NURSING SKILLS



Ernstmeyer & Christman (Eds.)

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Nursing Skills

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Licensing

*A detailed breakdown of this resource's licensing can be found in **Back Matter/Detailed Licensing**.*

CHAPTER OVERVIEW

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1.1: General Survey Introduction

Learning Objectives

- Perform a general survey assessment, including vital signs, ability to communicate, appropriateness of behaviors and responses, general mobility, and basic nutritional and fluid status
- Modify assessment techniques to reflect variations across the life span, cultural values and beliefs, and gender expression
- Document actions and observations
- Recognize and report significant deviations from norms

"Learn to see, learn to hear, learn to feel, learn to smell, and know that by practice alone can you become expert."[1]

This quote provides a good description of learning how to perform a general survey assessment. A **general survey assessment** is a component of a patient assessment that observes the entire patient as a whole. General surveys begin with the initial patient contact and continue throughout the helping relationship. In this instance, observation includes using all five senses to gather cues. Nurses begin assessing patients from the moment they meet them, noting their appearance, posture, gait, verbal communication, nonverbal communication, and behaviors. Cues obtained during a general survey assessment are used to guide additional focused assessments in areas of concern.

Introduction to the Nursing Process

Before discussing the components of a general survey, it is important to understand how assessment fits under the standards for professional nursing practice established by the American Nurses Association (ANA). These standards are the foundation of the nursing profession and include duties that all registered nurses, regardless of role or specialty, are expected to perform competently.[2] There are six components of the nursing process: Assessment, Diagnosis, Outcomes Identification, Planning, Implementation, and Evaluation. See Figure **1.1.1**[3] for an illustration of the nursing process. The mnemonic ADOPIE is an easy way to remember the ANA Standards and the nursing process. The nursing process is a continuous, cyclic process that is constantly adapting to the patient's current health status. This textbook contains several chapters pertaining to techniques used during the assessment phase of the nursing process. Read more about the "Nursing Process" in the Open RN *Nursing Fundamentals* textbook.

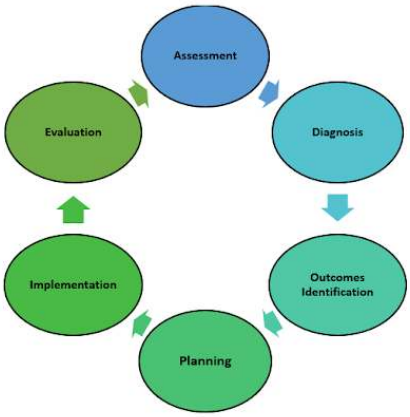


Figure **1.1.1**: Nursing Process

Assessment

According to the ANA, assessment includes collecting "pertinent data, including but not limited to, demographics, social determinants of health, health disparities, and physical, functional, psychosocial, emotional, cognitive, sexual, cultural, age-related, environmental, spiritual/transpersonal, and economic assessments in a systematic, ongoing process with compassion and respect for the inherent dignity, worth, and unique attributes of every person."[4]

Patient data is considered either subjective or objective, and it can be collected from multiple sources.

Subjective Assessment Data

Subjective data is information obtained from the patient and/or family members and offers important cues from their perspectives. When documenting subjective data, it should be in quotation marks and start with verbiage such as, "The patient reports…" or "The patient's wife states…" It is vital for the nurse to establish rapport with a patient to obtain accurate, valuable subjective data regarding the mental, emotional, and spiritual aspects of their condition.

Example. An example of documented subjective data obtained from a patient assessment is, *"The patient reports pain severity of 2 on a 1-10 scale."* Additionally, if you create an inference, then that data is considered subjective. For example, documenting an inference, such as *"The patient appears anxious,"* is subjective data.

There are two types of subjective information, primary and secondary. **Primary data** is information provided directly by the patient. Patients are the best source of information about their bodies and feelings, and the nurse who actively listens to a patient will often learn valuable information while also promoting a sense of well-being. Information collected from a family member, chart, or other sources is known as **secondary data**. Family members can provide important information, especially for infants and children or when the patient is unable to speak for themselves.

Objective Assessment Data

Objective data is anything that you can observe through your senses of hearing, sight, smell, and touch while assessing the patient. Objective data is reproducible, meaning another person can easily obtain the same data. Examples of objective data are vital signs, physical examination findings, and laboratory results.

Example. An example of documented objective data is, *"The patient's radial pulse is 58 and regular, and their skin feels warm and dry."*

Sources of Assessment Data

Assessment data is collected in three ways: during a focused interview, during physical examination, or while reviewing laboratory and diagnostic test results.

Interviewing

Interviewing includes asking the patient questions, listening, and observing verbal and nonverbal communication. Reviewing the chart prior to interviewing the patient eliminates redundancy in the interview process and allows the nurse to hone in on the most significant areas of concern or need for clarification. However, if information in the chart does not make sense or is incomplete, the nurse should use the interview process to verify data with the patient.

When beginning an interview, it may be helpful to start with questions related to the patient's medical diagnoses to gather information about how they have affected the patient's functioning, relationships, and lifestyle. Listen carefully and ask for clarification when something isn't clear to you. Patients may not volunteer important information because they don't realize it is important for their care. By using critical thinking and active listening, you may discover valuable cues that are important to provide safe, quality nursing care. Sometimes nursing students can feel uncomfortable with having difficult conversations or asking personal questions because of generational or other differences. Don't shy away from asking about information that is important to know for safe patient care. Most patients will be grateful that you cared enough to ask and listen.

Be alert and attentive to how the patient answers questions, as well as when they do not answer a question. Nonverbal communication and body language can be cues to important information that requires further investigation. A keen sense of observation is important. To avoid making inappropriate inferences, the nurse should validate any cues. For example, a nurse may make an inference that a patient is depressed when the patient avoids making eye contact during an interview. However, upon further questioning, the nurse may discover that the patient's cultural background believes direct eye contact to be disrespectful and this is why they are avoiding eye contact. Read more information about communicating with patients in the "Communication" chapter of the Open RN *Nursing Fundamentals* book.

Physical Examination

Physical examination is a systematic data collection method of the body that uses the techniques of inspection, auscultation, palpation, and percussion. **Inspection** is the observation of a patient's anatomical structures. **Auscultation** is listening to sounds,

such as heart, lung, and bowel sounds, created by organs using a stethoscope. **Palpation** is the use of touch to evaluate organs for size, location, or tenderness. **Percussion** is an advanced physical examination technique where body parts are tapped with fingers to determine their size and if fluid is present. See Figure **1.1.2**[5] for an image of a nurse performing a physical examination.



Figure **1.1.2**: Physical Examination

Registered Nurses (RNs) complete a physical examination and analyze the findings as part of the nursing process. Collection of physical examination data can be delegated to Licensed Practical Nurses/Licensed Vocational Nurses (LPNs/LVNs), or measurements such as vital signs and weight may be delegated to Unlicensed Assistive Personnel (UAP) when it is appropriate to do so. However, the RN remains responsible for analyzing the findings.

Assessment data is documented in the patient's electronic medical record (EMR), an electronic version of the patient's medical chart.

Reviewing Laboratory and Diagnostic Test Results

Reviewing laboratory and diagnostic test results is an important component of the assessment phase of the nursing process and provides relevant and useful information related to the needs of the patient. Understanding how normal and abnormal results affect patient care is important when implementing the nursing care plan and administering prescriptions. Read more about interpreting laboratory and diagnostic testing results based on nursing concepts in the Open RN *Nursing Fundamentals* textbook.

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1. Dallas Hall, W. (1990). Chapter 209: An overview of the general examination. In Walker, H. K., Hall, W. D., Hurst, J. W. (Eds.), *Clinical methods: The history, physical, and laboratory examinations* (3rd ed.). Butterworths. www.ncbi.nlm.nih.gov/books/NBK706/↵
2. American Nurses Association. (2015). *Nursing: Scope and standards of practice* (3rd ed.). American Nurses Association. ↵

3. "The Nursing Process" by Kim Ernstmeyer at Chippewa Valley Technical College is licensed under CC BY 4.0.↵
4. American Nurses Association. (2015). *Nursing: Scope and standards of practice* (3rd ed.). American Nurses Association. ↵
5. "13394660711603.jpg" by CDC/ Amanda Mills is in the Public Domain. ↵

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1.2: Initiating Patient Interaction

Before every patient interaction, the nurse must perform hand hygiene and consider the use of additional personal protective equipment, introduce themselves, and identify the patient using two different identifiers. It is also important to provide a culturally safe space for interaction and to consider the developmental stage of the patient.

Hand Hygiene and Infection Prevention

Before initiating care with a patient, hand hygiene is required and a risk assessment should be performed to determine the need for personal protective equipment (PPE). This is important for protection of both patient and nurse.

Hand Hygiene

Using hand hygiene is a simple but effective way to prevent infection when performed correctly and at the appropriate times when providing patient care. See Figure **1.2.1**.[1] for an image about hand hygiene from the Centers for Disease Control (CDC).[2] Use the hyperlinks provided below to read more information and watch a video about effective handwashing.

Key points from the CDC about hand hygiene include the following:[3]

- In general, hand sanitizers are as effective as washing with soap and water and are less drying to the skin. When using hand sanitizer, use enough gel to cover both hands and rub for approximately 20 seconds, coating all surfaces of both hands until your hands feel dry. Go directly to the patient without putting your hands into pockets or touching anything else.[4]
- Be sure to wash with soap and water if your hands are visibly soiled or the patient has diarrhea from suspected or confirmed C. Difficile (C-diff).
- Clean all areas of the hands including the front and back, the fingertips, the thumbs, and between fingers.
- Gloves are not a substitute for cleaning your hands. Wash your hands after removing gloves.
- Hand hygiene should be performed at these times:
  - Immediately before touching a patient
  - Before performing an aseptic task (e.g., placing an indwelling device) or handling invasive medical devices
  - Before moving from working on a soiled body site to a clean body site on the same patient
  - After contact with blood, body fluids, or contaminated surfaces
  - Immediately after glove removal
  - When leaving the area after touching a patient or their immediate environment



Figure **1.2.1**: Hand Hygiene

Checklists for performing handwashing and using hand sanitizer are located in Appendix A.

Note

Visit the Center for Disease Control and Prevention's website to read more about Hand Hygiene in Healthcare Settings

Download a factsheet from the Center for Disease Control and Prevention called Clean Hands Count

Video Reviews of Hand Hygiene:

Clean Hands Count[5]



Hand Washing Technique[6]



Hand Sanitizing Technique[7]



Check your knowledge with this learning activity.

Personal Protective Equipment (PPE)

Medical asepsis is a term used to describe measures to prevent the spread of infection in health care agencies. Performing hand hygiene at appropriate times during patient care and applying gloves when there is potential risk to body fluids are examples of using medical asepsis. Additional precautions are implemented by health care team members when a patient has, or is suspected of having, an infectious disease. These additional precautions are called **personal protective equipment (PPE)** and are based on how an infection is transmitted, such as by contact, droplet, or airborne routes. Personal protective equipment (PPE) includes gowns, eyewear, face shields, and masks. PPE is used along with environmental controls, such as surface cleaning and disinfecting to prevent the transmission of infection.[8] See Figure 1.2.2[9] for an image of health care team members applying PPE. These precautions are further discussed in the "Aseptic Technique" chapter. For the purpose of this chapter, be sure to perform a general risk assessment before entering a patient's room and apply the appropriate PPE as needed. This risk assessment include:

- Is there signage posted on the patient's door that contact, droplet, or airborne precautions are in place? If so, follow the instructions provided.
- Does this patient have a confirmed or suspected infection or communicable disease?
- Will your face, hands, skin, mucous membranes, or clothing be potentially exposed to blood or body fluids by spray, coughing, or sneezing?



Figure 1.2.2: Application of Personal Protective Equipment

Introducing Oneself

When initiating care with patients, it is essential to first provide privacy, and then introduce yourself and explain what will be occurring. Providing privacy means taking actions such as talking with the patient privately in a room with the door shut. A common framework used for introductions during patient care is **AIDET**, a mnemonic for Acknowledge, Introduce, Duration, Explanation, and Thank You.[10]

- **Acknowledge:** Greet the patient by the name documented in their medical record. Make eye contact, smile, and acknowledge any family or friends in the room. Ask the patient their preferred way of being addressed (for example, "Mr. Doe," "Jonathon," or "Johnny") and their preferred pronouns (i.e., he/him, she/her or they/them), as appropriate.
- **Introduce:** Introduce yourself by your name and role. For example, "I'm John Doe and I am a nursing student working with your nurse to take care of you today."

- **Duration:** Estimate a time line for how long it will take to complete the task you are doing. For example, “I am here to obtain your blood pressure, heart rate, and oxygen saturation levels. This should take about 5 minutes.”
- **Explanation:** Explain step by step what to expect next and answer questions. For example, “I will be putting this blood pressure cuff on your arm and inflating it. It will feel as if it is squeezing your arm for a few moments.”
- **Thank You:** At the end of the encounter, thank the patient and ask if anything is needed before you leave. In an acute or long-term care setting, ensure the call light is within reach and the patient knows how to use it. If family members are present, thank them for being there to support the patient as appropriate. For example, “Thank you for taking time to talk with me today. Is there anything I can get for you before I leave the room? Here is the call light (Place within reach). Press the red button if you would like to call the nurse.”

Note

For more information about AIDET, visit AIDET Patient Communication.

Patient Identification

Before performing assessments, obtaining vital signs, or providing care, patients must be properly identified using two identifiers.

First identifier:

- Ask the patient to state their name and date of birth. If they have an armband, compare the information they are stating to the information on the armband and verify they match. See Figure **1.2.3**[11] for an image of an armband.
- If the patient doesn’t have an armband confirm the information they are stating to information provided in the chart.
- If the patient is unable to state their name and date of birth, scan their armband or ask another staff member or family member to identify them.

Confirm first identifier with a different second identifier:

- Scan the wristband.
- Compare the name and date of birth to the patient’s chart.
- Ask staff to verify the patient in a long-term care setting.
- Compare the picture on the medication administration record (MAR) to the patient.
- If present, ask a family member to confirm the patient’s name.



Figure **1.2.3**: Patient Identification Armband

Cultural Safety

When initiating patient interaction, it is important to establish cultural safety. **Cultural safety** refers to the creation of safe spaces for patients to interact with health professionals without judgment or discrimination. See Figure **1.2.4**[12] for an image representing cultural safety. Recognizing that you and all patients bring a cultural context to interactions in a health care setting is helpful when creating cultural safe spaces. If you discover you need more information about a patient's cultural beliefs to tailor your care, use an open-ended question that allows the patient to share what they believe to be important. For example, you may ask, "I am interested in your cultural background as it relates to your health. Can you share with me what is important about your cultural background that will help me care for you?"[13]

> **Note**
>
> For more information about caring for diverse patients, visit the "Diverse Patients" chapter in the Open RN *Nursing Fundamentals* textbook.



Figure **1.2.4**: Cultural Safety Creates Safe Spaces for Everyone

Adapting to Variations Across the Life Span

It is important to adapt your interactions with patients in accordance their **developmental stage**. Developmentalists break the life span into nine stages[14]:

- Prenatal Development
- Infancy and Toddlerhood
- Early Childhood
- Middle Childhood
- Adolescence

- Early Adulthood
- Middle Adulthood
- Late Adulthood
- Death and Dying

A brief overview of the characteristics of each stage of human development is provided in Table 1.2.1 When caring for infants, toddlers, children, and adolescents, parents or guardians are an important source of information, and family dynamics should be included as part of the general survey assessment. When caring for older adults or those who are dying, other family members may be important to include in the general survey assessment. See Figure 1.2.5[15] for an image representing patients in various developmental stages of life.



