triage protocols and medication management, are adequately addressed.

During the response phase, nurses serve on the front lines, providing immediate medical care, triaging patients, and mobilizing resources as needed. They collaborate closely with interdisciplinary teams to ensure coordinated and efficient care delivery. Nurses are often responsible for implementing infection control measures, managing patient flow, and providing emotional support to patients, families, and colleagues during stressful situations.

In the recovery phase, nurses continue to play critical roles in restoring normalcy and rebuilding services. They contribute to efforts to assess and address the physical and mental health needs of patients and staff affected by the disaster. Additionally, nurses may participate in community outreach and education initiatives, helping to promote resilience and preparedness for future emergencies.

Throughout all phases of disaster preparedness, nurses demonstrate leadership, adaptability, and compassion, ensuring that patient safety and well-being remain the top priorities. Their expertise in patient care, clinical assessment, and crisis management makes them invaluable assets in hospital disaster preparedness efforts, ultimately contributing to the resilience and effectiveness of health-care systems in times of crisis.

Summary

34.1 Environmental Disasters

- Storms, thunderstorms, hurricanes, snow, floods, and tsunamis are just a few examples of water disasters that hospitals must be prepared for.
- Land disasters like earthquakes, landslides, and fires can cause damage to facilities and make them inaccessible due to blocked roads.
- During a disaster, the nurse's role spans from being a frontline responder to contributing their skills to a community's long-term recovery.

34.2 Biological and Technological Disasters

- Biological disasters like influenza, pandemics, and bioterrorism attacks present unique challenges for nurses. In the face of biological disasters, nurses must be equipped with knowledge of epidemiology, pathophysiology, and public health principles to effectively assess, triage, and treat patients.
- During biological disasters, nurses serve as educators, helping communities understand the importance of vaccination, hygiene practices, and other preventive measures.
- Technological disasters, including chemical, radiological, and nuclear accidents, can have immediate effects and long-lasting consequences.
- In technological crises, nurses play critical roles in both immediate response efforts and long-term recovery. During the acute phase, nurses are often among the first health-care providers to arrive at the scene, triaging and providing emergency medical care. Nurses also play key roles in communicating with affected populations, providing reassurance and guidance on protective measures. In the aftermath of a technological disaster, nurses continue to provide essential health-care services, addressing both physical and psychological needs.

34.3 Epidemics and Pandemics

- Epidemics (the occurrence of a disease in a population or geographical area at a higher frequency than expected) and pandemics (global outbreaks of infectious diseases) are challenging situations for health-care personnel.
- Globally, outbreaks of Ebola have required nurses to both provide care and education about infection control.
- During the COVID pandemic, nurses were challenged to provide care in a time of both unprecedented strain on the health-care system and rapid scientific achievement.
- In both epidemics and pandemics, nurses are tasked with providing care, ensuring patient safety (as well as their own), promoting resilience, and prioritizing education and prevention efforts.

34.4 Community Response to Disaster

- Disaster response includes several phases and the phases exist as part of a continuous cycle: mitigation includes actions taken to reduce potential harm before a disaster occurs; preparedness focuses on shoring up capacity and developing response plans; response is how immediate needs are addressed during a disaster, and recovery encompasses the long-term process of rebuilding communities and restoring normalcy or working together toward a "new normal."
- A culture of preparedness in community response to disaster refers to the recognition and integration of cultural considerations into emergency planning, response, and recovery efforts. It involves understanding the diverse cultural backgrounds, beliefs, values, and practices within a community and incorporating this knowledge into disaster preparedness strategies.
- During a community's response to a disaster, nurses must collaborate with others to address the unique needs of the populations affected and adapt their approaches as needed. Additionally, nurses play key roles in disease surveillance and control, monitoring for outbreaks of infectious diseases, implementing infection control measures, and administering vaccinations to prevent the spread of illness.

34.5 Hospital Preparedness for Disasters

- Facilities and organizations can use established protocols to train and evaluate emergency preparedness among staff.

- Training sessions with real-world simulations, as well as hands-on skills and competency assessments, help staff build confidence and feel empowered to perform their work in times of crisis.
- Staff training sessions can be conducted on-site or led by experts in the community. Protocols and procedures can be developed from an interdisciplinary standpoint.
- The nurse is responsible for staying up-to-date on training, knowing where to find information about their facility's protocols and procedures, and clearly understanding their role in the event of a disaster.

Key Terms

aftershock smaller earthquake that follows the main shock of a larger earthquake
anthrax serious infectious disease caused by the bacterium *Bacillus anthracis*
biological disaster wide range of events, such as an infectious disease outbreak, a pandemic, or a bioterrorism incident
bioterrorism intentional release of a biological agent, such as bacteria, viruses, or toxins, intended to cause harm to individuals, populations, or economies
black tag patients with critical injuries who are not expected to survive given the available resources and medical priorities
chemical hazard diverse array of substances that can pose risks to human health and the environment
COVID-19 respiratory illness caused by the novel coronavirus SARS-CoV-2
cultural of preparedness proactive efforts made by individuals, communities, organizations, and institutions to understand, respect, and integrate diverse cultural perspectives, values, beliefs, and practices into disaster preparedness, response, and recovery efforts
cyberattack deliberate, malicious attempts to disrupt, damage, or gain unauthorized access to computer systems, networks, or electronic devices
earthquake sudden and violent shaking of the ground caused by the movement of tectonic plates beneath the earth's surface
Ebola virus disease (EVD) highly infectious and often deadly viral disease caused by the Ebola virus, commonly known as Ebola
epidemic occurrence of a disease in a community or region at a rate that exceeds what is normally expected
flash flood rapid and extreme flooding event characterized by a sudden onset of high water levels, often with little to no warning
green tag patients with minor injuries or those who require minimal medical intervention
H1N1 influenza virus subtype of influenza A virus that can cause respiratory illness in humans
incident command system (ICS) central hub for incident management activities, housing key personnel, resources, and equipment necessary for coordinating response efforts
influenza caused by influenza viruses, a contagious respiratory illness that affects the nose, throat, and lungs
landslide geological event characterized by the movement of a mass of rock, earth, or debris down a slope under the influence of gravity
mass casualty triage systematic process used by health-care professionals to prioritize and categorize injured individuals during a mass casualty incident based on the severity of their injuries and the likelihood of survival
mitigation phase stage in disaster management characterized by efforts to minimize or mitigate the impact of a disaster on individuals, communities, and infrastructure
mixed epidemic combination of both a point source epidemic and a propagated transmission epidemic pattern
National Weather Service (NWS) agency within the United States federal government that is responsible for providing weather forecasts, warnings, and other meteorological information to the public, businesses, and government agencies
nuclear disaster range of catastrophic events involving the release of radioactive materials, each presenting unique challenges and risks to human health and the environment
pandemic outbreak of a disease that affects a high proportion of the population across a large geographic location
point source epidemic type of epidemic where a large number of individuals are exposed to the infectious agent at the same time and develop symptoms within a relatively short period
preparedness phase stage in disaster management where proactive measures are taken to enhance readiness and response capabilities before a disaster occurs
propagated epidemic type of epidemic where a disease is transmitted from person to person over an extended

period, leading to sustained transmission within a population

radiological disaster range of events involving the release of radioactive materials into the environment, posing risks to human health and the ecosystem

recovery phase period following a disaster when efforts are made to restore affected communities, infrastructure, and economies to a state of normalcy or to a condition better than before the disaster occurred

red tag patients with life-threatening injuries who require immediate medical attention to survive

response phase immediate period following the occurrence of a disaster when emergency measures are activated to address the immediate needs of individuals, communities, and infrastructure affected by the disaster

storm surge water from the ocean pushed ashore by the heavy winds and can cause widespread flooding and bring ocean life inland

technological disaster broad range of events with far-reaching implications for public health and safety

tornado warning urgent message issued by the National Weather Service (NWS) when a tornado has been detected by radar or spotted by trained observers, and there is an imminent threat to life and property in a specific area

tornado watch alert issued by the National Weather Service (NWS) when weather conditions are favorable for the development of tornadoes in a specified area; it is issued in advance to provide early notice and allow people to prepare for possible tornado activity

triage tag color-coded or numbered identifiers used by health-care professionals during mass casualty incidents to categorize and prioritize patients based on the severity of their injuries or medical conditions

tsunami series of large ocean waves caused by the displacement of a large volume of water, typically as a result of an underwater earthquake, volcanic eruption, landslide, or meteorite impact

wildfire uncontrolled and often fast-spreading fire that occurs in forests, grasslands, or other wild land areas

yellow tag patients with serious injuries that are not immediately life-threatening and can wait for medical care without compromising their survival chances

Assessments

Review Questions

1. The nurse is conducting a community education session about preparing for severe weather emergencies. What statement by a participant indicates an understanding of the topic?

a. “We should evacuate our homes immediately when a tornado warning is issued.”
b. “I’ll stock up on perishable foods and water before a hurricane warning.”
c. “Having a battery-operated weather radio is essential for staying informed during severe weather.”
d. “It’s best to park my car under a tree for protection during a storm.”

2. During a tornado watch, what intervention should the nurse implement first for patients on the medical-surgical unit?

a. Assist all patients with ambulation to the basement
b. Move all patients to the hallways
c. Continue providing routine patient care
d. Notify the hospital administration of the tornado watch

3. What action should the nurse prioritize when handling a technological hazard, such as a chemical spill, in the health-care setting?

a. Donning personal protective equipment (PPE)
b. Evacuating patients immediately
c. Notifying the Environmental Services department
d. Documenting the incident in the patient’s chart

4. What is the priority action for the nurse if they suspect their computer has been hacked?

a. Disconnect the computer from the network
b. Notify the IT department
c. Shut down the computer immediately

d. Run antivirus software to scan for malware

5. What statement accurately describes the transmission mode of COVID-19?
   a. COVID-19 is primarily transmitted through airborne droplets.
   b. COVID-19 is transmitted only through direct contact with infected individuals.
   c. COVID-19 can be transmitted through both airborne droplets and contact with contaminated surfaces.
   d. COVID-19 is not transmitted between individuals, but rather through ingestion of contaminated food or water.

6. A nurse is caring for a patient suspected of having Ebola virus disease (EVD). What personal protective equipment (PPE) is essential for the nurse to wear when providing direct care to this patient?
   a. Gloves and gown
   b. Gloves, gown, and surgical mask
   c. Gloves, gown, N95 respirator, and face shield
   d. Gloves, gown, surgical mask, and eye protection

7. What is the correct order of the phases of disaster response?
   a. Preparedness, mitigation, response, recovery
   b. Mitigation, preparedness, response, recovery
   c. Response, mitigation, recovery, preparedness
   d. Recovery, response, preparedness, mitigation

8. A nurse is working on promoting a culture of preparedness in a community prone to natural disasters. What action best demonstrates this concept?
   a. Ensuring emergency kits are distributed to all community members
   b. Educating the community on the importance of disaster drills
   c. Integrating cultural considerations into emergency planning and response
   d. Establishing a clear communication plan for first responders

9. During the response phase of a disaster, a nurse must collaborate with others to address the unique needs of the populations affected. What action best exemplifies this responsibility during the response phase?
   a. Conducting a community-wide survey to assess the impact of the disaster
   b. Coordinating with local shelters to ensure culturally appropriate food is available
   c. Distributing blankets and first aid supplies to affected individuals
   d. Setting up a temporary medical clinic in the disaster area

10. In the context of disaster response, what is the primary goal of the mitigation phase?
   a. Prepare for potential disasters by training first responders
   b. Respond to immediate needs during a disaster
   c. Reduce the impact of future disasters through preventive measures
   d. Assist communities in recovering from the effects of a disaster

11. What action is most appropriate for a nurse to take during the recovery phase of a disaster?
   a. Evacuating residents from dangerous areas
   b. Providing immediate first aid and emergency care
   c. Developing long-term mental health support plans for affected individuals
   d. Conducting disaster preparedness drills

12. A nurse is triaging patients following a mass casualty incident. What is an example of a patient the nurse would prioritize for immediate medical attention?
   a. A patient with a fractured arm
   b. A patient with difficulty breathing and cyanosis
   c. A patient with a laceration on the leg

d. A patient with a minor abrasion on the forehead

Check Your Understanding Questions

1. What challenges can be faced by nurses working in the hospital during a tornado warning?
2. What are the primary nursing interventions for managing a patient with suspected anthrax exposure?
3. As a nurse, how would you describe Ebola virus disease (EVD) and your role in its management?
4. Why is it essential for hospital staff to have regular updates and refreshers on emergency policies and procedures? How does the hospital ensure these updates are effectively communicated?

Reflection Questions

1. How would you prioritize patient safety and maintain calm during a tornado warning? Reflect on any challenges you might face and the decisions you will make to ensure the well-being of both patients and staff. Consider what strategies will be most effective.
2. How does cultural diversity impact disaster preparedness and response efforts in our community or health-care setting?
3. Reflect on a recent training or drill you participated in that was focused on disaster preparedness in your hospital.

What Should the Nurse Do?

1. What should the nurse do during a wildfire emergency to ensure the safety and well-being of patients and staff?

Competency-Based Assessments

1. Describe how you would apply your knowledge and skills to ensure patient safety and provide effective care during a flash flood emergency. Provide specific examples of actions you would take to assess risk, prioritize patient needs, and collaborate with the health-care team and emergency responders.
2. Describe how you would provide holistic care for a patient diagnosed with H1N1 influenza, considering their physical, emotional, and educational needs. Include specific interventions you would implement to promote recovery and prevent transmission of the virus.
3. You are a nurse working in a hospital located in a region where an outbreak of Ebola virus disease (EVD) has been reported. As part of your role, you are responsible for managing patients suspected or confirmed to have EVD and implementing infection control measures to prevent the spread of the virus. Describe the key steps you would take to ensure the safety of yourself, your colleagues, and your patients while caring for individuals suspected or confirmed to have EVD. Please include specific actions related to personal protective equipment usage, patient isolation, and communication protocols. Additionally, explain how you would effectively educate patients, families, and staff about EVD prevention and control measures.

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CHAPTER 35

Nursing Care of the Critically Ill Patient

FIGURE 35.1 A patient is cared for in an intensive care unit. The patient is intubated with multiple intravenous catheters. (credit: U.S. Navy, public domain)

CHAPTER OUTLINE

INTRODUCTION Critical care nursing is a specialty requiring astute assessment skills, clinical judgment, and critical thinking. Nurses who work in critical care settings are tasked with caring for extremely ill patients who are at high risk for death without life-saving medical intervention. Because of these patients' high acuity, critical care nurses in the intensive care unit (ICU) are typically assigned to care for only one or two patients at a time. A typical patient in the ICU is intubated, receiving ventilatory support, and receiving several continuous intravenous (IV) medications (e.g., sedation, vasoactive drugs) that must be monitored and adjusted frequently by the nurse because of their systemic effects on the patient's hemodynamics. In addition to managing the ventilator and medications, these patients also often have technological therapies in place, such as continuous renal replacement therapy or extracorporeal membrane oxygenation (ECMO), which the nurse is responsible for maintaining. Thus, critical care nurses must not only possess the technical skills to implement such complex therapies, they must also be able to think critically and make autonomous clinical decisions based on subtle changes in their patient's conditions. The

critical care nurse must be able to use all patient data—including assessments, medical histories, medications, and laboratory values—to determine real or potential complications the patient is currently experiencing or for which they are at risk.

Critical care is still a relatively new concept, with the first ICUs being established in the late 1950s to address the need for mechanical ventilation of patients with polio (Vincent, 2013). Over the next decade, ICUs were opened in many hospitals throughout the United States, Europe, and Australia. To assist with the education of nurses employed in these new intensive care settings, the American Association of Cardiovascular Nurses was established in 1960. The organization was renamed the American Association of Critical-Care Nurses (AACN) in 1970 to reflect the complex patient population more accurately (AACN, n.d.). As critical care units became more widespread in the 1970s, extensive research resulted in major advancements in medical technology. In present-day critical care units, these technological advancements are obvious. A wide variety of life-saving pharmacological and technological therapies have been developed and integrated into most ICUs worldwide. More recently, as telehealth has become more prevalent, electronic ICUs have been established in which critically ill patients are monitored remotely by critical care providers and nurses (Udeh et al., 2018).

The disease and financial burdens associated with critical care are already high, and several health-care trends continue to increase this burden. As patient life expectancy increases, so do the frequency of disease and resulting critical illness (Adhikari et al., 2010). Though technological advances have multiplied the available treatment options, they also bring an increased risk for treatment-associated complications, which can negatively affect the length of hospital stays and increase overall health-care costs. Additionally, incidence of burnout and post-traumatic stress disorder in bedside nurses and critical care providers has skyrocketed over recent years, largely related to the COVID-19 pandemic. This burnout has resulted in large-scale nursing and provider shortages that are likely to negatively affect critical care and health care in general for many years. According to the American Association of Colleges of Nursing (2022), there is a projected shortage of more than 200,000 nurses by the year 2031, and nursing school enrollments are not keeping up the pace to supply the workforce.

35.1 Assessment and Management of the Critically Ill Patient

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Identify admission criteria for intensive care
- Explain the required nursing skills and technological and pharmacological therapies that are unique to the critical care setting
- Describe the ethical and legal considerations of providing nursing care to critically ill patients

Critical care nurses are responsible for assessing, monitoring, and caring for high-acuity patients with multisystem disorders. These patients have complex medical conditions that require extensive medical intervention and nursing care. To provide optimal care to patients in the ICU, critical care nurses must skillfully display attention to detail, technical competence, and excellent communication skills. Caring for patients in these settings can be especially challenging because of the severity of their illness and the resulting stress and trauma experienced by patients and their families. Additionally, there are legal and ethical considerations that affect patients and their families in the critical care setting, often making this area of nursing even more challenging.

Admission Criteria for Intensive Care

Patients can be admitted to critical care settings for a variety of reasons, but most often there is a life-threatening medical condition that requires intensive monitoring and extensive medical and nursing care (Smith & Nielson, 1999). Some of the most common reasons for admission to the ICU are listed in Table 35.1.

Reason for Admission	Clinical Examples	Rationale
Requires interventions or therapies that are only available in critical care settings	• Continuous renal replacement therapy • Extracorporeal membrane oxygenation • Intra-aortic balloon pump therapy • Mechanical cardiovascular support using ventricular assistive devices • Mechanical ventilation • Noninvasive/invasive hemodynamic monitoring • Targeted temperature management • Titrating medications (e.g., vasopressors, sedation)	Critical care nurses have received extensive, specialized training and obtained certifications that qualify them to provide and manage complex interventions and therapies in the critical care setting.
Clinical instability	• Cardiac dysrhythmias • Hypoxemia • Severe hypotension • Shock	Admission to the ICU allows clinically unstable patients to be monitored closely and have easier access to life-saving therapies, should they be needed.
Postcardiac arrest	• Patients who experienced cardiac arrest, received cardiopulmonary resuscitation, and achieved return of spontaneous circulation	Patients experiencing cardiac arrest are at high risk for experiencing another cardiac event. Admission to the ICU allows for close monitoring and access to life-saving therapies.
Surgical recovery	• Craniotomy • Coronary artery bypass graft • Organ transplantation	Patients are admitted to the ICU after invasive surgical procedures because they are at high risk for hemodynamic instability and life-threatening postoperative complications.

TABLE 35.1 Reasons for Admission to Critical Care Setting

Risk Assessment Models

When a patient is admitted to the ICU, it is important to determine the severity of their condition because this information influences nurse staffing ratios and the allocation of other unit resources. This information also helps estimate the patient's survival rate, which is used to monitor and evaluate patient outcomes during and after their stay in the ICU. There are several risk assessment models that aid in determining the severity of the patient's medical condition. Two of the most widely used models are the Acute Physiologic Assessment and Chronic Health Evaluation (APACHE) II Scoring System (Medscape, n.d.) and the Sequential Organ Failure Assessment (SOFA). Both models evaluate several physiologic variables (e.g., temperature, heart rate), resulting in a score that reflects the severity of their condition. SOFA was originally used to determine the risk of organ failure in patients with sepsis (see Figure 23.7), but it is now used more broadly with patients admitted to the ICU. Scores from 0 to 4 are given in six key categories (e.g., respiration, renal); a higher score indicates a higher risk for organ failure and is associated with worse patient outcomes.

LINK TO LEARNING

This webpage provides information about the APACHE II Scoring system (https://openstax.org/r/77apache) and includes a template for calculating a score. A higher overall score indicates more severe disease and increased risk of hospital death.

Multisystem Organ Dysfunction

Though patients are often admitted to the ICU for one primary medical problem, it is common for critically ill patients to experience dysfunction of several body systems at once, contributing to the overall complexity of their care. This is known as **multiple organ dysfunction syndrome (MODS)** and is the leading cause of death for patients admitted to the ICU (Society of Critical Care Medicine, n.d.). Multiple organ dysfunction syndrome most often occurs in patients experiencing trauma-related events (e.g., motor vehicle accident) or systemic conditions such as shock or sepsis. When multiple body systems are affected, patient outcomes are negatively affected.

Required Skills for Critical Care Nurses

Working as a nurse in the critical care setting requires many skills, one of the most important being attention to detail. Because of the high acuity of patients in the ICU, it is important that critical care nurses can accurately assess and detect subtle changes in patient conditions that can quickly deteriorate and become life-threatening without appropriate intervention. Critical care nurses also must possess the technical skills and competence required to manage multiple IV medications and technological therapies at the same time. Critical care nurses need excellent communication skills to function well within a interdisciplinary team and to relay complex medical information to patients and their families. Additionally, it is imperative that critical care nurses be able to translate complex patient data into accurate and detailed documentation to be included in the patient's medical record as a resource for the rest of the interdisciplinary care team. The care of a patient in critical care commands a lot of time and detail; therefore, nurse-to-patient ratios are low in this setting; typically, one nurse cares for two critically ill patients during a shift.

Technological Supports Used in Critical Care

Critical care units are designed to provide life-sustaining care to critically ill patients while still maintaining a sense of comfort. Most ICUs consist of several single-bed rooms that are arranged for easy viewing from the nurses' station. Each patient room contains bedside equipment to monitor the patient's vital signs and other hemodynamic parameters, all of which are also in view of the nurse. There are usually several storage areas on the unit that contain medication-dispensing machines and other equipment such as ventilators and the crash cart. Storage areas should be easily accessible and located near patient rooms in case of medical emergency.

Though critical care units can be overwhelming for families and patients, especially when patients are hooked up to multiple IV pumps and other machines, they are usually designed to promote patient and family comfort. Some critical care units offer private family waiting rooms with couches as well as furniture in the patient rooms to support visitors' comfort when visiting the patient. Figure 35.2 shows a typical ICU room.

FIGURE 35.2 Patient rooms in a critical care unit room contain bedside equipment to monitor the patient's vital signs and other hemodynamic parameters. (credit: "An Intensive Care Unit in a Hospital" by R. Priseman/Wellcome Images, CC BY 4.0)

Critical care units use a wide range of technology and equipment to provide care to the critically ill. One of the most common pieces of equipment is the ventilator. Patients in the ICU are often unable to breathe effectively, indicating the need for **intubation**. This process involves the insertion of a flexible plastic endotracheal tube (ETT) through the mouth and into the trachea down to the airway; the ETT can then be connected to a ventilator. The ventilator is programmed by the respiratory therapist (RT) to provide effective control over the patient's breathing pattern when they are unable to adequately control it themselves. Another machine commonly used in critical care settings is the IV medication pump (IV pump). It is not uncommon to see patients in the ICU connected to multiple IV pumps at one time, receiving several different medications to maintain hemodynamic stability and comfort.

Pharmacological Supports Used in Critical Care

As mentioned, critical care patients being cared for in the ICU often receive multiple medications at one time. One of the most common classes of medications is vasopressors. These medications are used when patients cannot maintain adequate blood pressure on their own, which often is seen with conditions like shock. The critical care nurse is responsible for frequently adjusting the titration rate of these medications to keep the patient's blood pressure within the specific range prescribed by the health-care provider, which is why constant, detailed monitoring is an essential nursing skill. There are six major vasoactive medications used in this setting. The first five are vasopressors, which are indicated for blood pressure support, and include epinephrine, norepinephrine, phenylephrine, vasopressin, and dopamine. Another vasoactive agent, indicated for cardiac output (CO) support, is dobutamine.

Another medication class is sedatives. Patients who are connected to a ventilator or other invasive equipment often require sedation to ensure they stay calm and do not disconnect themselves from the life-saving machines. The

nurse is responsible for titrating these medications to maintain an appropriate level of sedation for the patient's condition. Patients may also receive opioid analgesic medications to mitigate pain, either via IV push or continuous infusion. Other common medication classes used in the critical care setting include anticoagulants, antidysrhythmic medications, and insulin. It is important to note that most of the medications given in the ICU must be administered intravenously (as opposed to orally) to deliver more immediate physiologic effects in critically ill patients.

Ethical and Legal Implications Confronted in Critical Care

Critical care nurses are often faced with ethical and legal issues in their day-to-day practice. Many of these issues are related to the complexity of the patients' conditions and the beliefs and values of the patients and their families. Dealing with highly emotional situations frequently can also have a profound impact on the critical care nurse, including feelings of depression and caregiver fatigue. It is important for nurses to be aware of their emotions and use resources such as counseling for their own mental health as needed. The two most common legal and ethical issues encountered by the critical care nurse include decision-making related to life-sustaining therapy and organ and tissue donation.

Life-Sustaining Therapy Decision-Making

As medical technology has advanced, there are more options for therapies that can be used to keep patients alive who previously would have died of their illnesses. Most of the legal and ethical issues surrounding life-sustaining care arise when there are questions relating to whether the patient would want particular interventions and what their anticipated quality of life would be. In some cases, the patient has proactively created an advance directive, which is a document that provides instructions for medical care if the patient cannot communicate their wishes. Often, patients who are on life-sustaining therapies are unable to convey their personal wishes. If they do not have an advance directive, medical decisions are made by their next of kin or a designated person via authorization called a durable power of attorney (DPOA), depending on state laws and/or previously identified wishes (e.g., the choice to withhold resuscitative measures) made by the patient. A person may be previously identified in a living will or advance directive as having DPOA for the patient. This may be an appointed family member, friend, or court-appointed attorney.

A related document is a do-not-resuscitate (DNR) order that indicates that the patient does not want cardiopulmonary resuscitation to be conducted if their heart stops. Do-not-resuscitate orders are discussed in are discussed in Chapter 32 Palliative Care.

If the patient has not previously explicitly written their health-care wishes, the designated person with DPOA or the patient's family is faced with determining what kind of care the patient would want to receive. This can be difficult to do, especially when there are multiple family members or legal decision-makers who have conflicting opinions, values, and beliefs. Ultimately, these decisions should be made based on knowledge of the patient's previous health status and determining whether the use of life-sustaining therapies could restore their quality of life to a level that would be acceptable to the patient. There are many moral and ethical considerations associated with these kinds of decisions and every patient situation is unique. Hospitals have developed ethics committees that can intervene and assist with decision-making if legal decision-makers and families are unable to determine the best course of action for the patient. Critical care nurses must be prepared to collaborate with these committees and advocate for their patients when necessary.

Organ and Tissue Donation

Although some critically ill patients make a full recovery, many others do not. Sometimes patients have experienced traumatic events or complications so great that they have lost all brain stem functioning, resulting in **brain death**, which is defined as the cessation of brain function, due to irreversible brain injury. In these situations, ethical and legal issues arise related to the potential for organ and tissue donation. Legal decision-makers or families may choose to continue life-sustaining therapy knowing that the patient will not recover neurologically, or they may choose to withdraw the life-sustaining therapies. If the decision is made to withdraw care, the potential for organ and tissue donation often becomes part of the conversation. Organ and tissue donation can be a difficult subject to discuss, and some families are not comfortable with having a loved one's organs harvested after death. The family or patient may have cultural or religious beliefs that affect whether they consider organ donation. Often, families also have fears related to misinformation or unknowns about the donation process that need to be addressed before the decision can be made to donate organs.

Because of the serious nature of these conversations, local organ procurement organizations should be called when death is anticipated, so that organ-donation nurses may come speak directly to the family. These professionally trained nurses have extensive experience with organ donation and can better speak to the process and provide details and emotional support to families. Most hospitals mandate that staff nurses not approach families about organ donation and instead wait for the organ procurement organization nurses to speak with them. This ensures that there has been no coercion or inaccurate information relayed to the family, minimizing the risk of future legal or ethical issues.

REAL RN STORIES

Narrative of a Nurse's Journey to Become an ICU Nurse

During nursing school clinical rotations, Alaina decided that she was most interested in critical care nursing. In her final semester of school, after completing a capstone rotation in the cardiovascular intensive care unit, she was certain that she wanted to become a critical care nurse after graduation. Though she was encouraged by many to start her career in a lower-acuity unit before pursuing critical care, Alaina was determined to enter the ICU right after graduation.

Sure enough, Alaina ended up securing a new graduate nursing position in a 28-bed trauma ICU. She knew that this would be a tough place to work, especially as a novice nurse. After every 12-hour shift, Alaina went home and spent at least two more hours studying the different conditions and medications she had encountered that day. After about a year of doing this, Alaina found that she was gaining more confidence in caring for critically ill patients. It was about this time in her nursing career when her unit manager approached her about being a preceptor for capstone students.

Over the next few years, Alaina served as a preceptor for nursing students and new employees and learned that she loved educating others about critical care. In addition to working in the ICU, Alaina started working part-time as a clinical instructor for a local nursing school, which allowed her to see other hospitals and ICUs and continue educating future nurses. After a few years in the ICU, Alaina studied for and obtained her Critical Care Registered Nurse (CCRN) certification, the highest level of competence in critical care nursing.

35.2 Cardiovascular Concerns

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiological changes to the patient's cardiovascular concerns when in the intensive care unit
- Describe the medical assessments and therapies that apply to the critical care patient's cardiovascular system
- Apply nursing concepts and plan associated nursing care for the critical care patient's cardiovascular system

The heart is arguably the most important organ in the body because it is responsible for providing perfusion to all other body systems and organs. Care of the critically ill patient with cardiac dysfunction and impaired CO is challenging because of the complex and invasive therapies required to maintain hemodynamic stability. Critical care nurses must possess the technical expertise to implement and monitor these interventions; they also need superior clinical knowledge and critical thinking skills. Though there are many different cardiovascular conditions experienced by patients in critical care settings, many of them will require the use of hemodynamic monitoring, pharmacological interventions, and invasive cardiovascular support, all of which are discussed in this section.

Pathophysiological Insult to the Critical Care Patient's Cardiovascular System

The underlying pathophysiologic mechanism of most critical cardiac conditions is a decrease in **cardiac output**, or the amount of blood the heart ejects each minute. A normal CO is 4–8 liters of blood per minute, illustrating the significance of the heart's function and the need for consistently maintaining an adequate CO. Bedside hemodynamic monitoring is often implemented in the ICU to assess CO and other parameters to determine the level

of functioning of the heart. See Table 35.2 for more information about hemodynamic parameters that are commonly monitored in the ICU.

Principles of Hemodynamic Monitoring

To understand the hemodynamic parameters being measured with invasive monitoring, it is important to become familiar with cardiac concepts that can directly influence heart function. As discussed in the chapter on the cardiovascular system, CO is calculated by multiplying the stroke volume, or the amount of blood ejected by the heart with each beat, by the heart rate, which is the number of heart beats per minute. Based on this formula, a decrease in heart rate will lower the patient's CO and an increase in heart rate will increase CO. However, it is important to recognize that although an increased heart rate can initially act as a compensatory mechanism to improve CO, eventually the heart will tire, resulting in a decreased CO.

In addition to heart rate, stroke volume also plays a significant role in the determination of CO and function. There are three main factors that influence stroke volume: preload, afterload, and contractility.

- The degree of stretch of the ventricle's cardiac muscles right before they contract is called preload. In other words, it is how much blood the ventricles can hold.
- The amount of resistance the ventricles must overcome to pump out blood with a contraction is called afterload. This resistance is influenced by several factors, including blood vessel tone and constriction, blood viscosity, and structural competency of the heart muscle.
- The strength of the contraction of the heart muscle itself is called **contractility**.

Changes to any one of these components can drastically affect the patient's stroke volume and overall CO.

Medical Assessments and Therapies

With knowledge of the mechanisms that influence CO, critical care nurses can assess and monitor hemodynamic parameters at the bedside with use of arterial catheters and pulmonary artery catheters. An **arterial catheter** is a small, flexible catheter that is inserted into either the radial or femoral artery and connected to monitoring equipment to reflect continuous blood pressure measurements. Figure 35.3 shows the different parts of an arterial line.

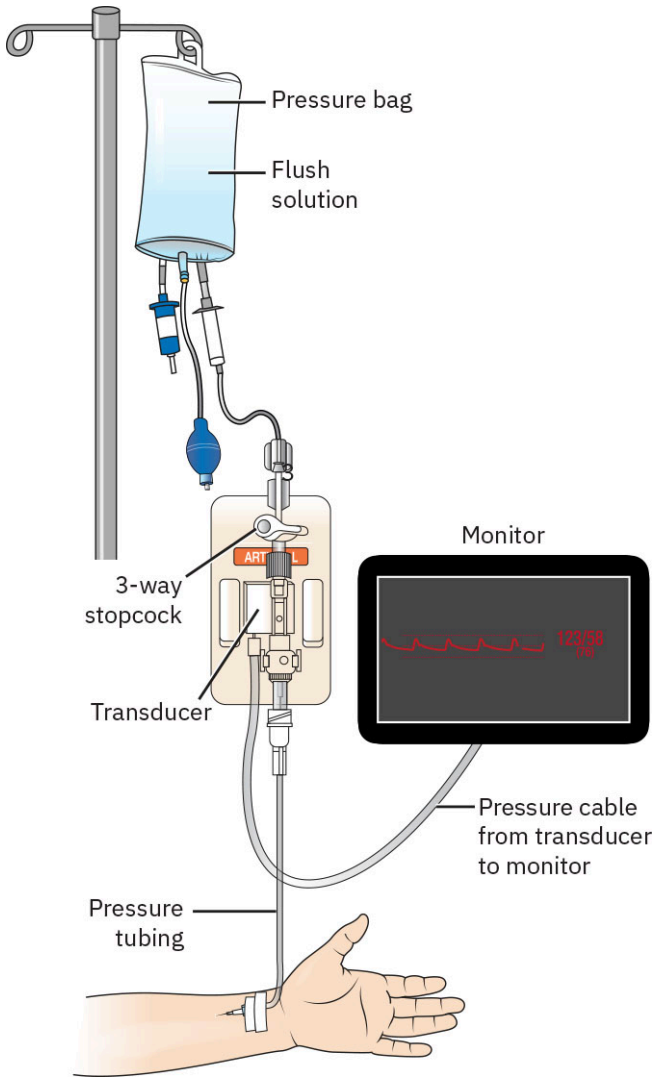

FIGURE 35.3 An arterial catheter is a small, flexible catheter that is inserted into either the radial or femoral artery and connected to monitoring equipment to reflect invasive blood pressure measurements. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

A pulmonary artery catheter, also known as a Swan-Ganz catheter, is a type of central venous catheter that is surgically inserted into the pulmonary artery and used to measure various pressures within the heart (Ziccardi & Khalid, 2023). Figure 35.4 shows the different parts of a pulmonary artery catheter. Pulmonary artery catheters assist with monitoring many different internal heart pressures, as listed and described in Table 35.2.

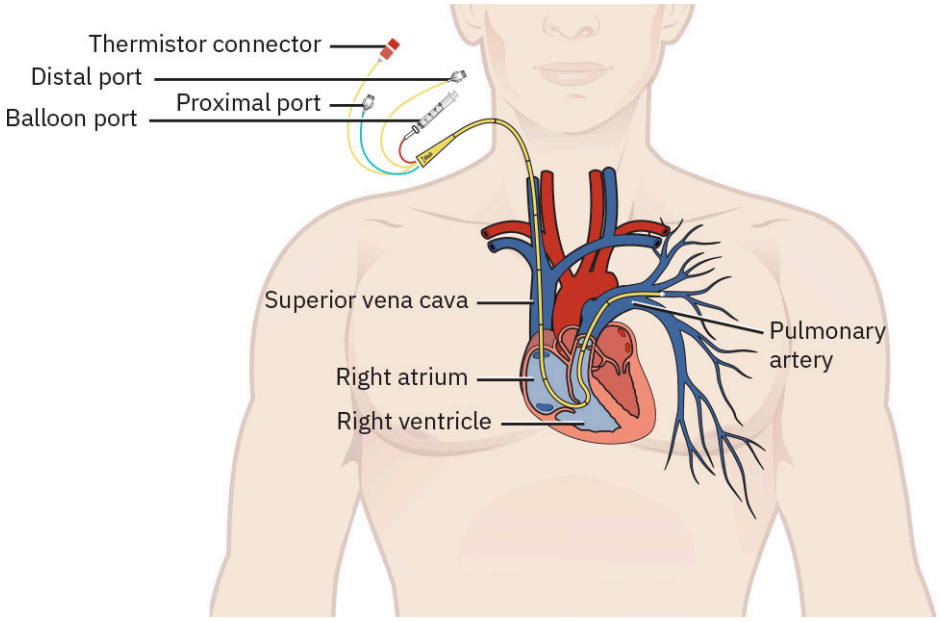

FIGURE 35.4 The distal end of the pulmonary artery catheter is placed in the pulmonary artery for pressure measurements. The other ports are connected to monitoring equipment and used to measure various internal heart pressures. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Hemodynamic Parameter	Description	Normal Range
Cardiac output (CO)	Amount of blood ejected from the ventricles each minute	4–8 L/min
Cardiac index	CO value that has been adjusted and personalized on the basis of the patient's body size and surface area	2.5–4.0 L/min/m^2
Stroke volume	Amount of blood ejected by the ventricle with each heartbeat	60–100 mL/beat
Right ventricular end-diastolic pressure	Reflects right ventricular preload	0–8 mm Hg
Left ventricular end-diastolic pressure	Reflects left ventricular preload	4–12 mm Hg
Right atrial pressure and central venous pressure	Interchangeable terms that reflect the pressure of the blood volume in the right side of the heart at the end of diastole	2–6 mm Hg
Pulmonary artery pressure	Pressure within the pulmonary artery	11–20 mm Hg at rest
Pulmonary artery occlusion ("wedge") pressure	Reflects the pressure in the left atrium; determined by injecting air into the balloon port, causing an occlusion or "wedge"	8–12 mm Hg
Systemic vascular resistance	Resistance that the left ventricle must overcome to pump blood to the body	800–1200 dynes/sec/cm^{-5}

TABLE 35.2 Commonly Monitored Hemodynamic Parameters and Their Normal Ranges

In addition to hemodynamic monitoring, there are several other diagnostic tests and procedures used in critical care settings to evaluate the function of the cardiovascular system. A description of these can be found in Table 35.3.

Diagnostic Test	Description	Clinical Significance
Chest radiography (X-ray)	Use of electromagnetic waves to produce images of the heart and surrounding structures	Used to evaluate the size and structure of the heart, heart positioning, abnormal fluid accumulation, and structural defects
12-Lead electrocardiogram	Noninvasive use of sticky leads placed on the chest and connected to a monitor to determine heart rate and rhythm by measuring internal electrical activity	Used to diagnose or rule out cardiac dysrhythmias and myocardial infarction
Echocardiogram	Noninvasive use of ultrasound waves to visualize the internal and external structure of the heart	Used to diagnose valve disorders, congenital defects, and cardiac tumors and to calculate ejection fraction
Cardiac catheterization	Invasive procedure that involves insertion of a catheter through the radial or femoral artery and advancing it up to the heart	Used to identify and determine the severity of blockages within the coronary arteries as the cause of the cardiogenic shock

TABLE 35.3 Common Diagnostic Tests and Procedures Used to Assess the Function of the Cardiovascular System

Pharmacological Supports

Medications used in critical care settings for cardiovascular support are called **vasoactive medications**, meaning they exert their effects on blood vessels and have the potential to significantly alter hemodynamics. Most of these medications are given intravenously and may only be administered in the ICU or progressive care unit (a.k.a., “stepdown units”), where there are more resources available for frequent hemodynamic monitoring. Additionally, doses of many of these drugs must be titrated by the critical care nurse according to standing orders and specific parameters set by the health-care provider to achieve optimal hemodynamic effects. A description of some of the most common classes of cardiovascular medications are presented in Table 35.4.

Medication Class	Examples (Example Brand Name)	Action	Side or Adverse Effects	Nursing Considerations
Beta-blockers	• Carvedilol (Coreg) • Metoprolol (e.g., Lopressor)	Block beta-adrenergic receptors, resulting in decreased heart rate, blood pressure, and heart contractility	• Asthma attacks • Bradycardia • Fatigue • Heart blocks Hypotension	• Consider holding a dose if heart rate is below 60 bpm. • Use caution in patients with diabetes, because these medications can mask signs of hypoglycemia.
Calcium channel blockers	• Amlodipine (Norvasc) • Diltiazem (e.g., Cardizem) • Nicardipine (Cardene)	Blocks flow of calcium into heart and blood vessels, resulting in muscle relaxation and a decreased workload on the heart	• Bradycardia • Dizziness • Headache • Heart blocks • Hypotension	• Consider holding a dose if heart rate is below 60 bpm. • If given orally, tablets cannot be crushed or chewed.
Inotropes	• Dobutamine (Dobutrex) • Dopamine (e.g., Intropin) • Milrinone (Primacor)	Improves CO by increasing heart contractility	• Extravasation and tissue necrosis at IV catheter site • Headache • Nausea/vomiting • Tachycardia • Ventricular ectopy	• Administer in a large vein, preferably through a central catheter. • Monitor heart rate, rhythm, and blood pressure closely. • Titrate dose to desired effects.

TABLE 35.4 **Common Classes of Cardiovascular Medications**

Medication Class	Examples (Example Brand Name)	Action	Side or Adverse Effects	Nursing Considerations
Nitrates	• Nipride • Nitroglycerin (e.g., Tridil)	Relaxation of smooth muscle in blood vessels, resulting in vasodilation and decreased workload of the heart	• Facial flushing • Hypotension • Lightheadedness • Severe headache	• Monitor blood pressure closely. • Titrate dose to desired effects.
Vasopressors	• Epinephrine • Norepinephrine (e.g., Levophed) • Phenylephrine (e.g., Neo-Synephrine) • Vasopressin	Vasoconstriction of blood vessels, resulting in an increased blood pressure	• Anxiety • Chest pain • Extravasation and tissue necrosis at IV catheter site • Hypertension • Tachycardia • Ventricular dysrhythmias	• Administer in a large vein, preferably through a central catheter. • Monitor heart rate, rhythm, and blood pressure closely. • Titrate dose to desired effects.

TABLE 35.4 Common Classes of Cardiovascular Medications

Nonpharmacologic Interventions

In addition to pharmacologic treatments, there are nonpharmacologic interventions that can be implemented in critical care settings to provide cardiovascular support. Most of these interventions are invasive and require complex medical equipment at the bedside, which must be monitored closely by the critical care nurse.

To decrease afterload and improve perfusion of the coronary arteries during diastole, **intra-aortic balloon pumps (IABPs)** are used. These devices are often used after invasive cardiac surgeries, with severe heart failure exacerbations, or after large myocardial infarctions (Khan & Siddiqui, 2023). The procedure involves the insertion of an introducer sheath into the femoral artery. The IABP catheter is then inserted into the sheath and advanced until the balloon part of the catheter is in the aorta. The IABP is often referred to as a counter-pulsation device, meaning that it inflates when the heart is not contracting (during diastole) and deflates during contraction (systole) (Figure 35.5.) When the balloon inflates during diastole, it pushes blood into the coronary arteries, which improves perfusion to the heart muscle and decreases cardiac workload. When the balloon deflates during systole, it reduces afterload, making it easier for blood to be pumped out to the rest of the body. IABPs are highly invasive and require specialized training to operate. Because they are inserted into a large artery, it is imperative that the ICU nurse monitor the patient closely for signs of bleeding or neurovascular changes such as a diminished pedal pulse, which may indicate thrombosis.