Figure 1.2.5: Developmental Stages Across the Life Span

Note

Visit the Human Development Life Span e-book at LibreTexts to read additional information about human development across the life span.

Table 1.2.1: Variations Across the Life Span

Stage of Development	Common Characteristics
Prenatal Development	Conception occurs and development begins. All major structures of the body are forming and the health of the mother is of primary concern. Understanding nutrition, teratogens (environmental factors that can lead to birth defects), and labor and delivery are primary concerns for the mother.
Infancy and Toddlerhood	The first year and a half to two years of life are ones of dramatic growth and change. A newborn with a keen sense of hearing but very poor vision is transformed into a walking, talking toddler within a relatively short period of time. Caregivers are also transformed from someone who manages feeding and sleep schedules to a constantly moving guide and safety inspector for a mobile, energetic child.
Early Childhood	Early childhood is also referred to as the preschool years, consisting of the years that follow toddlerhood and precede formal schooling. As a three- to five-year-old, the child is busy learning language, gaining a sense of self and greater independence, and beginning to learn the workings of the physical world. This knowledge does not come quickly however, and preschoolers may have initially interesting conceptions of size, time, space, and distance, such as fearing that they may go down the drain if they sit at the front of the bathtub. A toddler's fierce determination to do something may give way to a four-year-old's sense of guilt for doing something that brings the disapproval of others.
Middle Childhood	The ages of six through eleven comprise middle childhood, and much of what children experience at this age is connected to their involvement in the early grades of school. Their world becomes filled with learning and testing new academic skills, assessing one's abilities and accomplishments, and making comparisons between self and others. Schools compare students and make these comparisons public through team sports, test scores, and other forms of recognition. Growth rates slow down and children are able to refine their motor skills at this point in life. Children begin to learn about social relationships beyond the family through interaction with friends and fellow students.
Adolescence	The World Health Organization defines adolescence as a person between the age of 10 and 19. Adolescence is a period of dramatic physical change marked by an overall physical growth spurt and sexual maturation, known as puberty. It is also a time of cognitive change as the adolescent begins to think of new possibilities and to consider abstract concepts such as love, fear, and freedom. Adolescents have a sense of invincibility that puts them at greater risk of injury from high-risk behaviors such as car accidents, drug and alcohol abuse, or contracting sexually transmitted infections that can have lifelong consequences or result in death.
Early Adulthood	The twenties and thirties are often thought of as early adulthood. It is a time of physiological peak but also highest risk for involvement in violent crimes and substance abuse. It is a time of focusing on the future and putting a lot of energy into making

	choices that will help one earn the status of a full adult in the eyes of others. Love and work are primary concerns at this stage of life.
Middle Adulthood	The late thirties through the mid-sixties is referred to as middle adulthood. This is a period in which aging processes that began earlier become more noticeable but also a time when many people are at their peak of productivity in love and work. It can also be a time of becoming more realistic about possibilities in life previously considered and of recognizing the difference between what is possible and what is likely to be achieved in their lifetime.
Late Adulthood	This period of the life span has increased over the last 100 years. For nurses, patients in this period are referred to as "**older adults.**" The term "young old" is used to describe people between 65 and 79, and the term "old old" is used for those who are 80 and older. One of the primary differences between these groups is that the young old are very similar to midlife adults because they are still working, still relatively healthy, and still interested in being productive and active. The "old old" may remain productive, active, and independent, but risks of the heart disease, lung disease, cancer, and cerebral vascular disease (i.e., strokes) increase substantially for this age group. Issues of housing, health care, and extending active life expectancy are only a few of the topics of concern for this age group. A better way to appreciate the diversity of people in late adulthood is to go beyond chronological age and examine whether a person is experiencing optimal aging (when they are in very good health for their age and continue to have an active, stimulating life), normal aging (when the changes in health are similar to most of those of the same age), or impaired aging (when more physical challenges and diseases occur compared to others of the same age).
Death and Dying	Death is the final stage of life. Dying with dignity allows an individual to make choices about treatment, say goodbyes, and take care of final arrangements. When caring for patients who are actively dying, nurses can advocate for care that allows that person to die with dignity according to their wishes.

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1.3: Vital Signs

Vital signs are typically obtained prior to performing a physical assessment. Vital signs include temperature recorded in Celsius or Fahrenheit, pulse, respiratory rate, blood pressure, and oxygen saturation using a pulse oximeter. See Figure **1.3.1**[1] for an image of a nurse obtaining vital signs. Obtaining vital signs may be delegated to unlicensed assistive personnel (UAP) for stable patients, depending on the state's nurse practice act, agency policy, and appropriate training. However, the nurse is always accountable for analyzing the vital signs and instituting appropriate follow-up for out-of-range findings. See Appendix A to review a checklist for obtaining vital signs.



Figure **1.3.1**: Obtaining Vital Signs

The order of obtaining vital signs is based on the patient and their situation. Health care professionals often place the pulse oximeter probe on the patient while proceeding to obtain their pulse, respirations, blood pressure, and temperature. However, in some situations this order is modified based on the urgency of their condition. For example, if a person loses consciousness, the assessment begins with checking their carotid pulse to determine if cardiopulmonary resuscitation (CPR) is required.[2]

Temperature

Accurate temperature measurements provide information about a patient's health status and guide clinical decisions. Methods of measuring body temperature vary based on the patient's developmental age, cognitive functioning, level of consciousness, and health status, as well as agency policy. Common methods of temperature measurement include oral, tympanic, axillary, and rectal routes. It is important to document the route used to obtain a patient's temperature because of normal variations in temperature in different locations of the body. Body temperature is typically measured and documented in health care agencies in degrees Celsius (ºC).[3]

Oral Temperature

Normal oral temperature is 35.8 – 37.3ºC (96.4 – 99.1ºF). An oral thermometer is shown in Figure **1.3.2**.[4] The device has blue coloring, indicating it is an oral or axillary thermometer, as opposed to a rectal thermometer that has red coloring. Oral temperature is reliable when it is obtained close to the sublingual artery.[5]



Figure **1.3.2**: Oral Thermometer

Technique

Remove the probe from the device and slide a probe cover (from the attached box) onto the oral thermometer without touching the probe cover with your hands. Place the thermometer in the posterior sublingual pocket under the tongue, slightly off-center. Instruct the patient to keep their mouth closed but not bite on the thermometer. Leave the thermometer in place for as long as is indicated by the device manufacturer. The thermometer typically beeps within a few seconds when the temperature has been taken. Read the digital display of the results. Discard the probe cover in the garbage (without touching the cover) and place the probe back into the device.[6]See Figure **1.3.3**[7] of an oral temperature being taken.



Figure **1.3.3**: Oral Temperature

Some factors can cause an inaccurate measurement using the oral route. For example, if the patient recently consumed a hot or cold food or beverage, chewed gum, or smoked prior to measurement, a falsely elevated or decreased reading may be obtained. Oral temperature should be taken 15 to 25 minutes following consumption of a hot or cold beverage or food or 5 minutes after chewing gum or smoking.[8]

Tympanic Temperature

The tympanic temperature is typically 0.3 – 0.6°C higher than an oral temperature. It is an accurate measurement because the tympanic membrane shares the same vascular artery that perfuses the hypothalamus (the part of the brain that regulates the body's temperature). See Figure **1.3.4**[9] of a tympanic thermometer. The tympanic method should not be used if the patient has a suspected ear infection.[10]



Figure **1.3.4**: Tympanic Thermometer

Technique

Remove the tympanic thermometer from its holder and place a probe cover on the thermometer tip without touching the probe cover with your hands. Turn the device on. Ask the patient to keep their head still. For an adult or older child, gently pull the helix (outer ear) up and back to visualize the ear canal. For an infant or child under age 3, gently pull the helix down. Insert the probe just inside the ear canal but never force the thermometer into the ear. The device will beep within a few seconds after the temperature is measured. Read the results displayed, discard the probe cover in the garbage (without touching the cover), and then place the device back into the holder.[11] See Figure **1.3.5**[12] for an image of a tympanic temperature being taken.



Figure 1.3.5: Tympanic Temperature

Axillary Temperature

The axillary method is a minimally invasive way to measure temperature and is commonly used in children. It uses the same electronic device as an oral thermometer (with blue coloring). However, the axillary temperature can be as much as 1ºC lower than the oral temperature.[13]

Technique

Remove the probe from the device and place a probe cover (from the attached box) on the thermometer without touching the cover with your hands. Ask the patient to raise their arm and place the thermometer probe in their armpit on bare skin as high up into the axilla as possible. The probe should be facing behind the patient. Ask the patient to lower their arm and leave the device in place until it beeps, usually about 10–20 seconds. Read the displayed results, discard the probe cover in the garbage (without touching the cover), and then place the probe back into the device. See Figure 1.3.6[14] for an image of an axillary temperature.[15]



Figure **1.3.6**: Axillary Temperature

Rectal Temperature

Measuring rectal temperature is an invasive method. Some sources suggest its use only when other methods are not appropriate. However, when measuring infant temperature, it is considered a gold standard because of its accuracy. The rectal temperature is usually 1ºC higher than oral temperature. A rectal thermometer has red coloring to distinguish it from an oral/axillary thermometer.[16] See Figure **1.3.7**[17] for an image of a rectal thermometer.



Figure **1.3.7**: Rectal Thermometer

Technique

Before taking a rectal temperature, ensure the patient's privacy. Wash your hands and put on gloves. For infants, place them in a supine position and raise their legs upwards toward their chest. Parents may be encouraged to hold the infant to decrease movement

and provide a sense of safety. When taking a rectal temperature in older children and adults, assist them into a side lying position and explain the procedure. Remove the probe from the device and place a probe cover (from the attached box) on the thermometer. Lubricate the cover with a water-based lubricant, and then gently insert the probe 2–3 cm inside the anus or less, depending on the patient's size.[18] Remove the probe when the device beeps. Read the result and then discard the probe cover in the trash can without touching it. Cleanse the device as indicated by agency policy. Remove gloves and perform hand hygiene.

See Table **1.3.1** for normal temperature ranges for various routes.

Table **1.3.1**: Normal Temperature Ranges[19]

Method	Normal Range
Oral	35.8 – 37.3ºC
Axillary	34.8 – 36.3ºC
Tympanic	36.1 – 37.9ºC
Rectal	36.8 – 38.2ºC

Pulse

Pulse refers to the pressure wave that expands and recoils arteries when the left ventricle of the heart contracts. It is palpated at many points throughout the body. The most common locations to assess pulses as part of vital sign measurement include radial, brachial, carotid, and apical areas as indicated in Figure **1.3.8**.[20]

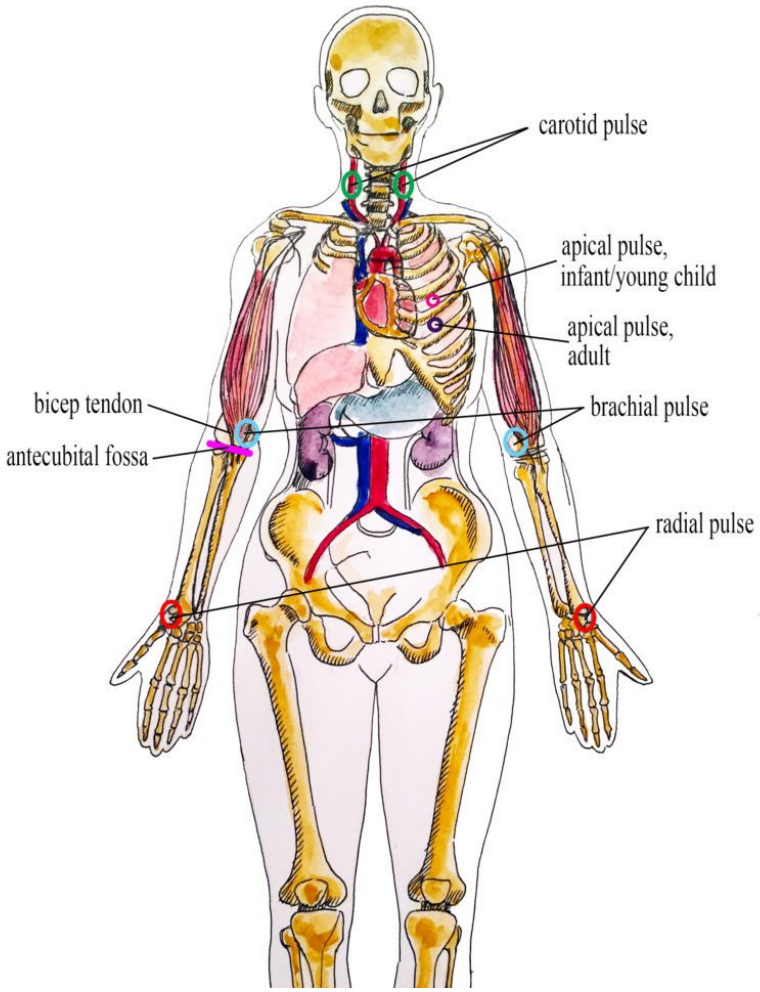


Figure **1.3.8**: Common Pulse Assessment Locations

Pulse is measured in beats per minute. The normal adult pulse rate (heart rate) at rest is 60–100 beats per minute with different ranges according to age. See Table **1.3.2** for normal heart rate ranges by age. It is important to consider each patient situation when analyzing if their heart rate is within normal range. Begin by reviewing their documented baseline heart rate. Consider other factors if the pulse is elevated, such as the presence of pain or crying in an infant. It is best to document the assessment when a patient is resting and comfortable, but if this is not feasible, document the circumstances surrounding the assessment and reassess as needed. [21]

Table **1.3.2**: Normal Heart Rate by Age

Age Group	Heart Rate
Preterm	120 – 180
Newborn (0 to 1 month)	100 – 160
Infant (1 to 12 months)	80 – 140
Toddler (1 to 3 years)	80 – 130
Preschool (3 to 5 years)	80 – 110
School Age (6 to 12 years)	70 – 100
Adolescents (13 to 18 years) and Adults	60 – 100

Pulse Characteristics

When assessing pulses, the characteristics of rhythm, rate, force, and equality are included in the documentation.

Pulse Rhythm

A normal pulse has a regular rhythm, meaning the frequency of the pulsation felt by your fingers is an even tempo with equal intervals between pulsations. For example, if you compare the palpation of pulses to listening to music, it follows a constant beat at the same tempo that does not speed up or slow down. Some cardiovascular conditions, such as atrial fibrillation, cause an irregular heart rhythm. If a pulse has an irregular rhythm, document if it is "regularly irregular" (e.g., three regular beats are followed by one missed and this pattern is repeated) or if it is "irregularly irregular" (e.g., there is no rhythm to the irregularity).[22]

Pulse Rate

The pulse rate is counted with the first beat felt by your fingers as "One." It is considered best practice to assess a patient's pulse for a full 60 seconds, especially if there is an irregularity to the rhythm.[23]

Pulse Force

The pulse force is the strength of the pulsation felt on palpation. Pulse force can range from absent to bounding. The volume of blood, the heart's functioning, and the arteries' elastic properties affect a person's pulse force.[24] Pulse force is documented using a four-point scale:

- 3+: Full, bounding
- 2+: Normal/strong
- 1+: Weak, diminished, thready
- 0: Absent/nonpalpable

If a pulse is absent, a Doppler ultrasound device is typically used to verify perfusion of the limbs. The Doppler is a handheld device that allows the examiner to hear the whooshing sound of the pulse. This device is also commonly used when assessing peripheral pulses in the lower extremities, such as the dorsalis pedis pulse or the posterior tibial pulse. See the following hyperlink to a video demonstrating the use of a Doppler device.

> **Note**
>
> Video Review of Using a Doppler Ultrasound Device to Assess a Pulse[25]:
> Doppler Device – How to

Pulse Equality

Pulse equality refers to a comparison of the pulse forces on both sides of the body. For example, a nurse often palpates the radial pulse on a patient's right and left wrists at the same time and compares if the pulse forces are equal. However, the carotid pulses should never be palpated at the same time because this can decrease blood flow to the brain. Pulse equality provides data about medical conditions such as peripheral vascular disease and arterial obstruction.[26]

Radial Pulse

Use the pads of your first three fingers to gently palpate the radial pulse. The pads of the fingers are placed along the radius bone on the lateral side of the wrist (i.e., the thumb side). Fingertips are placed close to the flexor aspect of the wrist (i.e., where the wrist meets the hand and bends). See Figure **1.3.9**[27] for correct placement of fingers in obtaining a radial pulse. Press down with your fingers until you can feel the pulsation, but not so forcefully that you are obliterating the wave of the force passing through the artery. Note that radial pulses are difficult to palpate on newborns and children under the age of five, so the brachial or apical pulses are typically obtained in this population.[28]



Figure **1.3.9**: Radial Pulse

Carotid Pulse

The carotid pulse is typically palpated during medical emergencies because it is the last pulse to disappear when the heart is not pumping an adequate amount of blood.[29]

Technique

Locate the carotid artery medial to the sternomastoid muscle, between the muscle and the trachea, in the middle third of the neck. With the pads of your three fingers, gently palpate one carotid artery at a time so as not to compromise blood flow to the brain. See Figure **1.3.10**[30] for correct placement of fingers in a seated patient.[31]



Figure **1.3.10**: Carotid Pulse

Brachial Pulse

A brachial pulse is typically assessed in infants and children because it can be difficult to feel the radial pulse in these populations. If needed, a Doppler ultrasound device can be used to obtain the pulse.

Technique

The brachial pulse is located by feeling the bicep tendon in the area of the antecubital fossa. Move the pads of your three fingers medially from the tendon about 1 inch (2 cm) just above the antecubital fossa. It can be helpful to hyperextend the patient's arm to accentuate the brachial pulse so that you can better feel it. You may need to move your fingers around slightly to locate the best place to accurately feel the pulse. You typically need to press fairly firmly to palpate the brachial pulse.[32] See Figure **1.3.11**[33] for correct placement of fingers along the brachial artery.



Figure **1.3.11**: Brachial Pulse

Apical Pulse

The apical pulse rate is considered the most accurate pulse and is indicated when obtaining assessments prior to administering cardiac medications. It is obtained by listening with a stethoscope over a specific position on the patient's chest wall. Read more about listening to the apical pulse and other heart sounds in the "Cardiovascular Assessment" chapter.

Respiratory Rate

Respiration refers to a person's breathing and the movement of air into and out of the lungs. Inspiration refers to the process causing air to enter the lungs, and expiration refers to the process causing air to leave the lungs. A respiratory cycle (i.e., one breath while measuring respiratory rate) is one sequence of inspiration and expiration.[34]

When obtaining a respiratory rate, the respirations are also assessed for quality, rhythm, and rate. The quality of a person's breathing is normally relaxed and silent. However, loud breathing, nasal flaring, or the use of accessory muscles in the neck, chest, or intercostal spaces indicate respiratory distress. People experiencing respiratory distress also often move into a tripod position, meaning they are leaning forward and placing their arms or elbows on their knees or on a bedside table. If a patient is demonstrating new signs of respiratory distress as you are obtaining their vital signs, it is vital to immediately notify the health care provider or follow agency protocol.

Respirations normally have a regular rhythm in children and adults who are awake. A regular rhythm means that the frequency of the respiration follows an even tempo with equal intervals between each respiration. However, newborns and infants commonly exhibit an irregular respiratory rhythm.

Normal respiratory rates vary based on age. The normal resting respiratory rate for adults is 10–20 breaths per minute, whereas infants younger than one year old normally have a respiratory rate of 30–60 breaths per minute. See Table **1.3.3** for ranges of normal respiratory rates by age. It is also important to consider factors such as sleep cycle, presence of pain, and crying when assessing a patient's respiratory rate.[35]

Read more about assessing a patient's respiratory status in the "Respiratory Assessment" chapter.

Table **1.3.3**: Normal Respiratory Rate by Age[36]

Age	Normal Range
Newborn to one month	30 – 60
One month to one year	26 – 60
1-10 years of age	14 – 50
11-18 years of age	12 – 22
Adult (ages 18 and older)	10 – 20

Oxygen Saturation

A patient's oxygenation status is routinely assessed using pulse oximetry, referred to as SpO2. SpO2 is an estimated oxygenation level based on the saturation of hemoglobin measured by a pulse oximeter. Because the majority of oxygen carried in the blood is attached to hemoglobin within the red blood cells, SpO2 estimates how much hemoglobin is "saturated" with oxygen. The target range of SpO2 for an adult is 94-98%. For patients with chronic respiratory conditions, such as chronic obstructive pulmonary disease (COPD), the target range for SpO2 is often lower at 88% to 92%. Although SpO2 is an efficient, noninvasive method to assess a patient's oxygenation status, it is an estimate and not always accurate. For example, if a patient is severely anemic and has a decreased level of hemoglobin in the blood, the SpO2 reading is affected. Decreased peripheral circulation can also cause a misleading low SpO2 level.

A pulse oximeter includes a sensor that measures light absorption of hemoglobin. See Figure **1.3.12**[37] for an image of a pulse oximeter. The sensor can be attached to the patient using a variety of devices. For intermittent measurement of oxygen saturation, a spring-loaded clip is attached to a patient's finger or toe. However, this clip is too large for use on newborns and young children; therefore, for this population, the sensor is typically taped to a finger or toe. An earlobe clip is another alternative for patients who cannot tolerate the finger or toe clip or have a condition, such as vasoconstriction and poor peripheral perfusion, that could affect the results.



Figure **1.3.12**: Pulse Oximeter

The target range of SpO2 for an adult is 94-98%. For patients with chronic respiratory conditions, such as chronic obstructive pulmonary disease (COPD), the target range for SpO2 is often lower at 88% to 92%.

Read more about pulse oximetry in the "Oxygen Therapy" chapter.

Technique

Nail polish or artificial nails can affect the absorption of light waves from the pulse oximeter and decrease the accuracy of the SpO2 measurement when using a probe clipped on the finger. An alternative sensor that does not use the finger should be used for these patients or the nail polish should be removed. If a patient's hands or feet are cold, it is helpful to clip the sensor to the earlobe or tape it to the forehead.

Blood Pressure

Read information about how to accurately obtain blood pressure measurement in the "Blood Pressure" chapter.

Interpreting Results

After obtaining a patient's vital signs, it is important to immediately analyze the results, recognize deviations from expected normal ranges, and report deviations appropriately. As a nursing student, it is vital to immediately notify your instructor and/or collaborating nurse caring for the patient of any vital sign measurement out of normal range.

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1.4: Basic Concepts

When performing a general survey assessment, nurses use all of their senses to carefully observe the patient. They look at a patient and ask themselves, what are they seeing? They listen to a patient and ask themselves, what are they hearing, both verbally and nonverbally? They smell a patient's odors and ask themselves, is there anything unusual we need to further assess? They observe a patient's behaviors and make notes about their functioning and ability to complete daily activities according to their developmental level.

Before performing a general survey assessment, it is important to first ensure the patient is medically stable by completing a brief primary survey. After ensuring the patient is medically stable, a general survey assessment is an overall observation of a patient's general appearance, behavior, mobility, communication, nutritional, and fluid status. A general survey assessment also includes analyzing height, weight, and vital signs for values that are out of range and require additional follow-up.

Primary Survey

At the beginning of every shift or patient visit, nurses perform a brief **primary survey** to ensure their patient is medically stable. If any signs indicate patient distress, the provider is notified and emergency care is initiated. For example, changes in level of consciousness or abnormal vital signs often provide early warning signs that a patient's condition is deteriorating and prompt medical treatment is needed.[1] Mental status, airway, breathing, and circulation are also quickly assessed and emergency actions taken as needed.[2]

In a clinic setting, the patient is observed from the time they are called from the waiting room. Nurses observe a patient's gait and balance as they walk to the exam room and assess their verbal and nonverbal communication while interacting. If signs of distress are occurring, the nurse follows agency policy and either immediately calls a provider into the room or initiates emergency assistance.

Mental Status

When assessing a patient's overall mental status, it is important to compare findings to their known baseline if this information is known or available. Initially determine if a patient is responsive or unresponsive. Can you awaken them and are they responding to your questions? Are they oriented to person, place, and time, meaning can they tell you their name, location, and the day of the week? If you are concerned about a sudden change in a patient's mental status, obtain emergency assistance according to agency policy.

Airway and Breathing

Determine if the patient's airway is open and if they are breathing adequately. Institute emergency care for respiratory distress as needed. See Figure **1.4.1**[3] for an illustration of checking a patient's airway, breathing, and circulation (ABCs).



Figure 1.4.1: Checking a Patient's ABCs

Circulation

If a patient is not responsive, try to awaken them using a sternal rub. A sternal rub is performed by firmly rubbing one's knuckles on a patient's sternum to try to elicit a response. If they do not respond, check the carotid pulse and obtain emergency assistance as needed. Briefly observe the color and moisture of their skin. Abnormal findings such as cool, moist, pale, or bluish skin can indicate signs of shock that require emergency care.

General Appearance

After ensuring your patient is medically stable by completing a primary survey, a general survey consists of using your senses to observe a patient's general appearance, behavior, mobility, and communication. Items to consider when assessing general appearance include the following:

- **Signs of pain or distress:** Patients may exhibit signs of pain or distress that should be reported to the provider such as grimacing, moaning, or increased anxiety. Set the priorities for your focused assessments based on any signs of distress demonstrated by your patient.
- **Age:** Observe if the patient appears their stated age. Chronic disease can cause a patient to appear older than their age. Factors can occur with older adults that may influence how well the patient can participate in the assessment, such as hearing, vision, or mobility impairments.
- **Body type:** No patient is exactly the same; some patients are in good physical shape and others are not. Body type can reflect nutritional status and lifestyle choices.
- **Hygiene, grooming, and dress:** Observe the overall cleanliness of the patient's hair, face, and nails and note any odors. Odors can indicate poor hygiene or various disease states. Validate odors by performing additional focused assessments as needed. Note the appearance of the patient's clothing; is it clean and appropriate for the season? If not, findings can reflect on a patient's cognitive abilities, emotional state, and ability to complete daily activities.

Behavior

While observing the patient, note their behaviors during your interaction. Consider the following items:

- **Affect and mood:** People express their mood through facial expressions, eye contact, what they do, and what they say. Eye contact is commonly used to judge a person's mood because people who are feeling down or depressed commonly avoid eye contact. However, be aware that cultural beliefs may also affect the use of eye contact. **Affect** refers to the outward display of one's emotional state. For example, a patient with a "flat affect" refers to very few facial expressions being displayed to indicate emotion, which is often associated with depression. If the patient's mood or behavior seems inappropriate for their current situation, make a note of that as well. For example, a patient in an usually elated mood in a situation when most people would be seriously concerned can be a symptom of mental illness.
- **Family dynamics:** If other family members are accompanying the patient, note the characteristics of their interactions. **Family dynamics** are the patterns of interactions between family members that influence family structure, hierarchy, roles, values, and behaviors. Family dynamics have a strong impact on the way children see themselves, others, and their world. They can also impact the lifestyles of older adults who rely on their children for assistance in activities of daily living and health care.
- **Signs of patient abuse:** Abuse occurs in many different forms such as physical, emotional, mental, verbal, sexual, economic, or financial. Most states mandate nurses and other health care professionals to report suspected child and elder abuse to the proper authorities. Observe if your patient seems fearful, excessively quiet, or has physical signs of abuse, such as bruising or burn marks. If you suspect abuse, attempt to interview the patient alone. Promptly report your concerns according to agency policy and state mandates.
- **Substance use disorder:** Approach your patient in a caring and nonjudgmental way, but be aware that unusual signs or behaviors can be indicators of substance use disorder. For example, if a patient's pupils are unusually dilated or constricted, this can be a sign of substance use disorder. Contact the provider with concerns about substance use disorder.

See Figure **1.4.2**[4] of an image of a man with poor hygiene and nonverbal behavior requiring further assessment, such as disease management, medication management, and ability to complete activities of daily living.



Figure **1.4.2**: Man Requiring Additional Assessment Based on Appearance and Behavior

Mobility

Observe your patient's body movements, noting posture, gait, and range of motion.

- **Posture:** Patients with normal sitting and standing posture are upright and have a parallel alignment from the shoulders to the hips. Note if the patient is hunched, slumped, contracted, or rigid. See Figure **1.4.3**[5] for an image of a patient with a type of slumped posture called kyphosis.



Figure **1.4.3**: Patient with Slumped Posture

- **Gait and balance:** Observe how the patient walks or stands. Are the movements organized, coordinated, or uncoordinated? Are they able to maintain balance while standing without leaning on or touching anything? Healthy people walk with a smooth gait and arms moving freely at their sides and are able to stand unassisted. A change in gait or balance often signifies underlying health conditions and increases the risk of falling. See Figure **1.4.4**[6] of a patient learning how to use an assistive device for an altered gait.



Figure 1.4.4: Altered Gait with Assistive Device

Range of motion and mobility: Observe the patient moving their extremities. Do extremities on the right and left sides move equally? Note any tremors or movements that are not purposeful. Are the patient's abilities appropriate for their age? Is the patient moving normally or do they have specific limitations? Does the patient use any assistive devices such as a cane or walker? Mobility is an important component in being able to care for oneself independently, so note any potential concerns for adults that may impact their ability to complete activities of daily living.

Communication

- **Speech:** Observe how your patient is speaking during your interaction. Are they speaking in an understandable tone and even pace, or is it garbled or difficult to understand? Neurological disorders can cause speech to be slow, slurred, and hard to understand. Is there an emotional component to their words? Is there a language barrier requiring an interpreter?
- **Response to commands:** Does the patient follow instructions you are providing during your assessment, or do they have difficulty in understanding or cooperating?

Nutritional Status

Visually observing the patient's overall nutritional status can provide cues for additional focused assessments related to appetite, diet, food intake, or exercise. Many factors can influence a patient's nutritional status such as financial or transportation issues,

swallowing difficulties, missing teeth, or poorly fitting dentures.

Fluid Status

Observe overall fluid status. Dehydration can be indicated by dry skin, dry mucous membranes, or sunken eyes. Conversely, patients with excess fluid often have swelling or edema in their extremities and may exhibit signs of difficulty breathing.

Height, Weight, and BMI

Height and weight can be used as a guide to reflect the patient's general health. Weight is routinely assessed during all health care visits. Infants and children are measured to assess their growth and development. Hospitalized patients often have daily weights assessed to monitor for changes in their medical condition. Document findings based on agency policy. For example, in some agencies, height is documented in centimeters and weight is documented in kilograms. Recall that one inch is equivalent to 2.5 centimeters and 1 kilogram is equivalent to 2.2 pounds.

Body Mass Index (BMI) is a standardized reference range that is used to analyze a patient's weight status and provides a representation of body fat. However, it is important to note that BMI may not be accurate for athletes with increased muscle mass, people with edema or dehydration, or older adults who have lost a significant amount of muscle mass. See a BMI table in Figure 1.4.5.[7] To use the BMI table, find the height in inches in the left column, move across the row to closest weight, and then read the BMI where the column and row intersect. For example, a person who is 5′ 9″ tall is 69 inches. If the patient weighs 155 pounds, the BMI is 23. BMI indicating a healthy weight is between 18.5 to 24.9.