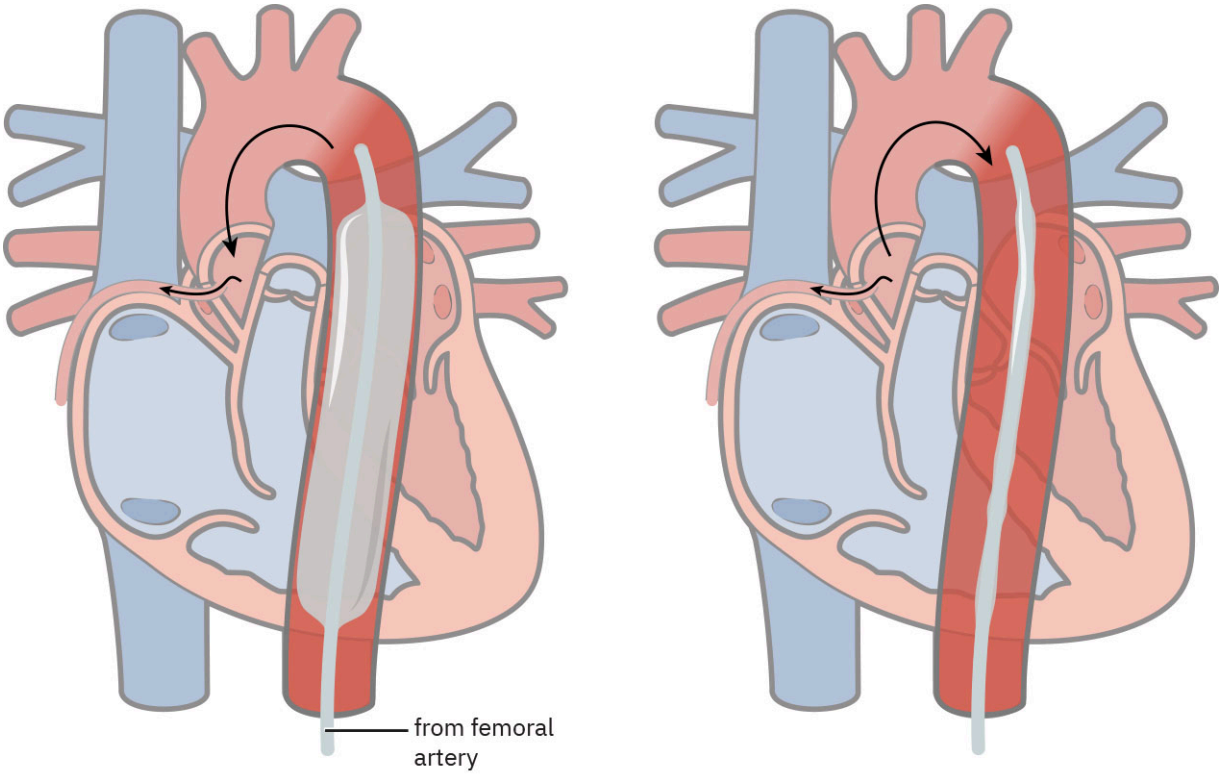

FIGURE 35.5 The intra-aortic balloon pump is inserted through the femoral artery and advanced to the aorta. (a) The pump inflates during diastole. (b) The pump deflates during systole. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Another invasive cardiovascular therapy that may occur in the ICU is **extracorporeal membrane oxygenation (ECMO)**. This procedure involves the use of a machine that acts as an artificial heart and lungs for the patient when their organs are not functioning at optimal levels. Blood is pumped from the right side of the heart to the ECMO machine, where it is oxygenated and warmed, and then sent back to the body (Figure 35.6.) Because the blood bypasses the heart and lungs, it gives them time to rest, which is important for patients who have experienced severe trauma or disease to these organs (Mayo Clinic, n.d.). ECMO is highly invasive and requires a high level of nursing skill to monitor and operate the equipment. Complications with ECMO are common and include bleeding, clotting, infection, and limb ischemia. Treatment of a patient receiving ECMO is interdisciplinary, inclusive of perfusionists who assist in the maintenance of the machine and a cardiologist who evaluates the response to the therapy.

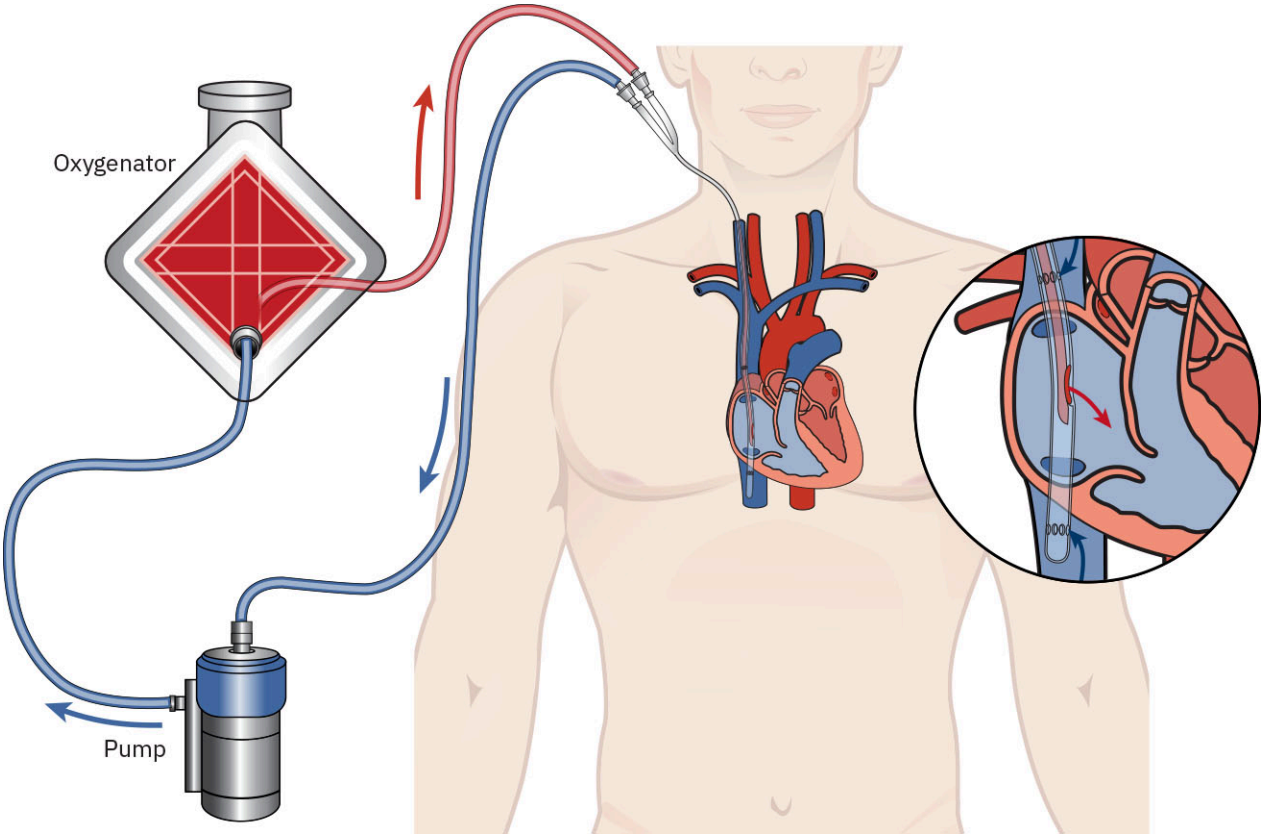

FIGURE 35.6 ECMO allows the patient's blood to bypass the heart and lungs. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

LINK TO LEARNING

Visit this overview of ECMO (https://openstax.org/r/77ecmo) provided by Yale Medicine.

External pacing, also called transcutaneous pacing, is another cardiovascular intervention that is performed in the ICU. This process involves the placement of electrode pads on the patient's chest to deliver shocks that keep the heart maintaining an adequate rate (Figure 35.7.) This procedure is performed when the patient is experiencing symptomatic bradycardia or some degree of heart block. This is only a temporary solution, however, and these patients will often need to be sent to the operating room quickly after initiation of the external pacing, to receive a permanent pacemaker.

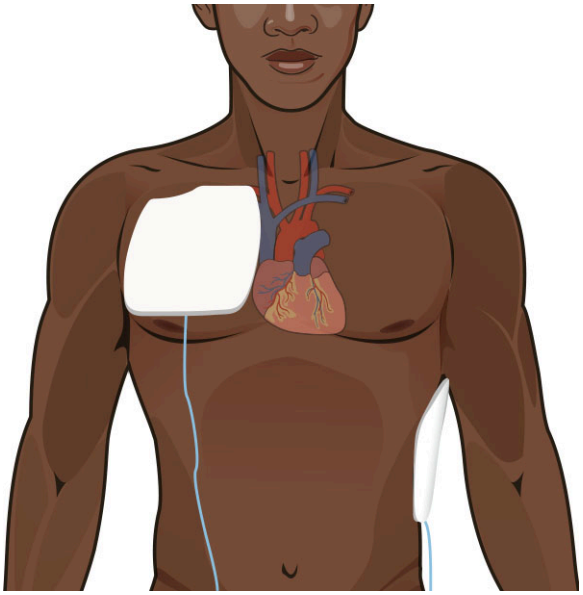

FIGURE 35.7 For transcutaneous pacing, electrode pads are placed on the patient's chest. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Exemplar: Cardiogenic Shock

Cardiogenic shock is a life-threatening cardiac disorder that may be experienced by patients in the ICU. Most often, this condition occurs secondary to a large **myocardial infarction (MI)**, or heart attack, but it can result as a secondary complication from many other disorders as well (National Heart, Lung, and Blood Institute. 2022).

Cardiogenic shock due to injury or death of the cardiac tissue causes the heart to stop pumping effectively. The inability of the heart to pump effectively results in severe hypotension and a lack of perfusion to all other body systems. This can lead to MODS.

When the heart is damaged, it loses some of its cardiac muscle strength and is unable to contract effectively. Without a strong heart contraction, less blood can be ejected, resulting in a decreased stroke volume and CO. The forward flow of blood backs up into the pulmonary system, resulting in fluid overload and hypoxia because the heart is no longer able to process the blood and pump it to other parts of the body. The heart will attempt to compensate for the decreased CO by increasing heart rate, but eventually the workload of the heart becomes too great and the body develops cardiogenic shock. Clinical manifestations of cardiogenic shock resemble those of left-sided heart failure, including

- crackles in the lungs
- diaphoresis
- hypotension
- S3 heart sound
- shortness of breath
- tachycardia

Treatment for cardiogenic shock focuses on determining and treating the underlying cause and decreasing the workload of the heart through both pharmacologic and nonpharmacologic interventions, some of which are discussed later in this section. Additionally, treatment involves providing supportive care to the rest of the body's organs and tissues that are negatively affected by decreased perfusion.

Nursing Concepts and Care

Nursing care of the critically ill patient experiencing cardiovascular dysfunction is complex and requires optimal clinical judgment and critical thinking skills. The nurse must be prepared to quickly intervene based on subtle changes in the patient's condition. These requirements are reflected within the Clinical Judgment Measurement Model, with each step of the model being explored further in the following sections.

Recognizing Cues and Analyzing Cues

First and foremost, critical care nurses must perform frequent assessments of the cardiovascular system. These assessments allow the nurse to detect subtle changes from baseline. Beyond physically assessing heart sounds and circulation (e.g., capillary refill, pulses), the nurse should closely monitor hemodynamic parameters such as CO and stroke volume and intervene as necessary on the basis of those findings.

Prioritizing Hypotheses, Generating Solutions, and Taking Action

Nursing care often involves administration of vasoactive medications that can significantly alter patient hemodynamics. Because of this, the nurse must have extensive knowledge of the mechanism of the medications and monitor and evaluate their effects closely. As with most medications administered in the ICU, frequent dose titrations, or adjustments, are based on the patient's hemodynamics and the physician's standing orders, requiring both careful assessment and attention to detail. Without proper attention to the effects of these medications, cardiovascular function may be greatly altered, resulting in systemic complications that could have otherwise been prevented. In addition to administering and titrating medications, the critical care nurse is responsible for maintaining invasive therapies such as IABPs and ECMO. These therapies present risks such as bleeding and thromboembolism, so the critical care nurse should be able to assess for these complications and intervene appropriately.

READ THE ELECTRONIC HEALTH RECORD

Caring for the Critically Ill Patient with Heart Failure

The nurse is caring for a patient admitted to the cardiac intensive care unit (CICU). Review the patient's electronic health record (EHR) and answer the questions that follow.

Nurse's note (0800):

- Patient brought to CICU from emergency department [ED]. ED nurse reports that the patient is exhibiting signs of biventricular heart failure. Pulmonary artery catheter was placed in the ED. Patient has been connected to the bedside monitor and vital signs are currently stable. Will continue to monitor.

Vital signs (0930):

- BP [blood pressure]: 90/52 mm Hg
- Cardiac index [CI]: 2–3 L/min
- CVP [central venous pressure]: 7 mm Hg

Vital signs (1030):

- BP: 82/52 mm Hg
- CI: 1–1.5 L/min
- CVP: 10 mm Hg

Current orders:

- Normal saline @ 100 mL/h (Widiarti et al., 2024)
- Dobutamine 5 µg/kg/min IV continuous infusion (titrate to maintain systolic BP >100 mm Hg)

1. What information in the EHR is the most concerning?
2. What other assessments should the nurse perform?
3. What action by the nurse would you anticipate?
4. What complications is this patient at risk for?

35.3 Respiratory Concerns

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiological changes to the patient's respiratory concerns when in the intensive care unit
- Describe the medical assessments and therapies that apply to the critical care patient's respiratory system
- Apply nursing concepts and plan associated nursing care for the critical care patient's respiratory system

One of the leading causes of ICU admissions is **acute respiratory failure (ARF)**, which is a sudden failure of the lungs that causes impaired gas exchange. The result is both hypoxemia, or low oxygen levels in the blood, and hypercapnia, or elevated carbon dioxide levels. In hypoxemia, body organs are not adequately perfused, leading to organ dysfunction and eventual failure. This highlights the importance of maintaining both a patent airway and adequate ventilation for patients in critical care settings. Without appropriate respiratory care, the patient's life is at risk and systemic complications may result.

Pathophysiological Insult to the Critical Care Patient's Respiratory System

Respiratory failure is common in critically ill patients, and the COVID-19 pandemic contributed to an increase in respiratory failure incidence over the last several years (Wilcox, 2020). There are two main types of respiratory failure: hypoxemic and hypercapnic (Mirabile, Shebl, Sankari, & Burns, 2023). These two types are briefly outlined in Table 35.5.

	Hypoxemic Respiratory Failure	Hypercapnic Respiratory Failure
Definition	The failure of the lungs and heart to provide adequate oxygen to meet the body's metabolic needs	The failure of the lungs to eliminate carbon dioxide (CO_2) from the body
Diagnostic criteria	Partial pressure of oxygen (PaO_2) <60 mm Hg without elevation of CO_2	Partial pressure of CO_2 ($PaCO_2$) >50 mm Hg (hypercapnia)
Causes	• Anemia • Diffusion defects • Hypoventilation • Intrapulmonary shunting • Low CO • Ventilation-perfusion mismatch	• Increased alveolar dead space • Increased CO_2 production • Intrapulmonary shunting • Pump failure (due to decreased respiratory drive or fatigue)

TABLE 35.5 Hypoxemic Versus Hypercapnic Respiratory Failure

Exemplar: Acute Respiratory Distress Syndrome

Acute respiratory distress syndrome (ARDS) is the most severe form of ARF, with a nearly 40% mortality rate (Siegel, 2022). Among other causes, studies have shown a direct correlation between severe COVID-19 cases and the development of ARDS. Other common causes of ARDS are listed in Table 35.6.

Direct causes	Fatty embolism Gastric aspiration Near-drowning Respiratory infection (e.g., COVID-19, pneumonia) Trauma resulting in chest or lung injury
Indirect causes	Burn injury Cardiopulmonary bypass Drug overdose Multiple blood transfusions Sepsis

TABLE 35.6 Common Causes of ARDS

The pathophysiology of ARDS is not well understood, but it appears to involve widespread lung inflammation after injury or insult, which results in an accumulation of fluid in the alveoli, or air sacs, of the lungs. Fluid-overloaded alveoli are not able to function effectively, which results in severely decreased gas exchange within the lungs and a decreased perfusion of oxygenated blood to the tissues. Assessment findings and diagnostic criteria associated with ARDS are listed in Table 35.7. Treatment for ARDS involves providing oxygenation, pharmacological interventions, and prone positioning, all of which are discussed in more detail later in this chapter.

Assessment findings	• Decreased level of consciousness • Dyspnea • Fine crackles in the lungs • Hypoxemia that does not improve with administration of oxygen • Restlessness or irritability • Tachypnea that results in respiratory alkalosis
Diagnostic criteria	• Acute onset (within 1 week) • Bilateral lung infiltrates on chest X-ray of noncardiac origin (ground-glass opacities) • Ratio of PaO_2 to the fraction of inspired oxygen <300 mm Hg

TABLE 35.7 Assessment Findings and Diagnostic Criteria for ARDS

Endotracheal Intubation and Mechanical Ventilation

Intubation refers to the placement of a flexible ETT through the patient's mouth or nose and into the trachea and airway. Most commonly, this is performed through the mouth and the tube is left in place so it can be connected to a ventilator to control the patient's respiratory efforts. At the end of the ETT is a distal cuff, or balloon, that is inflated with a small amount of air to keep the tube in place and seal off the trachea so that air passes through, and not around, the tube. An illustration of an ETT placement is shown in Figure 35.8. The ETT is secured with a harness that is threaded around the back of the patient's head and held in place with Velcro straps and padded stickers on the cheeks to prevent skin breakdown.

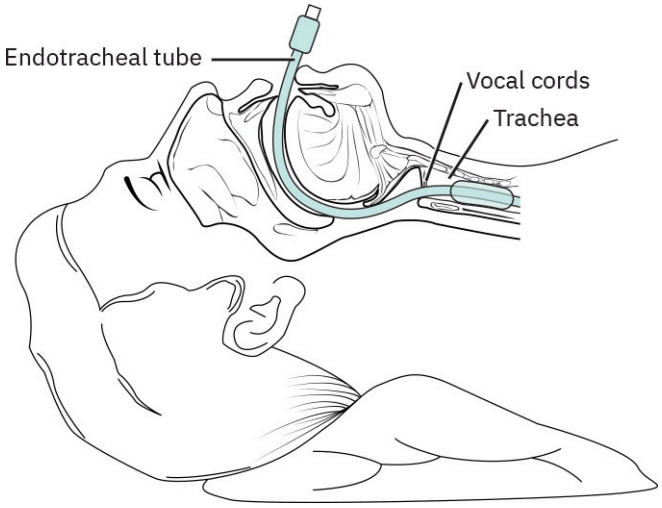

FIGURE 35.8 The endotracheal tube is placed through the trachea, with the end of the tube resting in the top portion of the airway. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Once the ETT has been placed, the nurse and RT collaborate to connect the tube to the ventilator. A ventilator provides mechanical ventilation that takes the place of the patient's own breathing and respiratory drive (Figure 35.9.) Successful placement of an ETT tube includes listening for air passage in all lobes, a chest X-ray to confirm placement, and end-tidal CO_2 measurements, which demonstrate appropriate ventilation. Ventilators are used for many conditions, some of which involve the patient being unable to adequately breathe on their own, such as ARF, or traumatic brain injury that interferes with the patient's respiratory drive. Ventilators provide several different modes and settings that can be adjusted according to the function of the patient's respiratory system. Some supplement the patient's initiated breaths; others deliver all breaths while the patient is sedated or pharmacologically paralyzed.

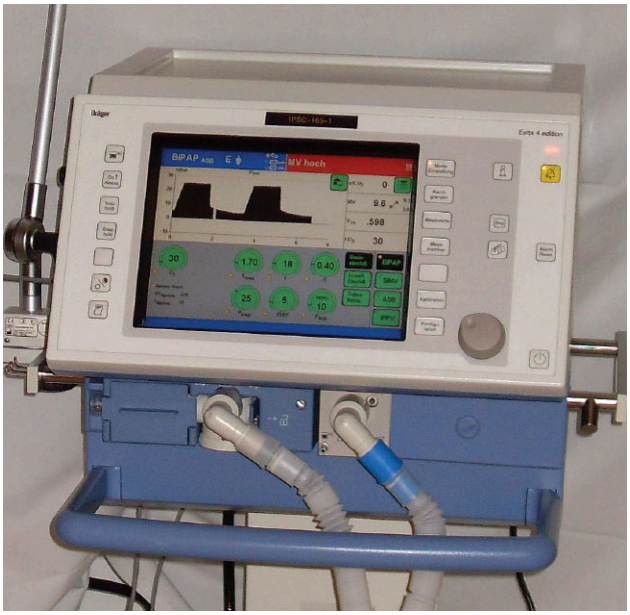

FIGURE 35.9 A ventilator provides mechanical ventilation that takes the place of the patient's own breathing and respiratory drive. (credit: "Respirator 'Evita4' on an ICU" by Blogotron/Wikimedia Commons, Public Domain)

Nurses work closely with the respiratory care team to ensure the correct ventilator mode is being used and that appropriate changes in settings are made on the basis of changes to the patient's condition. One of the main roles of the nurse when caring for patients connected to a ventilator is suctioning the airway as needed. Often, an in-line suction catheter is attached to the ETT, allowing for sterile suctioning of the airway at the bedside for patients with excessive respiratory secretions. Another role of the nurse when caring for a patient receiving ventilator assistance is communication with other team members, most notably the RT and provider, to ensure optimal functioning and management of the ventilator.

Exemplar: Ventilator-Associated Pneumonia

Though mechanical ventilators are necessary in many cases, their use increases the risk of aspiration and subsequent infection, which can result in ventilator-associated pneumonia (VAP), which is pneumonia that develops within 48 hours of the patient being intubated. The development of VAP has been linked to longer hospitalizations and increased health-care costs, indicating the important need for prevention measures in the critical care setting. Many ICUs have implemented intervention bundles that can help prevent the development of VAP. An example of one of these care bundles is presented in the following Quality and Safety Education for Nurses (QSEN) Feature Box.

CLINICAL SAFETY AND PROCEDURES (QSEN)

QSEN Competency: Evidence-Based Practice

Definition: integrate best current evidence with clinical expertise and patient and family preferences for delivery of optimal health care.

Evidence-Based Practice Strategies to Avoid VAP: VAP Practice Bundle.

The nurse will

1. maintain ETT cuff pressure,
2. keep the head of the bed elevated to at least 30°,
3. provide regular oral care with chlorhexidine swabs,
4. conduct daily awakening (“sedation vacation”) with assessment of need for continued intubation, and
5. administer prophylactic medications for stress ulcers and deep venous thrombosis.

Medical Assessments and Therapies

One of the most frequently used bedside diagnostic tests for assessing respiratory function and gas exchange in the ICU is arterial blood gas (ABG) measurement. This test involves obtaining a blood sample either by direct needle puncture of the radial artery (Figure 35.10) or from an arterial catheter. The sample is then processed and laboratory values reflect the patient’s oxygenation status. These values and their descriptions are listed in Table 35.8. Critical care nurses must understand the meaning of these values and collaborate with the respiratory therapy team to implement changes to the plan of care and interventions based on ABG findings.

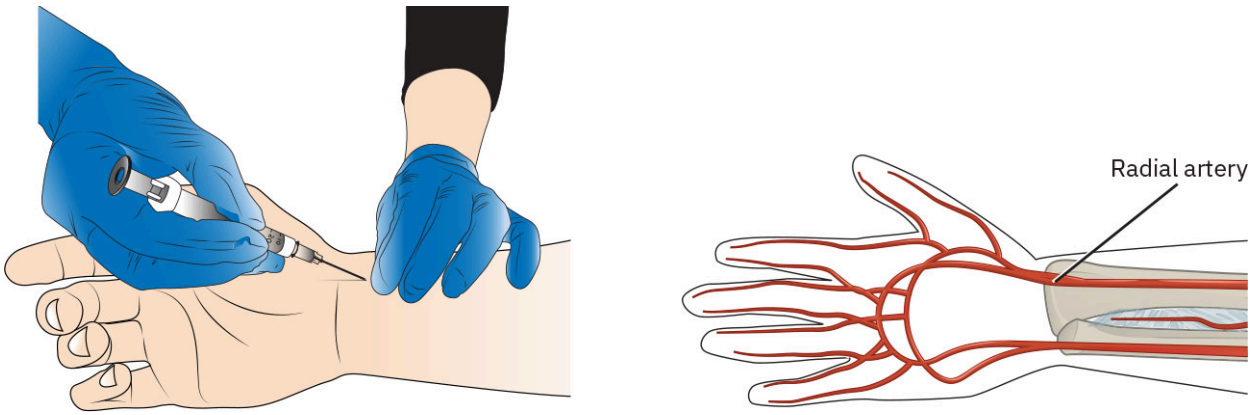

FIGURE 35.10 A direct needle stick to the radial artery obtains a sample for an ABG test. (a) The needle is inserted into the artery at a 45° angle. (b) The radial artery is located next to the radius of the arm. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

ABG Component	Normal Range	Description	Clinical Significance
PaO_2	80–100 mm Hg	The pressure of oxygen dissolved in the blood	• PaO_2 <60% indicates hypoxemia
pH	7.35–7.45	The concentration of hydrogen (H^+) ions in the blood	• pH < 7.35 indicates acidemia • pH > 7.35 indicates alkalemia
$PaCO_2$	35–45 mm Hg	The pressure of CO_2 dissolved in the blood	• $PaCO_2$ <35 mm Hg indicates respiratory alkalosis • $PaCO_2$ >45 mm Hg indicates respiratory acidosis
Bicarbonate (HCO_3^-)	22–26 mEq/L	A substance that acts as a base to neutralize acids in the body	• HCO_3^- <22 mEq/L indicates metabolic acidosis • HCO_3^- >26 mEq/L indicates metabolic alkalosis
Base excess or base deficit	−2 to +2 mEq/L	The sum of all buffer bases in the body	• Base deficit indicates metabolic acidosis • Base excess indicates metabolic alkalosis

TABLE 35.8 Components of an Arterial Blood Gas (ABG)

Pharmacological Supports

There are different classes of medications commonly given in critical care settings as part of care for the respiratory system. For patients receiving mechanical ventilation, use of sedatives and neuromuscular blocking agents (also called paralytics) may be indicated. These classes of medications are often used to minimize movement when patients are receiving ventilatory support; movement may potentially dislodge the ETT and compromise the patient's airway. It is important to temporarily pause these medications at least once per day to assess the patient's neurological status and continued need for intubation and mechanical ventilation. These periods are often called "sedation vacations," and they can be performed at the same time as spontaneous breathing trials (SBTs), which are discussed in the next section. In addition to sedation, patients receiving ventilatory support often receive IV opioid medications for pain relief. Placement of an ETT for long periods can cause pain, particularly when combined with immobility, so it is important for critical care nurses to frequently assess and treat patients for nonverbal signs of pain. This is especially important for patients receiving ventilatory support because they are unable to verbally communicate their pain level, requiring a degree of nursing assessment skills to determine pain level on the basis of body language and other nonverbal clues such as changes in vital signs.

Another class of medications used to treat severe respiratory conditions is corticosteroids. These are usually given through an inhaled nebulizer treatment or intravenously. The purpose of corticosteroids is to decrease the airway inflammation associated with many respiratory disorders. Use of corticosteroids poses some risks, including increased risk of infection due to immunosuppression, and episodes of hyperglycemia, so it is important for the critical care nurse to observe patients closely for adverse effects.

Prophylactic medications are usually given daily to patients receiving ventilatory support to prevent the development of stress ulcers and deep vein thrombosis (DVT), which are common in patients receiving mechanical ventilation. Medications for stress ulcers include sucralfate (e.g., Carafate), proton pump inhibitors (PPIs), and

histamine receptor blockers. DVT presents a risk for developing pulmonary emboli, which can result in respiratory complications and death. To prevent this, anticoagulants such as heparin or a low-molecular-weight heparin, such as enoxaparin (brand name, Lovenox), are administered subcutaneously.

Nursing Care

Most of the nursing care for patients in the ICU is related to care of the ETT and ventilator. First and foremost, critical care nurses are responsible for frequently monitoring ETT placement. If the tube becomes even slightly displaced, the ventilatory support being provided may not be efficient. Several times during the shift, the nurse should check the placement of the ETT to ensure it has not moved. Small markings on the ETT allow for easy visual assessment of placement at the lips. If the nurse determines that the tube may have migrated from its optimal position, it is imperative that they let the health-care provider know. It is likely that the patient will need an immediate X-ray to confirm tube placement.

Another aspect of nursing care for patients receiving mechanical ventilation is SBTs, which are overseen by the nurse and RT. SBTs involve switching the mode on the ventilator to a setting that allows for assessment of the patient taking breaths on their own. If the patient can breathe effectively in this mode and does not show any other signs of agitation or abnormal vital signs, they may be ready for removal of the ventilator and ETT. The main role of the nurse during this process is turning off the sedation and neuromuscular medications and paralytics so that the patient is fully awake and able to participate in the breathing trial process. Turning off the sedation can be startling to the patient who wakes up with an ETT in their throat, so the nurse must be present and able to communicate the process to the patient to ease their anxiety and prevent them from pulling out essential catheters and tubes. Current practices use risk assessment models such as the Richard Agitation Sedation Scale to gauge a patient's mental status when progressing on drug holidays (Sharma et al., 2024)

Finally, prone positioning has often been used in the ICU for patients with respiratory conditions, especially those with ARDS related to COVID-19. Prone positioning entails the patient lying on their abdomen, which enables gravity to improve perfusion to more parts of the lungs. This process is highly complex, especially when patients are connected to a ventilator and other invasive equipment. Proning a patient requires the assistance of several staff members to ensure the patient can be safely positioned without disruption of their equipment and catheterss. In the past several years, there have been developments in proning beds that provide protective padding for both the patient and their equipment, and make positioning much easier. A picture of one of these beds is shown in Figure 35.11.

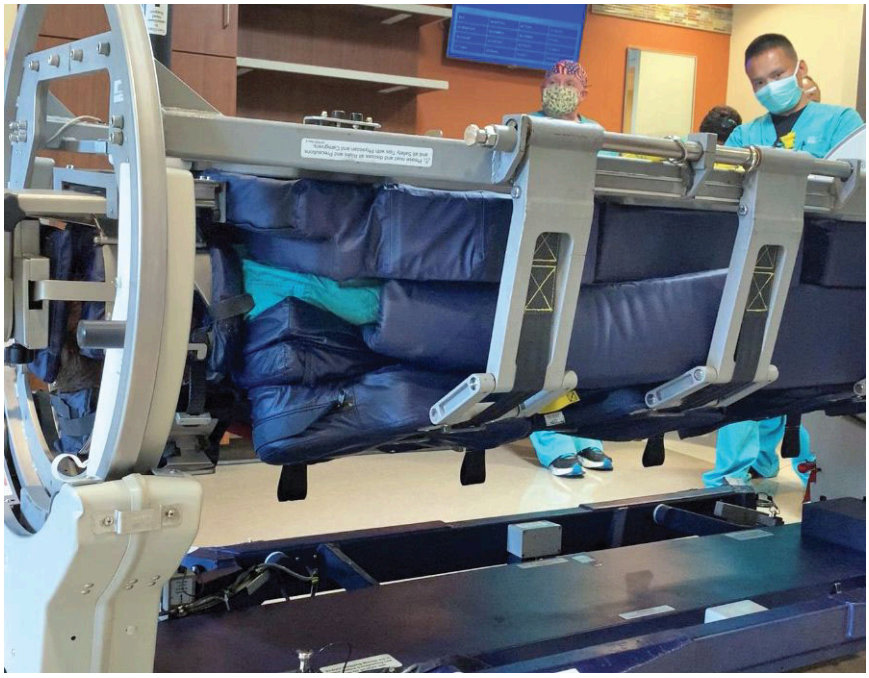

FIGURE 35.11 A padded proning bed in used in the ICU to safely position an intubated patient. (credit: Defense Visual Information Distribution Service, Public Domain)

35.4 Neurological Concerns

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiological changes to the patient's neurological system when in the intensive care unit
- Describe the medical assessments and therapies that apply to the critical care patient's neurological system
- Apply nursing concepts and plan associated nursing care for the critical care patient's neurological system

The neurological system is involved in consciousness and the control of physical movement and vital functions in the medulla, such as breathing, heart rate, and thermoregulation. Critically ill patients often have neurological system dysfunction that may result in serious systemic complications and permanent physical disabilities. For many patients, frequent neurological assessment and interventions are key components of nursing care in the critical care setting.

Pathophysiological Insult to the Critical Care Patient's Neurological System

The underlying pathophysiologic mechanism behind many neurological disorders observed in critical care settings is increased intracranial pressure (ICP). This pressure is normally between 1 and 20 mm Hg (Pinto, Tadi, & Adeyinka, 2023). Without intervention, sustained increased ICP can result in severe, permanent complications and death for the patient while in the hospital and upon discharge.

The cranium contains three main elements: the brain, CSF, and blood. The Monroe-Kellie Doctrine concludes that a change in one of these three components must be compensated for by another component (Teach Me Surgery, 2020). For example, if a patient is experiencing brain swelling, there needs to be a decrease in either blood or CSF volume to account for the extra space the swelling is now taking up. An elevation in ICP is observed when there is an increase in any one of the three components without adequate compensation from the other two. Some of the common causes of increased ICP are:

- brain tumors or hematomas
- cerebral edema (e.g., traumatic brain injury)
- increased CSF production (hydrocephalus)
- infections of the central nervous system (e.g., meningitis)
- structural abnormalities (e.g., stroke, aneurysms)

There are several key assessment findings that are indicative of increased ICP. The first sign, and one that is easy to miss, is a decrease in the level of consciousness (LOC). If the patient appears more drowsy than usual or slightly confused, it may indicate an early sign of increased ICP. The nurse can use the Glasgow Coma Scale (see Chapter 17 Nervous System and Chronic Diseases of the Nervous System) to observe neurological changes from the patient's baseline.

LINK TO LEARNING

For more information, go to this website about the Glasgow Coma Score (https://openstax.org/r/77glasgow) from First Aid for Free.

Another important assessment for patients at risk for increased ICP is the pupillary response. Pupillary dilation and lack of reactivity are associated with increased ICP and other neurological disorders. Another finding directly related to increased ICP is a combination of three factors, called Cushing's triad: (1) bradycardia, (2) irregular respirations, and (3) systolic hypertension with widening **pulse pressure**, or the difference between the systolic and diastolic blood pressures

Additional signs of increased ICP include headache, blurred vision, and projectile vomiting, often without nausea. Abnormal posturing is another sign: with decorticate posturing, the patient pulls their arms into their chest; with

decerebrate posturing, the patient's arms are flexed at the sides (Figure 35.12). If any signs of increased ICP are noted, quick intervention is necessary to prevent severe neurological complications.

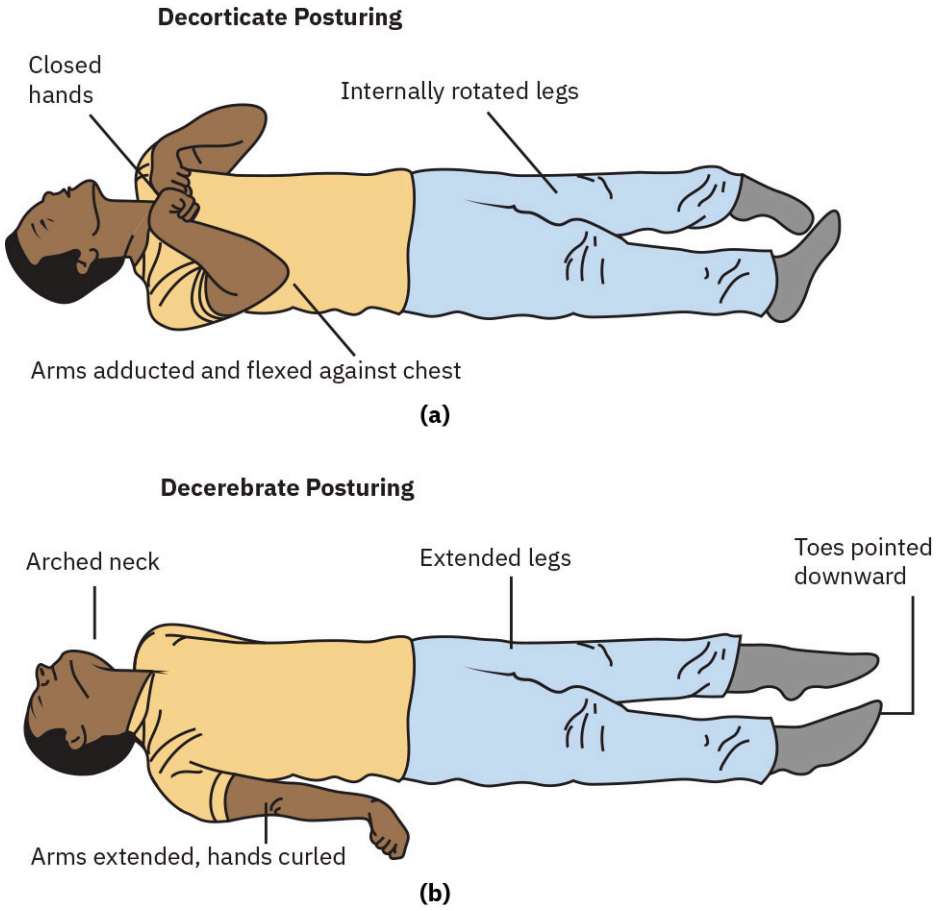

FIGURE 35.12 Both (a) decorticate positioning and (b) decerebrate posturing may be observed with increased ICP and brain injury. Decerebrate posturing indicates a more severe brain injury. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Exemplar: Traumatic Brain Injury

A common reason for admission to the ICU is traumatic brain injury (TBI). Annually, 2.8 million people in the United States will have a TBI, with more than 250,000 cases requiring hospitalization (Michael et al., 2023). Traumatic brain injury often occurs with trauma and can involve skull fractures, hematomas, and concussions, all of which have the potential to increase ICP. The treatment for TBI is similar to that for increased ICP, which is discussed in more detail in a later section.

Medical Assessments and Therapies

In addition to frequent neurological assessments, which are often a standard of care in the ICU, several other diagnostic tests are used to assess the function of the neurological system. These diagnostic tests and procedures are outlined in Table 35.9.

Diagnostic Test	Description	Clinical Significance
Computed tomography (CT) scan	Use of X-rays to create three-dimensional images of internal brain structures	A CT scan is often the first diagnostic test used to detect neurological issues. If abnormalities are noted, further testing is usually indicated. Contrast dye is used cautiously with patients who have existing allergies and renal impairment.
Magnetic resonance imaging (MRI)	Use of magnetic fields and radio waves to generate detailed images of internal brain structures	MRI is often performed after abnormality is noted on a CT scan. MRI provides more detailed images of the brain, allowing for easier diagnosis.
Electroencephalogram (EEG)	Use of small electrodes attached to the scalp that transmit electrical brain activity	An EEG is used to detect seizure activity or a lack of electrical activity that may indicate severe brain injury or death.

TABLE 35.9 Common Neurological Diagnostic Tests Used in the Critical Care Setting

Pharmacological Supports

Several different medications are commonly administered in the ICU to treat neurological disorders. The main medication used for increased ICP is mannitol, which is an osmotic diuretic. Mannitol works by pulling water out of the brain and back into the vessels. It is administered intravenously and should only be given when ICP can be closely monitored and frequent neurological assessments can be performed. If administered too quickly, mannitol can cause severe shifts in brain fluid status, which will worsen neurologic dysfunction. Other side effects of mannitol include: dehydration, electrolyte imbalances, hypotension, and rebound cerebral edema.

For cerebral edema and swelling, corticosteroids such as dexamethasone (e.g., Decadron) or methylprednisolone (e.g., Solu-Medrol) are often used. These medications decrease inflammation by suppressing white blood cells, which can improve brain swelling. Lastly, patients at risk for or who are having active seizures can be treated with an IV antiseizure medication such as levetiracetam (e.g., Keppra). Side effects to monitor for with use of levetiracetam include anemia, muscle weakness, and suicidal ideation or psychosis.

Nursing Care

Most of the nursing care for patients experiencing neurological dysfunction in the ICU centers around interventions to decrease ICP. In addition to pharmacologic interventions, there are several other ways critical care nurses can reduce the patient's ICP. First, the nurse should ensure the patient is receiving adequate oxygenation; if the brain is not receiving enough oxygen to function at its full capacity, hypoxia can make ICP worse. It may be necessary to change the settings on the mechanical ventilator to ensure adequate oxygenation and effective brain perfusion.

Another important aspect of nursing care for patients with neurological disorders and increased ICP is blood pressure management. It is vital that the nurse titrate medications or administer fluids as necessary to maintain an adequate mean arterial pressure (MAP). MAP must be between 70 and 90 mm Hg to ensure that cerebral perfusion pressure (CPP), or perfusion of oxygen and blood to the brain tissue, is adequate for optimal functioning. Lastly, the critical care nurse should implement interventions to decrease the body's metabolic demands. Decreasing these demands permits the body and brain to rest and heal accordingly. Table 35.10 lists key interventions for reducing metabolic demands and ICP.

Intervention	Description
Targeted temperature management (TTM)	• Body temperature is lowered to a state of hypothermia, which decreases the metabolic demands of the brain. • TTM may be performed noninvasively by placing cooling blankets or ice packs directly against the skin. • Target temperature varies by hospital protocol but is typically between 33 and 36 °C (91.4–96.8 °F). • Hypothermia is maintained for 24 hours, and then patient is slowly rewarmed to assess neurological function.
Sedation	• Sedative medications are administered to reduce pain, irritability, and movement, all of which can increase ICP. Sedation also reduces the increased risk of metabolic demand, because this makes ICP worse. Laxatives and stool softeners are administered to reduce straining and constipation, which also increase ICP.
Surgical intervention	• A craniectomy, or partial removal of the skull bone, can be used to improve brain swelling. • A ventriculostomy or shunt can be placed to remove excess CSF (based on parameters provided by the provider) and decrease ICP.
Maintain low-stimuli environment	• Limit visitors and procedures and keep room dim and quiet to allow patient to rest and prevent increased ICP.
Body positioning	• Keep patient's head midline, avoid hip flexion, and elevate the head of the bed to 30° to promote drainage of CSF and decrease ICP.

TABLE 35.10 Interventions and Protocols to Reduce Metabolic Demands and ICP (Teach Me Surgery, 2020)

35.5 Gastrointestinal Concerns

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiological changes to the patient's gastrointestinal concerns when in the intensive care unit
- Describe the medical assessments and therapies that apply to the critical care patient's gastrointestinal system
- Apply nursing concepts and plan associated nursing care for the critical care patient's gastrointestinal system

The gastrointestinal (GI) system is often overlooked for critical care patients because it may be viewed as less important than evidently life-sustaining body systems such as the cardiovascular or respiratory systems. However, the GI system plays an essential role in nutrient absorption, fluid and electrolyte balance, and provision of energy for the maintenance of overall body metabolism. Critically ill patients are at risk for adverse GI effects and complications if this system is not properly assessed and treated as part of the patient's plan of care while in the ICU. For these reasons, care of the GI system should be a nursing priority in addition to the care provided for all other body systems.

Pathophysiological Insult to the Critical Care Patient's GI System

The most common reason for admission to the ICU related to the GI system is acute bleeding. One of the main causes of GI bleeding is the presence of bleeding stress ulcers, usually in the stomach or intestines. These ulcers

often begin as peptic ulcer disease (PUD) and can quickly become life-threatening if they rupture and bleed.

Another common cause of GI bleeding is related to **esophageal varices**: small veins that form when portal hypertension is present, often due to alcoholic cirrhosis liver disease. Esophageal varices are only able to withstand low blood pressure, so they are prone to rupture and bleeding, especially in patients with chronic hypertension.