BMI can also be calculated using the formula of BMI = kg/m^2 (weight in kilograms divided by height in meters squared).

The following classifications are used based on a person's BMI:

Underweight: Below 18.5 kg/m2

Healthy weight: 18.6 to 24.9 kg/m2

Overweight: 25 to 29.9 kg/m2

Obesity: Over 30 kg/m2 to 34.9 kg/m2

Extreme obesity: Over 35 kg/m2

BODY MASS INDEX (BMI)

BMI	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Height (inches)	Body Weight (pounds)																
58	91	96	100	105	110	115	119	124	129	134	138	143	148	153	158	162	167
59	94	99	104	109	114	119	124	128	133	138	143	148	153	158	163	168	173
60	97	102	107	112	118	123	128	133	138	143	148	153	158	163	168	174	179
61	100	106	111	116	122	127	132	137	143	148	153	158	164	169	174	180	185
62	104	109	115	120	126	131	136	142	147	153	158	164	169	175	180	186	191
63	107	113	118	124	130	135	141	146	152	158	163	169	175	180	186	191	197
64	110	116	122	128	134	140	145	151	157	163	169	174	180	186	192	197	204
65	114	120	126	132	138	144	150	156	162	168	174	180	186	192	198	204	210
66	118	124	130	136	142	148	155	161	167	173	179	186	192	198	204	210	216
67	121	127	134	140	146	153	159	166	172	178	185	191	198	204	211	217	223
68	125	131	138	144	151	158	164	171	177	184	190	197	203	210	216	223	230
69	128	135	142	149	155	162	169	176	182	189	196	203	209	216	223	230	236
70	132	139	146	153	160	167	174	181	188	195	202	209	216	222	229	236	243
71	136	143	150	157	165	172	179	186	193	200	208	215	222	229	236	243	250
72	140	147	154	162	169	177	184	191	199	206	213	221	228	235	242	250	258
73	144	151	159	166	174	182	189	197	204	212	219	227	235	242	250	257	265
74	148	155	163	171	179	186	194	202	210	218	225	233	241	249	256	264	272
75	152	160	168	176	184	192	200	208	216	224	232	240	248	256	264	272	279
76	156	164	172	180	189	197	205	213	221	230	238	246	254	263	271	279	287

Source: Chart derived from the U.S. National Institute of Health's National Heart, Lung, and Blood Institute (NHLBI)

Figure 1.4.5: Body Mass Index



Establish a trusting, nonjudgmental relationship with your patient. Use a calm voice and do not appear rushed. Provide them with your undivided attention, and use all of your senses when interacting to pick up on important cues related to their current health status.

Life Span Considerations During a General Survey Assessment

Children

When performing a general survey on a child, be aware of their developmental stages to establish expectations for normal findings. Use a calm and gentle tone to establish trust. Demonstrations on dolls or stuffed animals before performing procedures are often helpful. Be aware that the parents of toddlers and school-aged children will likely provide most of the information during an assessment.

Adolescents

Adolescents may refrain from sharing important information related to their care in front of their parents, especially regarding high-risk behaviors such as smoking, alcohol or drug use, sexual activity, or suicidal thoughts. It is often helpful to allow time to interview the adolescent privately, in addition to gathering information when the parent is present.

Older Adults

Recognize normal changes associated with aging when performing a general survey. If your patient wears glasses or hearing aids, be sure they are in place before asking questions. You may need to allow for extra time for your assessment, depending on the abilities of your patient. If an older adult is unable to communicate effectively, nurses may also consult a variety of sources such as family members and electronic medical records for more information.

Cultural Adaptations During a General Survey Assessment

Adapt your communication during a general survey assessment to your patient's cultural beliefs and values. For example, some individuals believe that direct eye contact with authorities is considered disrespectful and avoid eye contact. Other individuals may nod to indicate they are listening but this does not mean they are in agreement with what you are saying. Some patients prefer that a same sex individual perform care. For additional details about caring for diverse patients, see the "Diverse Patients" chapter in the Open RN *Nursing Fundamentals* textbook.

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1. This work is a derivative of StatPearls by Toney-Butler and Unison-Pace licensed under CC BY 4.0↵
2. Chemical Hazards Emergency Medical Management. (2020, April 17). *Primary and secondary survey.* National Institutes of Health. https://chemm.nlm.nih.gov/appendix8.htm↵
3. "Checking respiratory.png" by User:Rama licensed under CC BY-SA 3.0 FR↵
4. "Homeless man in Los Angeles(7618018076).jpg" by Alex Proimos licensed under CC BY 2.0↵
5. "Posturalkyphosis" by Lab Science Career licensed under CC BY-NC-SA 2.0↵
6. "US_Navy_071015-N-5086M-202_Retired_Marine_Corps_Cpl._Timothy_Jeffers_walks_on_his_prosthetic_legs_while_using_the_hands-free_harness_walking_gait_training_device_during_a_therapy_session_in_the_new_Comprehensive_Combat_and_Com.jpg" by U.S. Navy photo by Mass Communication Specialist 2nd Class Greg Mitchell is in the Public Domain↵
7. This work is a derivative of U.S. National Institutes of Health's National Heart, Lung, and Blood Institute (NHLBI), https://www.wikidoc.org/index.php/File:BMIReferenceChart.jpg licensed under CC BY-SA 3.0↵

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1.5: Expected Versus Unexpected Findings

Table 1.5.1 compares expected and unexpected findings when performing a general survey assessment. These findings are included in documentation regarding the general survey assessment.

Table 1.5.1: Expected Versus Unexpected Findings on General Survey Assessment

Assessment	Expected Findings	Unexpected Findings (notify provider if a new finding*)
Signs of distress	No signs of distress	Unresponsive, difficulty breathing, confused, moaning, or grimacing
Mood and appearance	Calm and cooperative Responds appropriately to questions Appears stated age	Mood is depressed, anxious, or agitated Signs of suspected substance use disorder are present, such as the scent of alcohol
Orientation	Alert and oriented to person, place, and time	Unable to provide name, location, or day
Hygiene	Well groomed. Clothing is appropriate for weather	Unkempt appearance or inappropriate clothing according to the weather
Family dynamics	Family members demonstrate mutual respect, trust, and caring	Family members communicate in an unfriendly, disrespectful, or hostile manner Signs of suspected abuse are present
Speech and communication	Speech is clear and understandable; patient follows instructions appropriately	Speech is garbled or difficult to understand; unable to respond appropriately to questions or follow commands
Range of motion	Moves all extremities equally bilaterally with good posture	New facial drooping or altered/unequal movement of extremities
Mobility	Gait is smooth and even and can maintain balance without assistance. If present, assistive devices are used appropriately and this is documented	Gait is shuffling, staggering, or limping. Balance is impaired; assistive devices like a cane or walker are not used appropriately
Nutrition	BMI within normal range	BMI out of range. Unexplained weight loss or gain has occurred
Fluid status	Moist mucous membranes	Dry skin and dry mucous membranes; sunken eyes in adults; sunken fontanel in infants
CRITICAL CONDITIONS to report immediately:		Newly unresponsive or altered mental status; difficulty breathing; vital signs out of range; skin is cool, clammy, or cyanotic

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1.6: Sample Documentation

Sample Documentation of Expected Findings

Mrs. Smith is a 65-year-old patient who appears her stated age. She is calm, cooperative, alert, and oriented x 3. She is well-groomed and her clothing is clean and appropriate for the weather. Her speech is clear and understandable, and she follows instructions appropriately.

Mrs. Smith moves all extremities equally bilaterally with good posture. Her gait is smooth and she maintains balance without assistance. Her skin is warm and her mucous membranes are moist. She is 5'4" and she weighs 143 with a BMI of 24 in the normal weight category. Her vital signs were BP 120/70, pulse 74 and regular, respiratory rate 14, temperature 36.8 Celsius, and pulse oximetry was 98% on room air.

Sample Documentation of Unexpected Findings

Mrs. Smith is a 65-year-old patient who appears older than her stated age. She appears slightly agitated during the interview. She is oriented to person only and denies pain. She is wearing a heavy winter coat on a warm summer day and has an unclean body odor. She is slow to respond to questions and does not follow commands. She seems to neglect the use of her right arm. Her gait is shuffled with stooped posture but has no assistive devices. She is 5'4" and weighs 102 pounds with a BMI of 17.5 in the underweight category. Her vital signs were 186/55, pulse 102 and irregular, respiratory rate 22, temperature 38.1 Celsius, and pulse oximetry was 88%.

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1.7: Checklist for General Survey

Use this checklist to perform a “General Survey.” Checklists for hand washing, using hand sanitizer, and obtaining vital signs are included in Appendix A.

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

1. Knock, enter the room, greet the patient, and provide for privacy.
2. Introduce yourself, your role, the purpose of your visit, and an estimate of the time it will take.
3. Perform hand hygiene.
4. Ask the patient their legal name and date of birth for the first identifier. Verify information provided in their chart or wristband, if present. Use one of the following for the second identifier:
    - Scan wristband
    - Compare name/DOB to MAR
    - Ask staff to verify patient (in settings where wristbands are not worn)
    - Compare picture on MAR to patient
5. Address patient needs (pain, toileting, glasses/hearing aids) prior to starting assessment. Note if the patient has signs of distress such as difficulty breathing or chest pain. If signs are present, defer general survey and obtain emergency assistance per agency policy.
6. Explain the procedure to the patient; ask if he/she has any questions. Obtain an interpreter as needed if English is not the patient’s primary language.
7. Pause and explain to the instructor what you would purposefully observe and assess during a general survey assessment.
8. Upon completion of the survey, thank the patient and ask if anything is needed.
9. Ensure five safety measures before leaving the room:
    - CALL LIGHT: Within reach
    - BED: Low and locked (in lowest position and brakes on)
    - SIDE RAILS: Secured
    - TABLE: Within reach
    - ROOM: Risk-free for falls (scan room and clear any obstacles)
10. Perform hand hygiene and clean stethoscope.
11. Follow agency policy for reporting findings outside of normal range.
12. Document the assessment.

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1.8: Learning Activities

Learning Activities

(Answers to “Learning Activities” can be found in the “Answer Key” at the end of the book. Answers to interactive activity elements will be provided within the element as immediate feedback.)

Maria is working on a medical surgical unit and receives a direct admission from the internal medicine clinic. She arrives at the patient’s room to complete the initial admission assessment. All of the following conditions are found.

Of these conditions, which of the following should be reported immediately to the health care provider.

a. Patient ambulates with assistance of wheeled walker.
b. Patient’s BMI is outside of the normal range.
c. Patient appears unkempt and has strong body odor.
d. Patient is experiencing increased difficulty breathing.

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1.9: I Glossary

Affect: Outward display of one's emotional state. A "flat" affect with little display of emotion is associated with depression.

AIDET: Mnemonic for introducing oneself in health care that includes Acknowledge, Introduce, Duration, Explanation, and Thank You.[1]

BMI: A standardized reference range to gauge a patient's weight status.

Cultural safety: The creation of safe spaces for patients to interact with health professionals without judgment, racial reductionism, racialization, or discrimination.

Developmental stages: A person's life span can be classified into nine categories of development, including Prenatal Development, Infancy and Toddlerhood, Early Childhood, Middle Childhood, Adolescence, Early Adulthood, Middle Adulthood, Late Adulthood, and Death and Dying.

Family dynamics: Patterns of interactions between family members that influence family structure, hierarchy, roles, values, and behaviors.

General survey assessment: A component of a patient assessment that observes the entire patient as a whole. Observation includes using all five senses to gather cues that provide a guideline for additional focused assessments in areas of concern.

Medical asepsis: Measures to prevent the spread of infection in health care agencies.

Older adults: People over the age of 65.

Personal Protective Equipment (PPE): Includes gowns, eyewear, face shields, and masks, along with environmental controls, to prevent the transmission of infection for patients who are diagnosed or suspected of having an infectious disease.

Primary survey: A brief observation at the start of a shift or visit to verify the patient is stable by assessing mental status, airway, breathing, and circulation.

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1. Huron. (n.d.). *AIDET patient communication*. https://www.studergroup.com/aidet↵

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CHAPTER OVERVIEW

2: Blood Pressure

2.1: Blood Pressure Introduction
2.2: Blood Pressure Basics
2.3: Blood Pressure Assessment
2.4: Sample Documentation
2.5: Checklist for Manual Blood Pressure
2.6: Supplementary Video of Blood Pressure Assessment
2.7: Learning Activities
2.8: III Glossary

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2.1: Blood Pressure Introduction

Learning Objectives

- Accurately measure and document blood pressure using American Heart Association standards
- Adapt the procedure to reflect variations across the life span
- Recognize and report significant deviations from blood pressure norms

The accurate measurement of blood pressure is important for ensuring patient safety and optimizing body system function. Blood pressure measurements are used by health care providers to make important decisions about a patient's care. Blood pressure measurements help providers make decisions about whether a patient needs fluids or prescription medications. It is crucial to follow the proper steps to obtain a patient's blood pressure to ensure the care team has accurate data to help make health care decisions and determine a plan of care.

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2.2: Blood Pressure Basics

What is Blood Pressure?

A blood pressure reading is the measurement of the force of blood against the walls of the arteries as the heart pumps blood through the body. It is reported in millimeters of mercury (mmHg). This pressure changes in the arteries when the heart is contracting compared to when it is resting and filling with blood. Blood pressure is typically expressed as the reflection of two numbers, systolic pressure and diastolic pressure. The **systolic blood pressure** is the maximum pressure on the arteries during systole, the phase of the heartbeat when the ventricles contract. **Systole** causes the ejection of blood out of the ventricles and into the aorta and pulmonary arteries. The **diastolic blood pressure** is the resting pressure on the arteries during **diastole**, the phase between each contraction of the heart when the ventricles are filling with blood.[1]

Blood pressure measurements are obtained using a stethoscope and a **sphygmomanometer**, also called a blood pressure cuff. To obtain a manual blood pressure reading, the blood pressure cuff is placed around a patient's extremity, and a stethoscope is placed over an artery. For most blood pressure readings, the cuff is usually placed around the upper arm, and the stethoscope is placed over the brachial artery. The cuff is inflated to constrict the artery until the pulse is no longer palpable, and then it is deflated slowly. The American Heart Association (AHA) recommends that the blood pressure cuff be inflated at least 30 mmHg above the point at which the radial pulse is no longer palpable. The first appearance of sounds, called **Korotkoff sounds**, are noted as the systolic blood pressure reading. Korotkoff sounds are named after Dr. Korotkoff, who first discovered the audible sounds of blood pressure when the arm is constricted.[2] The blood pressure cuff continues to be deflated until Korotkoff sounds disappear. The last Korotkoff sounds reflect the diastolic blood pressure reading.[3] It is important to deflate the cuff slowly at no more than 2-3 mmHg per second to ensure that the absence of pulse is noted promptly and that the reading is accurate. Blood pressure readings are documented as systolic blood pressure/diastolic pressure, for example, 120/80 mmHg.

Abnormal blood pressure readings can signify an area of concern and a need for intervention. Normal adult blood pressure is less than 120/80 mmHg. **Hypertension** is the medical term for elevated blood pressure readings of 130/80 mmHg or higher. See Table **2.2.1** for blood pressure categories according to the 2017 American College of Cardiology and American Heart Association Blood Pressure Guidelines.[4] Prior to diagnosing a person with hypertension, the health care provider will calculate an average blood pressure based on two or more blood pressure readings obtained on two or more occasions.

> **Note**
>
> For more information about hypertension and blood pressure medications, visit the "Cardiovascular and Renal System" chapter in Open RN *Nursing Pharmacology.*

Hypotension is the medical term for low blood pressure readings less than 90/60 mmHg.[5] Hypotension can be caused by dehydration, bleeding, cardiac conditions, and the side effects of many medications. Hypotension can be of significant concern because of the potential lack of perfusion to critical organs when blood pressures are low. **Orthostatic hypotension** is a drop in blood pressure that occurs when moving from a lying down (supine) or seated position to a standing (upright) position. When measuring blood pressure, orthostatic hypotension is defined as a decrease in blood pressure by at least 20 mmHg systolic or 10 mmHg diastolic within three minutes of standing. When a person stands, gravity moves blood from the upper body to the lower limbs. As a result, there is a temporary reduction in the amount of blood in the upper body for the heart to pump, which decreases blood pressure. Normally, the body quickly counteracts the force of gravity and maintains stable blood pressure and blood flow. In most people, this transient drop in blood pressure goes unnoticed. However, some patients with orthostatic hypotension can experience light-headedness, dizziness, or fainting. This is a significant safety concern because of the increased risk of falls and injury, particularly in older adults.[6]

Table **2.2.1**: Blood Pressure Categories[7]

Blood Pressure Category	Systolic mm Hg (upper #)	Diastolic mm Hg (lower #)
Normal	< 120	< 80
Stage 1	130-139	80-89
Stage 2	At least 140	At least 90
Hypertensive Crisis	> 180	> 120

Note

View Ahmend Alzawi's Korotkoff Sounds Video on YouTube[8]

Equipment to Measure Blood Pressure

Manual Blood Pressure

A sphygmomanometer, commonly called a blood pressure cuff, is used to measure blood pressure while Korotkoff sounds are auscultated using a stethoscope. See Figure **2.2.1**[9] for an image of a sphygmomanometer.

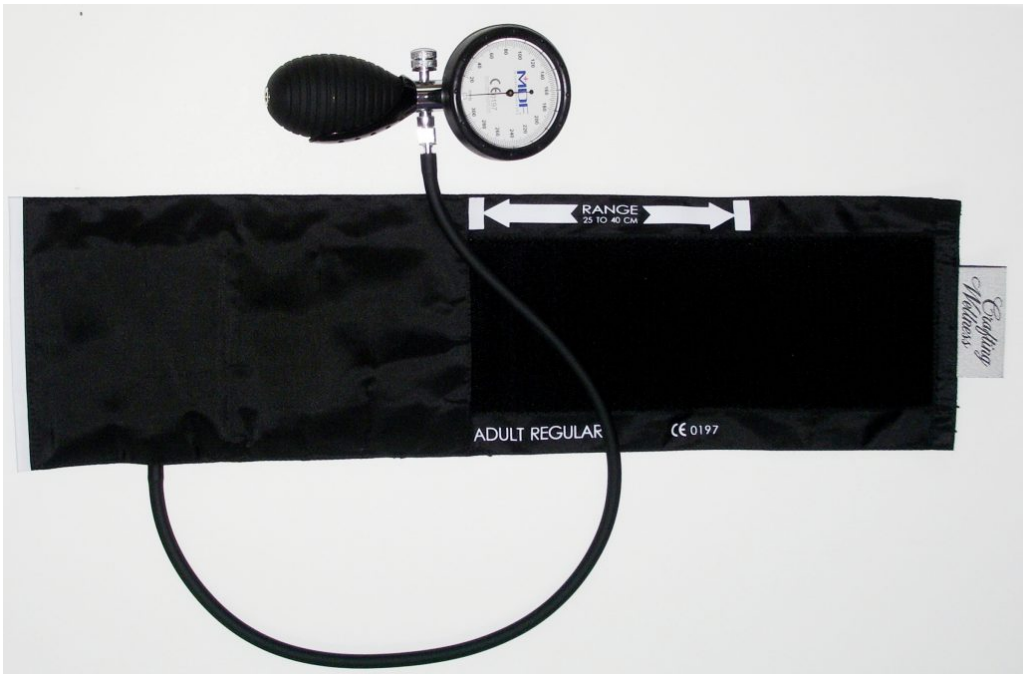


Figure **2.2.1**: A Sphygmomanometer

There are various sizes of blood pressure cuffs. It is crucial to select the appropriate size for the patient to obtain an accurate reading. An undersized cuff will cause an artificially high blood pressure reading, and an oversized cuff will produce an artificially low reading. See Figure **2.2.2**[10] for an image of various sizes of blood pressure cuffs ranging in size for a large adult to an infant.



Figure 2.2.2: Sizes of Blood Pressure Cuffs

The width of the cuff should be 40% of the person's arm circumference, and the length of the cuff's bladder should be 80–100% of the person's arm circumference. Keep in mind that only about half of the blood pressure cuff is the bladder and the other half is cloth with a hook and loop fastener to secure it around the arm.

Note

View Ryerson University's Accurate Blood Pressure Cuff Sizing Video on YouTube[11]

Automatic Blood Pressure Equipment

Automatic blood pressure monitors are often used in health care settings to efficiently measure blood pressure for multiple patients or to repeatedly measure a single patient's blood pressure at a specific frequency such as every 15 minutes. See Figure 2.2.3 [12] for an image of an automatic blood pressure monitor. To use an automatic blood pressure monitor, appropriately position the patient and place the correctly sized blood pressure cuff on their bare arm or other extremity. Press the start button on the monitor. The cuff will automatically inflate and then deflate at a rate of 2 mmHg per second. The monitor digitally displays the blood pressure reading when done. If the blood pressure reading is unexpected, it is important to follow up by obtaining a reading using a manual blood pressure cuff. Additionally, automatic blood pressure monitors should not be used if the patient has a rapid or irregular heart rhythm, such as atrial fibrillation, or has tremors as it may lead to an inaccurate reading.



Figure 2.2.3: Automatic Blood Pressure Monitor

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2. This work is a derivative of StatPearls by Campbell and Pillarisetty licensed under CC BY 4.0↵
3. This work is a derivative of Clinical Procedures for Safer Patient Care by British Columbia Institute of Technology licensed under CC BY 4.0↵
4. American College of Cardiology. Whelton, P. K., Carey, R. M., Aronow, W. S.., et al. (2018, May 7). *2017 guidelines for high blood pressure in adults.* https://www.acc.org/latest-in-cardiology/ten-points-to-remember/2017/11/09/11/41/2017-guideline-for-high-blood-pressure-in-adults↵
5. National Heart, Lung, and Blood Institute. (n.d.). *Low blood pressure*. https://www.nhlbi.nih.gov/health-topics/low-blood-pressure↵
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8. Alzawi, A. (2015, November 19). *Korotkoff+Blood+Pressure+Sights+and+Sounds SD*. [Video]. YouTube. All rights reserved. https://youtu.be/UfCr_wUepxo↵
9. "Sphygmomanometer&Cuff.JPG" by ML5 is in the Public Domain↵
10. "BP-Multiple-Cuff-Sizes.jpg" by British Columbia Institute of Technology (BCIT) is licensed under CC BY 4.0. Access for free at https://opentextbc.ca/vitalsign/chapter/how-is-blood-pressure-measured/↵
11. Ryerson University. (2018, March 21). *Blood pressure - Accurate cuff sizing*. [Video]. YouTube. All rights reserved. https://youtu.be/uNTMwoJTfFE↵
12. "Automatische bloeddrukmeter (0).jpg" by Harmid is in the Public Domain↵

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2.3: Blood Pressure Assessment

Subjective Assessment

Before taking a person's blood pressure, it is important to determine if they have a history of elevated blood pressure or if they are taking any blood pressure medication. It is helpful to establish a baseline by asking their usual blood pressure reading or reviewing previous records in their chart. It is also important to determine if there are any arm restrictions such as those due to a fistula, mastectomy, stroke, or IV line before measuring blood pressure. See Table **2.3.1** for sample interview questions associated with the subjective assessment of blood pressure.

Table **2.3.1**: Interview Questions for Subjective Assessment of Blood Pressure

Interview Questions
Have you ever been diagnosed with an elevated blood pressure? • Please describe the treatment.
Are you currently taking any medications, herbs, or supplements for your blood pressure? • Please identify what you are taking.
Do you have any restrictions on taking blood pressure in your arms such as those due to a fistula or mastectomy? • Please describe the restrictions.
What is your usual blood pressure reading?
Do you take your blood pressure at home? • What time of day do your take the reading? • Where do you obtain the reading from (i.e., cuff location and placement)? • What is the range of results that you commonly receive in the home setting?
If applicable: • Are you experiencing any symptoms related to high or low blood pressure now, such as a severe headache, dizziness with position changes, light-headedness, or fainting episodes?

Objective Assessment

Inspection

Before obtaining a blood pressure reading, it is important to inspect and consider conditions that would prevent the use of a blood pressure cuff, such as a history of clots or presence of current clots, lymphedema, wounds, a fistula, or current IV access lines. If these conditions exist, obtain the blood pressure in an alternative extremity.

Life Span Considerations

Children

Blood pressure measurement is not routinely performed on children under the age of 3 unless there are cardiac concerns.

Older Adults

Blood pressure measurements are sometimes difficult to hear in older adults. For patients who are clinically stable and Korotkoff sound auscultation is difficult, doppler auscultation may be helpful.

Clinical Tips

Blood pressure assessment should be completed after the patient has rested for a minimum of five minutes. If the patient has ingested caffeine or nicotine within 30 minutes before measuring blood pressure, this should be documented with the reading.

There are times when it is difficult to auscultate Korotkoff sounds. As a result, the care team must decide what alternate measures could be performed to obtain accurate blood pressure results. For patients who are critically ill or hemodynamically unstable, an arterial line may be placed directly into an artery to measure blood pressure. This is an invasive procedure and is not used for routine monitoring.

See Table **2.3.2** for a comparison of expected versus unexpected findings when assessing blood pressure.

Table **2.3.2**: Expected Versus Unexpected Findings on Blood Pressure Assessment

Assessment	Expected Findings	Unexpected Findings (Document or notify provider if this is a new finding*)
Inspection	Not applicable	Evidence of fistula, lymphadenopathy, IVs, clots, deficits from a stroke, or other restrictions from using the arm for blood pressure readings should be documented and communicated in handoff reports for continuity of care.
Auscultation	Able to identify Korotkoff sounds and blood pressure reading within expected parameters	Unable to identify Korotkoff sounds or blood pressure readings are outside of expected parameters.
Palpation	Able to palpate pulse	Unable to palpate pulse.
***CRITICAL CONDITIONS to report immediately**		Blood pressure readings are outside of expected parameters for this patient's age or the patient has symptoms associated with a blood pressure that is out of range.

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2.4: Sample Documentation

Sample Documentation of Expected Findings

Blood pressure was 120/80 mmHg on the left arm with the patient in a seated position using a manual cuff.

Sample Documentation of Unexpected Findings

Blood pressure reading was collected with routine vital signs and noted to be 160/95 in the right arm. Blood pressure was retaken in the left arm after the patient rested for 5 minutes and was 154/93. Patient reports no history of hypertension and no current blood pressure medications. Patient denies dizziness, headache, visual changes, and light-headedness. Dr. Smith was notified, and an order for furosemide 20 mg was received.

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2.5: Checklist for Manual Blood Pressure

Use the checklist below to review the steps for obtaining a “Manual Blood Pressure.”

Note: The two-step method includes the first step of inflating the cuff and palpating the radial pulse to estimate the systolic blood pressure before obtaining the blood pressure reading. This procedure is based on current AHA recommendations.[1]

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

1. Gather supplies: blood pressure cuff and stethoscope. (Select an appropriately sized cuff for the patient.)
    - The width of the cuff should be 40% of the person’s arm circumference, and the length of the cuff’s bladder should be 80–100% of the person’s arm circumference.
2. Perform safety steps:
    - Perform hand hygiene.
    - Check the room for transmission-based precautions.
    - Introduce yourself, your role, the purpose of your visit, and an estimate of the time it will take.
    - 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. Cleanse the stethoscope and blood pressure cuff prior to placing it on the patient’s skin.
4. Place the patient in a relaxed reclining or sitting position. The patient should be seated quietly for at least five minutes in a chair prior to blood pressure measurement. Ask the patient which arm they prefer to use. Be aware of conditions that contraindicate the use of an arm for blood pressure measurement, such as a previous mastectomy or the presence of a fistula. During the procedure, both feet should be on the floor and the arm should be supported at heart level.
    - Adapt the procedure to life span considerations of the patient.
5. Remove or rearrange clothing so the cuff and the stethoscope are on bare skin.
6. Center the bladder of the blood pressure cuff over the brachial artery with the lower margin 1″ above the antecubital space. Fit the cuff evenly and snugly. Palpate the brachial artery in the antecubital space.
7. Locate the radial pulse.
8. Inflate the cuff rapidly (while palpating the radial or brachial pulse) to the level at which pulsations are no longer felt and inflate the cuff 30 mmHg above the palpated pressure or the patient’s usual blood pressure. Note the level and rapidly deflate the cuff; wait 30 seconds.
9. With the eartips of the stethoscope placed downward and forward, place the bell/diaphragm lightly on the brachial artery and rapidly inflate the cuff to 30 points above where the brachial or radial pulse is no longer felt.
10. Deflate the cuff gradually at a constant rate by opening the valve on the bulb (2-3 mm Hg/second) until the first Korotkoff sound is heard. Note the systolic pressure.
11. Continue to deflate the cuff slowly at 2 mm Hg/second. Note the point at which Korotkoff sounds disappear completely as the diastolic pressure.
12. Deflate the cuff completely and remove the patient’s arm from the cuff.
13. Inform the patient of the blood pressure reading.
14. Cleanse the stethoscope and blood pressure cuff.
15. Perform proper hand hygiene.
16. Ensure five safety measures before leaving the room:
    - CALL LIGHT: Within reach
    - BED: Low and locked (in lowest position and brakes on)

- SIDE RAIL: Secured
- TABLE: Within reach
- ROOM: Risk-free for falls (scan room and clear any obstacles)

17. Document findings and report significant deviations from norms according to agency policy.

---

1. Chobanian, A. V., Bakris, G. L., Black, H. R., Cushman, W. C., Green, L. A., Izzo, J. L., Jones Jr., D. W., Materson, B. J., Oparil, S., Wright Jr., J., Roccella, E. J., & National High Blood Pressure Education Program Coordinating Committee. (2003). Seventh report of the Joint National Committee on the Prevention, Detection, Evaluation and Treatment of High Blood Pressure. *Hypertension*, *42*(6), 1206-1252. https://doi.org/10.1161/01.HYP.0000107251.49515.c2↵

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2.6: Supplementary Video of Blood Pressure Assessment

Video Review of Blood Pressure Assessment[1]



1. RegisteredNurseRN. (2019, June 4). *Blood pressure measurement: How to check blood pressure manually*. [Video]. YouTube. All rights reserved. Video used with permission. https://youtu.be/UGOoeqSo_ws↵

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2.7: Learning Activities

Learning Activities

(Answers to “Learning Activities” can be found in the “Answer Key” at the end of the book. Answers to interactive activity elements will be provided within the element as immediate feedback.)

You are a nurse assigned to help with blood pressure screenings at the local senior center. **What elements must be considered when selecting equipment and location of blood pressure assessment?**

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2.8: III Glossary

Diastole: The phase between each contraction of the heart when the ventricles are filling with blood.

Diastolic blood pressure: The resting pressure of blood on the arteries between each cardiac contraction.

Hypertension: Elevated blood pressure over 130/80 mmHg in an adult.

Hypotension: Decreased blood pressure less than 90/60 mmHg in an adult.

Korotkoff sounds: The audible sounds of blood pressure named after Dr. Korotkoff who discovered them.

Orthostatic hypotension: A decrease in blood pressure by at least 20 mmHg systolic or 10 mmHg diastolic within three minutes of standing from a seated or lying position.