Common assessment findings for patients with acute GI bleeding are:

- abdominal pain or cramping
- anemia
- cool, clammy skin
- decreased LOC
- decreased urine output
- **hematemesis** (bloody vomitus)
- hypoactive bowel sounds
- hypotension
- **melena** (bloody stools) and/or dark tarry stools
- tachycardia

Medical Assessments and Therapies

A complete blood cell count (CBC) and comprehensive metabolic panel can be used to detect the presence of GI bleeding. Results may show hemoglobin and hematocrit levels to be normal at first but then decreasing. Platelet count may initially increase to maintain clotting and stop the bleeding, but it decreases as platelets are used up. Other common laboratory values that may indicate a GI bleed are:

- elevated blood glucose level
- increased blood urea nitrogen (BUN) and serum creatinine levels
- increased partial thromboplastin time or increased prothrombin time
- increased serum lactate level
- increased white blood cell count due to inflammation

If an acute GI bleed is suspected, the patient will likely be scheduled for an emergent endoscopy. This procedure involves the insertion of an endoscope through either the esophagus (for upper GI bleeds) or rectum (for lower GI bleeds) to enable direct visualization of the potential bleeding site. During this procedure, if bleeding is noted, the provider can use a laser on the end of the scope to cauterize the bleeding so that it stops completely or at least slows.

Pharmacological Supports

There are several medications that are indicated for a critically ill patient experiencing an acute GI bleed. First, use of antibiotics is often implemented because the development of stress ulcers has been linked to bacterial infections by *Helicobacter pylori* (Zhang et al., 2021). Patients are prescribed a2-week course of antibiotics to eradicate the bacteria completely and prevent the development of additional ulcers in the future. Most patients experiencing bleeding from stress ulcers will also be recommended to take a PPI such as omeprazole (e.g., Prilosec) or pantoprazole (Protonix) to decrease gastric acid secretion and allow for complete healing of the ulcer. If the bleeding originates from esophageal varices, octreotide (Sandostatin) can be used to stop the bleeding. This medication works by reducing pressure within the portal vasculature, which slows bleeding. It is important to note that these medications should all be administered intravenously, because patients with acute GI bleeds should not ingest anything by mouth; this allows their GI system to rest and heal.

Nursing Care

Patients presenting with acute GI bleeds are immediately placed on “nothing by mouth” (NPO) restrictions. Thus, all medications will be administered intravenously instead of orally, and the patient will not be allowed to eat or drink until the bleeding has resolved. This allows the GI system to rest and heal without the added stress of having to process food and medications.

The immediate priority when caring for patients with acute GI bleeding is maintaining hemodynamic stability. Gastrointestinal bleeds can quickly become life-threatening without medical intervention. It is important for the

nurse to closely monitor the patient's hemodynamic status and vital signs and intervene as needed. Patients with GI bleeding may require IV fluid replacement or multiple blood transfusions to restore lost blood volume (DiGregorio & Alvey, 2022). They may also require the use of vasopressor medications if they are experiencing severe hypotension from the loss of blood. For patients requiring blood transfusions, it is important to ensure that informed consent has been obtained from either the patient or the patient's DPOA agent if they are unable to give consent. Some patients will not be agreeable to receiving blood transfusions because of personal or spiritual beliefs.

The insertion of a nasogastric tube (NGT) is often indicated for patients with acute GI bleeding; therefore, nurses must be familiar with and comfortable performing this skill quickly at the bedside. After insertion, the NGT is typically connected to low, intermittent suction. This level of suction allows for blood and other gastric contents to be pulled out of the patient's stomach in a slow, controlled manner.

CLINICAL SAFETY AND PROCEDURES (QSEN)

QSEN Competency: Safety

Definition: Minimizes risk of harm to patients and providers through both system effectiveness and individual performance.

Skills Checkoff: NGT Insertion

1. Wash hands.
2. Don appropriate personal protective equipment.
3. Explain procedure to patient.
4. Ask patient about potential contraindications (e.g., deviated septum, facial trauma).
5. Check nostril patency. Have the patient occlude one nostril and assess breathing through the other nostril. Determine which nostril provides better airflow and should be left open.
6. Estimate length of tube to be inserted by measuring the end of the tube from the tip of the patient's nose to the earlobe and then down to the xiphoid process. Mark this spot on the tube with tape or a marker or note the correct black measurement marking printed on the tube.
7. Lubricate the tip of the NGT with KY jelly or petroleum-based lubrication.
8. Gently insert the tip of the NGT into the chosen nostril and slide it along the nasal cavity floor, aiming the tube down and back.
9. Have the patient take sips of water through a straw while you insert the tube to facilitate its passage down the esophagus. Continue advancing the tube until the predetermined length of tube has been inserted.
10. If the patient is severely gagging or has a hoarse voice, or if oxygen saturation is decreasing, remove the tube immediately because it may be located in the airway.
11. Use hospital protocol to check correct placement of NGT. This typically involves use of a chest X-ray or aspiration of gastric fluid to check pH.

35.6 Renal Concerns

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiological changes to the patient's renal system when in the intensive care unit
- Describe the medical assessments and therapies that apply to the critical care patient's renal system
- Apply nursing concepts and plan associated nursing care for the critical care patient's renal system

The kidneys play many major roles in the body, most notably the filtration of toxins and control of blood pressure and hydration status. Without optimal kidney functioning, perfusion to body organs will be decreased and there will be a resulting buildup of toxins and electrolytes that can result in life-threatening systemic complications. For that reason, it is imperative to prioritize care of the renal system for all critically ill patients.

Pathophysiological Insult to the Critical Care Patient's Renal System

Although some patients may be admitted to the ICU for a primary kidney issue, most often, patients are admitted for an issue within another body system but then experience acute kidney injury due to the nature of their illness or

from medical interventions. Certain medications administered in critical care settings are **nephrotoxic**, or capable of causing renal damage, and some procedures also pose the risk of causing acute kidney injury. Therefore, it is important to closely monitor renal function and intervene as soon as the patient is at risk of injury.

Exemplar: Acute Kidney Injury

We define **acute kidney injury (AKI)** as a sudden reduction in kidney function. It is caused by an insult to the nephron unit that manifests with alteration in laboratory values and decreased urine output. There are many etiologies for the development of AKI (Goyal et al., 2022), several of which are listed in Table 35.11.

Etiology	Causes
Hypovolemia	• Burn injury • GI fluid loss (e.g., vomiting, diarrhea) • Sepsis
Severe hypotension from decreased CO	• Cardiogenic shock • GI bleed • Massive pulmonary embolism • MI
Severe hypotension from widespread vasodilation	• Anaphylactic shock • Effects of general anesthesia • Septic shock
Renal vasoconstriction	• Nephrotoxic medications • Overuse of nonsteroidal anti-inflammatory drugs • Use of contrast media during imaging procedures

TABLE 35.11 Common Etiologies of Acute Kidney Injury (AKI)

AKI can be classified into one of three categories on the basis of its etiology. These three classifications are defined and described in Table 35.12.

Classification Category	Definition	Clinical Examples
Prerenal causes	Conditions that result in decreased perfusion to the kidneys	• Burn injury • Hemorrhage • Hypovolemic shock • Prolonged vomiting or diarrhea
Intrarenal causes	Conditions that result in direct damage to kidney tissue itself	• Nephrotoxic medications (e.g., aminoglycosides, contrast media) • Prolonged ischemia from prerenal causes
Postrenal causes	Conditions that block the outflow of urine	• Benign prostatic hyperplasia • Blood clots • Renal stones or tumors

TABLE 35.12 Classification of the Causes of AKI

Medical Assessments and Therapies

Diagnosing AKI involves close evaluation of serum laboratory values, especially creatinine and BUN. Serum creatinine is a breakdown product of skeletal muscle. It is made at a relatively stable rate and so is a good laboratory value to use for the diagnosis of AKI when alterations are noted. An increase in serum creatinine level may indicate an early sign of AKI: as renal function decreases, the kidneys are unable to filter out the excess creatinine at the same rate as when they are optimally functioning. Blood urea nitrogen is a breakdown product of protein metabolism, so elevations in this value may indicate the kidneys are unable to effectively excrete the excess protein byproducts. However, there are other conditions beyond AKI that can increase BUN level, such as dehydration or GI bleeding; therefore, although important, it is not the most reliable indicator of AKI on its own.

Trends in glomerular filtration rate (GFR) should also be monitored closely to determine the level of functioning of the kidneys. Glomerular filtration rate is a measurement of how quickly the kidneys can filter out toxins and other waste products. A decrease in GFR indicates the kidneys are unable to filter as quickly as they could when functioning at an optimal level. The trend of the GFR will also influence medication therapy selection and dosing to avoid toxic level accumulation.

Beyond laboratory values, several imaging procedures may be used to diagnose kidney injury. These include renal ultrasound, CT scans, and renal angiography. The main concern with these procedures is that they often necessitate the use of nephrotoxic contrast media for better visualization. It is important to weigh the risks versus benefits of performing these procedures with contrast, depending on the patient's current renal status (Davenport et al., 2020).

Pharmacological Supports

Most of the pharmacological interventions for AKI are focused on maintaining optimal fluid and electrolyte balance. Patients experiencing prerenal causes of AKI may require IV fluid replacement to restore renal perfusion. For patients experiencing intra- or postrenal causes of AKI, use of diuretics to remove excess fluid and toxins may be indicated. It is important to note that diuretics have some nephrotoxic qualities; they should be used cautiously, with the lowest dose, to avert further damage. The decision to give IV fluids or diuretics is based on the specific cause of the AKI and the patient's current renal status.

When the kidneys are not functioning at their highest level, they are often unable to excrete electrolytes effectively. This can result in a buildup of some electrolytes in the body, with hyperkalemia being a significant resulting electrolyte imbalance. Elevated levels of potassium can result in life-threatening cardiac dysrhythmias. Patients with hyperkalemia will require continuous telemetry to monitor for dysrhythmias. Often, these patients will require the administration of sodium polystyrene (e.g., Kayexalate) to help the body excrete potassium and maintain a normal electrolyte balance. Administration of dextrose with insulin assists with mobilization of excess potassium into the intracellular fluids. Another therapy, calcium gluconate, has been used emergently by stabilizing hyperexcitability of myocardial cells, which is caused by excess potassium. In some cases, emergency dialysis may be required to remove the potassium more quickly.

Another important consideration when caring for patients with AKI is limiting the use of medications that may further harm the kidneys. Many medications, most notably antibiotics, are nephrotoxic. The nurse should work closely with the pharmacist to ensure that patients with or at risk for AKI are receiving the lowest doses possible of these medications to prevent worsening of the kidney injury.

Nursing Care

Because of the kidney's role in the maintenance of fluid balance, a priority aspect of nursing care for patients with AKI is measuring and recording strict intake and output data. A decrease in urine output can be one of the first signs of AKI; hence, it is vital that the nurse be attentive to any changes in urination, even subtle ones. Additionally, weighing the patient at the same time daily and comparing measurements is important. Every pound of weight gain is associated with a liter of fluid accumulation; therefore, these measurements can show fluid retention that may indicate AKI. Other deviations the nurse may observe are hypertensive blood pressures, due to fluid volume excess, and irregular heart rates and alteration of mentation, due to electrolyte disturbance. Lastly, appropriate use of medications is essential. There are many nephrotoxic medications whose risks and benefits must be determined before administration. Some of these medications are:

- aminoglycoside antibiotics (e.g., gentamicin, tobramycin)

- antivirals (e.g., acyclovir, nirmatrelvir co-packaged with ritonavir [brand name, Paxlovid])
- diuretics (e.g., furosemide)
- NSAIDs (e.g., ibuprofen, naproxen)
- vancomycin

CULTURAL CONTEXT

AKI and Ethnicity

Nurses must be aware that certain ethnic groups and patients with chronic comorbidities are at risk for AKI. Black, Hispanic, American Indian, and Alaskan Native people carry the highest risk for kidney failure (National Institutes of Health, 2023). Comorbid conditions, such as uncontrolled diabetes, hypertension, and hyperlipidemia, and risk factors, such as smoking, obesity, and use of certain recreational drugs, also place patients at risk. Nurses must reconcile all active medications against the EHR to spot patterns for potential new nephrotoxic agents. If identified early, and with the proper assessment and implementation of treatment, AKI can be reversed.

35.7 Integumentary Concerns

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiological changes to the patient's skin when in the intensive care unit
- Describe the medical assessments and therapies that apply to the critical care patient's integumentary system
- Apply nursing concepts and plan associated nursing care for the critical care patient's integumentary system

The skin, which is part of the integumentary system, is the largest organ of the body. It serves several important purposes, including thermoregulation and protection of internal body structures from injury and infection. The most-encountered integumentary system issue in critically ill patients is the development of pressure injuries and ulcers. In fact, studies have shown that anywhere from 8% to 23% of patients in the ICU will develop a pressure ulcer during their hospital stay (Krupp & Monfe, 2015). Because the development of **hospital-acquired pressure injuries (HAPIs)**, or pressure ulcers that are acquired during an inpatient hospital stay, increases health-care costs and negatively affects patient outcomes, it is an area of nursing research that has received a lot of attention in recent years.

Pathophysiological Insult to the Critical Care Patient's Integumentary System

Nursing care in the ICU is usually focused on performing life-saving medical interventions, so taking care of the patient's skin is often not treated as a high priority. However, skin breakdown can lead to **necrosis**, or tissue death, and contribute to the development of life-threatening infections, increasing the overall length and cost of hospitalizations. As a result, it is important for the critical care team to prioritize patient skin care (Spader, 2018).

Exemplar: HAPIs

In addition to negatively affecting patient outcomes, the development of pressure injuries while in the hospital is especially concerning because the Centers for Medicare & Medicaid Services will not reimburse hospitals for their treatment. These factors have resulted in many hospitals conducting their own research and implementing unit-specific policies to promote the prevention of skin breakdown.

Although pressure injuries can occur in any area of the hospital, it is common to see the highest rates within critical care settings. There are many factors specific to critical care settings that increase the risk of skin breakdown and the development of pressure injuries, including

- fluid volume replacement and resulting fluid overload causing edema and tissue breakdown
- hemodynamic instability that worsens with immobility
- medical device placement that puts pressure on the skin surface
- poor nutritional status resulting in delayed wound healing
- prolonged periods of immobility

- urinary and fecal incontinence
- vasoactive IV medications resulting in decreased tissue perfusion

Integumentary System in Critical Care

Although a thorough skin assessment should be conducted by the critical care nurse at a minimum of once per shift, special attention should be given to the most common sites of skin breakdown. These sites, which are found over bony prominences, include the coccyx, buttocks, sacrum, and heels.

Risk Assessment Scales

The use of assessment scales to calculate the risk of skin breakdown can be helpful for determining who will benefit from more frequent interventions to prevent skin breakdown. The most-used skin risk assessment scale in critical care settings is the Braden Scale. This scale assesses risk factors for skin breakdown, including the patient's sensory perception, skin moisture, mobility level, and nutrition status, to calculate a score that indicates their risk level. A low score on the Braden Scale indicates the patient has an increased risk for skin breakdown and subsequent pressure injury development. Hospital and unit protocols will vary, but it is typical to perform and document this scale score at least once per shift. Given the propensity for a critically ill patient to be bed bound, use of the Braden Scale identifies risk for skin integrity issues (Kennerly et al., 2022).

LINK TO LEARNING

Visit this source from the Agency for Healthcare Research and Quality to see a copy of the Braden Scale (https://openstax.org/r/77bradenscale2) and to learn more about preventing pressure injuries.

Nursing Care for the Prevention of Pressure Injuries

Many critical care units have implemented care bundles—groups of related, evidence-based care interventions—designed to decrease the incidence of pressure injuries. The included interventions will vary depending on the specific hospital and unit, but they often involve manual turning, specialty beds, and prophylactic dressings.

Manual Turning Protocols

Most critical care units have adopted some kind of manual turning protocol in which the nursing staff physically turns and repositions patients in bed when the patient cannot do it themselves (Padula & Black, 2019).. This is especially important for patients who are immobile or have difficulty repositioning themselves. Protocols usually call for manual patient repositioning every 2 hours, alternating the side of the body that the patient is lying on by placing pillows underneath them and elevating their heels (Figure 35.13). This practice has been shown to improve the incidence of skin breakdown in the ICU, but it can be difficult for nursing staff to keep up with the frequent manual turns, indicating the need for other options such as specialty beds and mattresses. It is also important to note that some patients in the ICU are not hemodynamically stable enough to tolerate even slight turns, so these patients are at an even higher risk for skin breakdown.

FIGURE 35.13 Patients who are immobile should be manually repositioned every 2 hours to prevent skin breakdown. Pillows are used to maintain the patient's position. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Specialty Pressure Beds

Over the last 2 decades, there has been an increase in the development of specialty hospital beds to reduce the incidence of skin breakdown. These beds work by redistributing air pressure under different parts of the patient's body to keep them from always lying on one side. The main drawback of these beds is the expense: some hospitals are unable to afford more than a few, if any, for their critical care units. In these cases, use of the manual turning protocol will suffice, but it is important to note that the use of specialty beds has been shown to decrease the incidence of HAPIs in critical care settings (McNichol et al., 2020).

Prophylactic Dressings

In addition to manual turning protocols and specialty mattresses, many critical care units have implemented the use of foam dressings that can be used prophylactically to prevent skin breakdown. These dressings act as a thick barrier between the skin and the potential cause of the breakdown, which may be the bed itself or some kind of medical device that is lying against the skin. The dressings used in critical care settings are usually placed on the coccyx and heels, but there are many other dressing styles available for other body parts at risk for pressure injuries.

INTERDISCIPLINARY PLAN OF CARE

Interdisciplinary Roles and Plan of Care for a Patient with a HAPI

- Nurse: performs daily skin assessment; repositions patient manually every 2 hours; applies prophylactic dressings on bony prominences
- Physical and occupational therapists: perform range of motion exercises; assist with manual patient repositioning
- Wound care team: assesses, manages, and cares for pressure injury wounds
- Dietitian: develops and implements nutrition plans that help improve wound healing and promote new tissue growth
- Pharmacist: monitors dosage of vasoactive medications to limit risk of tissue breakdown and potential necrosis

35.8 Musculoskeletal Concerns

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the pathophysiological changes to the patient's musculoskeletal system when in the intensive care unit
- Describe the medical assessments and therapies that apply to the critical care patient's musculoskeletal system
- Apply nursing concepts and plan associated nursing care for the critical care patient's musculoskeletal system

When receiving medical care in critical care settings, patients are often confined to their hospital beds for long periods. Although these medical interventions are necessary for sustaining life, musculoskeletal complications may arise from prolonged periods of immobility. These complications include **muscle atrophy**, or the severe loss of muscle mass, and the development of contractures, resulting in short, stiff joints. Both conditions have the potential to negatively affect the patient's quality of life and ability to perform activities of daily living long after they are discharged from the hospital. For this reason, thorough musculoskeletal assessments should be performed frequently on critically ill patients, and early mobility is encouraged as tolerated and appropriate for the patient's condition.

Pathophysiological Insult to the Critical Care Patient's Musculoskeletal System

Many critically ill patients who survive their acute illness report lingering physical limitations after discharge from the hospital. These limitations often affect both personal and professional aspects of life and can contribute to an overall lower quality of life. Most often, these limitations stem from severe muscle atrophy and contractures caused by prolonged immobilization in the ICU.

When patients are confined to bed for long periods, they are unable to effectively use their upper and lower extremity muscles, resulting in overall loss of muscle tone and subsequent atrophy (Figure 35.14). Immobility may also result in contractures because patients are unable to adequately perform full range of motion and other exercises independently. When patient extremities are held in one position for long periods, a permanent contracture can result. Contractures are especially common in the hands and feet of critically ill patients because of the way they are positioned in bed. The high incidence of muscle atrophy and contractures in critical care settings highlights the need for frequent musculoskeletal assessment and the promotion of early mobility strategies.

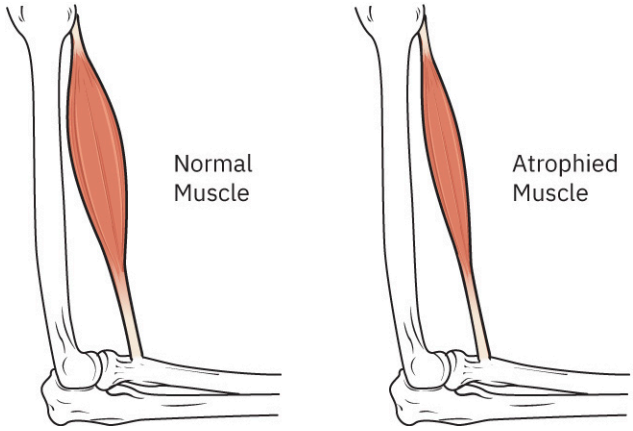

FIGURE 35.14 Muscle atrophy may occur in the legs of patients who are confined to bed for long periods. Compared with a normal muscle, the one with atrophy is much smaller. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Assessment and Early Mobilization

Prevention and treatment of muscle atrophy and contractures in the ICU should be a priority of nursing care to reduce the risk of permanent physical disability after discharge. Prevention and treatment strategies include frequent musculoskeletal assessment, promotion of early mobility, and physical and occupational therapies for critically ill patients. Additionally, other efforts such as optimal nutrition and fluid status help ensure the patient will be able to participate in early mobilization strategies.

Musculoskeletal Assessment

As part of the thorough physical assessment performed at least once per shift, the critical care nurse should assess the musculoskeletal system. This assessment provides baseline information about the patient's muscular function and can be compared with subsequent assessments to determine if the patient is at risk for developing atrophy or contractures. The components included in this assessment are listed and described in Table 35.13.

Assessment	Description and Rationale
Inspection and palpation	• Look at muscles and joints and observe for symmetry, color, and deformities. • Palpate muscles and joints for warmth or tenderness and deformities.
Range of motion (ROM)	• Compare bilateral joints to determine if one side has more-limited ROM. • May be active (patient initiated) or passive (nurse or other provider manipulates joint movement).
Muscle strength	• Compare strength of muscle groups bilaterally to determine if one side is weaker. • Grade muscle strength from 0 to 5, with 0 indicating no muscle contraction and 5 indicating full muscle strength

TABLE 35.13 Components of a Musculoskeletal Assessment in the Intensive Care Unit

Nursing Care for the Prevention of Musculoskeletal Declines

Although the acuity of the critically ill patient may deter progressive interventions to prevent musculoskeletal decline, the status of the patient will determine which interventions can be used. In addition to nutrition, the intent of early movement when clinically tolerated has demonstrated therapeutic effects on musculoskeletal decline of the critically ill patient.

Promotion of Early Mobility

Historically, critically ill patients were kept confined to bed; they were not ambulated or exercised at all for fear that it would negatively affect their healing process or increase their risk of falls. However, in recent years, earlier mobility during hospitalization in the ICU has been promoted. Studies have shown that the implementation of early mobility in critical care settings has greatly reduced the length of hospital stays and decreased the severity of physical disability experienced by patients after discharge (Bergbower et al., 2020).

Early mobilization of a critically ill patient requires collaboration among interdisciplinary teams, principally the nursing staff and physical and occupational therapists. It is important that the therapists have at least a basic knowledge of the invasive equipment the patient will be connected to while ambulating, such as a ventilator or chest tubes. Additionally, it is important that the nurse can effectively physically assist the therapists to help the patient ambulate or move as they are able. Hospitals and specific units will have varying protocols for early mobilization, but it is not uncommon to see critically ill patients walking in the unit hallways while still connected to life-saving medical equipment, to prevent future musculoskeletal complications. An interdisciplinary approach using input from physical and occupational therapists and case managers should guide the discharge planning. Anticipation of care needs is an ongoing evaluation and can be adjusted when the patient's acuity stabilizes. Above all, keep in mind that readiness to progress to a medical-surgical floor is an ongoing process.

Promotion of Nutrition on Musculoskeletal Health

Critical illness depletes necessary nutrients to combat illness. Because of increased metabolic demands, loss of muscle tone leads to muscle atrophy. A randomized control trial examined the role of nutrition and exercise on decreasing loss of muscle mass in the critically ill population (Chapple et al., 2022). With respect to nutritional modalities, parenteral nutrition consisting of amino acids and protein in that study was found to have prospective benefits of reduced incidence of muscle wasting in the critically ill patient. Ultimately, the benefits of early mobilization and addressing nutritional needs maximize positive outcomes on reducing muscle wasting and preserving caloric reserves. Nurses must advocate for these essential components when considering the musculoskeletal needs of the critically ill patient.

Summary

35.1 Assessment and Management of the Critically Ill Patient

- Critical care nursing is a specialty of its own, requiring astute clinical judgement and critical thinking, due to the complexity of the patient's medical challenges.
- Patients are typically admitted to critical care settings because they have a life-threatening medical condition that requires intensive monitoring and extensive medical and nursing care. Often, they are experiencing dysfunction of multiple body systems.
- Technological supports such as ventilators and continuous renal replacement, and pharmacological supports such as vasopressors and sedatives are commonly encountered in the care of the critically ill patient.
- Nurses caring for critically ill patients will confront ethical and legal dilemmas such as organ donation, end-of-life support, and integration of legal documents such as living wills to assist with navigation of goals of care.

35.2 Cardiovascular Concerns

- The underlying pathophysiologic mechanism of most critical cardiac conditions is a decrease in CO, which is calculated by multiplying the stroke volume by the heart rate. The three main factors that affect stroke volume are preload, afterload, and contractility.
- Assessment of cardiovascular insult typically requires the insertion of arterial catheters and pulmonary artery catheters, which monitor CO, cardiac index, and other hemodynamic parameters. Other diagnostic tests and procedures used in critical care settings to evaluate the function of the cardiovascular system include chest radiography, 12-lead electrocardiograms, echocardiograms, and cardiac catheterization.
- The care plan for a critically ill client with cardiovascular insult may include both pharmacological supports (typically vasoactive medications, which exert their effects on blood vessels) and technological therapies such as IABPs, ECMO, and external or transcutaneous pacing.
- Cardiovascular deviations in the critically ill patient may be complicated by cardiogenic shock, which commonly results from an MI, or heart attack.
- Nursing care of the critically ill patient experiencing cardiovascular dysfunction follows the Clinical Judgment Measurement Model, including frequent assessments of the cardiovascular system and close monitoring of hemodynamic parameters. The nurse is also responsible for administering and titrating medications and maintaining invasive therapies such as IABPs and ECMO.

35.3 Respiratory Concerns

- Respiratory failure and the development of ARDS is common in critically ill patients, with the incidence increasing over the past several years due to the COVID-19 pandemic.
- Pertinent assessments for critically ill patients with respiratory dysfunction include monitoring blood gases to determine CO_2 and oxygen levels, listening to lung sounds, and placing an ETT tube.
- Nursing interventions for ARDS include maintenance of the mechanical ventilator, prevention of VAP, and participation in SBTs.
- Effective care of the respiratory system and prevention of complications have the potential to significantly improve overall patient outcomes.

35.4 Neurological Concerns

- The underlying pathophysiologic mechanism behind many neurological disorders observed in critical care settings is due to increased ICP. Alterations in ICP can occur due to trauma, infection, or bleeds.
- Assessments require close monitoring of neurological findings such as LOC, pupillary response, posturing, or deviations in hemodynamics (i.e., abnormal respiration)
- Interventions for increased ICP include frequent neurological assessments; administration of medications, including steroids and diuretics; optimal patient positioning to promote drainage of CSF; and decreasing the body's metabolic demands.
- By intervening early and treating increased ICP, there is a better chance to prevent severe, permanent neurological disability.

35.5 Gastrointestinal Concerns

- The most common GI condition that results in ICU admission is the presence of acute GI bleeding, often related to ruptured stress ulcers or esophageal varices.
- Providers may observe hemodynamic instability, as evidenced by low blood pressure, active bleeding in the stools, or decrease in the CBC. The patient may report dizziness, abdominal pain, poor appetite, or bloody vomitus or stools.
- Interventions for acute GI bleeding include administration of medications, maintenance of hemodynamic stability, and NGT insertion.

35.6 Renal Concerns

- Physiological insult to the kidneys that is commonly encountered in critical care is AKI, which can have prerenal, infrarenal or postrenal causes. AKI reduces the kidneys' ability to filter toxins from the bloodstream and maintain fluid balance.
- Diagnosing AKI involves close evaluation of serum laboratory values, especially levels of creatinine and BUN. Trends in GFR should also be monitored closely to determine the level of functioning of the kidneys.
- Pharmacological interventions for AKI typically focus on maintaining optimal fluid and electrolyte balance. Hyperkalemia is a particular concern. Because many medications, most notably antibiotics, are nephrotoxic, patients should receive the lowest possible doses to prevent worsening of the kidney injury.
- When caring for patients with AKI, nursing interventions center around maintaining a normal fluid and electrolyte balance and administering appropriate medications to restore kidney function. Nursing assessments include monitoring vital signs, urine output, and weight.

35.7 Integumentary Concerns

- Integumentary pathophysiological insult results from multiple variables that place the critical care patient at risk, including nutritional problems, immobility, fluid shifts, and incontinence.
- Skin breakdown in critical care settings can contribute to necrosis and the development of life-threatening infections, increasing the overall length and cost of hospitalizations. Therefore, diligent skin care should be a high priority for critical care teams.
- Assessment of skin should occur every shift. Risk assessment models such as the Braden Scale help identify patients at risk, given their mobility, skin integrity, nutritional status, and skin moisture.
- Interventions for the prevention of skin breakdown in critical care settings include frequent manual patient repositioning and use of specialty beds and prophylactic skin dressings.
- The prevention of skin breakdown in the ICU involves an interdisciplinary care team to limit the risk of pressure injury development.

35.8 Musculoskeletal Concerns

- The most frequently encountered musculoskeletal problems in critically ill patients are muscle atrophy and contractures, both of which are related to prolonged immobility and bedrest.
- Prevention and treatment of muscle atrophy and contractures in the ICU should be a priority of nursing care to reduce the risk of permanent physical disability after discharge.
- Interventions for the prevention of muscle atrophy and contractures include frequent musculoskeletal assessments and promotion of early mobility.
- Implementation of early mobility in critical care settings requires interdisciplinary collaboration and knowledge about the complexity of the patient's medical condition and physical limitations.

Key Terms

acute kidney injury (AKI) sudden reduction in kidney function, usually related to another underlying condition or cause

acute respiratory failure (ARF) sudden failure of the lungs and respiratory system, resulting in hypoxemia and hypercapnia

arterial catheter small, flexible catheter that is inserted into an artery and connected to monitoring equipment to reflect continuous blood pressure measurements

brain death cessation of brain function due to irreversible brain damage that makes it impossible for the patient to remain alive without life-sustaining therapy
cardiac output amount of blood that the heart ejects from the left ventricle each minute
contractility strength of the cardiac muscles during a contraction
esophageal varices small veins that form as collateral circulation in the presence of portal hypertension
extracorporeal membrane oxygenation (ECMO) use of invasive equipment to serve as an artificial heart and lungs, allowing these organs to rest and heal
hematemesis blood in the vomit
hospital-acquired pressure injury (HAPI) pressure ulcers that are acquired during an inpatient hospital stay, most often related to pressure from medical devices or prolonged immobility
intra-aortic balloon pump (IABP) balloon pump inserted in the aorta that inflates during diastole to push blood into the coronary arteries and deflates during systole to push blood to the rest of the body.
intubation insertion of an artificial breathing tube into the airway to maintain patency and restore an effective breathing pattern, often with use of a mechanical ventilator
melena presence of partially digested blood in the stool
multiple organ dysfunction syndrome (MODS) syndrome often experienced by critical care patients that involves dysfunction of two or more body systems
muscle atrophy severe loss of muscle mass, most often due to prolonged immobilization or malnutrition
myocardial infarction (MI) occlusion of perfusion to the heart within the coronary arteries, resulting in eventual cardiac muscle death; also known as a "heart attack"
necrosis tissue death
nephrotoxic capable of causing renal damage
pulse pressure difference between systolic and diastolic blood pressures
vasoactive medication medication that exerts its effect on blood vessels
vasopressors medications that improve blood pressure and organ perfusion by constricting blood vessels

Assessments

Review Questions

1. The nurse is caring for a patient admitted to the ICU for hypovolemic shock. After assessing the patient, the nurse calculates the SOFA score to be 5. What statement accurately describes the significance of the calculated score?
   a. All assessment findings were within normal range.
   b. It is likely that the patient has a mild risk of organ failure.
   c. The patient is experiencing severe symptoms that result in high risk of organ failure.
   d. Based on the score alone, it is not possible to determine the patient's risk of organ failure.

2. The nurse is caring for a newly admitted patient in the ICU. Upon assessment, the nurse notes that the patient is breathing at a rate of seven breaths per minute and oxygen saturation is 84%. What action is most appropriate for the nurse to take at this time?
   a. Administer an opioid analgesic via IV push.
   b. Request an order for a vasopressor medication.
   c. Initiate a referral with the palliative care team.
   d. Prepare the patient for intubation at the bedside.

3. The nurse preceptor is explaining the function of an IABP to a new graduate nurse. What statement by the new graduate nurse would indicate understanding?
   a. "The balloon is inflated during systole."
   b. "IABPs work by increasing afterload."
   c. "The balloon helps perfuse the coronary arteries."
   d. "The IABP functions as an artificial heart for the patient."

4. What medication would the critical care nurse anticipate being ordered for a patient exhibiting severe hypotension?

a. carvedilol (Coreg)
b. furosemide (Lasix)
c. nitroglycerin (Tridil)
d. norepinephrine (Levophed)

5. What clinical condition would predispose the patient to cardiogenic shock?
a. congestive heart failure
b. acute respiratory distress syndrome
c. myocardial infarction
d. pleural effusion

6. What patient is most at risk for developing ARDS?
a. a patient with mild influenza
b. a smoker with a history of lung cancer
c. a survivor of a near-drowning experience
d. a person with a history of chronic obstructive pulmonary disorder

7. The nurse preceptor is educating a student nurse about prevention strategies for VAP. What statement by the nurse indicates an understanding of the teaching?
a. "I will keep the patient's head of bed at 20°."
b. "It is important to clean the patient's mouth with water only."
c. "Once per day, we need to turn off all sedative medications."
d. "The endotracheal cuff should be deflated daily to see how the patient tolerates it."

8. What laboratory value would be indicative of hypercapnic respiratory failure?
a. $PaCO_2$ 52 mm Hg
b. HCO_3^- 23 mEq/L
c. PaO_2 85 mm Hg
d. pH 7.40

9. The critical care nurse is taking care of a patient with traumatic brain injury who is receiving a continuous IV mannitol infusion. What is an example of a finding that would alert the nurse that the patient may be experiencing a side effect of the medication?
a. blood pressure of 125/86 mm Hg
b. decreased LOC
c. heart rate of 55 beats/min
d. bounding peripheral pulses

10. A patient is at risk of increased ICP. What might the nurse anticipate in the patient's medical history that contributes to this risk?
a. microcephaly
b. core body temperature of 37 degrees Celsius
c. meningitis
d. diabetes mellitus

11. The nurse is reviewing the patient's chart and observes the BUN level has elevated to 40 mg/dL and the creatinine level is 2.6 mg/dL, which is doubled from the day before. What order would most concern the nurse for this patient?
a. Diltiazem XR 320 mg daily.
b. Vancomycin 1,000 mg intravenously twice a day.
c. Warfarin 2 mg daily.
d. Normal saline 0.9% 100 mL/h intravenously.

12. What would likely be a prerenal cause for AKI?
    a. hemorrhage
    b. benign prostatic hypertrophy
    c. contrast media
    d. renal cell carcinoma

13. A preceptor is reviewing the graduate nurse's understanding of the critically ill patient's risk of muscular atrophy. What statement made by the graduate nurse would prompt the preceptor to provide more education?
    a. "Assessing the patient's range of motion can help determine their risk for muscle atrophy."
    b. "A muscle strength rating of 5 indicates the patient has no atrophy of that muscle."
    c. "It is important to keep the patient on strict bed rest because they are connected to a ventilator."
    d. "I will perform range of motion exercises often to prevent the patient from getting a contracture."

Check Your Understanding Questions

1. What challenges are often encountered by critical care nurses when working in an ICU setting?
2. You are the nurse caring for a patient who is about to receive ECMO therapy. How would you explain the procedure to the patient and their family?
3. What are examples of interventions that critical care nurses may take when caring for a patient with cardiogenic shock?
4. The patient's pH measurement comes back as 7.47 after being treated for acute hypercapnic respiratory failure. What acid or base pH would this represent?
5. The nurse observes that a patient's ETT tube has migrated forward. What intervention should the nurse anticipate next?
6. Briefly list three interventions nurses can implement to reduce ICP.
7. Describe how decorticate posturing differs from decerebrate posturing.
8. The critical care nurse has recently noticed an increase in pressure ulcers on their unit. What interventions should the nurse suggest to the unit manager and other staff nurses to decrease the incidence of skin breakdown on the unit?

Reflection Questions

1. Critical care nurses must possess many skills and traits to provide high-quality care to critically ill patients. What skill or trait do you think is most important for a critical care nurse to have, and why?
2. Discuss ethical considerations that a critical care nurse may encounter when participating in the care of a critically ill patient.
3. How would a nurse preceptor explain to a new graduate the pathophysiological insult from cardiogenic shock?
4. Discuss the role of the perfusionist in the collaborative care of a patient receiving ECMO therapy.
5. How would a nurse explain the benefits of proning a patient in the ICU to a family member?

What Should the Nurse Do?

The nurse is caring for a patient who presented to the ED with abdominal pain and fatigue for the past several hours. The patient reports a history of hypertension, PUD, and chronic obstructive pulmonary disorder. Laboratory values obtained include a hemoglobin of 7.8 g/dL and hematocrit of 24%.

1. Based on the patient's medical history and laboratory values, what condition should the nurse suspect?
2. Upon ambulating to the bathroom, the patient reports feeling lightheaded. The ED nurse takes the patient's vital signs, which reveal a blood pressure of 95/55 mm Hg and a heart rate of 117 beats/min. The patient is

able to sit on the commode; after wiping, they notice the presence of bright red blood in the stool. What actions are appropriate by the nurse at this point?

Sarah, a 55-year-old female, has been admitted to the ICU after a severe car accident resulting in multiple injuries, including fractures and internal bleeding. She presents with oliguria, indicating decreased urine output, and complains of generalized edema and discomfort in her lower back. Sarah has a medical history of hypertension and type 2 diabetes mellitus, both poorly controlled. On assessment, her blood pressure is 160/100 mm Hg, heart rate is 110 beats/min, respiratory rate is 22 breaths/min, and temperature is 37.8 °C (100.04 °F). Laboratory results reveal elevated serum creatinine and BUN levels, suggestive of AKI. Nurses prioritize assessing her fluid balance, monitoring electrolytes, and implementing measures to optimize renal perfusion.

3. What signs and symptoms indicate potential renal dysfunction in Sarah's presentation?
4. Considering Sarah's presentation and medical history, what are the primary hypotheses for the cause of her AKI? Consider prerenal, intrarenal, and postrenal causes.

Nikki, a 65-year-old female, is admitted to the ICU after a severe motor vehicle accident. She presents with multiple fractures, including a femoral fracture, and is intubated due to respiratory distress. Nikki reports severe pain in her left thigh and limited mobility. Her medical history includes hypertension and osteoporosis. Upon assessment, her vital signs reveal a blood pressure of 140/90 mm Hg, heart rate of 110 beats/min, respiratory rate of 24 breaths/min, and oxygen saturation of 92% with supplemental oxygen. Additionally, she exhibits signs of muscle wasting and decreased range of motion in her affected limb.

5. What physical examination findings might indicate potential musculoskeletal complications in a critically ill patient like Nikki?
6. What interventions would you implement to address Nikki's pain and limited mobility while minimizing the risk of further musculoskeletal complications in the ICU?
7. What would the nurse advocate for regarding nutritional support?

Competency-Based Assessments

1. Describe the nursing responsibilities associated with caring for a patient diagnosed with MODS. How does patient acuity influence these responsibilities?

2. There are numerous legal considerations associated with providing nursing care to critically ill patients. Provide an example of a legal issue that may arise in this context and explain how nurses can mitigate potential risks.

3. A patient admitted to the ICU after a TBI exhibits signs of ICP. Discuss the pathophysiological changes contributing to this patient’s neurological deterioration.

4. Place the following steps for NGT insertion in the correct order by letter:
    A. Estimate length of tube to be inserted by measuring the end of the tube from the tip of the patient's nose to the earlobe and then down to the xiphoid process. Mark this spot on the tube with tape or a marker or note the correct black measurement marking printed on the tube.
    B. Lubricate the tip of the NGT.
    C. Use hospital protocol to check correct placement of NGT. This typically involves use of a chest X-ray or aspiration of gastric fluid to check pH.
    D. Explain procedure to patient.
    E. Have the patient take sips of water through a straw while you insert the tube to facilitate its passage down the esophagus. Continue advancing the tube until the predetermined length of tube has been inserted.

5. Describe how the skin of patients in the ICU undergoes physiological alterations due to factors like extended periods of immobility, pressure, moisture exposure, and compromised blood flow.

6. When assessing a critically ill patient’s skin integrity in the intensive care setting, describe how you would recognize signs of pressure ulcers; evaluate skin elasticity, coloration, and temperature; and identify any indications of damage or infection.

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CHAPTER 36

Home Health Nursing and Rehabilitation

FIGURE 36.1 Home health nurses can assist their patients outside of a traditional hospital setting. (credit: modification of "Nurse Advising Senior Woman On Medication At Home" by agilemktg1/Flickr, Public Domain)

CHAPTER OUTLINE

INTRODUCTION People often picture health care and nurses only in the context of a hospital, but many patients whose injury or illness is initially treated in a hospital are eventually discharged and managed in their own homes. Home health nursing and rehabilitation is an increasingly essential area in health care that allows nurses to provide compassionate care outside the traditional clinical hospital setting. Healing, support, and education are combined and designed to foster resilience and build wellness for improved life in diverse populations. Nurses are essential to restoring health and function and empowering people and families in the communities that they serve. Nursing services include personal care for long-term care residents, home care, and care at post-acute care centers, also called rehabilitation centers, which are unique centers for continuing care.

36.1 Home Health Care

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the nurse's role in a home health setting
- Explain the process of conducting a home health visit

A holistic approach, **community-based care** goes beyond typical medical treatments for specific conditions to

address broader factors affecting health outcomes in a community. It is centered on delivering patient-centered care, which includes cultural sensitivity and considers the emotional, physical, social, and environmental factors that impact an individual's health. Community-based care includes home health care, school nursing, prison health, and more. Best practices for each of these specialties are established by the Home Health Agency Center, the National Association for Home Care and Hospice (NAHC), and the U.S. Department of Health and Human Services' Centers for Medicare and Medicaid Services (CMS).

Providing community and health-care services within a home setting, often referred to as home health care or home-based care, offers numerous benefits for patients who require medical attention, rehabilitation, or ongoing support. This approach allows individuals to receive personalized, high-quality care in the comfort of their own homes, promoting a sense of familiarity and autonomy. Home health care encompasses both medical and nonmedical services to address various needs and provide peace of mind for individuals, particularly older adults and those who are chronically ill or recovering from surgery or illness.

Due to its advantages, home health care has grown increasingly common within modern health-care systems. The Cleveland Clinic declared that the use of home health after an inpatient hospitalization decreases the rate of readmission hospitalizations, complications, and even death (National Association for Home Care & Hospice, 2021). Further, it saves at least $6,500 per patient in government Medicare costs (National Association for Home Care & Hospice, 2021). In this module, we explore the essential elements and advantages of home health care, particularly its role in improving overall quality of life and health-care outcomes for patients.

The Nurse's Role in Home Health Settings

Nurses play an instrumental role in developing comprehensive home-care plans for their patients. An important step in transitions of care, these plans should outline health-care needs, goals, interventions, and strategies that address conditions for patient health.

To prepare for planning, nurses perform a detailed assessment of patient health status, which involves reviewing past medical histories and present conditions, medications, allergies, physical abilities, environmental factors such as home fall risks, and any support systems in place. This preparation enables care plans to be customized to each person's unique requirements. Based on assessment findings, nurses collaborate with patients, their family, and members of their health-care team to set realistic and obtainable goals that meet SMART (specific, measurable, attainable, relevant, and timely) criteria. Examples could involve food preparation, medication administration, wound-care services, patient education sessions, and rehabilitation exercises, as appropriate. Following is an example of a SMART goal that a nurse could set with an older adult patient to help with improved medication adherence:

- Specific: The patient will take their prescribed blood pressure medication every day at 8 a.m. without fail.
- Measurable: The patient will track their medication adherence using a pill organizer or a medication adherence app, accurately recording each instance of medication taken.
- Achievable: The patient will consult with their health-care provider to ensure that the prescribed medication schedule fits their lifestyle and does not conflict with any other medications or personal commitments.
- Relevant: Maintaining consistent medication adherence is crucial for managing blood pressure effectively and reducing the risk of complications associated with hypertension.
- Timely: The patient will achieve 90 percent medication adherence within the next three months, as evidenced by their medication adherence records and discussions with their health-care provider during follow-up appointments.