Sphygmomanometer: A device used to measure blood pressure and is commonly referred to as a blood pressure cuff.

Systole: The phase of the heartbeat when the left ventricle contracts and pumps blood into the arteries.

Systolic blood pressure: The maximum pressure of blood on the arteries during the contraction of the left ventricle of the heart referred to as systole.

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CHAPTER OVERVIEW

3: Aseptic Technique

3.1: Aseptic Technique Introduction
3.2: Aseptic Technique Basic Concepts
3.3: Aseptic Technique
3.4: Sterile Fields
3.5: Checklist for Hand Hygiene with Soap and Water
3.6: Checklist for Hand Hygiene with Alcohol-Based Hand Sanitizer
3.7: Checklist for Personal Protective Equipment (PPE)
3.8: Checklist for Applying and Removing Sterile Gloves
3.9: Asepsis Learning Activities
3.10: IV Glossary

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3.1: Aseptic Technique Introduction

Learning Objectives

- Perform appropriate hand hygiene
- Use standard precautions
- Use category-specific, transmission-based precautions
- Maintain a sterile field and equipment
- Apply and safely remove sterile gloves and personal protective equipment
- Dispose of contaminated wastes appropriately

According to the Centers for Disease Control and Prevention (CDC), over 2 million patients in America contract a healthcare-associated infection, and 99,000 patients die from a healthcare-associated infection every year.[1] **Healthcare-associated infections** (HAIs) are unintended and often preventable infections caused by care received in a health care setting. Healthcare-associated infections can be prevented by consistently following standard precautions and transmission-based precautions outlined by the CDC (2020). Standard precautions are used when caring for all patients and include performing appropriate **hand hygiene**; wearing **personal protective equipment** when indicated; implementing category-specific transmission precautions; encouraging respiratory hygiene; and following environmental infection control measures, including handling of sharps, laundry, and hazardous waste. Additional infection control measures include the appropriate use of aseptic technique and sterile technique when performing nursing procedures to protect the patient from transmission of microorganisms.[2] Each of these strategies to keep patients and health care workers free of infection is discussed in further detail in this chapter.

1. The Joint Commission. (n.d.). *Hand hygiene*. https://www.centerfortransforminghealthcare.org/improvement-topics/hand-hygiene/?_ga=2.185680553.1649963228.1601313691-322773533.1571518854↵
2. Collins, A. S. (2008). Preventing health care-associated infections. In Hughes, R.G. (Ed.). *Patient safety and quality: An evidence-based handbook for nurses*. www.ncbi.nlm.nih.gov/books/NBK2683/ ↵

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3.2: Aseptic Technique Basic Concepts

Standard Versus Transmission-Based Precautions

Standard Precautions

Standard precautions are used when caring for all patients to prevent health care associated infections. According to the Centers for Disease Control and Prevention (CDC), **standard precautions** are "the minimum infection prevention practices that apply to all patient care, regardless of suspected or confirmed infection status of the patient, in any setting where health care is delivered."[1] They are based on the principle that all blood, body fluids (except sweat), nonintact skin, and mucous membranes may contain transmissible infectious agents. These standards reduce the risk of exposure for the health care worker and protect the patient from potential transmission of infectious organisms.

Current standard precautions according to the CDC (2019) include the following:

1. Appropriate hand hygiene
2. Use of personal protective equipment (e.g., gloves, gowns, masks, eyewear) whenever infectious material exposure may occur
3. Appropriate patient placement and care using transmission-based precautions when indicated
4. Respiratory hygiene/cough etiquette
5. Proper handling and cleaning of environment, equipment, and devices
6. Safe handling of laundry
7. Sharps safety (i.e., engineering and work practice controls)
8. Aseptic technique for invasive nursing procedures such as parenteral medication administration[2]

Each of these standard precautions is described in more detail in the following subsections.

Transmission-Based Precautions

In addition to standard precautions, transmission-based precautions are used for patients with documented or suspected infection, or colonization, of highly-transmissible or epidemiologically-important pathogens. Epidemiologically-important pathogens include, but are not limited to, Coronavirus disease (COVID-19), *C. difficile* (C-diff), *Methicillin-resistant Staphylococcus aureus* (MRSA), *Vancomycin-resistant enterococci* (VRE), *Respiratory Syncytial Virus* (RSV), measles, and tuberculosis (TB). For patients with these types of pathogens, standard precautions are used along with specific transmission-based precautions.

There are three categories of transmission-based precautions: **contact precautions**, **droplet precautions**, and **airborne precautions**. Transmission-based precautions are used when the route(s) of transmission is (are) not completely interrupted using standard precautions alone. Some diseases, such as tuberculosis, have multiple routes of transmission so more than one transmission-based precautions category must be implemented. See Table **3.2.1** outlining the categories of transmission precautions with associated PPE and other precautions. When possible, patients with transmission-based precautions should be placed in a single occupancy room with dedicated patient care equipment (e.g., blood pressure cuffs, stethoscope, thermometer). Transport of the patient and unnecessary movement outside the patient room should be limited. However, when transmission-based precautions are implemented, it is also important for the nurse to make efforts to counteract possible adverse effects of these precautions on patients, such as anxiety, depression, perceptions of stigma, and reduced contact with clinical staff.

Table **3.2.1**: Transmission-Based Precautions[3]

Precaution	Implementation	PPE and Other Precautions
Contact	Known or suspected infections with increased risk for contact transmission (e.g., draining wounds, fecal incontinence) or with epidemiologically important organisms, such as C-diff, MRSA, VRE, or RSV	• Gloves • Gown • Dedicated equipment Note: Use only soap and water for hand hygiene in patients with C. difficile infection.
Droplet	Known or suspected infection with pathogens transmitted by large respiratory droplets generated by coughing, sneezing, or talking, such as influenza, coronavirus, or pertussis	• Mask • Goggles or face shield
Airborne	Known or suspected infection with pathogens transmitted by small respiratory droplets, such as measles	Fit-tested N-95 respirator or PAPR • Airborne infection isolation room • Single patient room • Patient door closed • Restricted susceptible personnel room entry

Note

View a list of transmission-based precautions used for specific medical conditions at the CDC Guideline for Isolation Precautions.

Patient Transport

Several principles are used to guide transport of patients requiring transmission-based precautions. In the inpatient and residential settings, these principles include the following:

- Limiting transport for essential purposes only, such as diagnostic and therapeutic procedures that cannot be performed in the patient's room
- Using appropriate barriers on the patient consistent with the route and risk of transmission (e.g., mask, gown, covering the affected areas when infectious skin lesions or drainage is present)
- Notify other health care personnel involved in the care of the patient of the transmission-based precautions. For example, when transporting the patient to radiology, inform the radiology technician of the precautions.[4]

Appropriate Hand Hygiene

Hand hygiene is the single most important practice to reduce the transmission of infectious agents in health care settings and is an essential element of standard precautions.[5] Routine handwashing during appropriate moments is a simple and effective way to prevent infection. However, it is estimated that health care professionals, on average, properly clean their hands less than 50% of the time it is indicated.[6] The Joint Commission, the organization that sets evidence-based standards of care for hospitals, recently updated its hand hygiene standards in 2018 to promote enforcement. If a Joint Commission surveyor witnesses an individual failing to properly clean their hands when it is indicated, a deficiency will be cited requiring improvement by the agency. This deficiency could potentially jeopardize a hospital's accreditation status and their ability to receive payment for patient services. Therefore, it is essential for all health care workers to ensure they are using proper hand hygiene at the appropriate times.[7]

There are several evidence-based guidelines for performing appropriate hand hygiene. These guidelines include frequency of performing hand hygiene according to the care circumstances, solutions used, and technique performed. The Healthcare Infection Control Practices Advisory Committee (HICPAC) recommends health care personnel perform hand hygiene at specific times when providing care to patients. These moments are often referred to as the "**Five Moments for Hand Hygiene**."[8] See Figures 3.2.1[9]

and 3.2.2[10] for an illustration and application of the five moments of hand hygiene. The five moments of hand hygiene are as follows:

- Immediately before touching a patient
- Before performing an aseptic task or handling invasive devices
- Before moving from a soiled body site to a clean body site on a patient
- After touching a patient or their immediate environment
- After contact with blood, body fluids, or contaminated surfaces (with or without glove use)
- Immediately after glove removal

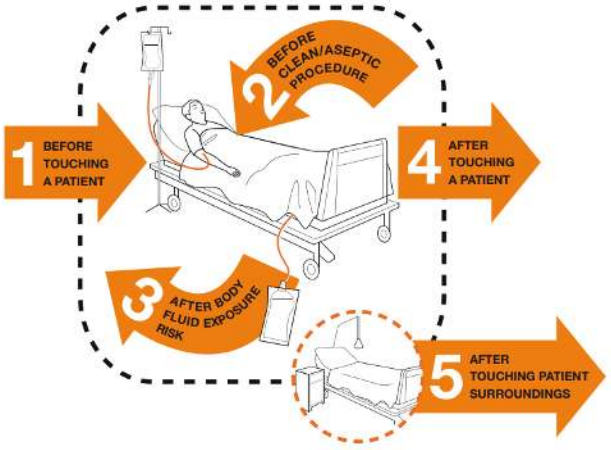


Figure 3.2.1: Five Moments of Hand Hygiene

1 BEFORE TOUCHING A PATIENT	WHEN? Clean your hands before touching a patient when approaching him/her. WHY? To protect the patient against harmful germs carried on your hands.
2 BEFORE CLEAN/ ASEPTIC PROCEDURE	WHEN? Clean your hands immediately before performing a clean/aseptic procedure. WHY? To protect the patient against harmful germs, including the patient's own, from entering his/her body.
3 AFTER BODY FLUID EXPOSURE RISK	WHEN? Clean your hands immediately after an exposure risk to body fluids (and after glove removal). WHY? To protect yourself and the health-care environment from harmful patient germs.
4 AFTER TOUCHING A PATIENT	WHEN? Clean your hands after touching a patient and her/his immediate surroundings, when leaving the patient's side. WHY? To protect yourself and the health-care environment from harmful patient germs.
5 AFTER TOUCHING PATIENT SURROUNDINGS	WHEN? Clean your hands after touching any object or furniture in the patient's immediate surroundings, when leaving – even if the patient has not been touched. WHY? To protect yourself and the health-care environment from harmful patient germs.

Figure 3.2.2: Five Moments of Hand Hygiene Expanded

When performing hand hygiene, washing with soap and water, or an approved alcohol-based hand rub solution that contains at least 60% alcohol, may be used. Unless hands are visibly soiled, an alcohol-based hand rub is preferred over soap and water in most clinical situations due to evidence of improved compliance. Hand rubs are also preferred because they are generally less irritating to health care worker's hands. However, it is important to recognize that alcohol-based rubs do not eliminate some types of germs, such as *Clostridium difficile* (C-diff).

When using the alcohol-based handrub method, the CDC recommends the following steps. See Figure 3.2.3[11] for a handrub poster created by the World Health Organization.

- **Apply** product to the palm of one hand in an amount that will cover all surfaces.
- **Rub** hands together, covering all the surfaces of the hands, fingers, and wrists until the hands are dry. Surfaces include the palms and fingers, between the fingers, the backs of the hands and fingers, the fingertips, and the thumbs.

- The process should take about 20 seconds, and the solution should be dry.[12]



Figure **3.2.3**: WHO Handrub Poster

When washing with soap and water, the CDC recommends using the following steps. See Figure **3.2.4**[13] for an image of a handwashing poster created by the World Health Organization.

- **Wet** hands with warm or cold running water and apply facility-approved soap.
- **Lather** hands by rubbing them together with the soap. Use the same technique as the handrub process to clean the palms and fingers, between the fingers, the backs of the hands and fingers, the fingertips, and the thumbs.
- **Scrub** thoroughly for at least 20 seconds.
- **Rinse** hands well under clean, running water.
- **Dry** the hands using a clean towel or disposable toweling.
- **Use** a clean paper towel to shut off the faucet.[14]

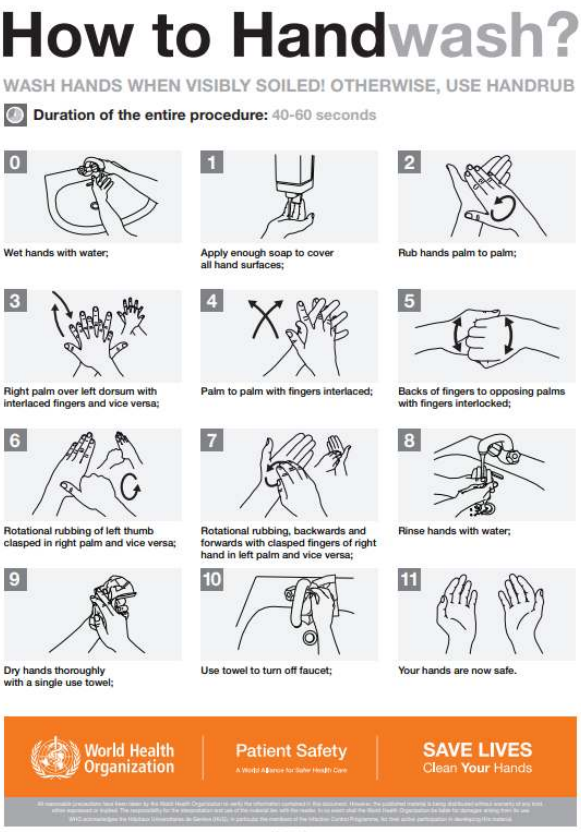


Figure **3.2.4**: WHO Handwashing Poster

By performing hand hygiene at the proper moments and using appropriate techniques, you will ensure your hands are safe and you are not transmitting infectious organisms to yourself or others.

Video Reviews of Handwashing

Hand Hygiene for Healthcare Workers[15]



CDC Handwashing for Children in School[16]



Note

For more information about hand hygiene recommendations, use the following links:
WHO Guidelines on Hand Hygiene
WHO Hand Hygiene Brochure
CDC Hand Hygiene in Healthcare Settings
Joint Commission on Hand Hygiene

Personal Protective Equipment (PPE)

Personal Protective Equipment (PPE) includes gloves, gowns, face shields, goggles, and masks used to prevent the spread of infection to and from patients and health care providers. Depending on the anticipated exposure, PPE may include the use of gloves, a fluid-resistant gown, goggles or a face shield, and a mask or respirator. When used for a patient with transmission-based precautions, PPE supplies are typically stored in an isolation cart next to the patient's room, and a card is posted on the door alerting staff and visitors to precautions needed before entering the room.

Gloves

Gloves protect both patients and health care personnel from exposure to infectious material that may be carried on the hands. Gloves are used to prevent contamination of health care personnel hands during activities such as the following:

- anticipating direct contact with blood or body fluids, mucous membranes, nonintact skin, and other potentially infectious material
- having direct contact with patients who are colonized or infected with pathogens transmitted by the contact route, such as *Vancomycin-resistant enterococci* (VRE), *Methicillin-resistant Staphylococcus aureus* (MRSA), and *Respiratory Syncytial Virus* (RSV)
- handling or touching visibly or potentially contaminated patient care equipment and environmental surfaces[17]

Nonsterile disposable medical gloves for routine patient care are made of a variety of materials, such as latex, vinyl, and nitrile. Many people are allergic to latex, so be sure to check for latex allergies for the patient and other health care professionals. See Figure **3.2.5**[18] for an image of nonsterile medical gloves in various sizes in a health care setting. At times, gloves may need to be changed when providing care to a single patient to prevent cross-contamination of body sites. It is also necessary to change gloves if the patient interaction requires touching portable computer keyboards or other mobile equipment that is transported from room to room. Discarding gloves between patients is necessary to prevent transmission of infectious material. Gloves must not be washed for subsequent reuse because microorganisms cannot be reliably removed from glove surfaces and continued glove integrity cannot be ensured.[19]



Figure **3.2.5**: Non-Sterile Medical Gloves

When gloves are worn in combination with other PPE, they are put on last. Gloves that fit snugly around the wrist should be used in combination with isolation gowns because they will cover the gown cuff and provide a more reliable continuous barrier for the arms, wrists, and hands.