Recognizing the unique circumstances surrounding home care, nurses tailor care plans specifically to each patient's home environment, the resources available, and personal preferences. Nurses consider each patient's cultural background, beliefs, and values when creating care plans; this ensures care is culturally sensitive and respectful.

Nurses engage patients as active participants in care planning by including their input and preferences and acknowledging the patient has ownership over their own health care. This collaboration allows care plans to remain relevant over time. Nurses work collaboratively with health-care team members such as physicians, therapists, social workers, home health aides, and home-care aides, with each contributing their unique expertise toward patient care. A nurse educates both patient and family on their care plan, including its purpose, techniques for

performing self-care tasks, and potential signs of complications to watch out for.

A registered nurse documents the care plan, detailing goals, interventions, expected outcomes, and changes made at subsequent visits. Accurate documentation ensures continuity of care and communication within the team. Nurses understand that care plans may need to change with time due to patient progress, health status changes, and new developments. Once established, nurses share the plan with primary care doctors and other health-care providers involved with managing patient care, which ensures a cohesive approach toward improving health management for each patient.

Nurses also must consider ethical considerations when providing care plans or making health-related decisions on behalf of others. Nurses ensure the care plans they create respect the autonomy, values, and rights of home-care patients. Producing such plans requires an assessment of patient needs as well as collaboration from health-care teams to promote efficient communication with positive results for home-care patients.

The nurse's role in home health care clearly extends beyond medical treatment. Nurses provide comprehensive care, education, and emotional support, enhancing patients' well-being and promoting optimal recovery within the familiar and comforting surroundings of their own homes. The nurse plays a central role in coordinating and delivering these services effectively (Chen, 2022).

Home Health Visits

A home health visit is an opportunity to conduct a nursing assessment in the patient's home, documenting the patient's health, monitoring their progress, and making sure they receive the care and support needed. A nursing home health visit may include different components depending on the patient and the purpose, but they usually include the following activities:

- Assessment of home environment: Nurses assess the patient's living conditions and make recommendations for modifications or adaptations to ensure safety and accessibility.
- Medical assessment and monitoring: Nurses conduct thorough assessments of the patient's health status, including vital signs, and monitor wound care, medication management, and chronic conditions. Regular assessments help detect changes in health and ensure timely interventions.
- Medication management: Nurses educate patients and caregivers about medication regimens, administer medications as needed, and monitor for adverse effects or interactions. They play a critical role in ensuring medication adherence and preventing medication-related issues.
- Wound care: Patients with wounds or surgical incisions require specialized care to promote healing and prevent infections. Nurses assess the wound's progress, change dressings, and provide guidance on wound-care techniques.
- Pain management: For patients with acute or chronic pain, nurses work to assess the nature and intensity of pain, administer pain medications, and implement nonpharmacological pain management strategies to improve comfort and quality of life.
- Rehabilitation services: Physical therapists, occupational therapists, and speech therapists may visit patients at home to provide rehabilitation services after surgeries, injuries, or medical events like strokes. Nurses collaborate with these therapists to ensure comprehensive care.
- Patient and family education: Nurses educate patients and their families about the patient's condition, self-care techniques, and lifestyle modifications to promote recovery and prevent complications. This education empowers patients to actively participate in their care.
- Emotional and psychological support: Nurses provide emotional support and counseling to patients and their families as they navigate the challenges of illness, recovery, and lifestyle adjustments.
- Care coordination: Nurses serve as the point of contact between patients, their families, and other health-care providers. They coordinate appointments, facilitate communication among the care team, and ensure a seamless transition between different levels of care.
- Assistance with activities of daily living (ADLs): For patients who have difficulty with activities such as bathing, dressing, and grooming, nurses coordinate with home health aides to ensure the patient's personal care needs are met.
- Chronic disease management: Patients with chronic conditions such as diabetes, heart disease, or respiratory disorders require ongoing management. Nurses help patients understand their conditions, manage symptoms,

and adhere to treatment plans. Especially for older adults who deal with chronic conditions and polypharmacy, home health visits can be helpful in resource utilization (Cook et al., 2022).
- End-of-life care: Nurses play a vital role in providing palliative and hospice care at home, ensuring that patients with terminal illnesses are comfortable, pain free, and supported emotionally during their final days.

How Nurses Should Prepare for a Patient Home Visit

It is important to prepare for a home visit to ensure that the nurse is equipped to provide comprehensive and effective care to patients. The nurse should take the following steps to prepare for a visit to a patient's home to maximize effective time with the patient:

- Review the patient information: Review the patient's **medication regimen**, which lists all medications the patient is currently taking, including over-the-counter medications and home remedies. For each medication taken, the nurse should know what the dosage is, how often the patient takes it, and if there are any side effects. Additionally, examine the patient's medical information, including referral information and any notes made by the health-care provider who referred the patient. If possible, interview the patient about their health, including any symptoms, medical conditions, allergies, surgery, family history, and medical history.
- Verify appointment details: To avoid scheduling mistakes, double-check the time, date, and address for the home visit. If necessary, confirm the visit with the patient's caregiver or the patient themself. Plan the travel route in advance, particularly if the patient's house is located in an unfamiliar area. This will ensure that the nurse arrives on schedule and is familiar with the area. Make sure to plan the visit to allow for adequate time to assess, intervene, educate, and document. It is important to be organized to maximize the time allowed with the patient.
- Gather the necessary supplies: Gather all the equipment and medical supplies before the visit, including tools to record vital signs such as a stethoscope and blood pressure cuff. Make sure any medical equipment that will be used, such as a stethoscope, pulse oximeter, glucometer, or thermometer, is in working order. Be sure to have all the necessary documentation tools such as a notebook or tablet for recording your findings, recommendations, and interventions.
- Prepare educational materials: Prior to the visit, prepare any handouts or visual aids needed to explain concepts to patients and their families.
- Prepare mentally: Review the care plan ahead of time to know what to focus on during the visit in order to best assist the patient. Be patient and empathic when you approach the visit. Prepare to actively listen to your patient's concerns and adjust your care plan to their needs. Be flexible and adaptable to any unexpected needs or changes that may occur during your visit. Having this mindset will help you provide quality care, establish rapport with the patient and their family, and improve outcomes.
- Check communication devices: Make sure that all communication devices, such as a mobile phone or tablet, are fully charged. These devices may be used to communicate and access patient records as well as document the visit. Keep a list of emergency numbers handy in case an unexpected situation arises during your visit.
- Consider your personal presentation: Dress in professional clothing and ensure that your appearance is neat and clean. This will help establish professionalism and trust during the visit.

Personal Safety Precautions

Nurses who conduct home visits must also take care to ensure their personal safety. Personal safety is always a top priority. Trust your judgment if you feel your safety has been compromised during a visit to a patient's home. Take the appropriate steps to ensure your well-being, and make sure to proactively plan for your personal safety while on home visits.

Prior to your visit, make sure to tell your supervisor or colleague about the details of your visit, such as the address and the expected duration. Schedule home visits during daylight hours as much as possible. Doing this will improve visibility and reduce the risk of visiting unknown areas at night. Also before your visit, make sure to research the area and neighborhood where the patient resides. You should be aware of local safety issues or concerns that may affect your visit. Additionally, make sure to bring the right personal protective equipment (PPE) with you, especially when dealing with situations that involve infection control or dangerous substances.

If taking public transit to the location of your visit, make sure to thoroughly research your route to avoid delays, unanticipated detours, or potentially unsafe stops. If you are driving, parking your car in a well-lit area will help you

to feel safer. Avoid parking in driveways and alleyways that may obstruct your exit. Trust your instincts if something seems off or unsafe.

On arrival, assess the environment as you approach the home of the patient and be aware of the surrounding areas. Observe for hazards such as uneven pathways, poorly lit areas, or aggressive animals. Consider rescheduling your visit or asking for assistance if you are uncomfortable or have any concerns about entering the home. Wear the proper identification, such as a uniform or badge, to clearly identify you as a health professional. Secure your belongings and keep them out of sight. This is especially important if you are using a bag to carry equipment. Keep valuables locked and out of sight.

Identify possible exit routes for emergencies when entering the home of a patient. Be alert to doors and windows that could be used as escape routes. Once you are inside the home, keep a safe distance from unfamiliar pets or other animals that may be a danger. Ask the patient to restrain the animal if needed.

Unfortunately, taking proper safety precautions may not always be enough. It is smart to invest in critical personal safety skills, such as de-escalation techniques and self-defense classes, prior to starting your home visits. Learning how to de-escalate tense situations and defend yourself, if necessary, will help you handle potentially dangerous situations. Report any safety concerns you may encounter during your visit to your supervisor, and always document them in your report.

How to Conduct a Home Visit

As a nurse, you should understand what a typical home health visit entails so that you can plan your time accordingly. Your time is valuable, and there is often a lot to do during a visit. An example of a general overview for a nurse conducting a home visit is presented in the following Feature Box. Please be sure to adhere to individual state regulations and regulatory body procedures as appropriate.

CLINICAL SAFETY AND PROCEDURES (QSEN)

Conducting a Home Visit

1. Review the patient's history and care plan before the visit. (Revisit How Nurses Should Prepare for a Patient Home Visit for all the preparation steps you should take prior to a home visit.)
2. Confirm with the patient or caregiver the date, time, and address of your visit. Inform the patient of any special instructions or preparations they should make.
3. Arrive on time at the patient's house. Introduce yourself to the patient, showing your identification (badge and uniform), and explain the purpose of your visit.
4. Assess the patient's current health. Differentiate prior and new changes since your last visit. If necessary, perform a physical exam.
5. Check the patient's medications to ensure they are being taken correctly. Answer any questions or concerns the patient may have about their medication.
6. Perform any necessary interventions such as treating wounds, administering medication, or teaching patients to use medical equipment.
7. Educate the patient and any caregivers about the illness, treatment plan, self-care strategies, and recommended lifestyle changes. Evaluate their understanding through a return demonstration or correct verbal response.
8. Provide support to the patient or coordinate with a home health aide if they need assistance with ADLs, like bathing or dressing.
9. Work with the therapists if you are a part of a rehabilitation program or therapy to ensure that all exercises and treatments are being performed correctly.
10. Document all findings and recommendations, including interventions and patient feedback. Communication with other members of the care team is important to ensure coordination. Recognize the concerns of the patient and their family and offer reassurance.

At the end of the visit, provide a summary of the visit for the patient. Outline any actions to be taken and give clear instructions that the patient and any caregivers can follow until your next visit. Review your findings with your

supervisor or the health-care team. Reflect on your experience after the visit and complete all required documentation, including visit reports, assessments, and interventions. Decide if any follow-up visit is needed; if so, make an appointment and explain the plan to the patient and any caregivers.

A successful home visit is dependent on effective communication, clinical expertise, and a patient-centered approach. Every visit is different, so nurses need to be flexible and responsive.

REAL RN STORIES

Nurse: Lucy, RN
Years in Practice: Eight
Clinical Setting: Home health practice
Geographic Location: San Jose, California
Mr. Garcia had recently been discharged from the hospital, where he had been treated for severe pneumonia and COVID-19. As I approached his home for my initial home health visit, my emotions mixed between excitement and fear. This would be my inaugural appointment to assess his recovery and see how he was doing at home. At first, I noticed only crisp autumn air as I rang the doorbell; shortly thereafter, Sonia, Mr. Garcia's daughter, welcomed me inside, showing me around their cozy living room, where there was an uncomfortable hospital bed in one corner. It reminded me of the many recent health challenges the family had been enduring.

Mr. Garcia was resting comfortably in an armchair, wrapped up warmly and looking exhausted. We began discussing his medications as well as any concerns he might have about their effectiveness or adverse interactions. He expressed both relief at being back home as well as concerns regarding managing his medications and breathing exercises. Together we reviewed his medications, discussed his respiratory therapy plan, and identified any warning signs to watch out for. I took time to assess his vital signs, breathing, and overall well-being. At first sight, it was obvious that the hospitalization had taken a toll, yet I could sense his resolve to rebuild his strength. We discussed maintaining a nutritious diet, staying hydrated, and gradually increasing his physical activity. Sonia was eager to offer support in helping her father's recovery process. Our discussion turned toward mental health concerns, and Mr. Garcia expressed some anxiety and uncertainty regarding his future well-being. I assured him that these emotions were perfectly natural, and we discussed resources for him and confirmed he is not in any danger to himself or others. Before departing, I made sure he had access to all his medications and equipment as well as scheduled a follow-up visit so we could monitor his condition closely.

As I left, I felt an immense sense of fulfillment. Being a home health nurse means providing support, empathy, and education during sensitive moments for patients like Mr. Garcia. I knew his road ahead would be challenging, but I was determined to help him regain both health and independence within his own environment.

Initial Visit

To build trust, it is important to establish a respectful and friendly rapport with both the patient and their family, beginning with the first visit. A positive rapport will also make it easier for you to assess the patient's needs and develop a care plan that is tailored for them. A simple but crucial first step is to respectfully introduce yourself and clearly explain your role as an at-home nurse.

Before beginning any treatments or suggesting interventions, the nurse needs to evaluate and gather critical information on the patient. Assess any health concerns, take vital signs, and perform a complete physical exam, moving from head to toe (Figure 36.2). Gather information about allergies, current medications, and previous treatments. The nurse should also evaluate the patient's living environment for safety hazards and accessibility. Identify potential obstacles to the patient's health or well-being.

FIGURE 36.2 A home health nurse takes vital signs during an initial visit with a patient. (credit: "JTF-Bravo Medical Element provides care to local community" Tech. Sgt. Amber Carter/Joint Task Force-Bravo, Public Domain)

Once the initial assessments have been made, the nurse should sit down with the patient and their family, if applicable, and discuss next steps and a care plan:

- Set goals and preferences: Discuss with the patient their health goals and care preferences. Ask what they want to achieve from home health care and how they see their plan of care. Inform the patient and family of the importance of home health care, the role played by the nurse, the level of coordination with other health professionals, and the results the patient can expect. Get informed consent to treatment and services. Emphasize that communication with the primary care provider, referring physician, and any other specialists involved in patient care is essential. This will ensure seamless coordination and an understanding of patient needs.
- Establish the initial care plan: Together with the patient, develop an initial plan of care. This plan should include goals, interventions, and a timetable for achieving the desired outcome.
- Create an emergency plan: Talk to the patient's family about an emergency plan. Give emergency contact information and explain the steps to be taken in an emergency.
- Plan for a follow-up and next visit: Plan the next visit to the patient's home and explain the purpose of a follow-up visit. Be sure that your patient is aware of when you will be returning and what preparations are needed. Address any fears or concerns the patient might have regarding their health or home health. Reassurance and emotional support are important. Keep a professional demeanor during the entire visit. Communicate clearly and respectfully to make sure the patient is comfortable and understands their care plan. The first visit to the patient sets the tone of the experience the patient will have with the service. This is an opportunity to collect comprehensive information, build trust, and lay the foundation for effective care planning.
- Last, make sure to document any information relevant to the patient record, including the care plan discussion, assessment findings, and other pertinent information. Documentation is essential for communication and continuity of care within the health-care team.

LINK TO LEARNING

Although there is much to prepare before conducting a home health visit, the patient's perspective about the home health visit (https://openstax.org/r/77HomeHealth) should be considered by the nurse. There may be pets present and areas or rooms that are off-limits.

Assessing the Need for Continued Visits

Assessing patients for continued home health visits requires an in-depth evaluation of their health needs and progress to determine whether home health-care services are meeting goals effectively. Start by reviewing a patient's medical history, assessment findings, and care plan, which provide context for gauging progress and noting any changes in condition. Conduct a comprehensive assessment of their current health status. Take vital signs, perform physical assessments, and examine any symptoms or complaints the patient might be having. Review the medication regimen to ensure the patient is able to adhere to the prescribed medications and is experiencing no side effects or interactions. If a patient is not taking the prescribed medications, do not simply label them as "noncompliant"; instead, find out what the barriers are and work to help the patient overcome them. Sometimes, it is a poor understanding or financial constraints, which the nurse can help the patient navigate.

Evaluate patient progress toward meeting goals outlined in their care plan and identify any hindrances to progress. Ask the patient whether their needs are being fulfilled with the home health services provided to them, and encourage open dialogue about any concerns or suggestions that arise. As you discuss these topics, remember that you will need to communicate what you learn with the patient's primary care physician and any specialists involved in their care; note any changes to the patient's condition or care plan that you will need to mention and questions you may need to ask, including the extent to which future home health visits are needed as well as their frequency and duration.

Ending the Visit

Effective home health visits must end on a positive and professional note to ensure the patient and family members feel fully informed and supported by the health-care services provided during visits. Briefly recap the key points discussed during your visit, such as assessment findings, interventions conducted, and any changes to care plans.

Leave behind educational materials, handouts, or written instructions that reinforce what was discussed during your visit and that can easily be understood by recipients. Remind patients about self-care techniques discussed during their visit, and emphasize their role in managing their health and well-being. Provide your contact details should a patient or their family have questions or concerns or need anything else between visits. Reaffirm your dedication to their health, reassuring them of your support throughout their care journey. It is also important to address cultural sensitivity during these interactions, particularly for patients with different cultural backgrounds or communication preferences. Be certain that throughout their visit, the patient feels valued as an individual. Thank them for trusting in you to fulfill their health-care needs. Before concluding the visit, make sure you ask both the patient and their family members whether they understand all the information that was discussed during this appointment, including any lingering queries or uncertainties they have. Having them repeat back information provided is usually more effective than just asking them if they understand.

Document your visit as soon as it has taken place to keep details fresh in your mind and ensure important data do not slip by unnoticed. When documenting visits, you should use objective language without bias or judgment being applied toward those you visit. Stick with facts rather than make assumptions and include all relevant details, including the following:

- patient identification information such as name, birth date, and address
- date, time, and place of visitation
- interventions conducted, such as medications prescribed, wound care provided, and education offered
- aspects or topics regarding patient concerns discussed during the visit, such as safety precautions or instructions given directly to the patient or caregiver

When possible, include the patient's own words when describing symptoms, feelings, or concerns, as this provides more depth and context to documentation. The following is an example of a simple nurse's documentation following

a home visit to check on wound care. Be sure to adhere to the agency and state's policy and guidelines around specific requirements for nursing documentation.

CLINICAL SAFETY AND PROCEDURES (QSEN)

Documenting a Home Visit

Patient Name: John Doe
DOB: January 10, 1955
Location: Patient's residence
Visit Time: 10 a.m. to 11 a.m.
Subjective: Patient reports mild discomfort at the wound site but denies any significant pain. He states that he has been following the wound care instructions diligently.

Objective:

- Wound inspected and measured:
  - Length: 2 cm
  - Width: 1.5 cm
  - Depth: 0.5 cm
- Wound bed appears clean with no signs of infection.
- Minimal serosanguinous drainage noted on dressing, within expected limits.
- Surrounding skin intact; no signs of maceration or irritation.
- Patient's vital signs within normal limits:
  - blood pressure: 120/80 mm Hg
  - pulse: 78 bpm
  - respiratory rate: 16 bpm
  - temperature: 98.6°F (36.9°C)
- Patient demonstrates understanding of wound-care instructions and is able to verbalize the steps for dressing changes.

Assessment: Wound healing progressing as expected without signs of infection or complications. Patient is compliant with the prescribed wound-care regimen.

Plan:

- Continue with current wound-care regimen:
  - Clean wound with saline solution daily.
  - Apply prescribed antibiotic ointment to wound bed.
  - Cover with sterile dressing.
- Educate patient on signs and symptoms of infection and when to contact health-care provider.
- Schedule follow-up visit in one week for reassessment of wound progress and to reinforce wound-care instructions.

Provider Signature: [Name], RN

Date and Time of Signature: April 16, 2024, 11 a.m.

36.2 Rehabilitative Care

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Identify members of the rehabilitation team
- Summarize the principles of patient-centered, rehabilitation-focused care
- Describe the nurse's role in rehabilitative care
- Discuss the various specialties associated with rehabilitative care
- Explain the role of functional ability assessments in patient rehabilitation

The recovery and strengthening phase of nursing that a patient encounters following an acute illness, injury, or hospitalization is known as **rehabilitative nursing**. It forms the cornerstone of patient-centered health care, acting as an intermediary between medical interventions and a patient's recovery of health, function, and independence. Rehabilitative nursing draws inspiration from holistic healing principles, which recognize that recovering from an illness or injury often involves physical, emotional, and psychological modifications. Individuals undergoing surgery, managing chronic conditions, or recovering from injuries often face unique difficulties during their recovery that go beyond medical treatments alone. Psychological, emotional, and spiritual dimensions of health should be included in the nursing plan of care. Rehabilitative nursing serves as a multidimensional solution to recovery, merging clinical expertise with compassionate care to guide individuals toward health and self-empowerment.

Nurses play an essential role in aiding rehabilitation processes as facilitators, educators, and advocates who assist their patients throughout the complex rehabilitation journey. Rehabilitative nursing care encompasses an expansive spectrum of interventions designed to restore mobility and build mental resilience, ultimately empowering patients to retake control over their lives throughout the healing process. Rehabilitative nursing care stands as one of the cornerstones of modern health care, helping patients maintain quality of life throughout the various stages of healing and wellness.

The Rehabilitation Team

Rehabilitation can be defined as an interdisciplinary effort among health-care providers to address complex patient needs such as injuries, surgeries, or chronic conditions. Typically, rehabilitation teams include the following professionals, who collaborate to meet the physical, emotional, and functional needs of each patient during their healing journey.

- Physiatrist: A **physiatrist** is a medical doctor specializing in physical medicine and rehabilitation. Physiatrists lead rehabilitation teams, assess functional abilities of their patients, and develop comprehensive treatment plans to increase mobility, function, and overall quality of life for each person they treat. They also oversee patients throughout treatment plans for ongoing improvements to mobility, function, and overall quality of life.
- Physical therapist: Physical therapists (PTs) specialize in movement and function. They create exercise plans, administer manual therapy techniques, and employ various other strategies to assist their patients in rebuilding strength, flexibility, balance, and mobility.
- Occupational therapist: Occupational therapists (OTs) specialize in helping their patients regain independence in daily activities such as working or leisure activities by conducting assessments, devising plans, and providing training tailored specifically for self-care needs, work situations, or recreational pursuits.
- Speech-language pathologist: Speech-language pathologists (SLPs) specialize in diagnosing and treating communication and swallowing disorders. They assess and treat issues regarding speech, language, cognition, and swallowing for patients recovering from neurological conditions or injuries.
- Rehabilitation nurse: Rehabilitation nurses specialize in care management for individuals recovering from injuries related to motion and undergoing rehabilitation. They help with ADLs, medication administration, wound-care management, and patient education while working alongside other members of the rehabilitation team.
- Social worker: Social workers assess the psychosocial needs of patients and their families. They provide counseling, support, and resources that address emotional, financial, and practical obstacles encountered during rehabilitation processes.
- Case manager: Case managers oversee and facilitate patients' rehabilitation journey. They ensure effective communication among team members, manage care transitions smoothly, and help access necessary services for optimal care.
- Psychologist/psychiatrist: Psychologists and psychiatrists play an essential part in supporting team efforts by meeting patients' mental health needs. Through counseling, therapy, and interventions, they help individuals cope with emotional strain and mental illness issues.
- Orthotist/prosthetist: These members of the rehabilitation team offer customized orthotic/prosthetic solutions. An **orthotist** designs, fabricates, and fits orthotic devices—supportive equipment for bones—to assist patients in improving mobility and functionality. A **prosthetist** does the same for prosthetic devices, which augment or replace damaged or missing body parts. Working closely with rehabilitation teams, they ensure proper fit and function are in place.

- Respiratory therapist: Respiratory therapists specialize in respiratory care for those experiencing difficulty with breathing. Their services may include helping improve lung function through exercises and managing chronic respiratory conditions.
- Dietitian/nutritionist: Dietitians and nutritionists assess patients' nutritional needs and develop plans that support recovery and overall health while accommodating any special considerations related to a particular condition or circumstance. They are extremely helpful for patients with unique dietary and nutritional education needs, such as persons with diabetes, cystic fibrosis, Crohn disease, and more.
- Adaptive equipment specialist: This professional assesses the need for and provides **adaptive equipment** to help restore body functions to patients with disabilities. They also help patients who need an **assistive device** to perform activities they find challenging due to a health condition or limitation.
- Neuropsychologist: A **neuropsychologist** specializes in diagnosing and treating cognitive and behavioral issues related to brain injuries or neurological conditions, providing interventions designed to correct cognitive deficits and boost mental well-being.

Principles of Patient-Centered, Rehabilitation-Focused Care

Patient-centered, rehabilitation-focused care is an approach that places the patient at the forefront of their recovery journey. This has great value for community health, as it assists people in moving from an acute care hospital setting back home to lead meaningful lives (Stucki et al., 2005). An acute hospitalization is truly only a short time period, yet the process of rehabilitation can be ongoing, impacting the quality of the rest of the patient's life. Effective rehabilitation emphasizes tailoring care plans, interventions, and communication to the individual needs, preferences, and goals of the patient. Table 36.1 displays a list of core principles of patient-centered, rehabilitation-focused care. By embracing these principles, health-care providers create an environment that promotes patient engagement, well-being, and successful rehabilitation outcomes

Principle	Description
Individualized care	• Recognize that each patient has unique needs, goals, and preferences. • Develop care plans that are tailored to the individual, considering their physical, emotional, cultural, and psychosocial aspects.
Shared decision-making	• Engage patients as active participants in their care. • Involve them in discussions about treatment options, goals, and plans, allowing them to make informed decisions based on their values and preferences.
Empowerment and autonomy	• Encourage patients' sense of control over their rehabilitation journey. • Provide them with information, education, and support to make choices that align with their values and aspirations.
Goal setting	• Collaborate with patients to set achievable, measurable, and meaningful goals that reflect their priorities. • Regularly review and adjust these goals based on progress and changes in the patient's condition.
Holistic approach	• Consider the physical, emotional, cognitive, and social dimensions of a patient's well-being. • Address all aspects of the patient's health, thereby contributing to a more comprehensive and effective rehabilitation process.

TABLE 36.1 Core Principles of Patient-Centered, Rehabilitation-Focused Care

Principle	Description
Cultural sensitivity	• Respect patients' cultural backgrounds, beliefs, and values. • Adapt care plans and interventions to align with cultural preferences, ensuring that care is respectful and culturally sensitive.
Effective communication	• Foster open and transparent communication with patients. • Listen actively to their concerns, questions, and feedback, and address any uncertainties they may have about their care.
Collaboration among health-care professionals	• Work collaboratively with interdisciplinary teams to ensure seamless and coordinated care. • Address different aspects of the patient's recovery as each team member contributes their expertise.
Psychosocial support	• Recognize the emotional and psychological impact of illness or injury. • Provide emotional support, coping strategies, and resources to help patients manage the psychosocial challenges they may face.
Patient education	• Educate patients about their condition, treatment options, and self-care strategies, as well as the rationale behind interventions. • Empower them to actively participate in their care and make informed decisions.
Respect for patient preferences	• Prioritize patients' preferences and choices within the bounds of safety and evidence-based practice. • Consider each patient's comfort, values, and lifestyle.
Continuity of care	• Ensure that patients experience a smooth transition between different phases of care, from acute treatment to rehabilitation and beyond. • Coordinate care and information-sharing to prevent gaps in care.
Outcome-oriented care	• Focus on achieving meaningful outcomes that enhance the patient's functional abilities, quality of life, and overall well-being.
Regular assessment and evaluation	• Continuously assess the patient's progress and evaluate the effectiveness of interventions. • Adjust the care plan as needed to align with the patient's changing needs and goals.
Respect for dignity and privacy	• Treat patients with dignity and respect their privacy. • Create a safe and comfortable environment that fosters trust and openness.

TABLE 36.1 Core Principles of Patient-Centered, Rehabilitation-Focused Care

The Nurse's Role in Rehabilitative Care

The nurse's role in rehabilitation nursing is multifaceted and integral to facilitating the recovery, well-being, and functional independence of patients undergoing rehabilitation. In this specialized field, nurses work collaboratively

with an interdisciplinary team to provide comprehensive care that addresses the physical, psychological, emotional, and spiritual needs of patients (American Association of Rehabilitation Nurses, 2017). A rehabilitation nurse may work in a rehabilitation facility other than the patient's home, such as in a long-term acute care (or simply "rehab") center. Rehab centers serve the transition period following an acute hospitalization when a patient may still need skilled nursing care around the clock before they may return home (Figure 36.3). For example, a patient may be in postsurgery recovery but may still need help getting in and out of their wheelchair.

FIGURE 36.3 A rehabilitation nurse helps patients during their recovery phase. (credit: "Therapists help Iraqi patients gain independence" by Airman 1st Class Jason Epley/U.S. Air Force, Public Domain)

The nurse's role in rehabilitation nursing includes many of the same elements as in home health nursing:

- assessment and care planning
- collaboration
- medication management
- physical care and functional rehabilitation
- psychosocial care
- communication
- documentation of all care

However, rehabilitation nurses must also assist with transition planning: helping patients to prepare for transitions from rehabilitation settings back to their homes or communities by coordinating the necessary resources, support, and education.

REAL RN STORIES

Nurse: Margaret, RN

Years in Practice: Five
Clinical Setting: Acute care center
Geographic location: Raleigh, North Carolina

As a rehabilitation nurse, I had the honor of working with Hadia, a 35-year-old patient from India who experienced a major car accident that resulted in spinal cord damage. Her journey toward recovery has been difficult, yet her spirit and courage are inspirational. At one of our sessions together, I assisted the physical therapist with exercises. During one key moment, Hadia managed to take steps using a walker by herself. It was truly transformative. I found great satisfaction in seeing Hadia's infectious joy: it validated all our hard work and reminded me why I chose to pursue rehabilitation nursing. We share in all our patients' triumphs, setbacks, and ultimately transformation as their lives begin reassembling themselves in new ways.

Rehabilitation Case Management

Rehabilitation case management plays an essential part in providing patients undergoing rehabilitation with comprehensive care, from coordinated assessments and planning through delivery of interventions and resources that help achieve their rehabilitation goals. Table 36.2 summarizes nursing activities related to the various roles of a rehabilitation case manager.

Role	Nurse Activities
Advocate and planner	• Share plan of care with team. • Address legal concerns to patient care.
Collaborator	• Communicate with interdisciplinary team. • Assist with insurance coverage.
Coordinator	• Schedule and follow up on appointments. • Order durable medical equipment.
Educator	• Provide education on self-care strategies, medication management, and lifestyle modification.

TABLE 36.2 The Role of the Case Manager in Rehabilitation

Rehabilitation Specialties

Rehabilitation nursing encompasses a range of specialties that focus on addressing specific aspects of patients' recovery, functional independence, and quality of life. Rehabilitation typically involves a team of specialists all working together for the good of the patient (O'Sullivan & Schmitz, 2019). Examples of these specialties include orthopedic rehabilitation, neurological rehabilitation (including stroke, spinal cord, and traumatic brain injury rehabilitation), pulmonary rehabilitation, geriatric rehabilitation, and pediatric rehabilitation.

LIFE-STAGE CONTEXT

Rehabilitating Older Adults

Rehabilitation nurses must recognize that older patients frequently experience age-related functional decline. In these populations, rehabilitation programs that target improving mobility, balance, and ADLs can greatly increase quality of life. Older adults often present multiple chronic illnesses. Rehabilitation nurses must coordinate care and address polypharmacy concerns while considering all interplay of conditions when developing treatment plans. It is vitally important for older adult patients to undertake risk analysis to provide a safe rehabilitation environment. Understanding environmental and physiological factors that cause falls is one key for creating such an atmosphere. Many older adults may also experience cognitive impairments like dementia; rehabilitation nurses must tailor

communication techniques as necessary to safely accommodate cognitive deficits and ensure patient well-being.

Stroke Recovery

Stroke recovery is an involved and multidimensional process that must address physical as well as psychological difficulties. Nurses play an integral part in treating their stroke patients' individual issues, and they can aid the recovery process in myriad ways.

People who have been impacted by stroke typically experience physical, cognitive, social-emotional, and socioeconomic challenges. Some physical impairments may include weakness or paralysis on one side of their body (known as hemiparesis), changes to muscle tone, and issues with balance and coordination. Physical therapy plays an integral part of stroke recovery by improving mobility, strength, and motor control. Experiencing dysphagia, an increasingly prevalent risk after stroke, may impede nutrition and hydration, increasing the risks of aspiration pneumonia and complicating recovery efforts. Patients who experience stroke with aphasia can develop depression, frustration, and even suicidal ideation because of their inability to communicate clearly. Rehabilitation nurses help individuals adapt to these changes by finding ways to communicate and engage in meaningful activities.

Recovering from stroke is an interdisciplinary journey in which nurses, therapists, and psychologists all come together to help those who experienced stroke regain independence, enhance quality of life, and adapt to a new reality. It is important to assist patients in regaining functional independence in ADLs, such as dressing, grooming, and feeding themselves. Occupational therapy plays an invaluable role in providing adaptive techniques and strategies. Speech therapy helps people who have experienced stroke rebuild their skills to address aphasia as well as strengthen the muscles to safely swallow and eat.

Recovery from stroke can be emotionally exhausting for patients. Many experience depression, anxiety, frustration, and mood changes; these sudden changes to physical and cognitive capabilities, while simultaneously adapting to a new normal, can add another layer of emotional challenge. Patients impacted by stroke frequently experience fatigue, which may impede their participation in therapy sessions and daily tasks. Therefore, finding an equilibrium between rehabilitation efforts and rest is of utmost importance.

Medication management is another integral part of rehabilitation therapy. Patients who experienced stroke must often manage multiple medications for conditions like hypertension, diabetes, and anticoagulation; maintaining appropriate medication adherence is critical in avoiding future strokes and managing other health concerns.

Spinal Cord Rehabilitation

Spinal cord rehabilitation addresses the complex challenges faced by individuals experiencing spinal cord injuries (SCIs). An SCI may lead to various degrees of paralysis or loss of function depending on its level of severity and location on the body. Rehabilitation for such individuals aims at optimizing functional independence, improving quality of life, and offering support for physical, emotional, and psychosocial well-being. This type of rehabilitation is typically achieved through adaptive techniques, assistive devices, and mobility training programs.

Individuals living with SCIs often experience changes to sensation, including loss of sensation, altered perceptions, and neuropathic pain. Therefore, managing sensory changes and pain management are critical elements of rehabilitation. Spinal cord injuries may disrupt the autonomic nervous system's control of bladder and bowel function, necessitating rehabilitation interventions to manage bladder and bowel control, prevent infections, and preserve skin integrity.

Depending on the severity of the spinal injury, respiratory function can also become compromised. Individuals having more serious wounds may require respiratory support such as breathing exercises and techniques designed to minimize complications related to breathing issues. Spasticity (involuntary muscle contractions) is common after an SCI and should be managed through medications, stretching exercises, and physical therapy to increase comfort and mobility.

Additionally, individuals with limited mobility are at an increased risk for pressure ulcers (bedsores). Proper skin care and preventive measures must be implemented to mitigate such complications. Many individuals with SCIs rely on wheelchairs or other assistive devices for mobility purposes; training in their safe use forms an integral component of rehabilitation.

Spinal cord injuries may lead to emotional challenges such as depression, anxiety, grief, and body image concerns; addressing these challenges may require counseling services, peer support groups, and other forms of psychosocial support. It may also be helpful for nurses to collaborate with rehab teams specializing in treating sexual health concerns associated with spinal injuries; these specialists can provide education about options for sexual activity and family planning. Spinal cord injuries often have an overwhelming effect on family and other caregivers of an affected individual, necessitating support and training to ensure a safe home environment for everyone involved in the process.

Spinal cord rehabilitation emphasizes enhancing functional independence for everyday activities such as dressing, bathing, and grooming. Occupational therapy assists individuals to redevelop the necessary self-care abilities needed for self-sufficiency. Reconnecting individuals with their communities and engaging them in recreational and social activities are also integral parts of spinal cord rehabilitation, helping promote social inclusion and foster feelings of belongingness and acceptance. Adaptive sports and recreational activities provide individuals with SCIs an avenue to maintain physical fitness, build self-confidence, and have fun. Rehabilitation nurses also work to evaluate individuals' vocational goals and capabilities before providing necessary training and support to reintegrate them back into the workforce.

Cardiac and Pulmonary Rehabilitation

Cardiac and pulmonary rehabilitation programs are tailored to improve the health and well-being of those experiencing cardiac or lung conditions, respectively.

Cardiac rehabilitation programs focus on personalized exercises tailored specifically for individuals living with heart conditions. Balancing intensity with one's cardiovascular fitness level and health status is integral to improving cardiac function and endurance. Education, lifestyle modifications, and medication administration each play key roles in cardiac rehabilitation programs. Cardiac rehabilitation programs provide essential education on medication usage, including potential side effects and the importance of sticking with prescribed regimens. Cardiac rehab programs also offer psychosocial support services, which offer counseling services, stress-management techniques, and support groups.

Patient education is integral to a cardiac rehabilitation program. Cardiac rehabilitation programs often offer nutritional advice regarding low-sodium diets and portion-control strategies, as well as ways to manage weight and blood sugar. It is also important to educate the patient on heart anatomy and function, cardiovascular system design and performance, and the effects of exercise. The patient should understand that these strategies all play a role in avoiding future adverse heart events.

Pulmonary rehabilitation aims at increasing lung capacity by means of breathing exercises and other methods that maximize oxygen exchange. Individuals living with lung conditions frequently experience shortness of breath and reduced exercise tolerance, making pulmonary rehabilitation programs an essential way of strengthening respiratory muscle strength and endurance. Pulmonary rehabilitation offers individuals who experience conditions like chronic obstructive pulmonary disease, asthma, and pulmonary fibrosis the tools needed to effectively manage symptoms, avoid exacerbations of their condition, and optimize lung function.

Many individuals living with lung conditions require oxygen therapy and inhaler medications. Pulmonary rehabilitation educates participants on energy conservation techniques such as safe storage, proper use, and delivery methods of inhalers and other tools for oxygen therapy. Pulmonary rehabilitation offers techniques for conserving energy and managing daily tasks without straining one's respiratory system. Individuals living with lung conditions require techniques to clear mucus from their lungs and improve lung hygiene, including coughing and huffing techniques that work most effectively. Pulmonary rehabilitation includes instruction in these techniques as well as psychosocial support services for individuals needing rehabilitation services. Lung conditions can lead to feelings of isolation, anxiety, and depression. Pulmonary rehabilitation programs offer support and teach strategies that address the physical needs of a lung transplant as well as the psychosocial impact of lung disease.

Patient education around nutrition and dietary needs is critical for pulmonary rehabilitation too. Nutritional education centers on maintaining a healthy body weight and optimizing energy levels to support lung function. Nutritional strategies also play a crucial role in managing conditions like obesity-related hypoventilation.

Both cardiac and pulmonary rehabilitation programs emphasize education, support, lifestyle modifications, and

lifestyle management services to maximize patients' well-being and quality of life. These specialized rehabilitation approaches allow people to manage their conditions more easily while increasing functional capacity and leading healthier lives.

Assessment of Functional Ability

Functional ability assessment in rehabilitation is an integral part of the rehabilitation process. It entails accurately assessing patients' physical, cognitive, and psychosocial capabilities to establish current levels of independence and potential areas for development. Assessments provide valuable data for creating personalized care plans with realistic rehabilitation goals in mind. Activities of daily living are daily self-care tasks performed by individuals, including bathing, dressing, grooming, eating, and toileting. Measuring how effectively patients complete ADLs on their own or with assistance allows us to determine their level of independence with self-care tasks.

An **instrumental activity of daily living (IADL)** is a more complicated task that contributes to an individual's overall well-being and independence; they include preparing meals, managing medications and finances, and completing home chores. Assessing IADLs provides insight into a patient's ability to function within both home and community environments. Evaluating a patient's mobility and transfer abilities entails evaluating their capacity for safe movement from one location to the next: for example, moving between beds, chairs, toilets, and tables. Assessing mobility also allows health-care practitioners to determine any additional assistance, such as assistive devices, gait training, or strength-building interventions, that might be required for them.

Assessing a patient's ability to walk and stand independently or with assistive devices can give valuable insights into their overall mobility and help identify areas for intervention to enhance balance, coordination, and walking ability. Evaluating cognitive abilities such as memory, attention, problem-solving, and decision-making is vital in treating brain injuries or cognitive impairments, especially among patients residing in care homes or residential facilities. Cognitive assessments help guide interventions designed to tackle any challenges to functional independence that might impact daily activities. Assessing a patient's ability to communicate, either verbally or via alternative channels, helps establish whether the patient can effectively express needs, understand instructions, and interact with others.

Patients experiencing dysphagia require frequent assessments to ensure safe eating without aspiration; rehabilitation nurses can provide essential guidance for diet recommendations and interventions to minimize complications. Speaking and swallowing are helpful components of a respiratory assessment. Patients living with lung conditions benefit from having their lung function and endurance assessed to gauge the potential capacity for physical activity and exercise.

Consideration should also be given to the social supports, family dynamics, mental health issues, and emotional well-being of patients undergoing rehab therapy; these factors can influence a patient's motivation, engagement in therapy, and overall rehabilitation outcomes. Assessing the living environment for accessibility and safety features serves to inform recommendations for modifications or assistive devices that facilitate functional independence at home.

Functional ability assessments provide health-care providers with baseline data that allow them to track patient progress. Regular reassessments enable health-care providers to adjust interventions and goals as patients' abilities change over time. Including patients in goal setting helps ensure their rehabilitation plan reflects their preferences and values. Setting realistic and obtainable goals motivates patients to actively engage with rehabilitation activities. Interdisciplinary teams that may include nurses, PTs, occupational therapists, SLPs, and psychologists conduct functional ability assessments on patients to gain a comprehensive understanding of functional abilities and limitations so they can design rehabilitation interventions to promote independence while increasing overall quality of life for these individuals. For many years, the Functional Independence Measure has been the gold standard for assessing a patient's function in rehabilitation; it is required by CMS. The **Inpatient Rehabilitation Facility Patient Assessment Instrument (IRF-PAI)** is the assessment instrument that IRF providers use to collect patient assessment data for quality measure calculation and payment determination in accordance with the IRF Quality Reporting Program.

36.3 Additional Care Settings in the Community

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the nurse's role in different community care settings
- Discuss care and collaboration efforts when caring for those experiencing homelessness

Nurses play a central role in a variety of health-care settings, including hospitals and community care settings, and address diverse patient needs. As the health-care industry shifts toward preventive and holistic approaches, nurses may find themselves leading efforts to offer services far beyond hospital walls. These settings can include health-care homes, schools, clinics, shelters, and beyond.

The Nurse's Role in Community Care Settings

Nurses play vital roles in many community-based settings, providing health-care expertise and compassionate care beyond hospital environments. For example, nurses may work in community clinics to provide preventive care, health screenings, immunizations, and treatments for common illnesses, as well as health education to empower individuals and communities in making informed decisions about their well-being. Nurses may participate in community health initiatives focused on health promotion, disease prevention, and education. For instance, they might organize health fairs, workshops, or screening programs as an effort to engage and empower communities toward improving their own well-being. Rural and remote regions often rely heavily on nurses as primary health-care providers due to limited access to medical facilities, providing a full array of health-care services, such as assessment, treatment, medication administration, and emergency responses.

Nurses may also offer these services in correctional facilities. Correctional facilities employ nurses who offer health-care services for incarcerated people's acute and chronic medical needs, including administering medications, managing chronic conditions, conducting health assessments, and making health assessments to ensure incarcerated people's needs are being met within this special setting.