Gloves should be removed properly to prevent contamination. See Figure **3.2.6**[20] for an illustration of properly removing gloves. Hand hygiene should be performed following glove removal to ensure the hands will not carry potentially infectious material that might have penetrated through unrecognized tears or contaminated the hands during glove removal. One method for properly removing gloves includes the following steps:

- Grasp the outside of one glove near the wrist. Do not touch your skin.
- Peel the glove away from your body, pulling it inside out.
- Hold the removed glove in your gloved hand.
- Put your fingers inside the glove at the top of your wrist and peel off the second glove.
- Turn the second glove inside out while pulling it away from your body, leaving the first glove inside the second.
- Dispose of the gloves safely. Do not reuse.
- Perform hand hygiene immediately after removing the gloves.[21]



Figure **3.2.6**: Proper Removal of Gloves to Prevent Contamination

Video Review of Applying and Removing PPE[22]



Gowns

Isolation gowns are used to protect the health care worker's arms and exposed body areas and to prevent contamination of their clothing with blood, body fluids, and other potentially infectious material. Isolation gowns may be disposable or

washable/reusable. See Figure **3.2.7**[23] for an image of a nurse wearing an isolation gown along with goggles and a respirator. When using standard precautions, an isolation gown is worn only if contact with blood or body fluid is anticipated. However, when contact transmission-based precautions are in place, donning of both gown and gloves upon room entry is indicated to prevent unintentional contact of clothing with contaminated environmental surfaces.

Gowns are usually the first piece of PPE to be donned. Isolation gowns should be removed before leaving the patient room to prevent possible contamination of the environment outside the patient's room. Isolation gowns should be removed in a manner that prevents contamination of clothing or skin. The outer, "contaminated," side of the gown is turned inward and rolled into a bundle, and then it is discarded into a designated container to contain contamination. See more information about putting on and removing PPE in the subsection below.[24]



Figure **3.2.7**: Isolation Gown

Masks

The mucous membranes of the mouth, nose, and eyes are susceptible portals of entry for infectious agents. Masks are used to protect these sites from entry of large infectious droplets. See Figure **3.2.8**[25] for an image of nurse wearing a surgical mask. Masks have three primary purposes in health care settings:

- Used by health care personnel to protect them from contact with infectious material from patients (e.g., respiratory secretions and sprays of blood or body fluids), consistent with standard precautions and droplet transmission precautions
- Used by health care personnel when engaged in procedures requiring sterile technique to protect patients from exposure to infectious agents potentially carried in a health care worker's mouth or nose
- Placed on coughing patients to limit potential dissemination of infectious respiratory secretions from the patient to others in public areas (i.e., respiratory hygiene)[26]

Masks may be used in combination with goggles or a face shield to provide more complete protection for the face. Masks should not be confused with respirators used during airborne transmission-based precautions to prevent inhalation of small, aerosolized infectious droplets.[27]



Figure 3.2.8: Surgical Mask

It is important to properly wear and remove masks to avoid contamination. See Figure 3.2.9[28] for CDC face mask recommendations for health care personnel.

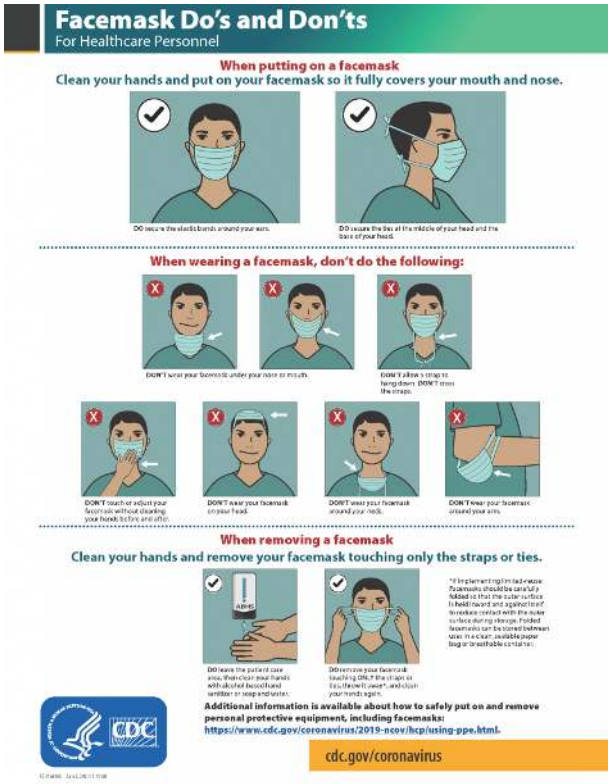


Figure 3.2.9: CDC Face Mask Recommendations

Goggles/Face Shields

Eye protection chosen for specific work situations (e.g., goggles or face shields) depends upon the circumstances of exposure, other PPE used, and personal vision needs. Personal eyeglasses are not considered adequate eye protection. See Figure 3.2.10[29] for an image of a health care professional wearing a face shield along with a N95 respirator.



Figure **3.2.10**: Face Shield and a N95 Respirator

Respirators and PAPRs

Respiratory protection used during airborne transmission precautions requires the use of special equipment. Traditionally, a fitted respirator mask with N95 or higher filtration has been worn by health care professionals to prevent inhalation of small airborne infectious particles. A user-seal check (formerly called a “fit check”) should be performed by the wearer of a respirator each time a respirator is donned to minimize air leakage around the facepiece.

A newer piece of equipment used for respiratory protection is the powered air-purifying respirator (PAPR). A PAPR is an air-purifying respirator that uses a blower to force air through filter cartridges or canisters into the breathing zone of the wearer. This process creates an air flow inside either a tight-fitting facepiece or loose-fitting hood or helmet, providing a higher level of protection against aerosolized pathogens, such as COVID-19, than a N95 respirator. See Figure **3.2.11**[30] for an example of PAPR in use.



Figure **3.2.11**: PAPR In Use

The CDC currently recommends N95 or higher level respirators for personnel exposed to patients with suspected or confirmed tuberculosis and other airborne diseases, especially during aerosol-generating procedures such as respiratory-tract suctioning.[31] It is important to apply, wear, and remove respirators appropriately to avoid contamination. See Figure **3.2.12**[32] for CDC recommendations when wearing disposable respirators.



Figure **3.2.12**: CDC Recommendations for Wearing Disposable Respirators

How to Put On (**Don**) PPE Gear

Follow agency policy for donning PPE according to transmission-based precautions. More than one donning method for putting on PPE may be acceptable. The CDC recommends the following steps for donning PPE:[33]

- Identify and gather the proper PPE to don. Ensure the gown size is correct.
- Perform hand hygiene using hand sanitizer.
- Put on the isolation gown. Tie all of the ties on the gown. Assistance may be needed by other health care personnel to tie back ties.
- Based on specific transmission-based precautions and agency policy, put on a mask or N95 respirator. The top strap should be placed on the crown (top) of the head, and the bottom strap should be at the base of the neck. If the mask has loops, hook them appropriately around your ears. Masks and respirators should extend under the chin, and both your mouth and nose should be protected. Perform a user-seal check each time you put on a respirator. If the respirator has a nosepiece, it should be fitted to the nose with both hands, but it should not be bent or tented. Masks typically require the nosepiece to be pinched to fit around the nose, but do not pinch the nosepiece of a respirator with one hand. Do not wear a respirator or mask under your chin or store it in the pocket of your scrubs between patients.
- Put on a face shield or goggles when indicated. When wearing an N95 respirator with eye protection, select eye protection that does not affect the fit or seal of the respirator and one that does not affect the position of the respirator. Goggles provide excellent protection for the eyes, but fogging is common. Face shields provide full-face coverage.
- Put on gloves. Gloves should cover the cuff (wrist) of the gown.
- You may now enter the patient's room.

Video Reviews of PPE Use

How to Put On a Respirator[34]



Donning and Donning PPE[35]



How to Take Off (**Doff**) PPE Gear

More than one doffing method for removing PPE may be acceptable. Train using your agency's procedure, and practice until you have successfully mastered the steps to avoid contamination of yourself and others. There are established cases of nurses dying from disease transmitted during incorrect removal of PPE. Below are sample steps of doffing established by the CDC:[36]

- Remove the gloves. Ensure glove removal does not cause additional contamination of the hands. Gloves can be removed using more than one technique (e.g., glove-in-glove or bird beak).
- Remove the gown. Untie all ties (or unsnap all buttons). Some gown ties can be broken rather than untied; do so in a gentle manner and avoid a forceful movement. Reach up to the front of your shoulders and carefully pull the gown down and away from your body. Rolling the gown down is also an acceptable approach. Dispose of the gown in a trash receptacle. If it is a washable gown, place it in the specified laundry bin for PPE in the room.
- Health care personnel may now exit the patient room.
- Perform hand hygiene.
- Remove the face shield or goggles. Carefully remove the face shield or goggles by grabbing the strap and pulling upwards and away from head. Do not touch the front of the face shield or goggles.
- Remove and discard the respirator or face mask. Do not touch the front of the respirator or face mask. Remove the bottom strap by touching only the strap and bringing it carefully over the head. Grasp the top strap and bring it carefully over the head, and then pull the respirator away from the face without touching the front of the respirator. For masks, carefully untie (or unhook ties from the ears) and pull the mask away from your face without touching the front.
- Perform hand hygiene after removing the respirator/mask. If your workplace is practicing reuse, perform hand hygiene before putting it on again.

Additional Video Reviews of PPE Use:

Putting on PPE[37]



Removing PPE[38]



Respiratory Hygiene

Respiratory hygiene is targeted at patients, accompanying family members and friends, and health care workers with undiagnosed transmissible respiratory infections. It applies to any person with signs of illness, including cough, congestion, rhinorrhea, or increased production of respiratory secretions when entering a health care facility. See Figure **3.2.13**[39] for an example of a "Cover Your Cough" poster used in public areas to promote respiratory hygiene. The elements of respiratory hygiene include the following:

- Education of health care facility staff, patients, and visitors
- Posted signs, in language(s) appropriate to the population served, with instructions to patients and accompanying family members or friends
- Source control measures for a coughing person (e.g., covering the mouth/nose with a tissue when coughing and prompt disposal of used tissues, or applying surgical masks on the coughing person to contain secretions)
- Hand hygiene after contact with one's respiratory secretions
- Spatial separation, ideally greater than 3 feet, of persons with respiratory infections in common waiting areas when possible.[40]

Health care personnel are advised to wear a mask and use frequent hand hygiene when examining and caring for patients with signs and symptoms of a respiratory infection. Health care personnel who have a respiratory infection are advised to avoid direct patient contact, especially with high-risk patients. If this is not possible, then a mask should be worn while providing patient care.[41]



Figure **3.2.13**: Cover Your Cough Poster

Environmental Measures

Routine cleaning and disinfecting surfaces in patient-care areas are part of standard precautions. The cleaning and disinfecting of all patient-care areas are important for frequently touched surfaces, especially those closest to the patient that are most likely to be contaminated (e.g., bedrails, bedside tables, commodes, doorknobs, sinks, surfaces, and equipment in close proximity to the patient).

Medical equipment and instruments/devices must also be cleaned to prevent patient-to-patient transmission of infectious agents. For example, stethoscopes should be cleaned before and after use for all patients. Patients who have transmission-based precautions should have dedicated medical equipment that remains in their room (e.g., stethoscope, blood pressure cuff, thermometer). When dedicated equipment is not possible, such as a unit-wide bedside blood glucose monitor, disinfection after each patient's use should be performed according to agency policy.[42]

Disposal of Contaminated Waste

Medical waste requires careful disposal according to agency policy. The Occupational Safety and Health Administration (OSHA) has established measures for discarding regulated medical waste items to protect the workers who generate medical waste, as well as those who manage the waste from point of generation to disposal. Contaminated waste is placed in a leak-resistant biohazard bag, securely closed, and placed in a labeled, leakproof, puncture-resistant container in a storage area. Sharps containers are used to dispose of sharp items such as discarded tubes with small amounts of blood, scalpel blades, needles, and syringes.[43]

Sharps Safety

Injuries due to needles and other sharps have been associated with transmission of blood-borne pathogens (BBP), including hepatitis B, hepatitis C, and HIV to health care personnel. The prevention of sharps injuries is an essential element of standard precautions and includes measures to handle needles and other sharp devices in a manner that will prevent injury to the user and to others who may encounter the device during or after a procedure. The Bloodborne Pathogens Standard is a regulation that

prescribes safeguards to protect workers against health hazards related to blood-borne pathogens. It includes work practice controls, hepatitis B vaccinations, hazard communication and training, plans for when an employee is exposed to a BBP, and record keeping.

When performing procedures that include needles or other sharps, dispose of these items immediately in FDA-cleared sharps disposal containers. Additionally, to prevent needlestick injuries, needles and other contaminated sharps should not be recapped. See Figure **3.2.14**[44] for an image of a sharps disposal container. FDA-cleared sharps disposal containers are made from rigid plastic and come marked with a line that indicates when the container should be considered full, which means it's time to dispose of the container. When a sharps disposal container is about three-quarters full, follow agency policy for proper disposal of the container.

If you are stuck by a needle or other sharps or are exposed to blood or other potentially infectious materials in your eyes, nose, mouth, or on broken skin, immediately flood the exposed area with water and clean any wound with soap and water. Report the incident immediately to your instructor or employer and seek immediate medical attention according to agency and school policy.



Figure **3.2.14**: Sharps Disposal Containers

Textiles and Laundry

Soiled textiles, including bedding, towels, and patient or resident clothing may be contaminated with pathogenic microorganisms. However, the risk of disease transmission is negligible if they are handled, transported, and laundered in a safe manner. Follow agency policy for handling soiled laundry using standard precautions. Key principles for handling soiled laundry are as follows:

- Do not shake items or handle them in any way that may aerosolize infectious agents.
- Avoid contact of one's body and personal clothing with the soiled items being handled.
- Place soiled items in a laundry bag or designated bin in the patient's room before transporting to a laundry area. When laundry chutes are used, they must be maintained to minimize dispersion of aerosols from contaminated items.[45]

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3.3: Aseptic Technique

In addition to using standard precautions and transmission-based precautions, **aseptic technique** (also called medical asepsis) is the purposeful reduction of pathogens to prevent the transfer of microorganisms from one person or object to another during a medical procedure. For example, a nurse administering parenteral medication or performing urinary catheterization uses aseptic technique. When performed properly, aseptic technique prevents contamination and transfer of pathogens to the patient from caregiver hands, surfaces, and equipment during routine care or procedures. The word "aseptic" literally means an absence of disease-causing microbes and pathogens. In the clinical setting, aseptic technique refers to the purposeful prevention of microbe contamination from one person or object to another. These potentially infectious, microscopic organisms can be present in the environment, on an instrument, in liquids, on skin surfaces, or within a wound.

There is often misunderstanding between the terms aseptic technique and sterile technique in the health care setting. Both **asepsis** and sterility are closely related, and the shared concept between the two terms is removal of harmful microorganisms that can cause infection. In the most simplistic terms, asepsis is creating a protective barrier from pathogens, whereas **sterile technique** is a purposeful attack on microorganisms. Sterile technique (also called surgical asepsis) seeks to eliminate every potential microorganism in and around a sterile field while also maintaining objects as free from microorganisms as possible. It is the standard of care for surgical procedures, invasive wound management, and central line care. Sterile technique requires a combination of meticulous hand washing, creation of a sterile field, using long-lasting antimicrobial cleansing agents such as betadine, donning sterile gloves, and using sterile devices and instruments.