Nurses working at senior care facilities, such as assisted living centers or nursing homes, provide medical assistance for older adults in various forms. This may involve managing chronic conditions, administering medications, and overseeing overall well-being in these community-based environments. Furthermore, nurses also serve as advocates, educators, caregivers, and coordinators of care for individuals within this setting: their roles go well beyond simple medical duties by including activities to promote health, education, and emotional support and collaboration to increase well-being outcomes and enhance overall quality of life.

We cover some additional community care settings in more detail, including hospice care, ambulatory and outpatient services, occupational health programs, and school health programs.

Hospice Care

The **hospice** and palliative care settings offer compassionate nursing services for individuals living with life-limiting illness. Nurses provide pain management, emotional support, and education about end-of-life care, while assuring patient comfort and dignity.

Hospice nurses play an invaluable role in providing health care beyond hospital settings, ensuring that individuals receive comprehensive yet personalized attention in the comfort of their own environments. Hospice care, especially home hospice, can have a significant impact on individuals facing life-limiting illness and improving quality of life during its final stages. Community-based nurses are at the core of hospice care, offering compassion, expertise, and comprehensive support to both patients and their families. Beyond medical tasks alone, the nurse's role spans emotional support, pain management, symptom relief, and education. They work in close cooperation with interdisciplinary teams composed of physicians, social workers, spiritual counselors, and volunteers to deliver tailored treatment to meet a patient's specific needs. The hospice nurse focuses on the patient's needs and supports family members and loved ones during the death and dying transition. Palliative care and hospice care often overlap in nursing care, but Table 36.3 shows how they are distinct.

	Palliative Care	Hospice Care
What is it?	A focus on relieving the pain, symptoms, and stress of a chronic illness, which may not be terminal	A focus on providing care for patients at the end of life
What is the time frame of care?	No time frame	Generally lasting up to six months
What is the scope of service?	Interdisciplinary team may be involved for a variety of treatments	Interdisciplinary team is involved for pain management but not curative treatments
Where is care given?	Patient's home, skilled nursing facility, assisted living facility, hospital	Patient's home, skilled nursing facility, assisted living facility, hospital, hospice facility
Does Medicare pay?	Medicare Part B pays 80 percent of charges	Medicare Part A pays all hospice services
What other services are offered?	Telehealth, patient education, advance care planning	Complementary therapies, professional end-of-life care, telehealth

TABLE 36.3 Palliative Care versus Hospice Care

Ambulatory Services

Outpatient health care or **ambulatory services**, also referred to as "ambulatory care," refers to health-care services in which the patient receives care without needing hospital admission. Ambulatory care services aim to meet an array of medical needs, from preventive services such as routine exams to diagnosis, treatment, and management of various health conditions. Ambulatory services are typically found in clinics, medical offices, urgent care centers, specialty centers, and even prisons. These services are offered exclusively to those not needing hospitalization. Nurses working in outpatient settings conduct initial assessments and prioritize care according to urgency and necessity, gathering medical histories, performing vital sign measurements, and analyzing symptoms to guide appropriate interventions or referrals for each individual patient.

Ambulatory services cover an array of health-care needs, such as preventive services, diagnostic testing, imaging and laboratory analysis, vaccinations, physical therapy services, and minor surgery treatments, as well as follow-up visits for chronic disease management. Patients receiving outpatient services typically return home the same day after medical appointments or procedures performed at outpatient facilities.

Ambulatory services allow convenient access to health care without hospital admission being necessary. Appointments can often be scheduled at times convenient to patients, and services are designed to offer efficient and timely care without prolonged wait times. Whereas health-care facilities typically deliver outpatient services via scheduled appointments to manage patient flow more efficiently, ambulatory services provide flexible scheduling to make receiving care as painless and comfortable as possible without disrupting daily lives or routines. They play a pivotal role in provision of preventive services, early diagnosis of conditions, and effective management. Table 36.4 compares the various services offered in different health-care settings.

Outpatient Care Settings	Services Provided
Ambulatory care	Lab work
Urgent care	Lab work, diagnostics, x-ray, first aid for acute medical problems, suturing, wound care, physical assessment
Health-care clinic	Visit with provider, diagnostics, medication prescribing, small treatments such as respiratory medications, wound care; nurses monitor progress with chronic disease management
Telehealth	Simple acute illness that can be treated by an online provider and that does not require suturing, x-ray, or lab diagnostics

TABLE 36.4 **Services of Outpatient Care Settings**

Occupational Health Programs

The field of health care focused on improving and protecting employees in their place of work is called **occupational health**. Occupational health programs aim to promote employee well-being and safety in the workplace. They incorporate various strategies and interventions designed to create a safer and healthier work environment by avoiding injuries, illnesses, and hazards. Nurses are an essential part of occupational health management, playing both advisory and managerial roles. Their responsibilities extend far beyond direct patient care to include health promotion, injury prevention, educational programs for both employees and employers, and collaboration among both parties involved.

Working closely with occupational safety specialists, nurses develop and implement safety protocols. They educate employees on workplace health and safety practices, such as appropriate ergonomics, the use of PPE, health screenings, and strategies to avoid injuries and lead a healthy lifestyle. Nurses assess workplace hazards, such as exposure to hazardous materials or musculoskeletal issues, and recommend measures to mitigate risks.

Occupational health nurses specialize in injury management and first aid response plans in workplace settings. They often can offer immediate attention for workplace accidents or refer the individual to an acute care outpatient facility for treatment. They administer first aid, assess injuries' severity, and determine if further medical attention is required. Duties also include monitoring employees to ensure compliance with health safety standards: for example, checking N95 mask measurement, ensuring people are up to date on their vaccines, and administering flu or COVID vaccines. Occupational health nurses are also involved in health surveillance, performing periodic monitoring checks on workplace employees' physical conditions for potential issues that might require medical intervention.

Occupational health nurses routinely monitor employees working in high-risk environments, such as those working with potentially harmful chemicals or on construction sites. By conducting regular health assessments, occupational nurses can detect potential health concerns early and initiate effective solutions. They help workers follow specific protocols after an injury to file an insurance claim for additional medical attention. By keeping detailed health records for employees' medical histories and conducting regular assessments, occupational health nurses assist in tracking trends, pinpoint areas of concern, and support evidence-based decision-making processes. As a result, they can devise and implement wellness programs designed to promote healthier behaviors among employees, such as smoking cessation initiatives, weight management plans, stress relief techniques, and fitness activities. Nurses work collaboratively with employers and management to establish policies and practices to create a safe and healthy work environment, serving on safety committees while contributing their health-care knowledge in decision-making processes.

Nurses play an essential part in emergency response planning in the workplace. They educate employees on emergency procedures, conduct drills, and ensure medical supplies and equipment are readily accessible. Nurses also help employees who are returning to work after an injury by teaching them about emergency procedures, conducting drills, and ensuring medical supplies are quickly available should an incident happen. Nurses work

alongside health-care providers to develop return-to-work plans that consider employees' medical conditions and job demands, in cases of workplace injuries or illnesses. Nurses also serve as advocates and provide employee support services when workplace injuries or illnesses arise. Nurses play an essential part in developing an environment conducive to employee well-being by working alongside employers to create safe work environments that promote both physical and mental well-being.

School Health Programs

School programs, more commonly referred to as school health programs, are comprehensive initiatives created to support students' physical, emotional, and academic well-being within an educational setting (de Buhr et al., 2020). School programs encompass various services, interventions, and activities designed to meet the physical, mental, and social health needs of pupils and staff.

Nurses serve as health-care professionals who can offer expert clinical knowledge and health education within a school environment. School nurses conduct a variety of assessments to determine students' needs and detect potential health concerns. They conduct vision and hearing screenings, monitor growth and development, and assess overall health status. Nurses provide health education to students, staff, and parents on topics like nutrition, hygiene, sexual health prevention strategies, substance use reduction plans, mental wellness awareness campaigns, and safety precautions.

School health nurses may also administer immunization shots. Nurses take great care to record all necessary immunizations received by students, thereby helping to prevent contagious diseases from spreading within the school community and aiding efforts to manage chronic diseases. In an era of controversy regarding immunizations, school nurses help educate parents about vaccines, including criteria for exemption. School nurses also provide services for children experiencing chronic health conditions, such as diabetes, asthma, and allergies. They create individualized health plans, educate school staff about students' needs, and ensure emergency medications such as EpiPens are easily available, should an emergency arise. Nurses in school settings are trained to respond promptly to medical emergencies in school settings—for example, injuries, allergic reactions, and seizures—and offer immediate emergency assistance if necessary.

One essential job of the school health nurse is to assess mental health needs and offer support to individuals experiencing anxiety, depression, trauma, and other forms of mental distress (Markkanen et al., 2021). Nurses should be able to recognize signs of mental health concerns in students, offer immediate assistance when necessary, and refer them to mental health professionals for further evaluation and intervention. Nurses provide counseling and emotional support for students facing health-related or personal difficulties, offering a safe space in which students may discuss or share any worries that arise. Collaborating closely with school administrators and staff members as well as parents and community resources, nurses organize health promotion events at school, such as health fairs, wellness workshops, and awareness campaigns. They also advocate for policies that foster an environment conducive to well-being at school.

School health nurses keep accurate health records on students, including immunization records, health assessments, and medical histories. They provide essential input when crafting health policies at schools to prioritize student well-being with respect to nutrition, physical activity, and other related matters. Nurses also provide an **individualized care plan** that outlines care requirements for each student with specific medical needs, for example, a child with diabetes or seizures (Potts et al., 2018). These personalized care plans outline necessary accommodations, interventions, and communication strategies in order to support each student's well-being.

Caring for Persons Experiencing Homelessness

Caring for people experiencing homelessness requires a holistic and compassionate approach that recognizes the unique challenges and vulnerabilities affecting this population. Homelessness can result in physical, mental, and social health complications due to limited housing or resources, which must all be addressed simultaneously. Working with people without housing involves building trust, providing support, and helping them access resources that will improve their overall well-being.

Nurses play an invaluable role in meeting the unique health needs and vulnerabilities experienced by persons without housing, such as lack of access to basic health services and environmental conditions that exacerbate physical and mental illnesses. Nurses provide essential health-care services like wound care, immunizations, blood

pressure monitoring, and treatment for minor illnesses or injuries. Wound care in particular can be an important element of infectious disease prevention. Nurses educate individuals experiencing homelessness about ways they can prevent infectious diseases like HIV, hepatitis, and tuberculosis by offering vaccinations and disseminating hygiene supplies.

When working with a patient without housing, the nurse should conduct a health assessment to detect and address immediate health concerns and establish an evidence-based framework for ongoing care (de Buhr et al., 2022). The assessment should cover physical and mental conditions, substance use, and any chronic conditions. People experiencing homelessness face a higher risk for mental illness and substance use disorders than the overall population in the United States (Narendorf et al., 2022). The assistance of a nurse could include counseling sessions or referrals to professional mental health services as well as crisis intervention strategies. Nurses address substance use by offering counseling services and referrals to treatment programs for substance use disorders. Nurses also educate individuals on safe injection practices and risks of overdose.

Nurses provide individuals experiencing homelessness with access to community resources such as shelters, food services, clothing donations, and employment assistance programs, as well as housing programs and social services. Nurses can also advocate for improved health-care access and social services for populations without housing and help raise awareness about the unique health challenges faced when experiencing homelessness. By working to meet the complex physical, mental, and social needs of this population, nurses contribute greatly toward improving individuals' overall well-being as they journey toward stability through housing solutions.

36.4 Transition and Continuity of Care

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the process of discharge planning for patients requiring continued services
- Describe the role of nurse case managers in supporting patients through the care continuum
- Explain how collaborative care functions and supports positive patient outcomes

A change from one patient setting to another outside of a hospital setting is called **transitional care**. It could be a change from the emergency department to another medical-surgical department, or a transition from a hospital to a rehabilitation center and then back home. Transitions and **continuity of care** play a central role in health care's ever-evolving landscape and represent key moments on an individual patient journey. They focus on the process of helping patients move between health-care settings to ensure seamless health-care experiences that focus on patient needs and positive outcomes. Transitioning between care settings and changing treatment plans are critical junctures that must be handled carefully to avoid errors or disruption. Through an examination of strategies, challenges, and key roles in ensuring continuity, this section explores how health-care systems can integrate all their various components effectively to offer patients optimal care outcomes.

Discharge Planning for Community or Home Care Settings

In home and community-based care settings, **discharge planning** is an organized process designed to facilitate a safe transition for patients from health-care facilities, like hospitals or rehabilitation centers, back into their own home or a care setting of choice. This process aims to ensure patients receive all the support, resources, and follow-up care necessary for ongoing recovery and self-management of health outside the hospital setting. Effective discharge planning is essential in avoiding readmissions, improving patient outcomes, and supporting overall well-being in the home or community environment. Key components of discharge planning in an inpatient or home care setting include collaborative decision-making, the creation of a care plan, patient education, medication reconciliation, home safety assessment, and coordination of assessment, care, services, and follow-ups.

Discharge planning begins with a detailed evaluation of a patient's physical, psychological, and social needs. Health-care providers, such as nurses, case managers, and social workers, collaborate in this assessment to ascertain the patient's level of independence, support network, and required services. Together with the patient, the nurse will review the patient's health status, treatment plan, and medication management needs, as well as any lifestyle modifications required, before discharging the patient from health-care services.

Based on the assessment, an individualized care plan is developed and tailored specifically for each patient. The care plan may include details regarding medications, wound-care treatments, and equipment requirements as well

as diet restrictions, exercise routines, and follow-up appointments. Discharge planners collaborate with health-care providers, community resources, and home-care agencies to coordinate services and support needed upon discharge from hospital care, including home health nursing services, physical therapy services, occupational therapy treatments, medical equipment delivery, and social services for their patients.

Patient education is an important component of discharge planning. Both patients and caregivers need to receive education about their conditions, treatment plans, medications, signs, and complications, as well as self-care strategies, to actively manage their own health at home. Discharge planners need to ensure their patients understand their medication regimen, including dosages, frequency, and potential side effects. They may arrange prescriptions from community pharmacies as well as home delivery services.

Home environments will be assessed to ensure they meet patient safety needs and accommodate mobility difficulties or medical equipment, with modifications recommended as appropriate for safety and functionality. Lowered countertops in the kitchen, wider doors, and easier-to-manipulate door handles may be some of the modifications needed to ease the transition to a home setting. Appointments will be scheduled with the patient's care provider after initial assessments to provide any needed follow-ups and updates as appropriate. Follow-up appointments will then take place to review how treatment has gone so far and offer recommendations where needed. Discharge planners facilitate these follow-up appointments between patients, primary care physicians, specialists, and health-care providers to monitor patient progress and adapt the care plan as necessary. Effective communication among all members of the care team is of utmost importance, and discharge planners ensure medical records, care plans, and instructions are communicated accurately to home-care providers, caregivers, and the patient.

The Nurse's Role in Discharge Planning

Nurses play a crucial role in supporting patients through their transition from inpatient to outpatient services. This transition is a critical juncture in a patient's health-care journey, and nurses contribute significantly to ensuring a smooth, safe, and successful shift from the hospital to a less-intensive care setting. Nurses provide essential education to patients and their caregivers about the patient's condition, medications, treatment plan, and self-care strategies. This education empowers patients to actively participate in managing their health and follow recommended practices after discharge.

Nurse Case Management

The role of a nurse case manager in community or home care settings is multifaceted and essential for ensuring the provision of high-quality, patient-centered care to individuals who require ongoing medical attention, support, and coordination of services in their homes or within the community. Nurse case managers play a pivotal role in facilitating effective communication, coordinating care services, and advocating for the well-being of their patients. A nurse case manager functions in acute care settings as well as in managed care organizations, rehabilitation centers, and long-term settings.

Collaborative Care

Also referred to as interdisciplinary or interprofessional care, collaborative care is an approach to health care that stresses collaboration among multiple health-care providers from different fields to deliver comprehensive and holistic treatment to patients. This approach acknowledges that health conditions often involve complex interactions spanning various domains and require specialists from diverse fields to properly meet patients' physical, psychological, emotional, and social needs. Collaborative care aims to optimize patient outcomes, elevate quality care delivery, and create patient-centered experiences. It involves teamwork, effective communication, and shared decision-making as part of its approach toward health challenges. Key characteristics and components of collaborative care include interdisciplinary teams, effective team communication, coordination of patient care, and patient-centered care.

Depending on the patient's needs, a collaborative care team may include physicians, nurses, pharmacists, social workers, PTs, occupational therapists, and psychologists, all of whom collaborate closely for patient care. Each team member brings their unique expertise to address various aspects of patient health. All team members work toward common goals related to improving well-being, safety, and recovery for the patient. Goal setting should begin with knowledge of the patient, including their preferences and needs. Involvement from every member in this endeavor

is of vital importance for meeting goals effectively.

Collaborative care ensures that care interventions and services are coordinated to minimize duplication, address gaps in care delivery, and maximize resource use, thus improving patient experiences while preventing fragmentation of care services. In collaborative health care, patients' preferences, values, and goals are taken into consideration when making care decisions. This approach empowers patients to actively take part in their treatment plans. Health-care professionals collaborate closely with patients and their family members, helping them make well-informed decisions regarding treatment options, interventions, and care plans. Patients' input is considered when making these choices.

Referring patients to support groups or peer-led programs can provide emotional support, shared experiences, and a sense of community for individuals facing similar health challenges.

Referrals to dietitians or nutritionists support patients with dietary restrictions or those needing guidance for managing specific conditions through proper nutrition. Referrals to pharmacists or medication management programs help patients better understand and adhere to their medications and regimens, managing side effects as necessary and adhering to prescribed regimens.

Summary

36.1 Home Health Care

- Home health nurses serve an invaluable function within health-care systems, acting as intermediary communication channels between health-care providers, such as physicians and therapists, and patients.
- Home health nurses conduct in-person home visits, which can involve a lot of planning. There are a number of steps nurses should take to prepare for their visit.

36.2 Rehabilitative Care

- Rehabilitation nurses are one part of a larger team of rehabilitation specialists, which can include occupational therapists, SLPs, and PTs, among many others.
- Therapy plays an essential part in helping restore functional independence for patients, improving quality of life and supporting return to normal ADLs. Rehabilitation nurses provide expert, patient-centered care that covers physical, emotional, and psychological well-being.
- The role of the rehabilitation nurse is to manage complex medical conditions, therapeutic interventions, and coordination of care to produce improved patient outcomes, reduced hospital readmission rates, and an easier transition back home or to community-based settings.
- There are several different specialties within the rehabilitation nursing field. A rehabilitation nurse may specialize in stroke recovery, spinal cord rehabilitation, cardiac and pulmonary rehabilitation, or many other areas.
- Being able to assess patients for functional ability is a critical part of being able to move forward with care plans. Nurses should be able to accurately evaluate their patients in their ability to complete ADLs and IADLs.

36.3 Additional Care Settings in the Community

- Community health nurses may work in a variety of settings, including hospice centers, ambulatory and outpatient centers, work environments, and schools. They play vital roles in assuring the well-being and health of various populations.
- Nurses may also work extensively with people who are experiencing homelessness, extending far beyond traditional health-care facilities to bring essential services directly into communities across the country.

36.4 Transition and Continuity of Care

- Discharge planning involves coordination and communication between health-care providers to meet patients' needs during times of transition.
- Nurse case managers play an invaluable role in providing continuity of care by serving as liaisons between various health-care professionals and patients.
- By collaborating with the rest of the health-care team, nurses play an invaluable role in maintaining continuity of care while enhancing the overall experience of care delivery for each of their patients.

Key Terms

adaptive equipment medical equipment, such as hearing aids or cochlear implants, used to help those with disabilities adapt to full function

ambulatory services health-care services provided on an outpatient basis, wherein a patient receives care without needing hospital admission for an extended stay

assistive device type of medical equipment, such as a cane or wheelchair, used to make activities of daily living easier

community-based care holistic approach that considers the emotional, physical, social, and environmental factors that impact an individual's health

continuity of care seamless communication between health-care professionals when a patient is transferring to a new setting

discharge planning organized process designed to facilitate a safe transition for patients from health-care facilities, like hospitals or rehabilitation centers, back into their own home or a care setting of choice

hospice service that provides care for patients at the end of life

individualized care plan outline of a personalized health-care plan

Inpatient Rehabilitation Facility Patient Assessment Instrument (IRF-PAI) assessment instrument that IRF providers use to collect patient assessment data for quality measure calculation and payment determination in accordance with the IRF Quality Reporting Program

instrumental activity of daily living (IADL) task that contributes to an individual's overall well-being and independence but that are more complicated than ADLs

medication regimen list of all medications the patient is currently taking

neuropsychologist medical specialist who diagnoses and treats cognitive and behavioral issues related to brain injuries or neurological conditions

occupational health field of health care focused on improving and protecting employees in their place of work

orthotist specialist who designs, fabricates, and fits orthotic devices to improve patients' mobility and functionality

physiatrist medical doctor specializing in physical medicine and rehabilitation

prosthetist specialist who designs, fabricates, and fits prosthetic devices to improve patients' mobility and functionality

rehabilitative nursing recovery and strengthening phase of nursing that helps a patient begin to recover from acute illness, injury, or hospitalization

transitional care change from one patient setting to another outside of a hospital setting

Assessments

Review Questions

1. What are some of the roles of a home health nurse during a home visit? (Select all that apply.)
    a. providing emotional support
    b. performing limited outpatient surgery in the home
    c. reviewing laboratory results
    d. educating the patient and family
    e. administering medications

2. What is an essential goal of documentation in home health nursing?
    a. to include personal opinions and assumptions
    b. to use the nurse's subjective language to describe assessments
    c. to document only positive outcomes
    d. to provide accurate and objective information

3. What is a crucial step when ending a home health visit?
    a. Skim through the summary and provide a physical copy.
    b. Leave educational materials with the assumption the patient will read them.
    c. Review next steps and follow-up appointments.
    d. Omit the patient's questions and concerns.

4. What is one activity of rehabilitation nursing?
    a. order medications
    b. refer for physical therapy
    c. facilitate maximum patient independence and function for activities of daily living
    d. focus solely on psychological well-being

5. What is one key component of assessing functional ability in rehabilitation nursing?
    a. evaluating only physical capabilities
    b. concentrating exclusively on cognitive skills
    c. examining emotional well-being
    d. ignoring family input during assessment

6. Rehabilitation nurses address which aspects in caring for stroke survivors? (Select all that apply.)

a. cognitive impairments
b. cardiovascular surgery
c. mobility challenges
d. emotional support

7. What are the primary goals of nurses working in school health programs?
   a. administering medications directly to students
   b. offering therapy services directly to teachers
   c. promoting student health and academic success
   d. conducting research related to educational methods

8. What should be the primary responsibility of a nurse who cares for persons without housing?
   a. offering cosmetic treatments
   b. offering luxury medical services
   c. building trust and rapport
   d. addressing only physical health concerns

9. What is the primary goal of transition and continuity of care in health care?
   a. reducing health-care personnel needs
   b. getting rid of wait times
   c. ensuring seamless coordination during transitions of care
   d. doing away with patient education.

10. What does "continuity of care" refer to in health care?
    a. frequent readmissions
    b. discontinuation of medical treatments
    c. coordinated delivery of health-care services
    d. avoidance of preventive services

Check Your Understanding Questions

1. Summarize the process of preparing for an initial home health visit.
2. Explain the difference between a rehabilitation nurse and a rehabilitation case manager.
3. Explain the different types of services that are available in outpatient settings, including urgent care centers and clinics.
4. What are resources a nurse case manager can use to help a patient transition out of the hospital and back home?

Reflection Questions

1. Think about your future role as a rehabilitation nurse. What skills and qualities do you think are needed to become a successful rehabilitation nurse?

What Should the Nurse Do?

1. Upon entering a patient's home and conducting a preliminary environmental assessment, the nurse notices two dogs not crated and asks the patient to move the dogs. The patient says no. The dogs begin to growl. The nurse does not feel safe to conduct the visit with the dogs not safely crated. What should the nurse do next?

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CHAPTER 37

Trends in Health-Care Technology

FIGURE 37.1 Health-care technology has revolutionized the delivery of individualized patient care, from robotic assistance in the operating room to the day-to-day patient care tools. (credit: modification of "Col. Lovette receives 81st MDG immersion tour" by Kemberly Groue/U.S. Air Force, Public Domain)

CHAPTER OUTLINE

INTRODUCTION Advancements in technology are significantly reshaping the landscape of health-care services, offering innovative solutions that enhance patient care and outcomes. Telemedicine has emerged as a transformative approach, enabling medical treatment to be delivered remotely, removing geographical barriers, and increasing access to health care for underserved populations. Artificial intelligence (AI) technologies have demonstrated the ability to perform human tasks, aiding in accurate diagnosis, personalized treatment recommendations, and efficient health-care management. Smart beds have revolutionized patient care by utilizing sensors and data analytics to monitor vital signs, optimize patient positioning, and prevent pressure ulcers, leading to improved patient comfort and health outcomes. Moreover, wearable devices have become increasingly popular for tracking health metrics, facilitating earlier disease detection, and empowering individuals to actively manage their well-being.

37.1 Telemedicine and Artificial Intelligence

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Define telemedicine
- Define artificial intelligence
- Explain how AI and telemedicine impact patient care
- Identify the challenges of integrating AI into telemedicine
- Describe the role of technology in nursing education
- Discuss the nurse's role in the evolution of telemedicine and AI

Imagine the convenience of connecting with your health-care provider through a video call during your lunch break at work, eliminating the need to take time off to seek medical care. What was once a futuristic idea has now become a reality with telemedicine. While telemedicine is not a new concept, recent advancements in technology—especially in the wake of the COVID-19 pandemic—have propelled its use, solidifying its place in modern health care. Embracing the power of artificial intelligence (AI) further enhances telemedicine's capabilities and creates endless possibilities for future developments. As nurses, it is important to be well-informed about the potential challenges posed by AI-based telemedicine and recognize the integral role we play in its evolution and successful implementation for safe and effective patient care.

The discipline of **informatics**, the science of information, plays a pivotal role in harnessing these technological advancements within health-care organizations. By incorporating informatics into their operational strategies, health-care providers can streamline workflows, enhance data-driven decision-making, and improve overall efficiency in delivering patient care. The Institute of Medicine's Healthy People 2030 objectives further emphasize the importance of health information technology for achieving enhanced access and effectiveness in health-care services, creating a strong impetus for health-care organizations to embrace technological innovations (National Academies of Sciences, Engineering, & Medicine, 2021). Due to all these factors, the total value of the health-care information technology market is projected to surpass $707 billion by 2032 (Acumen Research and Consulting, 2023).

As technology continues to transform the health-care landscape, it is critical for nurses to adapt effectively, understanding and embracing the uses and impact of health informatics and information technologies within their practice. High-tech devices are developed and implemented to improve patient care, but they will never replace the importance of human touch and compassion. Consequently, nurses must play a role in the digital evolution of health care, as they leverage new technologies to optimize workflows and achieve better patient health outcomes. In brief, nurses who stay abreast of technological advancements are best positioned to foster an environment of continuous improvement and patient-centered care.

What Is Telemedicine?

The remote diagnosis and treatment of patients by means of telecommunications technology is called **telemedicine**. Sometimes referred to as telehealth, telemedicine allows health care to be delivered from a distance using technologies such as computers, cameras, tablets, smartphones, videoconferencing, wireless communications, and the internet. Telemedicine may be used to provide care for a variety of situations, such as:

- postsurgical follow-up
- prescription management
- treatment of skin conditions
- delivery of lab or test results
- online counseling
- physical and occupational therapy
- remote monitoring of chronic or reoccurring conditions and urgent care issues

CLINICAL SAFETY AND PROCEDURES (QSEN)

Telemedicine for Stroke Assessment and Care

John, a sixty-year-old man, has a history of hypertension and is at risk for stroke. His health-care provider has equipped him with a telemedicine kit that includes a tablet, a high-resolution camera, and a connected blood pressure monitor. The telemedicine platform is designed to facilitate regular check-ins and immediate assessments in case of potential stroke symptoms.

- Remote monitoring: John uses the telemedicine kit at home to measure his blood pressure regularly. The data is transmitted securely to his health-care provider, who monitors trends and adjusts his medication as needed. Additionally, the tablet is equipped with an application that guides John through simple neurological assessments, such as checking for facial droop, arm weakness, and slurred speech.
- Regular telehealth check-ins: Every few weeks, John has scheduled video calls with his neurologist through the telemedicine platform. During these check-ins, the neurologist assesses John's overall neurological function using standardized stroke scales, such as the National Institutes of Health Stroke Scale (NIHSS). During the video call, the neurologist guides John through specific tasks to assess his neurological status, such as asking him to lift both arms, smile to check for facial symmetry, and articulate specific phrases. The neurologist scores each task based on the standardized scale, providing an objective measure of John's neurological health.
- Emergency assessment: One day, John experiences sudden weakness on one side of his body and difficulty speaking. Recognizing these potential stroke symptoms, John activates the emergency feature on his telemedicine platform. The neurologist is immediately notified and conducts a live video assessment. Using the tablet's camera, the neurologist observes John's physical symptoms in real time. The neurologist guides John through additional assessments to evaluate the severity of the symptoms. Based on the findings and the NIHSS scores, the neurologist determines that it's a potential stroke and activates the emergency response team.
- Timely intervention: Emergency medical services are dispatched to John's location, and he is taken to the nearest stroke center for immediate intervention. The early detection through telemedicine enables a faster response, potentially reducing the long-term impact of the stroke.

This example demonstrates how telemedicine, combined with stroke scale assessments, can be a powerful tool for continuous monitoring, early detection, and timely intervention in cases of stroke, ultimately improving patient outcomes.

While the delivery of virtual health care continues to increase in popularity and frequency, it may not be appropriate for all situations. For example, conditions that require the provider to physically assess the patient or perform diagnostic testing still require a face-to-face visit. Emergencies such as severe trauma, acute chest pain, or sudden neurological deficits demand immediate in-person evaluation to ensure timely and accurate treatment. Additionally, complex cases where multiple specialists need to collaborate or where nuanced physical examinations are crucial may also necessitate traditional office visits.

CLINICAL JUDGMENT MEASUREMENT MODEL

Take Action: Determining Appropriateness of Telemedicine Visits

While working the triage phone line, a nurse at a hospital receives a call from a patient reporting they woke up with their "eye crusted shut." The nurse asks the patient a series of follow-up questions, such as if the eye is red, if there is a foreign object in the eye, and if one eye or both eyes are affected (recognizing cues). From the patient's answers, the nurse determines there are no foreign objects in the eye, only the right eye is affected, and the eye is red. The nurse then analyzes the cues and suspects the patient may have conjunctivitis, or pink eye (prioritize hypotheses). The nurse determines the patient needs to be scheduled to see a provider to receive medical treatment (generate solutions). Recognizing that pink eye is contagious, the nurse determines it would be better to schedule a telemedicine visit. The nurse confirms the patient has access to the internet and a

mobile phone or computer, explains how the telemedicine visit will work, and schedules the appointment for later that day (take action).

Telemedicine allows for two-way telecommunications (Figure 37.2). The patient may be asked to supply the provider with their weight, vital signs, laboratory values, and symptoms. Additional documentation, such as images and medical records, may also be uploaded by the patient to ensure the provider has all information needed to accurately diagnose the problem. On the other hand, the provider may supply the patient with notifications or reminders related to their health, detailed instructions for home care, and encouragement for continuing with their treatment plan.

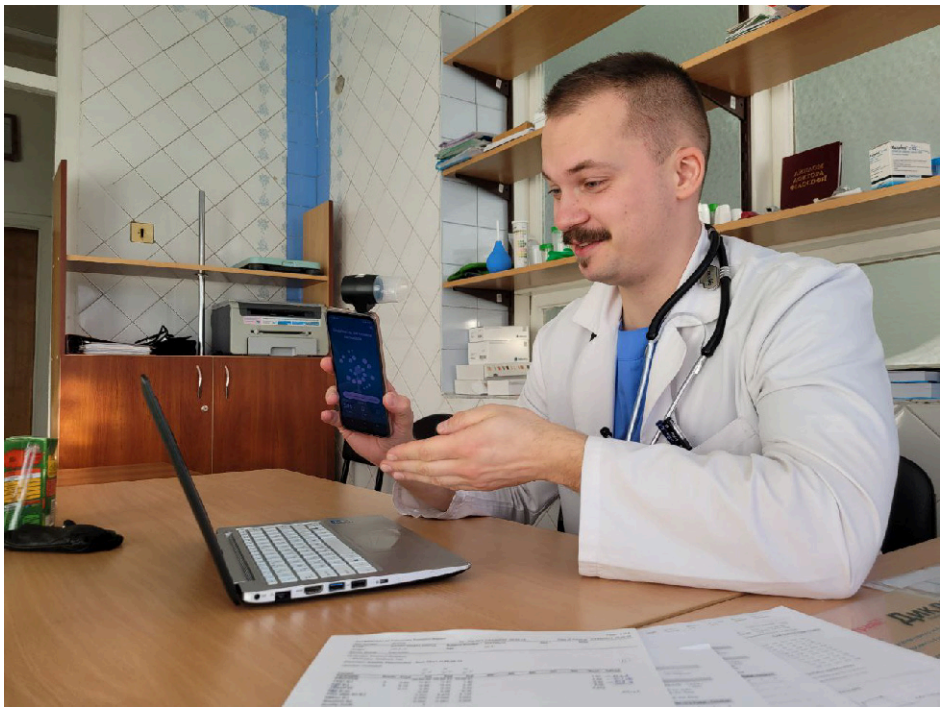

FIGURE 37.2 Telemedicine allows bidirectional audio and visual communication between patient and provider. (credit: "Оцінка ефективності телемедицини для навчання пікфлоуметрії пацієнтів із захворюваннями органів дихання" by Mariia Tsyben/Wikimedia Commons, CC0 1.0)

Utilizing telemedicine offers several benefits. It makes health care more accessible and affordable. Patients can conveniently access care from their current location, eliminating the need to travel, take time off work, or arrange childcare, thereby reducing associated costs. Additionally, telemedicine provides enhanced access to specialized providers, regardless of geographical constraints, while also minimizing wait times for appointments, lowering exposure to potential health risks, and increasing patient engagement and adherence to treatment (Vicente et al., 2022). For instance, patients can avoid exposure to contagious diseases such as influenza or COVID-19 by opting for virtual consultations instead of sitting in crowded waiting rooms. Research has shown that patients who participate in telemedicine visits experience lower hospitalization rates (Campion et al., 2023; Pande et al., 2015; Peters et al., 2021).

CULTURAL CONTEXT

Cultural Considerations of Telemedicine

Cultural considerations in telemedicine are crucial for providing effective and patient-centered care to individuals from diverse cultural backgrounds. When implementing telemedicine services, health-care providers should keep in mind the following variables:

- Language and communication: Language barriers can hinder effective communication between health-care

providers and patients. Telemedicine platforms should support multiple languages and use interpreters when necessary. When communicating with English as a Second Language (ESL) patients, it's important to use clear and straightforward language to ensure understanding. Avoiding slang can help facilitate effective communication.

- Cultural beliefs and practices: Each culture may have unique beliefs and practices related to health, illness, and treatment. Health-care providers must be culturally sensitive and respectful of these beliefs, as they can influence a patient's willingness to engage in telemedicine and adhere to treatment plans.
- Privacy and confidentiality: In some cultures, discussing personal health matters openly may be considered taboo. Providers must ensure that telemedicine consultations are conducted in a private and secure environment to respect patients' cultural norms and maintain confidentiality.
- Access to technology: Cultural factors can influence a patient's access to technology and willingness to use telemedicine services. Providers should be aware of potential disparities and work to ensure equitable access to telehealth services for all patients.
- Body language and nonverbal cues: In telemedicine, the inability to fully observe a patient's body language and nonverbal cues can pose challenges. Cultural differences in nonverbal communication, such as eye contact, should be considered, and providers should be sensitive to these nuances during virtual consultations.
- Family and community involvement: In some cultures, family and community members play a significant role in health-care decision-making. Providers should be open to involving family members in telehealth consultations if the patient desires and consents to it.
- Religious observances: Religious practices may impact a patient's availability for telemedicine appointments. Many religious traditions observe specific days or times for worship, rituals, or rest, which could conflict with standard telemedicine appointment schedules. For instance, in Islam, Muslims are required to pray five times a day at prescribed times. These prayer times could coincide with potential telemedicine appointments, making it challenging for patients to be available without interruption. Providers should be accommodating and flexible with scheduling to respect patients' religious observances.
- Health literacy: Cultural factors can influence a patient's health literacy level, affecting their understanding of medical information and treatment plans. Providers should use clear and simple language and patient education materials that are culturally appropriate.

By integrating these cultural considerations into telemedicine practices, health-care providers can ensure care is inclusive, respectful, and effective in meeting the diverse needs of their patients. This approach fosters trust, improves patient engagement, and leads to better health outcomes for individuals from different cultural backgrounds.

Influence of COVID-19 on Telemedicine

Because telemedicine limits the physical contact required to provide care, the prevalence of virtual care rapidly increased with the onset of the COVID-19 pandemic in 2020. Within the first three months of the pandemic, telemedicine encounters increased by 766 percent, from 0.3 percent to 23.6 percent of all encounters (Shaver, 2022). The widespread adoption of telemedicine played a crucial role in reducing disease transmission, facilitating triage care, ensuring uninterrupted access to health-care services, and safeguarding the well-being of patients, providers, and the entire community (Shaver, 2022).

Telemedicine not only enabled safer health-care delivery during the pandemic—it also played a pivotal role in driving progressive changes in reimbursement policies. Some of these policies were temporary, but others became permanent. For example, the federal government expanded coverage for reimbursable services, allowed reimbursement for care received at the patient's home, and expanded the number of providers eligible to provide telemedicine (Department of Health and Human Services [DHHS], n.d.). There has also been a rise in research studies providing evidence to support the use and effectiveness of telemedicine, which should further encourage policy changes as health care settles into a new "normal" postpandemic (Campion et al., 2023; Pande et al., 2015; Peters et al., 2021; Snoswell et al., 2023).

LINK TO LEARNING

The U.S. Department of Health and Human Services (HHS) provides telehealth policy resources (https://openstax.org/r/77TelehealthPol) for health-care providers and organizations.

Artificial Intelligence

Encompassing computer science and comprehensive data sets, **artificial intelligence (AI)** focuses on leveraging technology to address and solve complex problems, enabling machines to perform tasks that typically require human intelligence. AI analyzes data by using algorithms and models that recognize patterns in data to emulate how humans learn, a process known as **machine learning**. AI has the potential to increase the efficiency, accuracy, and speed at which health care is delivered. While there are benefits to AI, potential challenges include data privacy concerns, risk of error, and the inability of AI to demonstrate wisdom or compassion—both of which are essential to the delivery of health care. As such, AI is not intended to replace the provider. Rather, AI is intended to complement the provider so care can be delivered more efficiently, allowing providers more time to spend with their patients.

Common applications of AI in telemedicine include practices relevant to telemonitoring, patient care, and chronic disease management. AI-powered chatbots and virtual assistants can interact with patients to gather information about symptoms, provide initial assessments, and offer guidance on health-care queries. AI is used to analyze medical images—such as x-rays, MRIs, and CT scans—to aid in the detection and diagnosis of conditions. Wearable devices equipped with AI algorithms can analyze physiological data such as heart rate, blood pressure, and glucose levels, providing real-time insights to health-care providers and triggering alerts for potential issues.

Telemonitoring and Patient Care

The practice of monitoring aspects of a patient's health from a remote location is called telemonitoring. It allows data such as heart rate, blood pressure, oxygen saturation, weight, and blood sugar levels to be entered or transferred into a portal that can be accessed by the provider. Telemonitoring has proven to be effective at monitoring both acute and chronic conditions. Research has shown telemonitoring to be particularly useful in improving patient outcomes for heart failure, stroke, COPD, asthma, and hypertension (Noah et al., 2018). By closely monitoring these data, providers can identify changes in a patient's condition more quickly and alter the plan of care accordingly. In addition, telemonitoring reduces the patient's travel time, frequency of visits, costs associated with seeking care, and risk of infection; it also frees up medical providers to attend to patient needs that cannot be monitored remotely.

Patient data management systems (PDMSs) are comprehensive software solutions designed to manage and organize patient-related data within health-care facilities. PDMSs automatically retrieve data from bedside medical equipment, such as vital sign machines, ventilators, and intravenous (IV) pumps. The integration of PDMSs and telemonitoring creates a more comprehensive and seamless health-care management approach. Patient data collected through telemonitoring devices can be directly fed into the PDMS, providing health-care providers with a holistic view of the patient's health status. This integration promotes data-driven decision-making, enhances care coordination, and supports more personalized and proactive health-care interventions. Benefits of PDMSs include their integration with clinical decision support systems that enhance clinical decision-making, decreasing charting time, increasing time to spend with the provider, reducing medical errors, and improving clinical outcomes.

Patient Diagnosis

AI can also be used to assist providers in identifying and diagnosing diseases with increased accuracy, speed, and efficiency (Figure 37.3). AI can use stored medical images from x-rays, MRIs, ultrasounds, and CT scans to analyze subsequent images, for example. AI can also use patient data such as imaging, vital signs, demographics, medical history, and laboratory results to predict accurate diagnoses that may be used to support provider decision-making. While AI may be used to help providers make more informed patient care decisions and reduce the likelihood of misdiagnosis, it should not be used in solitude to diagnose a patient. AI can generate predictions; however, it is the responsibility of the health-care provider to apply their clinical judgment and expertise to accurately interpret the predictions and arrive at a diagnosis.

FIGURE 37.3 A body scanner microscope uses AI to analyze images of spots on the skin and rate the severity to help with diagnosis. (credit: "Artificial intelligence makes its way to MacDill dermatology clinic" by Senior Airman Adam R. Shanks/U.S. Air Force, Public Domain)

CLINICAL JUDGMENT MEASUREMENT MODEL

Prioritizing Hypotheses: Using AI for Patient Diagnosis

Scenario: A patient named Emily presents with a persistent cough and shortness of breath. Her primary care provider orders a chest x-ray to investigate potential pulmonary conditions.

In the hospital's diagnostic workflow, an advanced AI system designed for pulmonary imaging analysis is seamlessly integrated. Trained on a diverse data set, the AI algorithm excels at identifying nuanced patterns and abnormalities related to respiratory health. Emily's chest x-ray undergoes meticulous analysis by the AI algorithm, which examines the image for indications of nodules, infiltrates, or other respiratory anomalies. The AI system generates a comprehensive report highlighting regions of interest and providing an assessment of potential conditions based on recognized patterns in the x-ray.

The AI-generated report is made available to the attending radiologist, who collaborates with the AI system in a synergistic approach. The radiologist, leveraging their clinical expertise, conducts a thorough analysis, considering both the AI insights and their own observations, and determines Emily has pneumonia. This scenario showcases the collaborative and complementary role of AI in pulmonary imaging, illustrating how technology supports health-care professionals in providing precise and timely diagnoses for better patient care.

Patient Treatment Plans

AI provides models for searching medical data to assist with the development of patient treatment plans. By collecting and analyzing data, computers can formulate treatment recommendations based on the patient's diagnosis, health history, risk factors, and medical condition. While trial and error have historically guided some treatment plans, AI offers valuable insights into identifying the most beneficial treatment plan for the patient right from the beginning.

AI can be utilized to deliver individualized treatment for patients, tailoring medical interventions to meet their unique needs and conditions. AI chatbots, for instance, can be used to provide customized, real-time recommendations to patients according to the patient's symptoms. Additionally, AI can be employed to provide patient education. By storing patient data, including medical history and preferences, these AI-powered technologies can effectively provide patient-centered care.

Robots

Robots are becoming increasingly integrated within treatment. For example, robots can be used to complete simple, repetitive tasks such as taking a patient's vital signs and assisting with hygiene. Utilizing robots to complete these

tasks reduces human workload and provides the nurse more time to focus on other, more complex duties. Robots can also be used to assist with mobility, provide medication reminders, and engage patients in opportunities for social interaction. They may also be used to help deliver medication, collect labs, and disinfect equipment. Artificial intelligence coupled with these robotic supports can produce powerful outcomes in data analysis and, in some cases, with diagnosis or alerts.

Additionally, robots can be used to perform surgical procedures. For example, the da Vinci Surgical System is a robotic surgical platform used for various procedures, including prostatectomies, hysterectomies, and colorectal surgeries (Figure 37.4). It consists of robotic arms controlled by a console, providing the surgeon with enhanced dexterity and precision. Used in spine surgery, the Mazor X and Renaissance systems assist surgeons in the placement of spinal implants with high precision. These robots enhance accuracy and reduce the risk of complications. In fact, surgical procedures are the most widely used application of robotics within health care due to the volume of procedures that can be conducted in comparison to the volume achieved by humans (D'Souza et al., 2019). AI is increasingly being incorporated into these systems to provide feedback after each surgery, potentially helping the surgeon improve their performance and improve the robotic products.

FIGURE 37.4 The Davinci Surgical System, a robotic surgical platform used for surgical procedures, is an example of how robots can enhance health-care delivery and patient outcomes. Artificial intelligence can help surgeons and equipment-makers analyze the performance on these machines and improve them over time. (credit: Air Force/Arnold Air Force Base, Public Domain)

LINK TO LEARNING

Explore how robots are being used by nurses (https://openstax.org/r/77RobotNursing) at Cedars-Sinai.

Patient Engagement

The field of study and application that focuses on the use of information and communication technologies to empower individuals in managing their health and health care is called **consumer health informatics**. It involves the integration of technology, information, and communication tools to provide consumers (patients or individuals) with access to health information, support self-care, and facilitate communication with health-care providers. Consumer health informatics encompasses topics such as health literacy, consumer education, personal health records, and patient engagement and empowerment. Consumer health informatics addresses these areas by analyzing consumers' information needs, exploring methods to deliver accessible information, and implementing measures to cater to these needs. This includes integrating consumer preferences into health information systems and meeting the growing demands for internet-based health information.

Chronic Disease Management

AI technologies have the potential to bridge the gap between rising health-care costs and the increasing burden of chronic diseases, leading to reduced mortality rates. Algorithms offer the capability to identify individuals with an elevated risk of developing chronic diseases, predict the progression of existing conditions, and utilize health records to anticipate patient outcomes. Incorporating AI into chronic disease management holds the potential to lower costs, enhance outcomes, optimize resource utilization, expand access to care, improve quality of life, and alleviate the burden on the health-care system. It can also create personalized treatment plans based on each patient's individual needs, provide the right treatment at the right time, reduce the risks of complications and disease progression, and reduce side effects of unnecessary treatments.

AI telemonitoring may also prove beneficial to the treatment of chronic medical conditions. AI algorithms can analyze patient data in real time and produce alerts for abnormal readings or patterns, aiding in the detection of changes to a patient's health status and facilitating early interventions. Patterns can be identified to determine the effectiveness of a treatment plan and recommend adjustments as needed. Using real-time data, providers can then tailor the treatment plan to meet the individual needs of the patient, identify early warning signs, and provide personalized feedback.

Challenges with Telemedicine and AI

While telemedicine is associated with many benefits, there are also some notable challenges to be aware of. For example, telemedicine can be used to improve access to care, but providers must take caution not to inadvertently create or reinforce health disparities: preventable differences in the ability of socially disadvantaged populations to achieve optimal health. In particular, older adults, minorities, and those with lower socioeconomic status may not always have the necessary technologies, including internet access, needed for telemedicine. It is essential for providers to explore strategies for ensuring that patients who lack these key resources can still access telemedicine and to consider alternative approaches that reduce barriers to care for individuals who cannot access telemedicine.

Even when patients can access the internet and other necessary technologies, telemedicine adds a layer of complexity that may be difficult for some to understand. Patient education will be necessary prior to initiating telemedicine care. For this education to be effective, health-care professionals will need to receive training on how to use the technology and navigate potential challenges that may occur.

LINK TO LEARNING

The U.S. Department of Health and Human Services (HHS) maintains Telehealth.HHS.gov (https://openstax.org/r/77TelehealthGov), a great resource to help patients make and prepare for a telemedicine visit.

Telemedicine can also pose challenges when a provider is unfamiliar with the patient's medical history or unable to easily communicate with the patient's other providers. This may result in fragmented care, with each provider knowing only the conditions and prescribed medications that are directly relevant to their expertise. Additionally, some health conditions may not be suitable for virtual care, necessitating in-person provider visits and potentially duplicating care efforts.

Another significant challenge associated with the integration of AI and telemedicine is the potential for dehumanization in health-care interactions. As technology plays a larger role, there is a risk of diminishing the human touch and empathy traditionally associated with health care. Patients may feel a sense of detachment when engaging with AI-driven systems or virtual consultations, impacting the quality of the patient-provider relationship. Striking a balance between technological efficiency and the human aspects of care is essential to ensure that patients feel supported, heard, and cared for throughout their health-care journey. Addressing issues related to trust, communication, and emotional support is crucial to mitigate the dehumanizing effects of advancing technology in health-care delivery. Other challenges include legal, ethical, data security, and privacy issues, warranting careful consideration in telemedicine implementations.

Legal and Ethical Issues with AI Use

Use of AI within telemedicine does not come without legal and ethical issues that must be considered. Laws and

regulations are needed to ensure AI systems are transparent and their decision-making can be explained. AI technologies must prove to be fair, accurate, and nondiscriminatory. Regulations must also be in place to guide liability and clarify who is responsible for the decisions made by AI. Additional legal considerations include defining boundaries for AI use and developing international governance to maintain consistency across borders.

The most prevalent ethical concerns linked to the utilization of AI involve obtaining informed consent for data usage, ensuring algorithmic fairness, removing bias, and understanding the role of human judgment in AI-driven decisions. (Gerke et al., 2020). Although data is essential for effective machine learning, the critical issue is whether each patient must consent for their health information to be included in the data collection. Before permitting AI to use stored data from medical records to create algorithms, providers should have satisfactory answers to the following questions: Who owns an individual's health-care records? With whom will health information be shared? Is the patient's consent necessary to share their data? According to the Health Insurance Portability and Accountability Act (HIPAA), the patient owns their health-care records and must give consent for them to be shared.

Effective use of AI must also acknowledge the potential for bias. AI bias occurs because humans select the data used to develop the AI algorithms and are responsible for the decision-making process through which the algorithms are applied. AI systems are trained with data that reflect bias and often are not representative of diverse populations. Biased data leads to biases in the patterns identified and the recommendations provided. Addressing bias in AI-powered telemedicine requires a multidimensional approach. Diverse teams, accurate data, and extensive testing are needed to ensure accurate AI algorithms are developed without bias.

The role of human judgment in AI-driven decisions is crucial and multifaceted. While artificial intelligence systems are capable of data processing, pattern recognition, and decision-making, they lack the capacity to demonstrate the understanding, empathy, and wisdom that humans possess. Human validation is necessary to interpret and determine the accuracy of AI recommendations. Human judgment is also necessary to adapt AI-driven decisions to specific situations and consider factors that AI cannot capture. AI-powered glucose monitoring systems, for instance, may provide insights for diabetes management; however, endocrinologists must use their clinical judgment to interpret these trends, consider lifestyle factors, and make recommendations for insulin adjustments or other interventions. AI algorithms may also analyze data to predict patient deterioration; however, nurses and providers must draw on their judgment, interpret these predictions, assess the broader clinical picture, and make decisions regarding treatment adjustments or interventions. Ultimately, humans are responsible for the provisions of health care and will be held liable for actions and decisions taken, regardless of whether they are based on AI recommendations.

Data Security and Privacy

Data security protects personal information from unauthorized access. By adequately securing data, providers ensure it is accurate, reliable, and available to authorized users when they need it. While the delivery of all health care requires participants to follow HIPAA laws, telemedicine adds a layer of complexity to data security and privacy. Because cybercriminal attacks are a major concern when sensitive personal health information is shared, telemedicine requires a secure platform that meets HIPAA compliance (DHHS, n.d.). Additional technological factors that impact data security include the potential hacking of virtual visits and the use of cellular data or public Wi-Fi that is not secure (Houser et al., 2023).

Due to the data security risks involved, federal regulations are in place to guide organizations in implementing strategies to keep patient data secure. Strong network security features, controlled access rights, and encryption are strategies used to deliver HIPAA-compliant telemedicine. Other strategies include using secured websites that feature the "lock" icon in the address bar, requiring passwords for virtual visits, keeping antivirus software up-to-date, and avoiding public Wi-Fi and shared devices. Nurses must be knowledgeable of the data security policies established by their health-care agency and implement measures to ensure compliance with these policies.

Privacy is a human right; therefore, all individuals have the right to keep their personal information private. Data privacy involves properly handling, processing, storing, and using personal information. Furthermore, additional environmental factors outside the provider's control may affect a virtual care session. For example, the lack of privacy—whether real or perceived—may decrease the likelihood that patients will share sensitive health information with the provider. It may also expose details of the patient's living conditions. Though unauthorized exposure violates a patient's privacy, it is often beneficial for the provider to gain a better understanding of the environmental

factors affecting the patient's health. With the patient's consent, the provider may conduct a home safety assessment.

To safeguard patient privacy during telemedicine visits, patients should be educated to seek out a private setting, wear headphones, and be mindful of their surroundings before initiating the virtual visit. Privacy standards should be incorporated into the agency's policies, procedures, and workflows. Staff and providers should receive patient privacy training that is directed toward the specific use of telemedicine.

AI, Technology, and Nursing Education

AI and related technological advancements have drastically changed how education is delivered. In particular, they have played instrumental roles in the use of simulations utilizing augmented and virtual reality. Using AI algorithms, education can provide personalized training experiences that are customized to the learner's needs. AI also allows educators to collect and analyze data to identify areas of opportunity within the curriculum, such as an increased focus on remote learning.

Simulation

Simulation plays a crucial role in nursing education because it helps nurses to practice skills in safe, controlled replications of clinical scenarios. AI has enhanced the capabilities of simulation, including the ability to present a variety of patient profiles that allow the learner to practice providing comprehensive care to a more diverse population (Figure 37.5). For example, it allows the inclusion of psychosocial dynamics, introducing patient variability that better prepares learners for real-life situations and clinical encounters. Additionally, the automation of scenarios enables them to progress independently, relieving instructors of system management responsibilities. This autonomy allows instructors to focus their attention on observing and assessing students' interactions during the simulation.

FIGURE 37.5 AI-driven virtual simulations provide realistic clinical scenarios, such as this demonstration of CPReality, allowing nursing students to practice assessing, diagnosing, and providing care in a safe and controlled environment. These simulations can adapt to student actions, providing varied scenarios and challenges. (credit: "CPReality Demo" by Penn Libraries-TRL/Flickr, CC BY 2.0)

Augmented Reality/Virtual Reality

The technology of **augmented reality (AR)** superimposes a computer-generated environment onto the real world to create an interactive experience for the user. In contrast, **virtual reality (VR)** integrates hardware (a headset) and software (the VR platform) to create an immersive, simulated environment; typically, the user is represented by an interactive **avatar**, a digital representation of an individual created within a virtual environment. AI algorithms play a pivotal role in enabling avatars to respond and clinical variations to unfold as virtual scenarios progress. These algorithms also facilitate voice recognition within the virtual environment, allowing avatars to recognize user commands and respond appropriately. AI also allows three-dimensional (3D) scenes to be created by a single photo, provides motion tracking data, and collects, stores, and analyzes user-specific data as individuals navigate

the scenario.

Benefits of incorporating AI into AR and VR include an improved user interaction and user experience, as well as the possibility of augmenting human intelligence and reducing educational costs. AI algorithms in AR/VR systems can analyze individual learning patterns and preferences. By tailoring content and experiences to the specific needs of each learner, personalized learning enhances comprehension and knowledge retention, optimizing the educational process. If a learner demonstrates mastery in a particular area, the system can advance to more challenging material, promoting efficient learning. AI-driven assessments in AR/VR environments provide immediate and detailed feedback to learners, allow individuals to identify and rectify mistakes promptly, and enable remote learning opportunities to make education more accessible. Students can engage in immersive learning experiences without the need for extensive physical infrastructure, lowering expenses related to building and maintaining educational facilities.

The Nurse's Role

Technology has instrumentally changed health care and the way in which care is provided. Nurses are responsible for learning, integrating, and supporting the evolution of technology within health care. This responsibility brings both benefits and challenges.

Emerging technologies have the potential to make the nurse's workload more manageable. Electronic health records and digital records improve accessibility, accuracy, and clarity of documentation. Technology may also reduce the nurse's risk of error and liability by automating tasks with precision and speed. The integration of additional technology leads to improved communication capabilities, facilitating real-time interactions that have the potential to enhance care coordination and minimize delays in providing health-care services. As technologies improve patient care and allow it to be provided in rural and remote areas, the health of the patient may improve, thereby reducing the number of patient visits and overall workload of the nurse.

As new and innovative technologies emerge, nurses must engage in continuous learning to stay updated on the latest techniques for providing care. Each new technology requires training, the establishment of new workflows, and patient education. The constant state of change can be overwhelming and take a toll on nurses, possibly leading to resistance toward adopting new technologies and eventually to burnout. While the role of the nurse may shift with the advancement of technology, the nurse will continue to be essential to the processes of coordinating patient care, developing trusting relationships with patients, and adapting to new technologies that allow us to provide the best care for our patients. The nurse's role will retain its essential qualities of wisdom, clinical judgment, and compassion—qualities that cannot be replaced by technology.

37.2 Health Informatics

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the impact of health informatics
- Identify the legal boundaries on health informatics, communications, and technology
- Differentiate between electronic health records and electronic medical records

Health-care informatics is focused on the applications of the massive quantities of data generated by the health-care industry. These data are used to develop strategies to positively influence and improve the delivery of health care. Legislation and governing institutions provide legal boundaries around health informatics by developing guidelines, regulations, and initiatives to support national adoption and acceptance of health informatics. Many of these initiatives have supported the elimination of electronic medical records and the widespread adoption of electronic health records (EHRs).

Health Informatics

Informatics is the science of information. When we talk about informatics, we are talking about the use of technology and computer systems to process data and information. Informatics is a broad term that can be applied to many disciplines. Within health care, the concept can be further broken down by specialty area, such as biomedical, clinical, medical, nursing, population health, and public health informatics. These specialized fields collectively form the broader domain of health informatics.

The field that integrates information science with health care is called **health informatics** (Saba & McCormick, 2015). In other words, it is a specialized field within health care that combines information, technology, and health-care knowledge to improve patient care. Through health informatics, care may be streamlined and coordinated so that quality care can be delivered in the most efficient and cost-effective manner.

Health informatics helps to identify, define, manage, and communicate data, information, knowledge, and wisdom within health care. It creates information structures, processes, and technologies that can be used to support nurses, providers, consumers, patients, and the interdisciplinary teams that guide decision-making. Additionally, informatics enhances collaboration, communication, safety, satisfaction, efficiency, and effectiveness within the delivery of health care.

Information and Communications Technology

All communication technologies that enable users to access, retrieve, store, transmit, and manipulate digital information make up **information and communications technology (ICT)** (Figure 37.6). A broader term for information technology (IT), ICT includes technologies such as the internet, wireless networks, computers, cell phones, software, and other media applications such as videoconferencing and social networking. ICT allows for remote care, interdisciplinary clinical support, and knowledge support. The use of ICT has the potential to promote patient-centered care at a lower cost, improve quality of care and information sharing, educate patients and health professionals, encourage relationships between patients and their health providers, and reduce travel time.

FIGURE 37.6 Information and communications technology (ICT) consists of many components, including hardware, software, data, and access to the internet. (attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

Predictive Medicine and Precision Health

The use of laboratory and genetic tests to determine an individual's probability of developing a disease is called **predictive medicine**. The goal of predictive medicine is to use biomarkers to predict an individual's risk for developing a clinical disorder, predict the most effective treatment, and then intervene before the patient develops the condition. While genetics-based predictive medicine has been used for quite some time, the scope of this field is expanding to include conditions beyond those solely reliant on genetic predictions.

Considering the massive amounts of health-care data that are collected, stored, and processed, and the new analytical techniques available, predictive medicine is one of the most promising applications of informatics. Using its power, providers may soon be able to individualize the risk for a variety of health outcomes and determine individualized treatment options for patients. For predictive medicine to be successful, however, significant efforts will be needed to purchase, develop, and refine the necessary information technology infrastructure. Furthermore, predictive medicine has its limitations: in particular, its reliance on stored data for predictive modeling means its accuracy is limited to the quality of the data available; 100 percent precision cannot be guaranteed. Therefore, it

becomes vital for nurses and all health-care providers to prioritize accurate and appropriate data collection, maintain proper assessment techniques, and comprehend the potential impact of the data they enter on a patient's chart—not only on the patient's immediate needs but on future applications throughout health care.

In comparison, **precision health** refers to an innovative approach to health care that considers individual differences in genetics, environment, and lifestyle. The goal of precision health is to tailor medical care and treatment plans to the unique characteristics of each patient, with the aim of achieving the best possible outcomes. At the core of precision health is the integration of genomic information, where an individual's genetic makeup is analyzed to unveil insights into disease susceptibility, response to medications, and inherent genetic factors influencing health. Precision health allows health-care professionals to develop personalized treatment plans that consider not only genetic factors but also environmental and lifestyle influences. This approach is particularly promising in areas such as cancer treatment, where targeted therapies based on genetic profiles can lead to more effective and less toxic interventions.

By tailoring interventions to the specific needs of each patient, precision health aims to optimize treatment effectiveness, minimize adverse effects, and improve overall health outcomes. However, precision health also presents challenges, including the need for robust and secure data management systems, ethical considerations related to privacy and consent, and the integration of this approach into routine clinical practice. Additionally, disparities in access to genetic testing and other precision health tools must be addressed to ensure equitable health-care outcomes for diverse populations. Despite these challenges, precision health holds great promise in revolutionizing health care, moving away from the traditional, one-size-fits-all model toward a more individualized and targeted approach to medical care.

Epidemic Tracking

The field that applies science and technology to meet the needs of public health is called **public health informatics**. This specialized field encompasses population health, policy development, and the accessibility of public health services; however, its main focus is to promote health and prevent diseases within populations and communities.

The public health domain of informatics is responsible for several functions, including the surveillance and prevention of epidemics and the spread of diseases. Collecting, analyzing, and disseminating data related to diseases, health outcomes, and injuries is called **surveillance**; through careful surveillance, public health officials can reduce the spread of disease and other poor health outcomes and injuries. Incidence and prevalence are two key epidemiological concepts used within surveillance measures to quantify and describe the occurrence of diseases or health-related events within a population. The number of new cases of a specific disease or health-related event that occur within a defined population during a specified time period is called **incidence**; it measures the risk of developing a condition. In comparison, **prevalence** represents the total number of cases (both new and existing) of a particular disease or condition in a population at a specific point in time or over a specific period; it indicates how widespread the condition is within the population (Arnold et al., 2020).

A recent example of surveillance is the contact tracing conducted by state and local health departments, the Centers for Disease Control and Prevention (CDC), and other public health agencies during the COVID-19 pandemic. Incidence and prevalence measures were constantly evaluated to determine the risk of developing COVID-19 and the extent of the virus's spread by region. By tracking reports of positive COVID-19 cases and conducting follow-ups, officials documented the movements, interactions, and duration of contact of positive cases. This enabled the mapping of cases and facilitated the implementation of quarantine measures to slow the spread of the virus (Ibrahim, 2020).

Legislation and Governing Institutions

Legislation and governing institutions play a significant role in the development of health informatics, communications, and technology. They create organization, structure, and policy, while also offering support for ongoing advancements and improvements. It is crucial for nurses to comprehend the legal framework that underpins health informatics so they can advocate for changes that promote safer, more effective, and more efficient information technologies in health care.

Legislation

There are several important pieces of legislation that impact health-care informatics. Perhaps the best known is the

Health Insurance Portability and Accountability Act (HIPAA), passed in 1996 to curtail health-care fraud and abuse, enforce standards for health information, guarantee the security and privacy of health information, and ensure health insurance portability for employed persons (Office of the National Coordinator for Health Information Technology [ONC], n.d.-b). The law also identifies consequences for any health-care providers who violates its provisions. Nurses should be familiar with the following main components of HIPAA:

- The Privacy Rule describes what information is protected and how the protected information can be used or disclosed.
- The Security Rule describes who is protected and what safeguards must be in place to protect electronic protected information.
- The Enforcement Act describes what compliance consists of, when and how investigations must occur, how to report noncompliance, and how consequences for privacy and security breaches should be enforced (ONC, n.d.-b).

Another piece of legislation that has shaped nursing informatics is the **American Recovery and Reinvestment Act (ARRA)**, which was passed in 2009 to stimulate the economy following the Great Recession of 2007–2009. Lawmakers identified the economic value of health information technology and the related need to improve health-care delivery. As such, concepts of health-care informatics are embedded throughout the act. The act is divided into two parts:

- Part A addresses health information technology policies and standards, as well as privacy and security.
- Part B addresses Medicare and Medicaid health information technology, as well as incentives to providers and organizations that adopt EHRs and meaningful use (which will be defined later in this section) (Federal Communications Commission, n.d.).

Within the American Recovery and Reinvestment Act is the **Health Information Technology for Economic and Clinical Health (HITECH) Act**. The act's purpose is to improve health-care quality by preventing errors and assisting with patient-centered decisions at the point of health-care delivery. The act also seeks to lower costs by reducing inefficiencies and service duplication, promote health through prevention and early detection, and improve the management of chronic diseases (Peterson & Holman, 2018). Moreover, it facilitates clinical research, works toward reducing health disparities, ensures the security of patient information, and strives to bolster public health by enabling early detection and response to infectious diseases and bioterrorism.

Overall, the HITECH Act has increased the adoption rate of EHRs and has contributed to a national health information infrastructure in which an individual EHR can be accessed by any provider (ONC, n.d.-c; Peterson & Holman, 2018). While the adoption of EHRs across the United States has increased significantly in recent years, not all Americans have access to these digital health records. The associated costs and complexities of implementing EHR systems pose barriers, particularly for smaller health-care providers in underserved areas that may face financial constraints. Additionally, the infrastructure and readiness for adopting EHRs vary across regions, with rural areas often encountering difficulties due to limited access to high-speed internet and advanced technology. Resistance to change, concerns about data privacy and security, and disparities in resources further contribute to uneven EHR adoption rates. Regulatory hurdles, including variations in state-level regulations and a lack of standardization in EHR systems, also impede the seamless exchange of health information. Achieving universal EHR coverage will require continued concerted efforts to address these multifaceted challenges and promote a more integrated and accessible digital health infrastructure.

The **Medicare Access and CHIP Reauthorization Act (MACRA)**, enacted in 2015, fundamentally transformed the way Medicare pays health-care providers. MACRA repealed the Sustainable Growth Rate formula and introduced the Quality Payment Program (QPP). This program established two tracks for provider reimbursement: the Merit-based Incentive Payment System (MIPS) and Advanced Alternative Payment Models (APMs). MIPS consolidates existing quality reporting programs into a unified framework, tying reimbursement to performance on measures related to quality, cost, improvement activities, and the promotion of interoperability. APMs provide financial incentives for practices to participate in innovative payment models designed to improve care quality and reduce costs. MACRA aims to shift the health-care system toward value-based care, emphasizing quality and outcomes while incentivizing providers to embrace new payment models that prioritize patient-centered, efficient, and coordinated care (ONC, n.d.-a).

The **Food and Drug Administration Safety and Innovation Act (FDASIA)** of 2012 developed "a report that contained strategies and recommendations for a risk-based regulatory framework for health IT, including medical mobile applications, which promoted innovation, protected patient safety, and avoided regulatory duplication" (FDA, 2020). The recommendations were a collaborative effort from the Food and Drug Administration (FDA), the Office of the National Coordinator for Health Information Technology (ONC), and the Federal Communications Commission (FCC).

The **21st Century Cures Act (Cures Act)** was signed into law in 2016. It was developed to promote and fund the acceleration of research to prevent and cure serious illness, accelerate drug and medical device development, address the opioid crisis, and improve the delivery of mental health services. The Cures Act Final Rule, a set of regulations issued by the ONC in the United States as a part of the 21st Century Cures Act, supports seamless and secure access, exchange, and use of electronic health information and is designed to give patients and their health-care providers secure access to health information (ONC, n.d.-b).

Finally, the **Coronavirus Aid, Relief, and Economic Security (CARES) Act**, passed in 2020 at the start of the COVID-19 pandemic, has significant implications for health care. The CARES Act highlighted the need to modernize public health data surveillance and infrastructure. The onset of the pandemic quickly demonstrated the deficiencies of the United States' current health-care system, which proved to be outdated and unable to keep up with patient needs. Modernizing the surveillance infrastructure would enable users to automatically obtain real-time data that is coordinated across the health-care system's various subsystems. The CARES Act also expanded access to telehealth and other connected health technology capabilities and supported the application of Smart health IT technologies and systems. Additionally, the act provided federal grants to evaluate and address the risks associated with cyber threats in remote customer service or telework practices (U.S. Department of the Treasury Office of Recovery Programs, 2023).

LINK TO LEARNING

The Office of the National Coordinator for Health Information Technology (ONC) provides information about health IT laws, regulations, and policies (https://openstax.org/r/77ITlaws) on its website.

Governing Institutions

Governing institutions are critical for maximizing the potential of health informatics at both the national and global levels. They can assist by promoting the adoption of electronic health records, encouraging interoperability, providing incentives to improve quality and efficiency, and fostering technical advancements. Financial support is essential to aid the adoption of health information systems, facilitate information exchange, support research and development, and ensure robust information security measures.

The most notable U.S. agency at the forefront of informatics is the Office of the National Coordinator for Health Information Technology (ONC), which is a division of the Office of the Secretary for the U.S. Department of Health and Human Services (HHS). HHS is responsible for national health-care regulation. The ONC is responsible for delivering provisions of the Cures Act, including regulating health information technology, advancing interoperability, prohibiting information blocking, and enhancing the usability, accessibility, privacy, and security of health information technology. Its employees coordinate national efforts related to the access, exchange, and use of data, with the goal of advancing the development and use of health information technology capabilities and establishing expectations for data sharing (ONC, n.d.-a) (Figure 37.7).

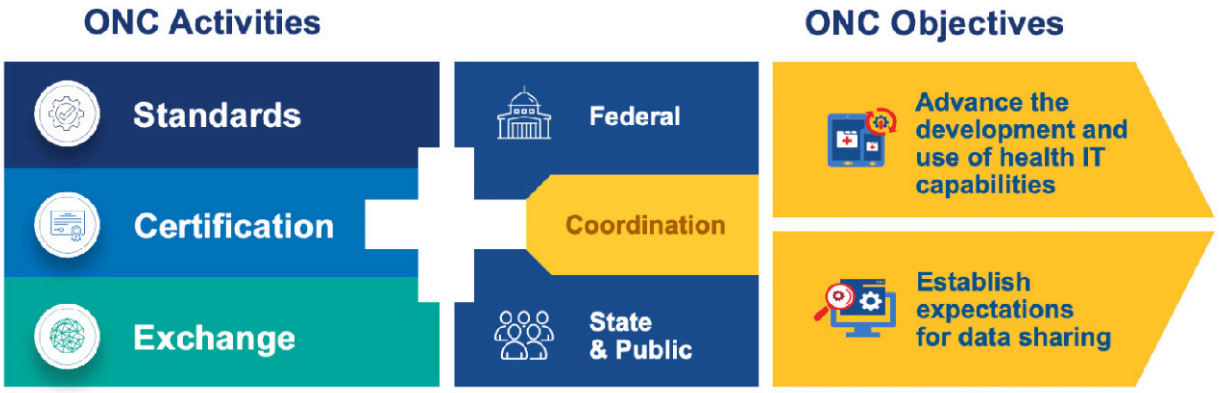

FIGURE 37.7 The ONC engages in activities related to standards, certification, and exchange of information to assist with the coordination of nationwide initiatives aimed at advancing the development and use of health IT capabilities and establishing expectations for data sharing. (credit: "ONC Act ivies ONC Objectives" by HealthIT.gov, Public Domain)

The Health Informatics and Interoperability Group (HIIG) within the Office of Burden Reduction & Health Informatics (OBRHI) oversees interoperability efforts by the Centers for Medicare and Medicaid Services (CMS), another division of HHS. The HIIG promotes the secure exchange, access, and use of electronic health information. This group plays a significant role in publishing policies and establishing a governance framework for interoperability (CMS, 2023b).

Another key institution is the Office of Health Informatics within the U.S. Food and Drug Administration (FDA). This agency provides health informatics tools, solutions, and expertise to enhance the ability of the FDA to promote public health. Some of its functions include developing and implementing health initiatives, promoting effective use of informatics, creating open-source informatics platforms, implementing standardized vocabularies, standardizing data collection and analysis, and researching informatics solutions (FDA, 2019).

The International Organization for Standardization (ISO) is a global federation that works to establish consensus standards globally. The American Health Information Management Association (AHIMA) has been leading the development of health information management standards at the ISO. Together, the ISO and AHIMA have been working to develop shared rules, content, and infrastructure. They are focused on developing standards for rules, guidelines, practice, data, information exchange, safety, privacy, and security (Orlova et al., 2017).

Electronic Health Records

An electronic health record (EHR) is a digital version of a patient's comprehensive medical history. EHRs are transportable, moving with the patient, and accessible by everyone involved in the patient's care—including the patient. They allow health-care information to be shared across practice settings, connecting providers both within a particular organization and between organizations, and have built-in tools that assist with decision-making. EHRs provide enhanced communication and coordination of care that can result in increased efficiency, cost savings, and a seamless delivery of care.

Providing patients with access to their health information empowers them to have more control over their health-care decisions. According to the HIPAA Privacy Rule, patients have a right to access and obtain their own medical records. This right is a legal and enforceable right, encompassing both paper and electronic formats (DHHS, 2022).

While the adoption of EHRs is intended to create a seamless delivery of care, they do not always support **interoperability**, the ability of different systems to "talk" to each other. According to the Healthcare Information and Management Systems Society, interoperability is "the ability of different information systems, devices and applications (systems) to access, exchange, integrate and cooperatively use data in a coordinated manner, within and across organizational, regional and national boundaries, to provide timely and seamless portability of information and optimize the health of individuals and populations globally" (HIMSS, n.d., para. 1).

Recognizing the importance of an electronic health record that moves with the patient, Congress created the **Meaningful Use Electronic Health Record (HER) Incentive Program** as an attempt to modernize the managing and sharing of health-care information. This program, which stemmed from the HITECH Act, was established in 2011

with the intent to increase the adoption of electronic health record usage within the United States. Under the meaningful use program, health-care providers must demonstrate the meaningful use of certified EHR technology to qualify for financial incentives provided by Medicare and Medicaid. The program is part of broader efforts to promote the adoption of EHRs, enhance health-care quality, and improve patient outcomes through the effective use of health information technology (Anumula & Sanelli, 2012).

Using the EHR in a "meaningful" way—that is, to its full extent—facilitating the electronic exchange of information so that quality of care may be improved is considered **meaningful use**. Examples of meaningful use include structuring data entry to ensure all pieces of critical information are captured, ensuring computerized provider order entry is occurring in practice, e-prescribing, capturing vital signs within the EHR, and ensuring medications are being reconciled at every visit (or, in an acute care setting, upon admission and discharge). Meaningfully implementing EHRs has the potential to improve quality, safety, and efficiency; reduce health disparities; engage patients and families; coordinate care; enhance privacy and security; and improve population and public health—all of which are priorities for health-care providers in the United States.

The Meaningful Use EHR Incentive Program was designed so that meaningful use would be achieved within three stages(Table 37.1) (Anumula & Sanelli, 2012; ONC, 2013).

Stage	Date Implemented	Purpose	Outcomes
1	2011	To facilitate data gathering and sharing	Providers tasked with transferring data to EHRs and sharing health information: e.g., by printing after-visit summaries to send home with the patient
2	2014	To advance clinical processes	Built on Stage 1 by adding new standards, such as online access for patients to their health information, electronic health information exchange between providers, and emphasis on utilizing the clinical decision support tools within EHRs
3	2017	To improve outcomes and demonstrate improvements in quality of care	Built on Stage 2 by using health information technology for population health management, clinical quality measurement, and public health reporting; ensures data is stored according to data regulations; improves care through implementation of electronic prescribing, clinical decision support systems, computerized provider order entry, and patient access to electronic records; emphasizes coordination of care through patient engagement with patient portals; supports health information exchange by implementing electronic summaries of care

TABLE 37.1 Stages of the Meaningful Use EHR Program

Once Stage 3 was introduced, the term "meaningful use" was officially replaced with "advancing care information," although the concept is often still referred to as meaningful use.

While the EHR Incentive Program made great strides in achieving meaningful use of EHRs, the U.S. health-care system continued to struggle with interoperability. Therefore, in 2018, the program was renamed the Promoting Interoperability Program. The Promoting Interoperability Program was intended to look beyond the original intent of the EHR Incentive Program by creating new measurements of EHR implementation and increasing the focus on interoperability and improving access to health information (CMS, 2023a).

Nevertheless, interoperability continues to lag within the U.S. health-care system due to the high volume of health information and the variety of EHR systems that use different techniques for programming and formatting. Because of the global nature of EHR systems—working together, talking together, and transcribing information to and from each other—standardization will be key to achieving interoperability. An important goal is to standardize terminology

so that concepts are presented in an unambiguous manner between a sender and receiver of information; it is also important to standardize the format of how the information is transported, the privacy and security measures in place, and the identifiers used to identify individual patients and providers. With all these features in place, any record could be read by anyone with the assurance that the same message is being sent and received.

Another strategy is to investigate how AI and machine learning can be used to transcribe data that have been programmed using different formats. AI and machine learning are already used to process large amounts of data, which can then be used to identify common trends, but they might also be used to pull information from various systems into a unified format. Strategies for achieving interoperability are managed by the Office of Interoperability and Standards (OIS), which is a division of the ONC (ONC, n.d.-a).

REAL RN STORIES

Nurse: Emile, BSN
Years in Practice: One
Clinical Setting: Orthopedic unit
Geographic Location: Rural town in Georgia

When I first graduated nursing school, I remember thinking I would never need to know about health IT legislation. However, I now realize it impacts my nursing practice on a daily basis. For example, I begin my shift by accessing the EHR system, which is designed to comply with the American Recovery and Reinvestment Act (ARRA), Health Information Technology for Economic and Clinical Health (HITECH) Act, and 21st Century CURES Act. Had it not been for these pieces of legislation, I would not have access to comprehensive and secure patient records to explore the patient's medical history or chart the care I provide. When discussing patient information with colleagues and documenting patient care activities, I follow strict protocols to protect patient confidentiality, ensuring compliance with the Health Insurance Portability and Accountability Act (HIPAA).

As I interact with diverse patient populations, I apply the guidelines outlined in the Patient Data Access and Security Implementation Act (PDASIA) to provide culturally sensitive care and tailor my communication and approach to meet the unique needs of each individual. I also actively participate in quality reporting initiatives to address quality measures as mandated by the Medicare Access and CHIP Reauthorization Act (MACRA), contributing to the hospital's efforts to improve patient outcomes. In response to the COVID-19 pandemic, I incorporated provisions from the Coronavirus Aid, Relief, and Economic Security (CARES) Act into my practice, such as embracing telehealth services to minimize in-person contact and using technology for remote patient monitoring to ensure continuity of care while adhering to safety protocols.

As you can see, health IT legislation significantly impacts how nurses practice and deliver care to our patients. My commitment to stay informed about evolving health-care regulations not only enhances patient care but also contributes to the hospital's compliance with the ever-changing landscape of health-care policies. Staying informed about health IT legislation empowers nurses to navigate the digital health-care landscape responsibly, contributing to improved patient outcomes and compliance with regulatory standards.

Electronic Medical Records

When talking about electronic patient records, you will likely encounter two important terms: electronic health record (EHR) and electronic medical record (EMR). While sometimes used interchangeably, these are very different terms with quite different implications for health care as we move into the digital future of health-care delivery.

Recall that EHRs are digital versions of a patient's complete medical history; they are intended to move with the patient from provider to provider. In contrast, an **electronic medical record (EMR)** is a digital form of a paper chart for use by one medical practice. The distinguishing factor to remember is that the digital chart is stored for use only by the respective practice. For the patient or another provider to access the chart, one must physically print it or save it to a digital storage device. This lack of portability decreases communication between providers and across health systems; it also makes it more difficult for patients to make informed decisions about their care. Other key differences between EMRs and EHRs are summarized in (Table 37.2). Due to government regulations and technological innovations, EMRs have largely been phased out and replaced with EHRs, allowing for a more

seamless delivery of care.

Electronic Medical Record (EMR)	Electronic Health Record (EHR)
A digital version of a paper chart from one provider only	A digital version of a patient's overall health history from various health-care providers
Cannot be shared with another health-care provider	Designed to easily share health information across various health-care settings
Not intended to allow patient information to move outside one health-care setting	Designed to allow medical information to move with the patient to various health-care settings
Used for diagnosis and treatment only	Includes various built-in tools for supporting medical decision-making

TABLE 37.2 EMRs vs. EHRs

Patient Portals

A **patient portal** is a secure online platform that provides patients with twenty-four-hour access to their personal health information. By connecting to the internet and logging in with their secure username and password, patients may access information such as recent health-care visits, discharge summaries, medications, immunizations, allergies, procedure results, and lab results. Some portals even allow the patient to securely message their provider, request prescription refills, schedule appointments, check insurance benefits and coverage, update contact information, make payments, download and complete medical forms, and view educational materials. Not only do patient portals save time, enhance communication between patients and providers, and provide support to patients, they also allow patients to become more engaged and in control of their own health and care.

37.3 Influences on Delivery of Health Care

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss the impact of information technology on health care
- Identify ways that information technology transforms direct and indirect patient care
- Discuss the nurse's role in fostering the use and advancement of technology in health care

In recent years, information technology has been at the forefront of revolutionizing numerous industries, and health care is no exception. The integration of technology into health-care systems has led to significant advancements, positively impacting patient care and outcomes. As the health-care landscape continues to evolve, nurses find themselves at the forefront of this digital transformation, playing a vital role in leveraging technology to improve health-care services.

Impact of Information Technology on Health Care

Information technology has revolutionized health care and will continue to do so in the future. Key areas of influence include:

- Communication: EHRs, telemedicine, and secure messaging systems have significantly improved communication between health-care providers and patients, enabling more timely and efficient exchange of information.
- Patient outcomes: Information technology has facilitated the use of advanced diagnostic tools, personalized treatment plans, and evidence-based practices, all of which contribute to improved patient outcomes. Real-time data monitoring and predictive analytics also help in early detection and prevention of medical conditions.
- Data utilization: The integration of big data analytics in health care allows for the collection, analysis, and interpretation of vast amounts of patient data, enhancing overall clinical decision-making, supporting research and development, and enabling health-care providers to deliver more accurate and effective care.

- Operational efficiency: Automation of administrative tasks, such as appointment scheduling, billing, and inventory management, has streamlined operations, reduced errors, and increased efficiency in health-care facilities.
- Patient engagement: Health information technologies, such as patient portals and mobile health applications, empower patients to take an active role in managing their health. These tools provide access to medical records, facilitate appointment bookings, and offer educational resources to support informed decision-making.
- Security and privacy: Advanced IT solutions have improved the security and privacy of patient information through the implementation of robust encryption protocols, access controls, and compliance with regulatory standards.

Communication

Information technologies have led to enhanced communication among the patient, provider, and care team. Through use of technologies such as EHRs, messaging systems, and patient portals, coordination of care has been enhanced. All parties can access the most up-to-date information, ask and answer questions, and review the plan of care to ensure understanding. Enhancing communication has resulted in benefits such as informed decision-making, stronger relationships, and decreased delays in care.

For example, patient portals allow patients to access their personal health information and provide two-way communication with their provider. Telemedicine has provided the opportunity for patients to receive care via real-time, two-way communication with a provider or via asynchronous transmission of patient information. Messaging systems allow nurses to quickly send medical updates and questions to the provider without causing interruptions to their workflow.

Other technologies have impacted communication during transitions of care. “Hand-off” communication tools have structured the reporting of patient-specific information from one caregiver to another. Discharge summaries provide a snapshot of the patient’s condition, care that was provided, necessary education, and home care instructions. Not only have discharge summaries enhanced communication for patients upon discharge, but they also serve to ensure continuity of care upon transfer to other levels of care, thereby protecting patient safety.

Patient Outcomes

Information technologies are a valuable tool for improving health-care quality and safety. Technology has improved the accuracy, speed, and accessibility of diagnostics and has the potential to decrease the severity of chronic illnesses due to earlier detection and intervention. Telehealth platforms, for example, leverage technology to remotely monitor and manage chronic conditions. Patients can use wearable devices to track vital signs, and health-care providers can access real-time data to make timely adjustments to treatment plans; these practices enhance accessibility to care, reduce the need for frequent in-person visits, and help manage chronic illnesses more effectively. It has also led to enhanced patient safety by reducing medication errors, reducing adverse drug reactions, improving compliance to practice guidelines, and enhancing care coordination.

For example, **computerized provider order entry (CPOE)** has allowed providers to enter medical orders directly into the patient’s electronic medical record. Not only has this practice reduced the human error in transcribing orders, but it has also been instrumental in catching possible medication order errors, such as prescribing a medication that the patient may be allergic to or a medication that is contraindicated. Clinical decision supports—such as notifications, alerts, reminders, clinical guidelines, condition-specific order sets, clinical summaries, documentation templates, and diagnostic supports—have supplied providers with the necessary information to make informed decisions to support patient care.

Other examples of how technology has impacted patient care can be identified within the medication administration process. Bar code administration has helped to ensure the right medication for the right patient. Smart pumps are programmed to reduce errors with intravenous (IV) administration. Automated dispensing cabinets are electronic drug cabinets that store and dispense medications at the point of care. Medications may be placed within the patient’s profile by the pharmacy, thereby reducing the risk of the nurse removing the wrong medication. Additional features—such as dual-sign off on “high risk” and controlled medications (e.g. insulin, heparin), use of red or tall lettering to identify look-a-like drugs, and providing access to only the intended medication—have been implemented to enhance medication administration safety.

CLINICAL SAFETY AND PROCEDURES (QSEN)

Leveraging Technology for Enhanced Health-Care Quality and Safety

Information technologies stand at the forefront of advancing health-care quality and safety, offering a myriad of benefits that positively impact patient outcomes.

- Patient-centered care: Innovative tools such as AI-powered diagnostics and genomic medicine accelerate diagnostic processes, enabling a patient-centered approach by swiftly identifying conditions and potentially mitigating the severity of chronic illnesses.
- Evidence-based practice: Embracing EHRs ensures adherence to practice guidelines, promoting standardized and evidence-based care. This technological integration reduces medication errors and adverse drug reactions, contributing to enhanced patient safety.
- Quality improvement: The use of technology in chronic disease management, including remote monitoring devices and telehealth platforms, fosters continuous quality improvement. Real-time data exchange allows for timely interventions, ultimately reducing the severity of chronic conditions and improving overall health outcomes.
- Safety: Electronic communication platforms and health information exchange systems play a crucial role in enhancing care coordination. By enabling real-time collaboration among health-care teams, technology contributes to a safer health-care environment, reducing the likelihood of errors.

By integrating these technological advancements, nurses are better equipped to provide patient-centered, evidence-based care, foster continuous quality improvement, and enhance safety measures, aligning with the core competencies outlined by the Quality and Safety Education for Nurses (QSEN).

Role of Data in Patient Care

Information technologies provide insightful data that can be analyzed to improve the delivery of health care for individuals and populations—for example, by investigating methods of improving the provision of clinical care, enhancing disease prevention, and measuring the effectiveness of various treatment options. Technologies that enable the collecting and storing of data in real time have led to improved decision-making, advancements in treatment analysis, production of research, and root-cause analyses when a breakdown in care is identified. By identifying warning signs in data, providers can implement interventions before a disease or condition worsens. Data collected during the COVID-19 pandemic, for example, allowed for contact tracing of the virus and tracking of "hot spots" that experienced a high incidence rate of the virus. In collecting and analyzing this data, public health officials could identify trends and put measures in place to decrease the spread of the virus.

LINK TO LEARNING

Read this article for more information about the benefits of data analytics in health care (https://openstax.org/r/77DataAnalytics) from Maryville University.

The role of data in health care cannot be underestimated. Data is needed for continuous improvement in what we do and how we do it. For data to be meaningful, however, it must be accurate, complete, reliable, relevant, and timely. Data must also be standardized to allow for a mutual understanding of the data and interoperability between systems. Four types of standards must be addressed (Table 37.3): terminology standards, content standards, data exchange or transport standards, and privacy and security standards.

Type of Standard	Purpose	Example
Terminology	Ensure clarity of meaning, help to provide a mutual understanding of what is meant, and ultimately help to reduce miscommunication	ICD-10 codes to codify medical diagnoses
Content	Ensure that medical data is properly organized and represented in forms that are clear and easy to understand	Rules for structuring medical records or encoding data elements
Data exchange/ transport	Facilitate the movement of information between different health systems	The exchange of direct personal health information from one provider to another
Privacy/ security	Establish rules to protect sensitive health data	HIPAA

TABLE 37.3 Standards for Data Analytics in Health Care

Transforming Patient Care

New, innovative information technologies are transforming both direct and indirect patient care. The comprehensive integration and adoption of digital technologies, processes, and strategies across an organization to fundamentally change how they operate and deliver value, or **digital transformation**, gives health-care organizations the opportunity to gain a competitive advantage by modifying their business processes, culture, and customer experiences. Organizations can leverage digital technologies to improve operational decision-making related to patient flow, staffing, scheduling, and supply chain management. For example, a decision-support algorithm can be used to remove bias from operational tasks or predict the level of care a patient may need or the number of expected admissions, discharges, and transfers during a specified time period. Algorithms can also be used to predict nurse absenteeism to determine staffing patterns and needs. Data related to the timing of procedures, time spent in the post-anesthesia care (PACU), and timing of discharge education can be used to create scheduling algorithms. In terms of supply chain management, radio-frequency identification (RFID) technologies can be used to track and locate supplies and devices, and electronic databases can be used to keep track of supplied inventory, in both cases decreasing operating costs for the organization.

Information technologies have also improved the workload of nurses and other care providers. For example, the process of centralizing patient records into EHRs has eliminated time spent searching through paper charts, helped to clarify and streamline the documentation of care, and enabled the setting of electronic reminders for tasks that need to be completed. Such time-saving measures create more time for nurses and providers to spend with patients.

Technologies intended to improve safety, efficiency, and quality are also transforming how we deliver care and the resulting patient outcomes. The way care was delivered ten years ago is quite different than today, and the care we deliver today will look very different in ten years. Rapid advances in care will be revolutionized through evidence-based practice (EBP), research, advances in technologies, and federal regulatory organizations such as The Joint Commission and the Centers for Medicare and Medicaid Services.

Smart Beds

A **smart medical bed** is a highly innovative hospital bed with additional technical features that support best practice for patient care. They are a Class 2 medical device (which are subject to specific regulatory controls to ensure their safety and efficacy) and have become a gold standard in patient care. High-tech beds reinforce patient safety and improve patient care outcomes.

Available features depend on the type of bed purchased; however, most smart beds include fall prevention features. Bed alarms signal staff when the patient is getting out of the bed. Some beds are even programmed with verbal

commands that will tell the patient not to get up until help arrives. As an added feature, the verbal prompts can sometimes be set in different languages to accommodate diverse patients. Additional safety features to prevent falls include motion-activated night-lights and reminders for the health-care staff, such as alerts if the wheels are not locked or the bed alarm is not set.

Data captured from smart beds can be used to improve patient care. For example, by conducting a debrief in the event a patient falls to determine which settings were activated, how long the bed alarm had been sounding, and how the patient had moved prior to the fall. The data may also be used to prevent falls: for example, by analyzing the patient's movements to determine which bed alarm setting would be most appropriate for the patient.

Smart beds can also be used to reduce the prevalence of pressure ulcers. The latest mattresses include pressure-redistribution functions that help to redistribute weight over bony prominences. Some mattress surfaces are made of "microclimate" technology that reduces body heat and absorbs excess moisture, thereby preventing the breakdown of skin. Additional features may also include supports to help the care team turn the patient.

By utilizing special sensors, smart beds can also capture data that may be used to support clinical diagnostics. Some beds can detect the patient's pulse, respirations, and temperature. If abnormalities are noted, the provider or health-care team is alerted to check on the patient. Smart beds can also capture patient weights—they can even be programmed to subtract the weight of the bed linens from the patient's weight to ensure accuracy.

Other features enhance convenience for the patient: for instance, a call bell may be built into the side rails for use when the handheld call bell cannot be reached. Some beds also include USB ports for the patient to charge their electronics and storage compartments for easy access to their belongings. Additional features to support patient comfort include adjustable head and foot positions, back and leg massagers, and Bluetooth speakers.

Wearable Devices

A **wearable device** is a health monitoring device worn on the body to monitor health data. Using biosensors, wearable devices can collect data such as heart rate, blood pressure, respirations, sleep patterns, activity, blood glucose, and more. These devices can be used to monitor fitness, wellness, and disease management; to store patient health information; and to provide patient reminders (Smuck et al., 2021).

There are many different types of wearable devices on the market, with new technologies constantly being developed. Smartwatches, for instance, can detect oxygen saturations and pulse and provide ECG readings. While smartwatches cannot provide accurate blood pressure readings, there are blood pressure cuffs that will automatically connect to a smartphone to store data that can be shared with the provider. Fitness trackers can be used to measure heart rate, steps, activity, and sleep patterns. A **continuous glucose monitor (CGM)**, a device to automatically estimate blood glucose levels, can be scanned to provide blood sugar readings (Figure 37.8). Sensors reduce the need for routine finger sticks (finger sticks are still needed for calibration and quality control) and allow blood sugar readings to be shared instantaneously with the provider. All these technologies enable patients to take a more proactive approach to their health and well-being, while also sharing important data with their providers.

(a) (b)

FIGURE 37.8 (a) A wearable glucose monitor utilizes a sensor to capture blood glucose readings. (b) By gently waving or tapping a mobile device over the sensor, the mobile application will present the blood glucose reading and store it for future reference. (credit a and b: reproduced with permission from Laurie Sparks)

Smart Pumps

A **smart pump** is an intravenous (IV) infusion device that combines computer technology and drug libraries to limit the potential for medication errors. Embedded software provides a drug library that stores usual concentrations, dosing, and dose limits for each medication. The nurse may search the drug library for the medication to be administered, automatically populating the pump settings. Safeguards can also be programmed to alert the nurse if the dose exceeds a predetermined limit. These features reduce the likelihood of the medication being programmed and delivered incorrectly.

Additional safety features of smart pumps include alerts of possible adverse drug reactions and the ability to input patient weight to determine the appropriate dose of medication. Smart pumps also provide a variety of alarms to alert the nurse of line occlusions, air bubbles, and completed infusions, as well as reminders to start the infusion and plug the IV pump into the power outlet.

Many smart pumps enhance interoperability by integrating the IV pump with the patient's EHR. Bar code medication administration allows the medication to be verified within the patient's orders. Once the medication is scanned, the EHR will then send the administration details (such as medication name, rate, dose) to the smart pump for the nurse to verify before initiating the administration. Following this process minimizes the risk of human error in programming the smart pump and promotes accurate documentation of medication administration in the EHR. Two-way communication between the smart pump and the EHR enables the pump to feed information (such as volume infused and rates of titratable drugs) back to the EHR, reducing the need for the nurse to manually input this information into the chart. Nevertheless, the nurse administering the medication is ultimately responsible for any errors that may occur, so they should always have a questioning and critical thinking mindset as they work.

Like other information technologies, smart pumps produce data that may be captured, stored, and analyzed. Drug libraries, for instance, detail the lower and upper bounds that govern each medication's safe infusion rate—information that can be used to support point-of-care decisions. If a hard stop is overridden, data can be collected to determine the date, time, nurse, and reason selected for the override. In the event of a medication error, data can be reviewed to determine if the drug library was used to program the pump, if the correct medication was

selected from the drug library, and if the pump was programmed correctly. Vital signs, such as continuous capnography of respirations and pulse-oximetry, can be collected when patient-controlled analgesia is used. These data can be automatically populated in the EHR, and the care team can be alerted of the potential for adverse reactions, such as narcotic-induced respiratory depression.

Role of the Nurse

Nurses play a vital role in fostering the use of technology and supporting the advancement of technology in health care. As nurses, we must embrace the reality that technology is here to stay and use it to our advantage to deliver the very best care possible. When we embrace technology, we open the door to possibilities that will transform the nursing profession and enhance the provision of quality outcomes in health care.

How nurses perceive technology will influence the perceptions of others and ultimately impact the usage and acceptance of technology within the health-care arena. It is important that nurses take the lead in the transformation of services and involve themselves in all aspects of designing, developing, and implementing technologies. The feedback from nurses regarding the performance of technology is invaluable in shaping the adoption and improvement of new tools in health-care settings. Nurse managers recognize the significance of frontline health-care professionals' experiences and insights in assessing the practicality and effectiveness of technology. Nurses' opinions serve as a crucial gauge of usability, functionality, and overall impact on patient care. This user-centric approach allows nurse managers to make informed decisions about technology adoption, ensuring that the tools align with the workflow, enhance efficiency, and contribute positively to patient outcomes. Regular feedback loops also empower nurses to play an active role in the iterative improvement of technology, fostering a collaborative and adaptive approach to health-care innovation.

Education

One of the primary roles of nursing is education. We educate our patients on all aspects of care, including technology. As nurses, it is our responsibility to educate our patients about the role of technology in health care, its benefits, and the ways in which it facilitates the delivery of care.

We should encourage patients to embrace technology and empower them to use technology to take an active role in their care. One way to do this is to educate patients on how to set up and use a patient portal. Engaging in discussion and offering to assist with setting up their account before leaving the visit will increase the likelihood of successfully creating their portal account. Once logged in, nurses can help patients to navigate the portal and locate important features they may frequently use. Similarly, we can help patients to set up telemedicine accounts and demonstrate how to request and access a visit. Patients should also be educated on what to expect during a telemedicine visit, as well as tips to enhance their experience, such as minimizing background noise and distractions and setting up audio and video in advance.

As patients take a more active role in their care, nurses may need to teach them how to locate credible sources of health information that are current, relevant, accurate, serve the right purpose, and are sourced by experts with authority in the topic. Even with the increased use of technology and the internet in today's world, we need to be cognizant that not all patients have access to such digital advantages. The gap between those who have and those who lack access to the internet and such technologies is referred to as the **digital divide**. As health-care providers, we need to be aware that the digital divide exists and ask our patients if they have access to the internet before providing them with electronic and web-based information sources and options of care.

Nurses also play a role in educating fellow nurses and providers. A nurse who takes the lead in implementing new technologies can become a **super user**: a clinical end user who receives specific training that enables them to provide support and education to others. Not only do super users provide technical support, but they also serve to create excitement, engagement, and ownership in the implementation of the technology.

Informatics

From their position at a patient's bedside, nurses are key informants about current trends, needs, ideal workflows, challenges, and gaps in care. By involving nurses from the beginning of the technology design process, technologies can be developed with the end user in mind to address actual health-care issues, which may sometimes be different than what developers originally planned to address.

Involving nurses in the development of technologies will enhance the user's experience when interacting with an

object, a product, or a service. The concept of user experience focuses on who the user is, what they need, what their abilities and limitations are, and if they value the product, system, or service. The goal of creating a good user experience is to maximize usefulness and pleasure in using the product, service, system, or interface. Nurses may also improve **usability**, the ease with which people can use a product to achieve a certain goal.

REAL RN STORIES

Nurse: Lisa, BSN
Years in Practice: Two
Clinical Setting: Medical-surgical unit
Geographic Location: Small rural city in North Carolina

Our organization had been using an electronic medical record; however, we decided to switch to a more nationally known electronic health record. I was selected to be a super user to help educate staff on how to use the system. Super users attended an eight-hour training session to learn the system and how to use it. Having this training before the system was implemented made me feel much more at ease on "go-live" day. I knew what to expect, where to find the information I needed, and how to navigate the chart. I served as a resource for my peers for the first week after implementation, helping them to navigate the system, boost their confidence, and create excitement about the change.

While all staff received training on the system ahead of time, the super user training was provided by nursing informaticists and was geared toward how nurses would interact within the system. Staff training was provided by information technology (IT) support from the EHR company; however, the trainers were not nurses. While IT super users were available to support staff during the transition, it was the nurse super users who had the biggest impact in supporting the user experience. Nurse super users were able to provide insight into the clinical workflows and share tips with staff for charting and finding the information they need, when they need it, in the most convenient way. One nurse even mentioned she had "learned more from me in ten minutes than she did during her training course." While the IT team has the technical knowledge of information technologies, nurses are essential to bridging the gap between the health-care team and the IT team by providing the nursing and health perspectives to ensure successful implementation of health informatic technologies.

Strategies for Staying Current

As nurses, we must continuously strive to stay abreast of the most current and up-to-date methods for delivering care. This includes staying well-informed on current uses of informatics and information technology, implications for practice, and data usage, as well as future trends of care. As such, nurses should participate in continuing education opportunities as informatics and information technologies continue to be developed.

Several well-regarded organizations provide educational opportunities, advocacy, and continuing development within the realm of health-care informatics. The Healthcare Information and Management Systems Society (HIMSS) is the oldest nursing informatics organization. Created in 1961, this organization is the global leader in health innovation, public policy, and workforce development. Other professional organizations can be found in Table 37.4; they exist alongside many others that continue to develop as the specialty of health informatics accelerates. It is important for nurses to take an active role in these professional organizations to stay up-to-date on the continual evolution of health-care technologies and to bring the nursing perspective to conversations about the future of care.

Professional Organization	Mission	Strategic Goals	Website
American Medical Informatics Association (AMIA)	"AMIA aims to lead the way in transforming health care through trusted science, education, and the practice of informatics. AMIA connects a broad community of professionals and students interested in informatics. AMIA is the bridge for knowledge and collaboration across a continuum, from basic and applied research to the consumer and public health arenas." (AMIA, n.d., para 1)	1. Advance science of informatics 2. Promote informatics education 3. Ensure effective use of health information technology 4. Advance informatics profession 5. Member services and development	https://amia.org/
American Nursing Informatics Association (ANIA)	"The purpose of ANIA is to advance nursing informatics through education, research, and practice in all roles and settings." (ANIA, n.d., para 1)	1. Provide informatics nursing education 2. Support informatics nursing research and EBP 3. Advance informatics nursing practice	https://www.ania.org/

TABLE 37.4 Informatics Professional Organizations

Professional Organization	Mission	Strategic Goals	Website
Alliance for Nursing Informatics (ANI)	"To advance nursing informatics practice, education, policy, research and leadership through a unified voice of nursing informatics organizations." (ANI, n.d., para 1)	1. Membership outreach 2. Nursing informatics competencies, education, and training 3. Provide national leadership for health information technologies 4. Promote professional practice of nursing informatics 5. Support nursing informatics research	https://www.allianceni.org
American Health Information Management Association (AHIMA)	"AHIMA is the leading voice and authority in health information, wherever it is found. Our people work at the intersection of healthcare, technology, and business." (AHIMA, n.d., para 1)	1. Help families make informed decisions 2. Guide EBP 3. Educate health information professionals	https://www.ahima.org/
International Medical Informatics Association (IMIA)	". . . to bring people together from around the world to advance biomedical and health informatics science, education, and practice through mutual learning and exchange of knowledge, skills and ideas." (IMIA, n.d., para 2)	1. Advocacy 2. Collaboration 3. Membership engagement 4. Promote academic and professional excellence	https://imia-medinfo.org/wp/

TABLE 37.4 Informatics Professional Organizations

Another way nurses can stay well-informed about the evolving field of informatics is by reading current literature. Several journals that are geared toward health informatics include the *Journal of Healthcare Information Management*, *Online Journal of Nursing Informatics*, *JAMIA* (the *Journal of the American Medical Informatics Association*), and *CIN: Computers, Informatics, Nursing, and International Journal of Medical Informatics*. As the nursing informatics specialty continues to grow, new journals may be created to disseminate the important work

and knowledge that result.

Nurses interested in a career in informatics may obtain an advanced degree or certification in the field. While some entry-level informatics positions do not require an advanced degree, earning a master of science in nursing (MSN) or a doctor of nursing practice (DNP) provides nurses with considerable professional opportunities. Most graduate nursing programs that provide a specialization in informatics focus on health information systems, data management, or health law/ethics. Upon completion of a graduate program, one may earn their certification in informatics nursing by sitting for a national certification exam such as the Informatics Nursing Certification Exam, established by the American Nurses Credentialing Center (ANCC). HIMSS has also established two exams: the Certified Associate in Healthcare Information and Management Systems (CAHIMS), for relatively new informaticists, and the Certified Professional in Healthcare Information Management Systems (CPHIMS), for more advanced informaticists.

Beyond Bedside

While all nurses are users of nursing informatics, it is important to note that nursing informatics is considered a nursing specialty. A nurse who works within this specialty is called an **informatics nurse specialist (INS)**. This specialty of nursing is unique because it brings clinical knowledge to the world of technology to create useful and usable solutions to make nurses' lives easier and patient care safer and more effective. Informatics nurse specialists have contributed to health care through the purchase, design, and implementation of information systems, as well as by developing, critiquing, and promoting standard terminology to be used in health-care informatics. According to the U.S. Bureau of Labor Statistics, employment for health informatics specialists is projected to grow 9 percent between 2020 and 2030 (U.S. Bureau of Labor Statistics, 2022).

With the advent of nursing informatics as a specialty, the American Nurses Association (ANA) developed scope and standards of practice for nursing informatics. There are a wide variety of roles in which nurse informaticists can apply the ANA scope and standards of practice. They can take charge of planning and managing informatics projects through a project manager role. They can become consultants and share their advice, opinions, and recommendations with others. They can be educators, developing and implementing trainings and educational materials for organizational systems or upgrades. They can create new informatics or clinical knowledge as researchers. They can design, produce, or market new informatics solutions or products as product designers or developers. As decision support or outcomes managers, they can work to ensure that data integrity and reliability are maintained. They can advocate for patients and support the development of health-care policy. As clinical analysts, they can function as liaisons between the worlds of clinical practice and information technology. Informatics nurse specialists may also become entrepreneurs, creating marketable business ideas, solutions, or products for the health-care market.

Not only do nurse informaticists have the potential to impact the delivery of health care, but they are also involved in what can be a very financially rewarding career. According to a 2020 survey conducted by the Healthcare Information and Management Systems Society (HIMSS), 49 percent of nursing informaticist salaries reached $100,000 per year and 10 percent of salaries reached $151,000 or higher (HIMSS, 2020). Obtaining a doctorate degree or certification in informatics contributed to the highest salaries, as did experience in the field.

LINK TO LEARNING

To learn more about nursing career opportunities in the field of informatics, read this interview with nurse informaticists (https://openstax.org/r/77Informatics) from the Healthcare Information and Management Systems Society (HIMSS).

Summary

37.1 Telemedicine and Artificial Intelligence

- Telemedicine enables remote health-care delivery using technology for diagnosis and treatment.
- Artificial intelligence (AI) enables machines to solve problems and perform tasks that typically require human intelligence by leveraging the power of computer science and robust data sets (IBM, n.d.-a).
- AI enhances telemedicine by providing telemonitoring, diagnosis, treatment plans, patient engagement, and chronic disease management. The integration of AI and telemedicine can lead to improved quality of care, reduced costs, improved outcomes, optimized resources, and increased access to care. Challenges of utilizing telemedicine include the need to learn how to use new technologies, potential health disparities, limitations in remote treatment for certain conditions, and the potential to dehumanize patient care. Establishing laws and regulations is crucial for determining liability, defining boundaries, enhancing transparency, providing informed consent of data use, and ensuring data security and privacy.
- Reliable data are essential for accurate AI algorithms, while human expertise is needed to validate AI-produced diagnoses and recommendations.
- Technological advancements, including AI, have transformed nursing education through enhanced simulation, augmented reality, and virtual reality. Nurses have a responsibility for learning, integrating, and supporting the evolution of health-care technologies. It is important to identify how technology has improved the role of the nurse and minimize challenges, such as resistance to change and burnout.

37.2 Health Informatics

- Health informatics is a specialized field that combines information, technology, and health-care knowledge to improve patient care.
- Informatics enhances collaboration, communication, safety, satisfaction, efficiency, and effectiveness within the delivery of health care. Examples of advances in health informatics that have been used to improve care include information and communication technologies, predictive medicine, and epidemic tracking.
- Pieces of legislation related to health informatics include the Health Insurance Portability and Accountability (HIPAA) Act, American Recovery and Reinvestment Act (ARRA), Health Information Technology for Economic and Clinical Health (HITECH) Act, Medicare Access and CHIP Reauthorization Act (MACRA), 21st Century Cures Act (Cures Act), Food and Drug Administration Safety and Innovation Act (FDASIA), and Coronavirus Aid, Relief, and Economic Security (CARES) Act.
- Health IT is governed by agencies such as the Office of the National Coordinator for Health Information Technology (ONC), the Health Informatics and Interoperability Group (HIIG), the Centers for Medicare and Medicaid Services (CMS), the U.S. Department of Health and Human Services (HHS), the Office of Health Informatics within the Food and Drug Administration (FDA), the International Organization for Standardization (ISO), and the American Health Information Management Association (AHIMA).
- Interoperability in health care refers to the seamless exchange and use of electronic health information across different systems, enabling coordinated and patient-centered care.
- Meaningful use incentivizes health-care providers to adopt and effectively use electronic health records to enhance patient care, improve outcomes, and promote health IT interoperability.
- An electronic medical record (EMR) is a digital form of a paper chart for use by one medical practice, whereas electronic health records (EHRs) are comprehensive medical records that are portable and move with the patient. EHRs provide enhanced communication and coordination of care, resulting in increased efficiency, cost savings, and seamless delivery of health care.

37.3 Influences on Delivery of Health Care

- Information technology has revolutionized health care by significantly impacting aspects of communication, patient outcomes, and data used for patient care.
- Health-care technology has transformed patient care by improving safety, efficiency, quality, and patient outcomes. Examples of technologies that have transformed patient care include smart beds, wearable devices, and smart pumps.
- Nurses play a critical role in the adoption of health technologies. Educating patients and staff on the advantages of technology and tips for utilizing it will empower them to accept and engage in the technology.

Thus, it is important for nurses to actively engage in designing, developing, and implementing new technologies.
- Continuing education related to informatics is available through professional organizations and journals. Advanced degrees and certifications are also available as pathways to informatics roles beyond the bedside.

Key Terms

21st Century Cures Act (Cures Act) legislation passed in 2016 to promote and fund the acceleration of research to prevent and cure serious illness, accelerate drug and medical device development, address abuse crisis, and improve the delivery of mental health services

American Recovery and Reinvestment Act (ARRA) legislation passed in 2009 to stimulate the economy following a recession

artificial intelligence (AI) ability of machines, by applying computing power to large amounts of data, to solve complex problems and perform tasks that typically require human intelligence

augmented reality (AR) superimposition of a computer-generated environment onto the real world to create an interactive experience for the user

avatar digital representation of an individual created within a virtual environment

computerized provider order entry (CPOE) medical order that a provider enters directly into the patient's electronic medical record

consumer health informatics field of study and application that focuses on the use of information and communication technologies to empower individuals in managing their health and health care

continuous glucose monitor (CGM) device to automatically estimate blood glucose levels

Coronavirus Aid, Relief, and Economic Security Act (CARES Act) legislation passed in 2020 in response to the COVID-19 pandemic

digital divide gap between those who have access to the internet and related technologies and those who do not

digital transformation comprehensive integration and adoption of digital technologies, processes, and strategies across an organization to fundamentally change how they operate and deliver value

electronic medical record (EMR) digital form of a paper chart for use by one medical practice

Food and Drug Administration Safety and Innovation Act (FDASIA) legislation passed in 2012 to develop strategies and recommendations for a health IT regulatory framework

health informatics field that integrates information science with health care

Health Information Technology for Economic and Clinical Health (HITECH) Act legislation passed in 2009 (as part of ARRA) to promote electronic health records and a national health information infrastructure to support interoperability

incidence number of new cases of a specific disease or health-related event that occur within a defined population during a specified time period; measures the risk of developing a condition

informatics science of information

informatics nurse specialist (INS) nurse who specializes in nursing informatics

information and communications technology (ICT) all communication technologies that enable users to access, retrieve, store, transmit, and manipulate digital information

interoperability ability of different systems to "talk" to each other

machine learning ability of AI to analyze data by using algorithms and models that recognize patterns in data

meaningful use use of electronic health records to their full extent, facilitating the electronic exchange of information so that quality of care may be improved

Meaningful Use Electronic Health Record (EHR) Incentive Program initiative established by the U.S. government under the HITECH Act to encourage health-care providers to adopt and demonstrate meaningful use of certified EHR technology

Medicare Access and CHIP Reauthorization Act (MACRA) legislation passed in 2015 to reward Medicare clinicians with payment increases for delivering high-quality care and reduce payments for clinicians who do not meet performance standards

patient portal secure, online platform that provides patients with twenty-four-hour access to their personal health information

precision health innovative approach to health care that takes into account individual differences in genetics, environment, and lifestyle

predictive medicine use of laboratory and genetic tests to determine an individual's probability of developing a disease
prevalence total number of cases (both new and existing) of a particular disease or condition in a population at a specific point in time or over a specific period
public health informatics field that applies science and technology to meet the needs of public health
smart medical bed highly innovative hospital bed with additional technical features that support best practices for patient care
smart pump intravenous (IV) infusion device that combines computer technology and drug libraries to limit the potential for medication errors
super user clinical end user who receives specific training for providing support and education to others
surveillance collecting, analyzing, and disseminating data related to diseases, health outcomes, and injuries
telemedicine remote diagnosis and treatment of patients by means of telecommunications technology
usability ease with which people can use a product to achieve their goals
virtual reality (VR) use of hardware (a headset) and software (the VR platform) to create an immersive, simulated environment
wearable device health monitoring device worn on the body to monitor health data

Assessments

Review Questions

1. The nurse is discussing machine learning with a nursing student during a clinical rotation. What is an example of a statement made by the nursing student that would warrant further education?
   a. "Machine learning algorithms analyze patient data, including electronic health records and lifestyle information, to predict the risk of diseases such as diabetes or cardiovascular conditions."
   b. "Machine learning is used to analyze medical images (MRI, CT scans, x-rays) for the early detection and diagnosis of conditions like cancer."
   c. "Machine learning uses rule-based clinical decision support systems with a set of predetermined rules based on clinical guidelines to assist health-care providers in making decisions."
   d. "Machine learning algorithms match eligible patients with appropriate clinical trials by analyzing patient records and trial criteria."

2. A newly graduated nurse educates a patient on the benefits of artificial intelligence in health care. What is an example of a statement made by the nurse that would warrant further education by the nurse preceptor?
   a. "AI enhances the speed and accuracy at which health care is delivered."
   b. "AI can use algorithms to predict diagnoses and treatment plans."
   c. "AI can be used to provide personalized treatment plans to improve health outcomes."
   d. "AI analyzes real-time data to definitively diagnose patient conditions."

3. While telemedicine is associated with many benefits, it may also create challenges. How can the nurse help to reduce potential challenges of integrating AI into telemedicine?
   a. assume informed consent of using patient data for machine learning
   b. inform patients to seek telemedicine visits for all care needs
   c. educate patients without internet access to access telemedicine using public Wi-Fi
   d. verify all AI recommendations using human judgment and knowledge

4. What piece of legislation was responsible for widespread adoption of electronic health records?
   a. 21st Century Cures Act (Cures Act)
   b. Health Information Technology for Economic and Clinical Health (HITECH) Act
   c. Health Insurance Portability and Accountability Act (HIPAA)
   d. Medicare Access and CHIP Reauthorization Act (MACRA)

5. What piece of legislation was responsible for ensuring electronic medical records could be used in a meaningful way?

a. Coronavirus Aid, Relief, and Economic Security Act (CARES Act)
b. Food and Drug Administration Safety and Innovation Act (FDASIA)
c. Health Insurance Portability and Accountability Act (HIPAA)
d. Medicare EHR Incentive Program

6. What is an example of a statement that demonstrates an accurate understanding of the impact of legislation on health-care informatics?
a. "The CARES Act was developed to promote the acceleration of research to prevent and cure serious illness."
b. "The American Recovery and Reinvestment Act (ARRA) was responsible for adoption of electronic health records in a meaningful way."
c. "The 21st Century Cures Act (Cures Act) was developed to modernize the infrastructure of public health surveillance."
d. "The HITECH Act was developed to create privacy standards and stimulate the economy."

7. What is an example of a statement that demonstrates an accurate understanding of the governing institutions of health-care informatics?
a. "The Office of the National Coordinator for Health Information Technology (ONC) oversees regulating health information technology."
b. "The Office of Health Informatics within the Food and Drug Administration (FDA) works to establish global informatics standards."
c. "The International Organization for Standardization (ISO) researches informatics tools, solutions, and expertise."
d. "The Health Informatics and Interoperability Group (HIIG) coordinates national health information technology efforts."

8. What is the significance of the HITECH Act's impact on nursing documentation practices?
a. It encourages nurses to prioritize handwritten documentation over electronic records.
b. It has no influence on nursing documentation practices.
c. It emphasizes the adoption of electronic health records to improve accuracy and accessibility of documentation.
d. It made documentation in nursing practice more difficult and time-consuming.

9. As a nurse working in a technologically advanced health-care facility, how would the nurse best apply health informatics principles to optimize patient care?
a. Prioritize traditional, paper-based documentation for a comprehensive patient record.
b. Implement electronic health records (EHRs) to seamlessly capture, store, and retrieve patient information.
c. Limit the use of technology to avoid potential privacy and security concerns.
d. Rely solely on manual calculations for medication administration to ensure precision.

10. A nurse is educating a patient on uses for wearable devices. What is an example of a statement made by the patient that would warrant further education?
a. "Smartwatches ensure an accurate blood pressure is captured."
b. "Fitness trackers can help me to better understand my sleep patterns."
c. "Sensors can be used to detect my blood glucose levels."
d. "ECG readings may be captured via wearable devices."

11. What is an example of a statement that demonstrates an accurate understanding of the role of the nurse in fostering the use of technology?
a. "Nurse informaticists will tell the bedside nurses everything they need to know about technology."
b. "The user experience and usability impact the adoption of technology."
c. "Super users provide key insight into the development of technological products."

d. "Technology should be avoided if the patient doesn't know how to use it."

12. The nurse is precepting a nursing student. What is an example of a statement made by the nursing student that indicates an accurate understanding of informatics?
   a. "Super users provide peer-to-peer training and support during implementation of a product."
   b. "The digital divide refers to electronic health records not interacting with one another."
   c. "Usability refers to the user's experience while interacting with a product."
   d. "User experience refers to the ability of the user to achieve their goal when using the product."

Check Your Understanding Questions

1. What is telemedicine?

2. What is artificial intelligence?

3. What is health informatics?

4. What is the difference between an electronic health record and an electronic medical record?

5. What is the impact of health informatics on patient care?

6. How have smart pumps transformed direct patient care?

Reflection Questions

1. Reflect on your experiences with simulation or augmented or virtual reality. How was AI used? What role did these technologies play in preparing you for practice?

2. Many health-care organizations have adopted electronic health records, yet the goal of health records being accessible by all providers has not been achieved. Why is this?

3. How has information technology impacted health care?

What Should the Nurse Do?

Mrs. Johnson, a forty-year-old female, contacts the telemedicine service with complaints of persistent headaches and visual disturbances. She reports a medical history of hypertension and diabetes, currently managed with medications. During the video consultation, Mrs. Johnson mentions feeling fatigued and having trouble managing her blood glucose levels. Her vital signs include a blood pressure of 150/90 mmHg, heart rate of 80 bpm, respiratory rate of 16 breaths per minute, and a temperature of 37.2°C (99°F). Through the telemedicine platform, an AI algorithm analyzes Mrs. Johnson's symptoms and medical history, providing real-time suggestions for adjusting her diabetes management plan and recommending lifestyle modifications.

1. How did the AI algorithm contribute to your analysis of Mrs. Johnson's symptoms, and what key insights did it provide regarding her diabetes management?
2. Considering Mrs. Johnson's medical history of hypertension and diabetes, how did you prioritize hypotheses related to the cause of her persistent headaches and visual disturbances?

Mr. Klein, a fifty-five-year-old male, arrives at the primary care clinic presenting with symptoms of chronic fatigue, unexplained weight loss, and generalized weakness. His medical history includes hypertension and type 2 diabetes; both conditions are managed with medications. During the initial assessment, his vital signs reveal a blood pressure of 140/90 mmHg, heart rate of 82 bpm, respiratory rate of 18 breaths per minute, and a temperature of 98.6°F (37.0°C). Mr. Klein has a comprehensive electronic health record (EHR) that integrates information from various health-care providers and includes details about his chronic conditions. The nurse, leveraging health informatics, accesses and reviews the EHR to identify potential correlations between Mr. Klein's current symptoms and his medical history.

3. How did Mr. Klein's symptoms and medical history serve as cues for recognizing the importance of utilizing health informatics, particularly the electronic health record (EHR), in your assessment?
4. What solutions or interventions did you consider based on the information obtained from the EHR, and how did you prioritize potential diagnostic tests for further investigation?

Ms. Long, a sixty-five-year-old female, visits the outpatient clinic reporting a recent onset of shortness of breath and chest pain. She has a history of hypertension and hyperlipidemia, currently managed with medications. During the assessment, her vital signs include a blood pressure of 150/90 mmHg, heart rate of 100 bpm, respiratory rate of 22 breaths per minute, and a temperature of 98.6°F (37.2°C).

To enhance the efficiency of care, the clinic utilizes an integrated health information system. The nurse, recognizing the potential urgency of Ms. Long's symptoms, swiftly accesses the integrated health information system to retrieve the patient's electronic health record (EHR). Within moments, the nurse obtains crucial data, including recent diagnostic tests and a comprehensive medication history. The EHR reveals that Ms. Long underwent lipid profile testing and a cardiac stress test two months ago, both of which were within normal ranges. Her prescribed medications, including antihypertensives and statins, are up to date.

5. How did the analysis of Ms. Long's vital signs and EHR data contribute to your understanding of her current health status, and what key information did you extract from the EHR?
6. How would you communicate with Ms. Long to initiate an electrocardiogram (ECG), and what steps would you take to ensure a swift and seamless process?

Competency-Based Assessments

1. Verbalize how to educate a patient about telemedicine and prepare for a telemedicine visit.
2. Create a bulleted list of benefits to the patient for using patient portals.
3. Develop a presentation as if you were a nursing educator preparing to discuss informatics and its optimization in health care.
4. During the sample presentation, how would you incorporate an understanding of the nurse's role in fostering the use and advancement of technology in health care?

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CHAPTER 38

Unfolding Case Study and NCLEX Preparation

FIGURE 38.1 Nurses use clinical judgment in practice by assessing patient conditions, interpreting data, and making informed decisions to provide safe, effective, and individualized care. (credit: Army Spc. Logan Ludwig/Joint Base San Antonio, public domain)

CHAPTER OUTLINE

INTRODUCTION Picture this: You're a new graduate nurse, fresh out of orientation on a critical care unit. You're getting a report on your patient, who has been admitted for an acute exacerbation of heart failure. The nurse mentions that the patient has been receiving a large dose of diuretic medications and has been having some irregular heartbeats on the telemetry monitor. Reflecting on your nursing knowledge, you remember that abnormal potassium levels can affect the heart's rhythm, so you pull up the patient's chart to check the latest entry for their potassium levels. Sure enough, the patient's potassium levels are very low, likely from the high dose of diuretics being administered. You quickly contact the provider to make them aware of the situation and recommend potassium replacement to bring the patient's levels back to normal. Had you not made this connection, the patient could have experienced cardiac arrest or other life-threatening symptoms related to low potassium levels. You used your nursing knowledge to make a clinical judgment that probably saved your patient's life.

It is imperative that new nurses are able to think critically and employ clinical judgment in practice. The rest of this chapter provides an unfolding case study that highlights how nurses can systematically work through the clinical judgment measurement model and use clinical judgment to make practice decisions.

38.1 Unfolding Case Study Dissection

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Examine the clinical decisions based on patient needs in the case study
- Recognize steps in application of patient care in the case study
- Identify patient care outcomes in the case study

UNFOLDING CASE STUDY

Nursing Care of a Patient Who Fell

Part 1

Mrs. Jackson, a 68-year-old female patient, presents to the emergency department after experiencing a fall at home. Her daughter witnessed the fall and brought Mrs. Jackson to the hospital saying, "My mom has been acting really confused after falling. I'm scared she might have a concussion."

Past Medical History	Medical History: Hypertension, atrial fibrillation, type 2 diabetes. Family History: Married for 45 years, 3 grown children. Mother deceased from Alzheimer's. Father alive, with hypertension and prostate cancer, currently undergoing treatment. Social History: Former ½ pack/day smoker, quit 15 years ago. Allergies: No known drug allergies Current Medications: • amlodipine (Norvasc) 5 mg PO daily • losartan (Cozaar) 50 mg PO daily • metformin (Glucophage) 500 mg PO daily • warfarin (Coumadin) 2 mg PO daily • aspirin 81 mg PO daily
Assessment	Time: 1200 General Survey: Patient appears anxious and confused. She is repeatedly asking, "Where am I? Why am I here?" Neurological: Alert and oriented x1, slurred speech, decreased sensation on right side of body. HEENT: Slight right facial droop. Respiratory: Clear lung sounds, normal breathing pattern. Cardiovascular: Rapid, thready pulse, capillary refill <2 seconds, warm extremities. Abdominal: Bowel sounds normoactive in all 4 quadrants, no tenderness. Musculoskeletal: muscle strength of right upper and right lower extremities, 2/5; left upper and lower extremities, 5/5 Integumentary: Skin pale but dry and intact.
Nursing Notes	Time: 1210 During assessment, signs/symptoms of stroke were noted. Code stroke paged overhead at 1208. Per protocol, patient transported for STAT CT scan. History obtained from daughter, who reports the time the patient was last seen normal was 1045.

Flow Chart	Time: 1215 pm Blood pressure: 148/79 mmHg Heart rate: 112 beats/minute Respiratory rate: 29 breaths/minute Temperature: 99.6 °F (37.5°C) Oxygen saturation: 92% on room air Pain: 4/10 Weight/BSA: 144lbs
Provider's Orders	Time: 1230 STAT CT scan STAT labs including point-of-care glucose, CBC, BMP, INR, PTT, HA1C, 12-lead ECG NPO order (swallow screen prior to any PO) Admit to neuro floor for observation Q15 minute neuro checks x 4 hours, then Q 1 hour Continuous telemetry monitoring Fasting lipid panel at 0600 tomorrow MRI with contrast
Test Results	Time: 1240 Noncontrast CT scan confirms acute ischemic infarction involving the left middle cerebral artery, no evidence of hemorrhage. Glucose 125 mg/dL INR 2.3
Nursing Notes	Time: 1245 Patient is within the time-appropriate time window for tPA, but history of anticoagulant use and INR >2 is a contraindication, per stroke protocol. Q15 minute neuro checks being completed. 12-lead ECG shows atrial fibrillation, provider notified. Patient made NPO and family updated on plan of care.

Part 2

Mrs. Jackson has been on the neuro unit for two days and is now showing a slight improvement in symptoms. The family has requested to meet with the unit's social worker to discuss rehabilitation options.

Assessment	Time: 0800 General Survey: Patient is calm and pleasant. States, "I feel ready to go home." Neurological: Alert and oriented x4, some intermittent slurred speech. Sensation improved. HEENT: Slight right facial droop. Respiratory: Clear lung sounds, normal breathing pattern. Cardiovascular: Strong pulse, normal sinus rhythm on the monitor, capillary refill <2 seconds, warm extremities. Abdominal: Bowel sounds normoactive in all 4 quadrants, no tenderness. Musculoskeletal: 4/5 muscle strength of right arm and right leg, left arm and left leg 5/5 Integumentary: Skin pale but dry and intact.
Flow Chart	Time: 0830 am Blood pressure: 138/82 mmHg Heart rate: 98 beats/minute Respiratory rate: 22 breaths/minute Temperature: 99.6 °F (37.5°C) Oxygen saturation: 98% on room air Pain: 2/10
Provider's Orders	Time: 0900 Start clopidogrel, loading dose of 300 mg today, 75 mg daily starting tomorrow, to take for 90 days Physical therapy consult Occupational therapy consult Bedside swallow study before PO (including meds), advance diet as tolerated Social work to coordinate discharge to home vs. rehab facility per PT/OT recommendations
Nursing Notes	Time: 1400 Bedside swallow study completed; patient passed. Clopidogrel loading dose administered, patient and family educated regarding the need to adhere to medication as prescribed to prevent future strokes. Patient and family expressed understanding. Physical and occupational therapy to evaluate patient this afternoon. Discharge planning to home vs. rehab facility in process with social work. Family has been updated on plan of care and all questions and concerns have been addressed.

Clinical Decisions Based on Patient Needs

As soon as the patient arrived at the emergency room, the nurse began the process of critically thinking about what needed to be done. The nurse assessed the patient's situation and then recognized, analyzed, and prioritized the patient's needs. Once the needs were prioritized, the nurse made clinical decisions about the care to provide, then developed and refined the planned nursing interventions. Each of these actions by the nurse is discussed in more detail in the following sections.

Assessment of Patient Situation

The nurse began assessing the patient as soon as they arrived at the hospital. The nurse was informed that the patient fell at home and was brought to the emergency department by her daughter, who is concerned that the patient may have a concussion. The nurse immediately performed a general survey, looking for cues that would be indicative of a concussion or injury from the fall. During the general survey, the nurse noticed that the patient appeared anxious and confused. The nurse hypothesized that the confusion could be related to head injury from the fall, but that there may be more going on, and further assessment was indicated. The nurse performed a quick head-to-toe assessment and recognized the following relevant cues:

- Alert and oriented only to self

- Slurred speech
- Slight right facial droop
- Rapid, thready pulse
- Decreased muscle strength in right side extremities
- Decreased sensation to right side of body

The nurse recognized that the patient's symptoms were consistent with a cerebrovascular accident (stroke) from using the FAST assessment and immediately activated a code stroke, recognizing the importance of initiating interventions in a timely manner. Additionally, the nurse recognized other important cues from the patient's medical history that increased the probability of a stroke: hypertension, atrial fibrillation, and type 2 diabetes. The nurse also took note of the patient's current medications, because that information often provides more context for a patient's situation. In this case, the patient was actively taking two antihypertensive medications, an antidiabetic medication, an anticoagulant, and a daily aspirin.

Recognize, Analyze, and Prioritize Patient Needs

After recognizing symptoms of stroke and alerting the stroke team, the nurse also quickly initiated patient transport to the imaging department for a STAT head CT to determine if the patient was actually experiencing a stroke, and to identify, if necessary, the type of stroke (e.g., ischemic, hemorrhagic). The nurse also recognized the importance of asking the patient's daughter when the patient was "last seen normal," as the patient must be in the allotted time window from the onset of symptoms to receive tissue plasminogen factor (tPA), a clot-busting medication that is used to treat ischemic stroke. The nurse then performed important diagnostic tests per the provider's order, including a point-of-care glucose, CBC, BMP, INR, PTT, HA1C, and 12-lead ECG.

Develop and Refine Interventions

Based on the provider's orders, the nurse performed a 12-lead ECG and found the patient's cardiac rhythm to be atrial fibrillation on the monitor. The nurse recognized that this cardiac rhythm is often a risk factor for stroke and hypothesized that it may have been a contributing factor to the patient's presenting symptoms.

Other nursing interventions included performing frequent neurological checks, frequent vital sign checks, analyzing lab and test results, and initiating NPO orders. The nurse recognized the importance of performing frequent neurological checks, because these checks provide tangible measurements of the subtle changes that may indicate the patient's status is worsening. While analyzing lab and test results, the nurse recognized that the CT report showed findings that were consistent with an ischemic stroke on the left side of the brain. These findings are consistent with the patient's right-sided symptoms, as symptoms of a stroke are often exhibited on the opposite side of the body in relation to their location in the brain. The nurse also recognized that the patient's blood glucose was slightly elevated, consistent with the patient's diabetes, but was likely not the cause of the patient's symptoms. Typically, hypoglycemia can mimic symptoms of stroke, not hyperglycemia. Lastly, the nurse initiated an NPO order for the patient because strokes increase the risk of dysphagia. At this point, the nurse should anticipate that the patient will require a bedside swallow screen and possibly future consultation with a speech language pathologist to determine their ability to swallow food, liquids, and medications before the NPO status will be changed.

Application of Nursing Care

Application of nursing care in the case study included the interventions mentioned in the previous section, as well as educating the patient and family about the plan of care. Experiencing a stroke can be stressful for both the patient and family members, so the nurse can help ease some anxiety by keeping everyone informed about what is happening. In this case, it was important for the nurse to let the patient's family members know that the patient had experienced a stroke, but that typical treatment (tPA) was contraindicated because of the patient's elevated INR value. The nurse should explain this in simple terms, avoiding complex medical jargon to ensure understanding. For example, the nurse might say, "We would typically give a medication that would dissolve the clot that is causing the stroke, but that medication carries a large risk of bleeding. Because the patient is on a blood thinner medication, she is already at an increased risk of bleeding, so if we gave this medication, it could cause her to experience bleeding in the brain, which is life-threatening. Instead, we are going to watch her closely to make sure her symptoms don't get worse and do all we can to improve them."

Incorporated Factors Affecting Patient Care

Caring for a patient who is having a stroke involves a lot of physical nursing tasks and skills, but it is also important to recognize the need to provide emotional support to the patient and their family members. Experiencing a stroke can cause a lot of anxiety, especially in this case, as the patient was unable to receive standard pharmacological treatment because of contraindications. The nurse should remain available to the patient and the family to discuss concerns and answer questions about the plan of care. It is important for the nurse to ask what kind of support or resources would help them cope with the diagnosis and, if possible, provide them. After being in the hospital for a few days and experiencing an improvement in symptoms, the nurse in the case study connected the patient and family to a social worker to help them transition from the hospital to home or to a rehabilitation facility.

Revising the Plan of Care

Even though the patient was not actively receiving treatment for the stroke, the nurse was still closely monitoring and assessing for subtle changes in health status that would indicate the need for a revised plan of care. Specifically, the nurse monitored the patient's vital signs and neurological status, looking for improvement or worsening of symptoms. As the patient progressed through the hospital stay, the plan of care required revision to account for discharge and possible rehabilitation.

Evaluate Outcomes

After performing interventions, the nurse evaluated outcomes by reassessing the patient's vital signs and neurological status. The patient's vital signs remained stable, and the neurological status improved. Also, the nurse must evaluate the patient and family's understanding of provided education. The nurse can do this by using the "teach back" strategy, which asks the learner to repeat the information in their own words to verify the message was received.

Evaluate Nursing Actions

In this case study, the nurse initially evaluated the patient's neurological status every 15 minutes, looking for worsening or improving of symptoms. Because the patient was unable to receive tPA, the nurse did not administer a specific treatment for the stroke, but closely monitored the patient's neurological status. This is an action that can be evaluated. For example, if the nurse notices that the patient's neurological status is worsening, they might hypothesize that the stroke has expanded or the patient may be experiencing a hemorrhagic transformation and would relay this information to the provider to determine the next course of action, which may involve a surgical intervention. Thankfully, in the case study, the patient's symptoms showed improvement a few days after the onset of the stroke, and the nurse began facilitating physical, occupational, and speech therapies to help the patient restore function and work toward discharge home. Additionally, the nurse facilitated communication between the patient and family and the social worker to initiate the process of leaving the hospital, either to home or to an appropriate rehabilitation facility for the patient to continue her journey of healing.

Another important way that the nurse monitored outcomes was ensuring patient and family understanding of the education provided. Specifically, the nurse provided information about the importance of taking the clopidogrel as prescribed to decrease the risk of subsequent strokes. To evaluate the patient and family's understanding, the nurse should consider asking them to "teach back" the information. This process helps the nurse feel confident that they understand the significance of adhering to the medication.

Revised Plan of Care

The nursing interventions were successful, as indicated by the improvement in the patient's neurological symptoms. If the symptoms had not improved, the nurse would have revised the plan of care to treat the patient's condition more effectively. This may have included alerting the provider about the lack of improvement in the patient's condition and/or requesting alternative treatment options, as available. The nurse was continually assessing the patient's condition, monitoring for signs of worsening or improvement to use as a guide for revising the plan of care as necessary. This continuous assessment occurs until the patient is discharged.

38.2 NCLEX Preparation

LEARNING OBJECTIVES

By the end of this section, you will be able to:

- Discuss assessment of nursing knowledge by the NCLEX
- Explain characteristics of the new NCLEX, including question types

Nursing judgment is a learned skill. The ability to think critically develops more fully over time in nursing practice. Basic understanding of the process is evaluated pre-licensure during the nurse's academic preparation and on the licensure examination for nursing graduates.

Every two years, the National Council of State Boards of Nursing (NCSBN) investigates nursing education and aspects of the nursing workforce via survey in the United States. These surveys provide information on the type of practice required and the availability of working nurses. This information is utilized for curriculum development in schools of nursing and workforce planning in health-care settings, as well as in the development of questions for NCLEX. This section addresses the measurement of nursing judgment, specifically on the licensure examination, and in nursing practice.

Assessment of Nursing Knowledge by the NCLEX-RN

The NCLEX-RN changed in 2023 due to research evidence of the need for nursing graduates to show increased understanding of safe practice at the entry level. The focus and formatting of the questions on the licensure examination changed to meet this goal. The examination now presents the test-taker with items (questions) that pose problem-solving scenarios, in short form as specific questions, or in longer form as client need categories. Candidates can expect items to address categories as depicted in Figure 38.2.

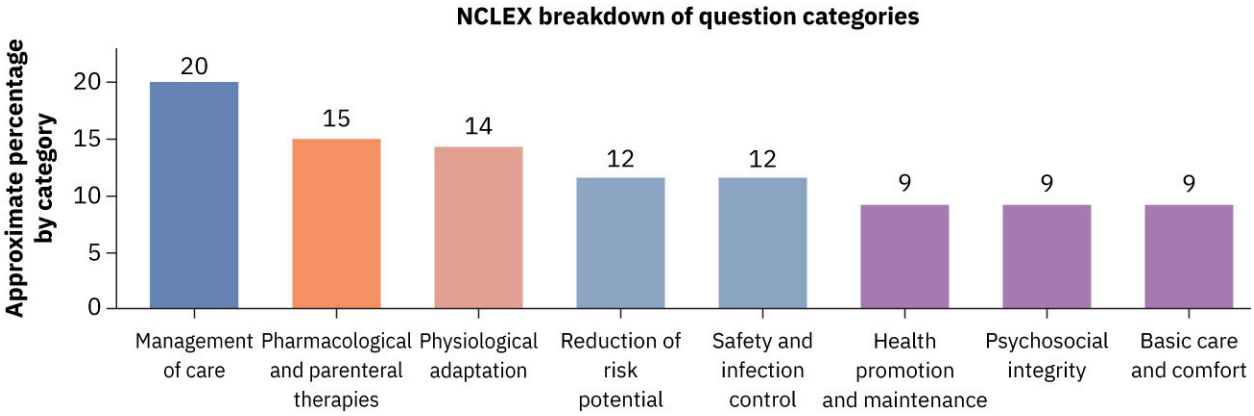

FIGURE 38.2 This graph shows the approximate breakdown in categories of questions on the NCLEX, but distributions may vary slightly based on individual examinations. (modification of work from *Psychiatric-Mental Health Nursing*. attribution: Copyright Rice University, OpenStax, under CC BY 4.0 license)

To guide the candidate's study, meaning of the categories depicted left-to-right on the graph are as follows:

- Management of care means the nurse observes scope of practice guidelines, incorporates all available support, delegates and directs others, and conserves resources.
- Pharmacological and parenteral therapies mean the nurse safely administers or supervises safe administration of prescribed medications, fluids, and blood products by all routes and teaches and monitors indication, intended effect, side effects, and adverse reactions.
- Physiologic adaptation means the nurse manages and promotes patients' adjustment to emergency, corrective, or supportive care, interventions, and treatments.
- Reduction of risk potential means the nurse monitors for complications of patients' diagnoses and educates and intervenes to mitigate potential harms and adverse outcomes to care and treatment.
- Safety and infection control means the nurse recognizes and mitigates harm and risks, observes practice standards, monitors patient acuity, and educates others.
- Health promotion and maintenance means the nurse brings preventative care and wellness care at all stages of human development, detects potential problems, and conducts health screening.
- Psychosocial integrity means the nurse promotes patients' adaptation and stress management, teaches

others, integrates nursing interventions, advocates for emotional, social, and spiritual wellness, and delivers psychiatric nursing care in therapeutic settings.
- Basic care and comfort mean the nurse provides and directs physical care for basic needs, such as nutrition, hydration, comfort, elimination, activity, and rest.

The essence of nursing practice is the identification of client needs, which are then addressed through the nursing process. By successful completion of the NCLEX-RN, nursing graduates show their competence at the entry level of practice.

Computerized Interactive Questions

The NCLEX-RN items measure clinical judgment by NGN (or Next Generation NCLEX) case study and stand-alone questions. Case studies present multiple questions about a realistic nursing care scenario. Stand-alone items ask for application of the six elements in Layer 3 of the CJMM, which are steps of the nursing process, and, as discussed in previous chapters, depict the actions the nurse can take. Answers may be entered by "click to specify" or "click to highlight" chosen responses. Test item formats include bow-tie, drag-and-drop, drop-down, extended multiple response, and matrix. Visualizing questions on a split screen is another new feature of the exam.

- Bow-tie: Move provided answers to provided categories.
- Drag-and-drop: Move provided answers to the correct target.
- Drop-down: Select an option from text, chart, or table.
- Extended multiple response: Select all applicable responses; partial credit is awarded for items with more than one key.
- Matrix: Select from a table of options in columns or rows.

Available Resources

Knowledge base and examination preparation together are essential for NCLEX success.

Schools of nursing provide preparation for the NCLEX throughout the nursing program, many utilizing a software package (e.g., Kaplan, ATI). Near graduation, programs offer more specific preparation in the forms of exit exams, capstone projects, clinical preceptorship/field placements, or wrap-up components of the school's software product. In addition, final semester students frequently present a project that is designed to bring together multiple concepts of nursing practice.

There are numerous NCLEX preparation offerings. Nursing graduates may personally decide how to customize the process. What is important to the test-taker? Graduates should consider their own learning style. Printed materials, online formats, mobile applications, videos on demand, practice questions, recorded mini-lectures, question libraries, and real-time study groups, coaches, and tutors are all available.

Graduates may want to consider whether the study resource contains access to customized study help and access to user reviews. Cost is another factor, whether purchase or subscription. The testing programs selected by the graduate's school of nursing can serve as a guide for NCLEX prep or prompt investigation into what other schools use. Important to consider is practice with simulated adaptive NCLEX-style test items. The graduate's selection of preparation packages should include those that provide a focus on Next Gen-type questions.

LINK TO LEARNING

The NCLEX Frequently Asked Questions page (https://openstax.org/r/77nclexfaq) provides a lot of useful information for nursing graduates preparing to take the exam.

Application of Clinical Judgment to Patient Care

Nursing graduates can think of the NCLEX-RN as a safety test. The test evaluates candidates' ability to decide how to proceed in patient care situations, as opposed to strict memorization of answers to standard questions. The candidate can expect scenarios posing complex decisions that require cultural competence and use of available resources. NCLEX-RN seeks to present situations that occur in real health-care settings. There is an increased focus

on client acuity and nursing management of change in condition. The goal is improvement in care that avoids medical errors by emphasizing clinical judgment and promoting optimal patient outcomes.

Summary

38.1 Unfolding Case Study Dissection

- Clinical judgment skills continue in licensed practice.
- Successfully stabilizing a client's anxiety, pain, or fear will enhance outcomes of care. In addition, nurses are likely to feel personally rewarded in their careers.

38.2 NCLEX Preparation

- Critical thinking and clinical judgment develop in nursing practice over time and through models like the CJMM. Schools of nursing evaluate these skills for successful completion of academic courses.
- The NCLEX evaluates these skills prior to licensure as a professional nurse. Nurses must act efficiently and safely, while identifying and seeking to meet client care goals.

Assessments

Review Questions

1. Based on the unfolding case study information, what assessment finding by the nurse is the most concerning?
    a. pale, dry skin
    b. blood pressure 148/79
    c. right-sided weakness
    d. history of type 2 diabetes

2. What is the best rationale for the NPO order and swallow study for Mrs. Jackson?
    a. to prevent aspiration due to possible dysphagia
    b. to prepare for potential surgical intervention
    c. to avoid interfering with blood glucose levels
    d. to reduce the risk of gastrointestinal bleeding

3. After two days on the neuro unit, Mrs. Jackson shows slight improvement in symptoms. What intervention is most appropriate for the nurse to take to address her current needs?
    a. discharge planning with no further follow-up
    b. starting clopidogrel and scheduling evaluation by physical therapy
    c. requesting a higher dose of warfarin to prevent further strokes
    d. maintaining strict bedrest to avoid further complications

4. What assessment category of the NCLEX would include how the nurse delegates to others?
    a. physiologic adaptation
    b. psychosocial integrity
    c. management of care
    d. reduction of risk potential

5. What question style on the new NCLEX involves selecting the correct option from the text, a chart, or a table?
    a. drop-down
    b. bowtie
    c. drag-and-drop
    d. matrix

Check Your Understanding Questions

1. What is the rationale behind not administering tPA to Mrs. Jackson upon finding an ischemic stroke on the CT scan?

2. What is the main reason the NCLEX was changed in 2023 to a new format?

Reflection Questions

1. How do you think having an interdisciplinary, interprofessional care team would affect Mrs. Johnson's quality of care and patient outcomes?
2. How do you think the new NCLEX will impact the clinical practice of new graduate nurses?

Competency-Based Assessments

1. Draw a flowchart illustrating steps that the nurse would take when caring for a patient admitted for a suspected stroke.

APPENDIX A

Diagnostic Studies and Interpretation

Diagnostic tests and procedures are used in clinical health-care settings to aid in the identification of a condition, disease, or prognosis with a high degree of accuracy. They are crucial to early detection and application of the proper treatment plan for each patient. Every provider is responsible for the analysis of each study and the individual action plan because of the interpretation. Every diagnostic has four phases. The first is to determine normal or acceptable ranges of the test. The second is to evaluate the accuracy of the test. The third is to determine clinical consequences of the results of the test. The fourth is to evaluate if more diagnostics are needed before determining an individual plan. Table A1 lists common laboratory tests and expected results. Table A2 displays commonly used diagnostic studies for providing competent and comprehensive patient care.

Serum, Plasma, and Whole Blood	
Red blood cell (RBC)	4.5–5.0 million cells/mm^3 (female) 4.7–6.2 million cells/mm^3 (male)
White blood cell (WBC)	4,500–11,000 cells/mm^3
Platelets	150,000–400,000/mm^3
Blood urea nitrogen (BUN)	6–24 mg/dL
Serum creatinine	0.6–1.2 mg/dL
Estimated glomerular filtration rate (eGFR)	> 60 mL/min/1.73m^2
Carbon dioxide	23–29 mmol/L
Glucose	65–110 mg/dL
Aldolase	22–59 mU/L
Chloride	95–105 mEq/L
Potassium	3.5–5.2 mEq/L
Sodium	135–145 mEq/L
Calcium	8.3–10.2 md/dL
Phosphorus	3.0–4.5 mg/dL
Magnesium	1.3–2.1 mEq/L
Serum osmolality	285–295 mOsm/kg H_2O

TABLE A1 Common Laboratory Tests

Albumin	3.5–5.5 g/dL
Total protein	5.5–8.3 g/dL
Bilirubin	0.1–1.2 mg/dL
Ammonia	11–32 mcmol/L
Aspartate aminotransferase (AST)	9–25 units/L (female) 10–40 units/L (male)
Alanine aminotransferase (ALT)	7 – 20 units/L (female) 10 – 55 units/L (male)
Copper	70–15 mcg/dL
Ferratin	18–160 ng/mL (females) 18–270 ng/mL (males)
Folic acid	3–13 ng/mL
Arterial Blood Gas (ABG)	
pH	7.35–7.45
Partial pressure of oxygen (PaO_2)	80–100%
Partial pressure of carbon dioxide ($PaCO_2$)	35–45 mmHg
Bicarbonate (HCO_3)	22–26 mEq/L
Hematology	
Fibrinogen	200–400 mg/dL
Erythrocyte count	3.6–5.0 × 1012/L (female) 4.2–5.4 × 1012/L (male)
ESR	0–20 mm/h (females less than 50 yrs) 0–30 mm/h (females greater than 50 yrs) 0–15 mm/h (males less than 50 yrs) 0–20 mm/h (males greater than 50 yrs)
Hematocrit	36–48% (female) 42–52% (male)
Hemoglobin	12–16 g/dL (female) 13–17 g/dL (male)
International normalized ratio (INR)	0.8–1.2 2–3 is normal for patients on warfarin

TABLE A1 Common Laboratory Tests

Prothrombin time (PT)	11–13 seconds 1.5–2× longer if on anticoagulants
Partial thromboplastin time (PTT)	60–70 seconds 1.5–2× longer if on anticoagulants
Activated partial thromboplastin time (aPTT)	25–35 seconds 1.5–2× longer if on anticoagulants
Cardiac Markers	
Total creatine kinase (CK)	500–2250 nkat/L (female) 917–2833 nkat/L (male)
Myoglobin	5–70 ng/mL
Troponin	<0.4 ng/mL
Atrial natriuretic peptide (ANP)	22–77 ng/L
Brain natriuretic peptide (BNP)	<100 ng/L
Lipid Panel	
High-density lipoprotein (HDL)	> 40 mmol/L
Low-density lipoprotein (LDL)	< 100 mmol/L
Triglycerides	< 120 mmol/L
Total cholesterol	< 170 mmol/L
Hemoglobin A1C	
Normal	< 5.7%
Prediabetes	5.7–6.4%
Diabetes	> 6.5%
Proteins	
Protein total	6–8 g/dL
Albumin	3.5–5.2 g/dL
Globulin	1.7–3.3 g/dL
Vitamins	
Vitamin A	30–120 mcg/dL

TABLE A1 Common Laboratory Tests

Vitamin B_1	1.6–4 mcg/dL
Vitamin B_6	5–30 ng/mL
Vitamin B_{12}	200–900 pg/mL
Vitamin E	0.5–1.8 mg/dL
Zinc	55–150 mcg/dL
Urine Chemistry	
Ketones	< 2.0 mg/dl
Amylase	1–17 units excreted per hour
Calcium	100–250 mg per 24/hour
pH	4.5–8
Osmolality	50–1200 mOsm/kg
Glucose	Negative
Note: These values could change slightly based on parameters set by specific health-care facilities	

TABLE A1 Common Laboratory Tests

Diagnostic	Description
Angioplasty	Widens the arteries and increases cardiac blood flow
Biopsy	Removes a sample of tissue or cells from the body for microscopic examination to diagnose cancer or other diseases
Bronchoscopy	Examines the larger airways: trachea and bronchi
Chest X-ray	Evaluates the lungs, heart, or chest wall to diagnose pneumonia, heart failure, emphysema, lung cancer, and other medical conditions
Colonoscopy	Examines the colon, or large intestine
Computed tomography scan (CT)	Evaluates all major parts of the body, including the abdomen, back, chest, and head
Electrocardiography (EKG or ECG)	Records the heart's electrical activity to detect abnormal rhythms, heart damage, or heart failure
Electroencephalogram (EEG)	Records the brain's electrical activity

TABLE A2 Common Diagnostic Procedures (Bolboacă, 2019)

Diagnostic	Description
Endoscopy	Examines the inside of certain tube-like structures in the body with a fluoroscope; for example, upper GI series examines the esophagus, stomach, and duodenum
Fecal occult blood test	Examines stool samples for traces of blood; also called a stool guaiac or hemoccult test
Lumbar puncture	Uses a needle to remove a sample of fluid from the space surrounding the spinal cord to diagnose infections, such as meningitis, and some neurological conditions.
Magnetic resonance imaging (MRI)	Uses a magnetic field to produce pictures of structures inside the body
Ultrasonography	Uses high frequency sound waves to generate snapshots or moving pictures of structures inside the body, especially vital organs; also called sonography
Ventilation-perfusion scan (V-Q scan)	Nuclear scan that examines both airflow (ventilation) and blood flow (perfusion) in the lungs
X-ray	Uses waves of electromagnetic radiation to create images of organs and other structures inside the body

TABLE A2 Common Diagnostic Procedures (Bolboacă, 2019)

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APPENDIX B

Major Fluid and Electrolyte Imbalances

Any condition that can cause fluid electrolyte imbalances, such as cardiac, circulatory, endocrine, gastrointestinal or lung disorders, malnutrition, kidney dysfunction, or acid-base imbalance requires frequent monitoring of blood electrolytes (Ambati et al., 2023). Electrolyte evaluation is done through a blood specimen using lithium heparin tubes. Common laboratory ranges will vary slightly depending on location and facility protocols. Table B1 lists common laboratory ranges and clinical manifestations for each electrolyte.

Electrolyte	Normal Range	Mild to Moderate Range	Complications
Sodium	135–145 mmol/L	Hyponatremia: 125–135 mmol/L Hypernatremia: 145–160 mmol/L	May lead to neurological consequences such as seizures
Potassium	3.6–5.5 mmol/L	Mild hypokalemia: < 3.6 mmol/L Moderate hypokalemia: < 2.5 mmol/L Mild hyperkalemia: 5–5.5 mmol/L Moderate hyperkalemia: 5.5–6.5 mmol/L	May lead to cardiac arrhythmias, fatigue, lethargy, and muscle weakness
Calcium	8.8–10.7 mg/dL	Hypocalcemia: < 8.8 mg/dL Hypercalcemia: > 10.7–11.5 mg/dL	May lead to cardiac arrhythmias, fatigue, lethargy, and muscle weakness
Bicarbonate	23–30 mmol/L	Acidosis: < 23 mmol/L Alkalosis: > 30 mmol/L Increases or decreases depending on acid-base status either respiratory or metabolic	Acidosis: may inhibit O_2 transport at the cellular level Alkalosis: may cause tetany and paresthesia
Magnesium	1.46–2.68 mg/dL	Hypomagnesemia: < 1.46 mg/dL Hypermagnesemia: > 2.68 mg/dL	May lead to neurological consequences such as seizures, imbalances, fatigue, lethargy, and muscle weakness

TABLE B1 Electrolyte Imbalances (Hoppe et al., 2018)

Electrolyte	Normal Range	Mild to Moderate Range	Complications
Chloride	95–105 mEq/L	Hypochloremia: < 95 mEq/L Hyperchloremia: > 105 mEq/L	Hypochloremia may lead to fatigue and weakness Hyperchloremia may lead to high blood pressure, changes in fluid secretion, headache, metabolic acidosis, muscle cramps, arrythmias, and confusion
Phosphorus	3.4–4.5 mg/dL	Hypophosphatemia: < 2.5 mg/dL Hyperphosphatemia: > 4.5 mg/dL	May lead to bone and muscle disorders and increase risk of cardiovascular and neurological disorders

TABLE B1 Electrolyte Imbalances (Hoppe et al., 2018)

Significant variation can occur depending on the cause of each electrolyte imbalance. Many electrolytes are interdependent of one another, meaning that if one is abnormal, it can elicit a chain reaction causing others to become abnormal (Kraut & Madias, 2017). The delicate balance of fluid and electrolytes within the body to maintain homeostasis needs constant and comprehensive evaluation. Table B2 lists the most common causes.

Electrolyte	Cause
Sodium	Hyponatremia: adrenal insufficiency, cirrhosis, chronic hyperglycemia, heart failure, low dietary sodium intake, polydipsia, severe dyslipidemia, and syndrome of inappropriate antidiuretic hormone secretion (SIADH) Hypernatremia: hypertonic IV administration, osmotic diuresis, or unreplaced fluid loss via the skin or gastrointestinal tract
Potassium	Hypokalemia: aldosteronism or administration of loop diuretics Hyperkalemia: acute kidney injury, administration of beta blockers, insulin deficiency, metabolic acidosis
Calcium	Hypercalcemia: malignancy, hyperparathyroidism, malignancies, or tuberculosis Hypocalcemia: pancreatitis, parathyroid dysfunction, hypomagnesemia, or sepsis
Bicarbonate	Increase: metabolic alkalosis or respiratory acidosis Decrease: metabolic acidosis or respiratory alkalosis
Magnesium	Hypermagnesemia: ingestion of high amounts of oral magnesium, such as over-the-counter antacids, and renal failure Hypomagnesemia: alcohol use disorder, diuretic administration, or fluid loss such as from excessive vomiting and diarrhea

TABLE B2 Common Causes of Electrolyte Imbalances (Shrimanker & Bhattarai, 2023)

Electrolyte	Cause
Chloride	Hyperchloremia: administration of excessive IV NS, diarrhea, ingestion of saltwater, and excessive amounts of salt Hypochloremia: excessive vomiting, diarrhea, or other gastrointestinal fluid loss
Phosphorus	Hypophosphatemia: parathyroid disorders, and vitamin D deficiency Hyperphosphatemia: kidney injury and parathyroid disorders

TABLE B2 Common Causes of Electrolyte Imbalances (Shrimanker & Bhattarai, 2023)

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ANSWER KEY

Chapter 6

Read the Electronic Health Record

1. Possible considerations: The elevated amylase and lipase levels are concerning and indicate potential blockage of the pancreatic duct. The patient's history of recent birth, elevated BMI, and symptoms surrounding ingestion of fatty food including increased abdominal pain are also worrying signs.
2. The most concerning information is the elevated liver enzymes combined with the findings from the CT scan indicating acute cholecystitis with potential pancreatitis. This suggests a significant inflammation and inability to eliminate bile that could lead to complications if not promptly managed.
3. An expected finding is the presence of inflamed bile duct due to blockage, because the patient has a known history of gallstones. The patient is the classic example of the 4 Fs (female, fat, forty, fertile). She has pain after ingestion of a fatty meal, accompanied with steatorrhea.
4. It is important to question if the patient has any history of allergic reactions to the previous anesthesia. Surgical removal of gallbladder is evident, and the nurse should identify the need to educate the patient on the procedure. Ask when the patient last ingested food or water. Additionally, considering the patient's recent delivery of twins, it is crucial to ask about blood loss or any abnormal experience with the delivery. Furthermore, questioning the adequacy of the current medication regimen and considering the need for IV fluids and pain medication or hospitalization should be discussed with the healthcare team.

Chapter 7

Read the Electronic Health Record

1. The numerical rating scale to assess pain should not be used for those who cannot quantify the severity of their pain (i.e., a patient who has difficulty communicating). Another scale that assesses pain in a nonverbal person should be used to quantify the patient's pain. The numbers assigned to the patient's pain may not be accurate because of his aphasia.
2. Pain medications were given at 14:45 and not reassessed within one hour; pain was not at target pain goal at 16:10, but no additional pain interventions were enacted; pain score and pain goal were left blank at 20:10; pain was not reassessed after 20:10 intervention.

Chapter 8

Read the Electronic Health Record

1. The elevated fasting glucose level of 254 mg/dL indicates severe hyperglycemia, characteristic of diabetic ketoacidosis (DKA). The high white blood cell count of 15,000 mL suggests an infection, which commonly accompanies DKA, due to compromised immune function. The normal red blood cell count indicates the patient is not currently experiencing anemia, and the elevated sodium level of 156 mg/dL reflects dehydration, a common consequence of DKA. The presence of urine ketones further confirms the body's breakdown of fats or proteins in the absence of insulin, contributing to the metabolic derangements seen in DKA.
2. The elevated white blood cell count of 15,000 mL suggests an inflammatory response and potential infection, which can exacerbate the patient's condition and complicate management. Poor response by leukocytes may indicate impaired immune function, placing the patient at increased risk of sepsis and other serious complications. Nurses should closely monitor the patient for signs of infection and collaborate with the health care team to initiate appropriate antimicrobial therapy and supportive care.
3. Priority nursing interventions include initiating insulin therapy to correct hyperglycemia and acidosis, administering intravenous fluids to address dehydration and electrolyte imbalances, and monitoring the patient closely for signs of infection. Additionally, providing supportive care, such as pain management and

emotional support, is crucial for optimizing patient outcomes. Continual assessment and reassessment of the patient's condition are essential to guide timely interventions and promote recovery from DKA.

Chapter 11

Unfolding Case Study

1. Option 1: Respiratory infection; Option 2: Increased SOB and fever
   Rationale: A respiratory infection would most likely be present in a patient with increased SOB and an elevated temperature. A panic attack or depression would most likely cause irritability, irrational thinking, lightheadedness, or dizziness. Asthma will most likely present with wheezing or tightness in the patient's chest, not usually with a fever. Depression may present with irritability, a hopeless outlook, and possible crying. Medication side effects may present with the indications the patient is taking them for. For example, fever or irritability would not be the cause of the absence of taking the medications of a beta blocker, ARB, or statin.
2.

Assessment Finding	Respiratory Infection	COPD	Pneumothorax
Pain in chest and intense chest pain that is worse with movement			X
Temperature: 101.2	X		
Tracheal deviation			X
Subcutaneous emphysema			X
Barrel-shaped chest		X	

   Rationale: The patient with pneumonia has a temperature of 101.2, which can indicate an infectious process and also has a positive blood culture result of *Streptococcus pneumoniae*. Lung fields will have crackles or decreased breath sounds, and the patient is not likely to experience wheezing. A fever is not likely to be present with COPD; increased SOB is most likely to be present. A patient with COPD can present with noted use of the accessory muscle, pursed lip breathing, and cyanosis. The anterior-posterior chest wall diameter can increase and become barrel shaped from the chronic air trapping as well as an increase in wheezing and cough. A pneumothorax occurs when a volume of air has entered the pleural space affects the degree of lung collapse. The patient will present with chest pain that increases with movement. Patients commonly report a rapid onset of dyspnea, cough, and intense chest pain that is worse with movement.

Read the Electronic Health Record

1. The patient's low oxygenation saturation accompanied with SOB and pleuritic chest pain alongside positive ultrasound findings indicate a pneumothorax.
2. The most concerning information is the decreased oxygenation. Air elimination, reduction of air leakage, and promoting re-expansion of the lung are the priorities.
3. An expected finding is the presence of a small pneumothorax based on patient description of a recent fall and current symptoms. The nurse expects the provider to apply supplemental oxygen and perform a small needle biopsy.

Chapter 12

Unfolding Case Study

1.

CUE	Acute MI	Possible sepsis	Bacterial pneumonia
Respiratory failure			X
Decreased cardiac contractility and dysfunction	X		
Lactic acid increased		X	

Rationale: Cardiac myocytes require adequate coronary perfusion for contractility. Decreased cardiac output due to left ventricular dysfunction as a result of the anteriolateral wall MI. Cardiogenic shock of the anterior wall MI is associated with higher hospital mortality when compared to solely an inferior MI. Systolic heart dysfunction has a higher rate of mortality. Hypovolemic shock and cardiogenic shock can lead to sepsis and septic shock. The patient is acidotic (increased lactic acid and respiratory acidosis), hypotensive, and hypovolemic. If the patient's cardiac decompensation is reversed, the progression of sepsis/septic shock may be adverted. The respiratory failure treatment has already been initiated with antibiotic therapy and mechanical ventilation.

2. Intervention: Administer vasopressors IV; Rationale: Hypotension, decreased cardiac contractility; Intervention: Hemodynamic monitoring; Rationale: Monitor the effectiveness of therapeutics for pulmonary and heart function
Rationale: Cardiac decompensation can begin to negatively affect the body's organs, and the administration of vasoconstrictors is necessary to increase tissue perfusion to the patient's organs. In addition to fluid resuscitation, IV vasopressor therapy is a fundamental treatment of possible septic shock-induced hypotension, as it aims at correcting the decreased vascular tone and improving organ perfusion pressure. Antiplatelets or anticoagulants are administered for patients who have had an MI to prevent the formation of blood clots. Positive end-expiratory pressure is not necessarily a treatment for bacterial pneumonia. PEEP maintains the expansion of the alveoli at the end of the patient's respiration. Diuretics are not administered if the patient is hypotensive or had a significant drop in BP from baseline.

Read the Electronic Health Record

1. The patient has a low potassium and a low magnesium.
2. Normal potassium levels should be between 3.5 and 5.0 and magnesium should be greater than 2.0.
3. The nurse should review the telemetry to see if there is any ectopy on the monitor. A set of vitals should be obtained. The nurse should get an order for electrolyte replacement.
4. Over the span of 15 hours, Mr. Smith's BNP is trending up, suggesting worsening HF.
5. The elevation in the liver function tests indicates liver damage, likely from right-sided heart failure, and the patient will likely have increased abdominal ascites and hepatosplenomegaly.

Chapter 13

Read the Electronic Health Record

1. The patient's history reveals very active young male with a risk-led lifestyle. Tibial fractures require the patient to remain non–weight-bearing for six weeks while in a long leg cast. This patient's chart indicates this may be problematic.
2. An expected finding is the presence of a tibial shaft fracture based on patient's description of accident and current symptoms. The nurse expects the provider to determine if surgery is indicated or not. If not, the patient will be placed in a long leg cast.
3. It is important to learn if the patient has any previous allergies to pain medications. Ensuring the patient has no allergies can prevent a reaction if the wrong medication is administered. The nurse should provide education regarding the need to maintain active knee and ankle range of motion during the recovery period. Deep vein thrombosis (DVT) prophylaxis should also be administered to non–weight-bearing, lower-extremity fractures.

Chapter 19

Read the Electronic Health Record

1. Possible considerations: the elevated WBC and CRP levels indicate an inflammatory or infectious process, which is concerning, given the patient's history of diverticular disease. The increased abdominal pain and fever are also worrying signs.
2. The most concerning information is the elevated WBC count and CRP levels, combined with the findings from the CT scan indicating acute diverticulitis with pericolonic fat stranding. This suggests a significant

inflammatory process that could lead to complications if not promptly managed.

3. An expected finding is the presence of inflamed diverticula in the sigmoid colon, because the patient has a known history of diverticular disease. The mild fever and elevated inflammatory markers (WBC and CRP) are also expected in the context of acute diverticulitis.
4. It is important to question if the patient has any history of allergic reactions to the prescribed antibiotics (ciprofloxacin and metronidazole). Additionally, considering the patient's decreased appetite and occasional nausea, it may be necessary to assess for any potential adverse reactions to the medications or need for adjustments in pain management. Furthermore, questioning the adequacy of the current antibiotic regimen and considering the need for IV antibiotics or hospitalization should be discussed with the health-care team.

Chapter 20

Read the Electronic Health Record

1. Sample answer: Exacerbation of CKD. Anticipate use of diuretics and possibly dialysis.

Chapter 23

Unfolding Case Study

1. a
   Rationale: IV resuscitation is an immediate need to increase tissue perfusion and reverse hypovolemia. Administration of vasopressors constrict the blood vessels and increase tissue perfusion. Obtaining a CXR is an early diagnostic test that can help diagnose a pulmonary infection consistent with sepsis. The hemodynamic measurements are obtained as clinically indicated. IV crystalloids are recommended to administer because they contain nonproteins, minerals, salts, and sugars, and are responsible for maintenance of adequate F&E balance. They are also usually the first choice for IV solution recommended.
2. a, c, e
   Rationale: Anuria, or absence of urine output, is an indication of organ failure in septic shock. MODS result when two or more organs are dysfunctional as the result of having progressive sepsis. An elevated lactic acid of > 4mm/L is indicative of septic shock. With the value rising, the lactic acid continues to demonstrate the progression of septic shock and MODS. Metabolic acidosis is a physiologic disturbance defined by a pH less than 7.35 and a low HCO_3 level. Metabolic acidosis can develop if sepsis progresses and there are too many acids in the blood, which decreases the bicarbonate. Respiratory acidosis can be reversed early in the sepsis progression.

Chapter 25

Unfolding Case Study

1. Option 1: Left knee injury, preop; Option 2: Pain
   Rationale: Patient has an old knee injury from playing sports in high school and college. The patient has been off of her medication, ibuprofen, and is likely in pain.
   A panic attack may cause irritability, irrational thinking, lightheadedness, or dizziness; however, it is not the primary reason the patient presented to the hospital, or cause of the patient's presenting problem.
   Depression may be present with a hopeless outlook and possible crying; however, it is not the primary reason she presented to the hospital. This certainly needs to be addressed by the nurse but is not the primary cause of the patient's priority problem. Medication side effects are unlikely as she only takes ibuprofen and has not taken in 1 week. The patient has a normal WBC and is afebrile, thus is not likely to have an infection, nor a cause of her knee injury. Although patient education is a priority, that is not the cause of a fever, possible infection, respiratory rate of 30, or irritability. Patient education is a high priority for the patient and begins preoperatively. The nurse will assess any knowledge gaps and provide these for the patient.

2.

Assessment Finding	Left knee injury repair	Depression	Anxiety
Pain in the left knee	X		
Lack of education for surgery			X
Grieving loss of prior activity and exercise tolerance		X	
Emotional support from her husband		X	
Withdrawn		X	

Rationale: The pain in the patient's left knee is a direct result of overuse and damage from her athletic career. The patient's anxiety can be a significant result of the unknown of the surgery scheduled for that day. Without explanation and expressed understanding by the patient, the anxiety will most likely manifest. The patient had admitted to depression from the loss of the active lifestyle and endurance in performing prior activities using her left knee. It is very likely this has been a contribution to her depression. Support from her husband most likely provides comfort and working towards acceptance. This may assist her depression from escalation and being more manageable. The patient admitted withdrawal and lack of pleasure from the regression of prior left knee injuries and damage. The mutual goals created with the nurse and the patient and husband need to be reasonable for the patient to assure the ability to comply. They may include the external support resources that have been provided to the patient and her husband along with the patient's agreement and confirmation of understanding of how to accomplish her goals. All of the nurse's assessment findings relate to the diagnoses listed; however, the correlations of the preceding assessments are the most likely reasons for the nurse's findings on patient presentation and obtained history.

Chapter 26

Unfolding Case Study

1. aspiration, bleeding

Rationale: The patient has a history of an adverse reaction of postoperative nausea and vomiting (PONV) immediately postoperatively. The patient also has many risk factors for nausea and vomiting from the anesthesia. The nurse must prioritize the management of the patient's potential complications such as airway protection because the patient is still sedated. The nurse must be prepared for nursing interventions, such as having antiemetics readily available, as well as the potential of hypotension as a result of the anesthetic medications along with hyperemesis and fluid and electrolyte imbalance. Given the patient was taking the maximum dose of ibuprofen pre-operatively and she stopped her ibuprofen 7 days pre-operatively, the nurse must be aware that there is a potential risk for bleeding. Seizures of all types are caused by abnormal electrical activity in the brain. Causes of seizures can include abnormal levels of sodium or glucose in the blood; brain infection, including meningitis and encephalitis; or a patient with a history of having seizures. Developing a fever intraoperatively is unlikely. Hypothermia is a core body temperature less than 36.0°C (96.8°F). It is a common incident in the immediate postoperative period. Often, the patient is hypothermic from the cold temperature in the surgical suite. Dysrhythmias may be more likely in a patient with a cardiovascular history as a result of cardiac muscle damage, electrical abnormalities, valve repairs, or history of a myocardial infarction.

2.

Options for 1	Options for 2
Hypovolemia	Provide appropriate IV fluid management per provider order.
Emesis, PONV	Administer an antiemetic per provider order.
Depression, pre-operative	Prepare the postoperative team. The patient will require support and empathy when learning of the total knee replacement due to admitted depression.

Rationale: Hypovolemia: Appropriate IV fluid management per provider order is administered to increase vascular permeability as probable result of the anesthesia, significant blood loss, fluid shift and third spacing loss, PONV, and lack of oral intake pre-operatively.
Emesis, PONV: Patient has a history of severe PONV post-anesthesia. The nurse needs to anticipate the same adverse effect may occur. Emesis or hyperemesis can also lead to hypotension requiring IV fluid replacement and fluid and electrolyte monitoring.
Depression, postoperative: Prepare the postoperative team that patient will need to learn postoperatively that she required a total knee replacement. Because of her admitted depression, this can include support and empathy from the staff, referral to social workers, counselors if present, or spiritual support if desired by patient. The husband may need support from the staff as well providing positive feedback and guidance for the recovery period.
Hypertension: The patient did not experience hypertension, but it is a possible complication.
Blood loss: The patient had minimal blood loss during the surgery and did not require blood transfusions.

Read the Electronic Health Record

1. The patient's history of hypertension (HTN) and diabetes (DM)
2. The patient does not have a recent blood glucose or labs entered into the chart yet; must verify safe for surgery before proceeding.
3. The nurse should expect blood glucose to be elevated and need for insulin prior to surgery. The nurse should expect the patient's blood pressure to be elevated and potential need for an IV antihypertensive medication to be ordered.
4. The nurse will question missing documentation objective data from the chart. The nurse will interview the patient and collect any missing data such as vital signs, and verify diagnostics were completed.

Chapter 27

Unfolding Case Study

1. a, c, e
Rationale: Normal Saline (0.9% sodium chloride) causes hyperchloremia and metabolic acidosis, which may move potassium from the intracellular space into the interstitial fluid and plasma. Normal saline is a cornerstone of intravenous solutions commonly used in the clinical setting. It is a crystalloid fluid that hydrates and improves electrolyte disturbances. The primary indications for the use of normal saline infusion that have been approved by the FDA:
    - extracellular fluid replacement (e.g., dehydration, hypovolemia, hemorrhage, sepsis)
    - mild sodium depletion

    Administration of antiemetic will limit the nausea and vomiting and further loss of fluids. Administration of pain medication needs observation for hypotension. If the patient has pain with a BP < 89/49, the provider needs to be notified for an alternate pain medication.
    There is no need to have a CXR, as there is no fluid buildup, lungs are clear, and there is no SOB. The need for ABG at this point is not necessary for treatment options. Ketorolac can be administered, separately, but close in time to the hydromorphone. There is no contraindication and the patient should not go long periods of time

without both the NSAID and analgesic.

2. a, d, e
   Rationale: The patient is eating regular food without N/V. The surgeon will send the patient home with oral ondansetron if needed. The patient's K+ level has returned to normal range and is asymptomatic of signs/symptoms of an elevated K+. The patient's pain has been moderately managed. The patient was educated to expect pain will not be a 0–1 level and will continue with increased activity and PT. Also to continue the same meds po for pain and inflammation as she was. The patient was also educated to not go more than 4–6 hours at the most without taking her pain and anti-inflammatory medication ordered by the provider. The pain will then become harder to manage and may not be as effective because of the length of time going without medication.
   The patient chemistries do not reflect a metabolic acidosis. The patient's oxygenations and kidney function are normal. The patient has feen afebrile with a normal WBC and no signs of infection. Multiple organ dysfunction syndrome involves dysfunction of two organs and extreme decreased tissue perfusion and oxygenation. Cardiac status and VS are within the patient's baseline.

Chapter 33

Read the Electronic Health Record

1. Sample answer: Low BP, skin cool to touch, tachycardic heart rate.
2. Sample answer: Perform a more thorough peripheral vascular assessment, look for capillary refill in the limb with the surgical intervention, check for edema, pulse quality.
3. Sample answer: The patient may go into early compartment syndrome from the trauma and surgical intervention; if there is a pulse deficit, this is a medical emergency and warrants a call to the provider. An ECG may be done as hyperkalemia can be driving the tachycardia, which is a sign of compartment syndrome/crush injury.
4. Answer may include rhabdomyolysis and the patient may need an emergent intervention.

Chapter 35

Read the Electronic Health Record

1. Answers will vary. Sample answer: Blood pressure is dropping, CVP is increasing, and indices are going down, indicating worsening heart failure and possible cardiogenic shock.
2. Answers will vary but may include listen to heart sounds and monitor for perfusion by looking at capillary refill, pulses, and so forth.
3. Answers will vary. Sample answer: Adjust the dose of dobutamine to improve BP. Initiate another medication if needed. Have provider assess patient to determine the need for other interventions.
4. Answers will vary but may include MODS and cardiogenic shock.

INDEX

Symbols

A

B

C

D

E

F

G

H

I

J

K

L

M

N

O

P

Q

R

S

T

U

V

W

X

Y

Z