Principles of Aseptic Non-Touch Technique

Aseptic non-touch technique (ANTT) is the most commonly used aseptic technique framework in the health care setting and is considered a global standard. There are two types of ANTT: surgical-ANTT (sterile technique) and standard-ANTT.

Aseptic non-touch technique starts with a few concepts that must be understood before it can be applied. For all invasive procedures, the "ANTT-approach" identifies key parts and key sites throughout the preparation and implementation of the procedure. A **key part** is any sterile part of equipment used during an aseptic procedure, such as needle hubs, syringe tips, needles, and dressings. A **key site** is any nonintact skin, potential insertion site, or access site used for medical devices connected to the patients. Examples of key sites include open wounds and insertion sites for intravenous (IV) devices and urinary catheters.

ANTT includes four underlying principles to keep in mind while performing invasive procedures:

- **A**lways wash hands effectively.
- **N**ever contaminate key parts.
- **T**ouch non-key parts with confidence.
- **T**ake appropriate infective precautions.

Preparing and Preventing Infections Using Aseptic Technique

When planning for any procedure, careful thought and preparation of many infection control factors must be considered beforehand. While keeping standard precautions in mind, identify anticipated key sites and key parts to the procedure. Consider the degree to which the environment must be managed to reduce the risk of infection, including the expected degree of contamination and hazardous exposure to the clinician. Finally, review the expected equipment needed to perform the procedure and the level of key part or key site handling. See Table **3.3.1** for an outline of infection control measures when performing a procedure.

Table **3.3.1**: Infection Control Measures When Performing Procedures

Infection Control Measure	Key Considerations	Examples
Environmental control	• Recognize and avoid risks in the environment that may increase risk of infection.	• Ensure clean bed linens. • Monitor patient lines that are near or across work areas. • Clean surfaces before establishing a work area. • Keep food and personal items away from working areas.
Hand hygiene	• Perform hand hygiene frequently and during key moments. (Review the Five Key Moments under the "Appropriate Hand Hygiene" section.)	• Scrub with soap solution and water for 20-30 seconds. • Use alcohol-based rub until dry, unless hands are visibly soiled or the patient has C-diff.
Personal protective equipment (PPE)	• Select sterile or clean gloves based on the need to touch key parts or key sites directly. • Gloves do not replace the need for hand hygiene.	• Gloves (sterile or clean, based on the procedure) • Mask or respirator • Protective eyewear, goggles, or face shield • Gown (sterile or clean, whichever is appropriate)
Aseptic field management	Determine level of aseptic field needed and how it will be managed before the procedure begins: • **General aseptic field**: Key parts and sites are easily protected. Sterile field does not need to be set up and managed as a key part. • **Critical aseptic field**: Key parts and sites are large, numerous, or not easily protected using non-touch technique. Sterile field needs to be established before and managed during procedure.	General aseptic field: IV irrigation Dry dressing changes Critical aseptic field: Urinary catheter placement Central line dressing change Sterile dressing change
Non-touch technique	• Non-touch is the primary goal, even when sterile gloves are used. • Requires preparation and knowledge of planned procedure sequencing. • Touching key sites and key parts is limited, purposeful, and only when needed.	• Handling key parts only at the time needed to assemble or use in procedure • Handling syringes away from the hub • Applying bandages by the edges away from key parts that will contact key sites
Sequencing	• Order of procedure requires planning to be efficient, logical, and safe. • Practicing guidelines give direction as to optimal order from preparation to completion.	• Generally, follow "clean to dirty" standards, working from least to most contaminated key parts and sites.

Use of Gloves and Sterile Gloves

There are two different levels of medical-grade gloves available to health care providers: clean (exam) gloves and sterile (surgical) gloves. Generally speaking, clean gloves are used whenever there is a risk of contact with body fluids or contaminated surfaces or

objects. Examples include starting an intravenous access device or emptying a urinary catheter collection bag. Alternatively, sterile gloves meet FDA requirements for sterilization and are used for invasive procedures or when contact with a sterile site, tissue, or body cavity is anticipated. Sterile gloves are used in these instances to prevent transient flora and reduce resident flora contamination during a procedure, thus preventing the introduction of pathogens. For example, sterile gloves are required when performing central line dressing changes, insertion of urinary catheters, and during invasive surgical procedures. See Figure **3.3.1**[1] for images of a nurse opening and removing sterile gloves from packaging.

See the "Checklist for Applying and Removing Sterile Gloves" for details on how to apply sterile gloves.

Video Review of Applying Sterile Gloves[2]



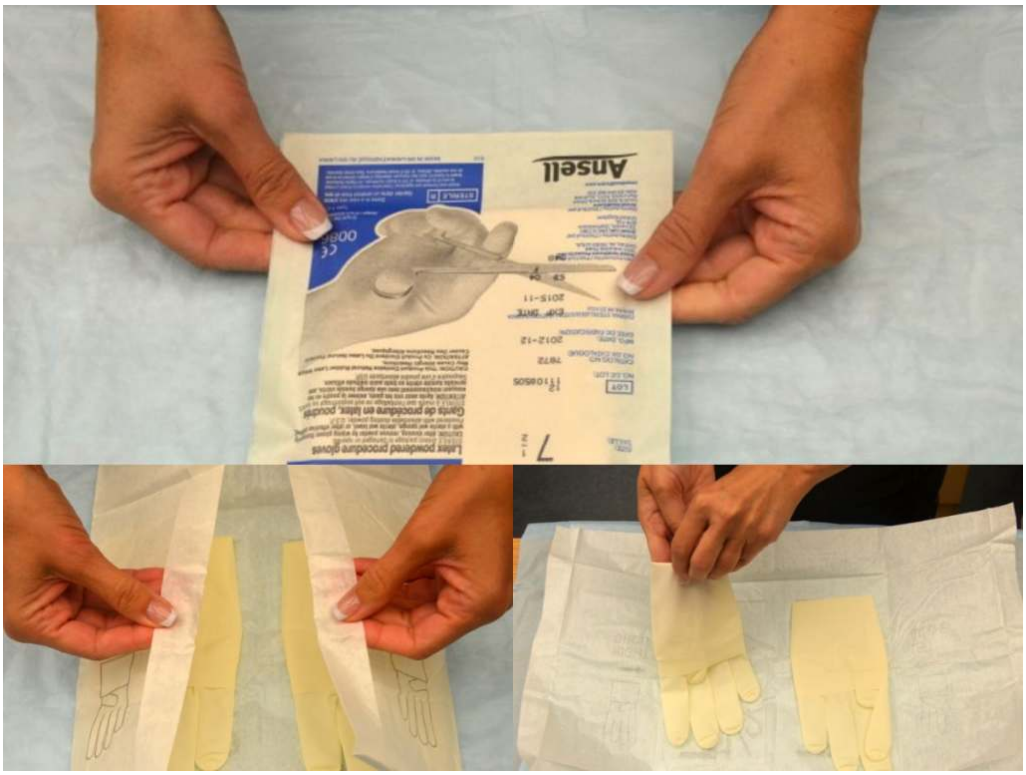


Figure **3.3.1**: Sterile Gloves

1. "Book-pictures-2015-199-001-300x241.jpg," "Book-pictures-2015-215.jpg," and "Book-pictures-2015-219.jpg" by British Columbia Institute of Technology are licensed under CC BY 4.0. Access for free at

https://opentextbc.ca/clinicalskills/chapter/sterile-gloving/↵
2. RegisteredNurseRN. (2017, April 28). *Sterile gloving nursing technique | Don/donning sterile gloves tips.* [Video]. YouTube. All rights reserved. Video used with permission. https://youtu.be/lumZOF-METc↵

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3.4: Sterile Fields

A sterile field is established whenever a patient's skin is intentionally punctured or incised, during procedures involving entry into a body cavity, or when contact with nonintact skin is possible (e.g., surgery or trauma). Surgical asepsis requires adherence to strict principles and intentional actions to prevent contamination and to maintain the sterility of specific parts of a sterile field during invasive procedures. Creating and maintaining a sterile field is foundational to aseptic technique and encompasses practice standards that are performed immediately prior to and during a procedure to reduce the risk of infection, including the following:

- Handwashing
- Using sterile barriers, including drapes and appropriate personal protective equipment
- Preparing the patient using an approved antimicrobial product
- Maintaining a sterile field
- Using aseptically safe techniques

There are basic principles of asepsis that are critical to understand and follow when creating and maintaining a sterile field. The most basic principle is to allow only sterile supplies within the sterile field once it is established. This means that prior to using any supplies, exterior packaging must be checked for any signs of damage, such as previous exposure to moisture, holes, or tears. Packages should not be used if they are expired or if sterilization indicators are not the appropriate color. Sterile contents inside packages are dispensed onto the sterile field using the methods outlined below. See Figure **3.4.1**[1] for an image of a nurse dispensing sterile supplies from packaging onto an established sterile field.



Figure **3.4.1**: Dispensing Sterile Supplies onto a Sterile Field

When establishing and maintaining a sterile field, there are other important principles to strictly follow:

- Disinfect any work surfaces and allow to them thoroughly dry before placing any sterile supplies on the surface.
- Be aware of areas of sterile fields that are considered contaminated:
  - Any part of the field within 1 inch from the edge.
  - Any part of the field that extends below the planar surface (i.e., a drape hanging down below the tray tabletop).
  - Any part of the field below waist level or above shoulder level.
  - Any supplies or field that you have not directly monitored (i.e., turned away from the sterile field or walked out of the room).
  - Within 1 inch of any visible holes, tears, or moisture wicked from an unsterile area.
- When handling sterile kits and trays:
  - Sterile kits and trays generally have an outer protective wrapper and four inner flaps that must be opened aseptically.
  - Open sterile kits away from your body first, touching only the very edge of the opening flap.

- Using the same technique, open each of the side flaps one at a time using only one hand, being careful not to allow your body or arms to be directly above the opened drape. Take care not to allow already-opened corners to flip back into the sterile area again.
- Open the final flap toward you, being careful to not allow any part of your body to be directly over the field. See Figure **3.4.2** [2] for images of opening the flaps of a sterile kit.
- If you must remove parts of the sterile kit (i.e., sterile gloves), reach into the sterile field with the elbow raised, using only the tips of the fingers before extracting. Pay close attention to where your body and clothing are in relationship to the sterile field to avoid inadvertent contamination.

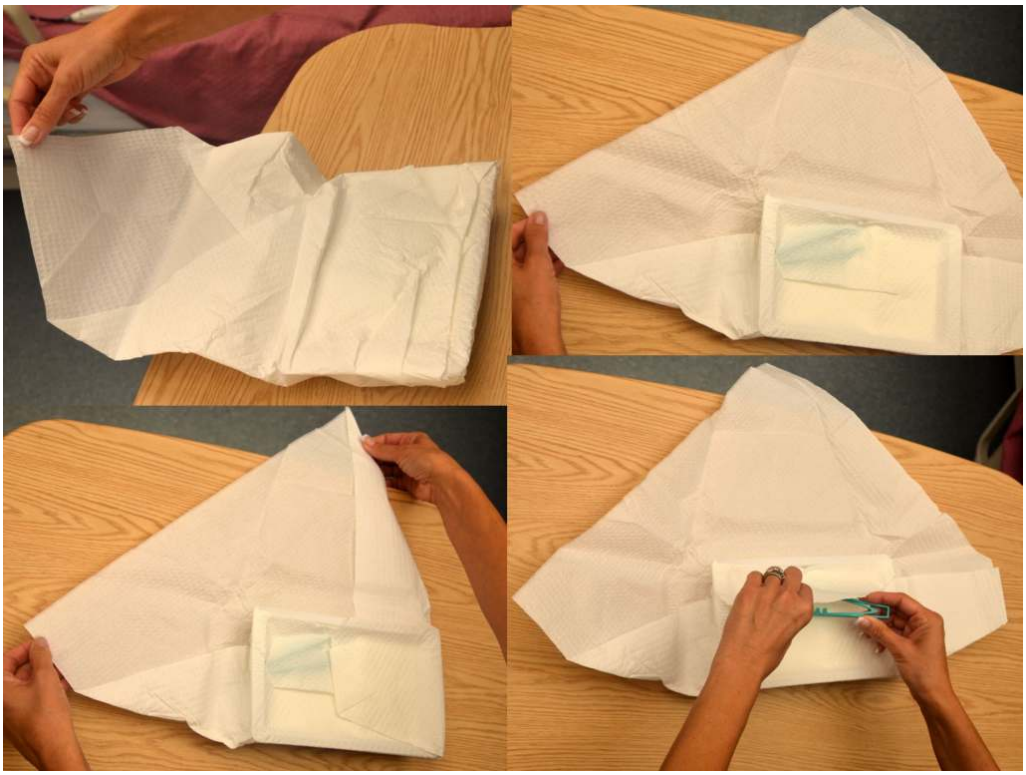


Figure **3.4.2**: Opening a Sterile Kit

- When dispensing sterile supplies onto a sterile field:
  - Before dispensing sterile supplies to a sterile field, do not allow sterile items to touch any part of the outer packaging once it is opened, including the former package seal.
  - Heavy or irregular items should be opened and held, allowing a second person with sterile gloves to transfer them to the sterile field.
  - Wrapped sterile items should be opened similarly to a sterile kit. Tuck each flap securely within your palm, and then open the flap away from your body first. Then open each side flap; secure the flap in the palm one at a time and open. Finally, open the flap (closest to you) toward you, while also protecting the other opened flaps from springing back onto the wrapped item.
  - Peel pouches (i.e., gloves, gauze, syringes, etc.) can be opened by firmly grasping each side of the sealed edge with the thumb side of each hand parallel to the seal and pulling carefully apart.
  - Drop items from six inches away from the sterile field.
  - Sterile solutions should be poured into a sterile bowl or tray from the side of the sterile field and not directly over it. Use only sealed, sterile, unexpired solutions when pouring onto a sterile field. Solution should be held six inches away from the field as it is being poured. Avoid splashing solutions because this allows wicking and transfer of microbes. After pouring of solution stops, it should not be restarted because the edge is considered contaminated. See Figure **3.4.3** [3] of an image of a nurse pouring sterile solution into a receptacle in a sterile field before the procedure begins.
  - Don sterile gloves away from the sterile field to avoid contaminating the sterile field.



Figure **3.4.3**: Pouring Sterile Solution

1. “DSC_0319-1024x678.jpg” by British Columbia Institute of Technology is licensed under CC BY 4.0. Access for free at https://opentextbc.ca/clinicalskills/chapter/sterile-gloving/↵
2. “Book-pictures-2015-700.jpg," "Book-pictures-2015-706.jpg," "Book-pictures-2015-708.jpg," and "Book-pictures-2015-709.jpg” by British Columbia Institute of Technology are licensed under CC BY 4.0. Access for free at https://opentextbc.ca/clinicalskills/chapter/sterile-gloving/↵
3. “DSC_0313.jpg” by British Columbia Institute of Technology is licensed under CC BY 4.0. Access for free at https://opentextbc.ca/clinicalskills/chapter/sterile-gloving/↵

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3.5: Checklist for Hand Hygiene with Soap and Water

Use the checklist below to review the steps for completion of “Hand Hygiene with Soap and Water.”

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

1. Remove jewelry according to agency policy; push your sleeves above your wrists.
2. Turn on the water and adjust the flow so that the water is warm. Wet your hands thoroughly, keeping your hands and forearms lower than your elbows. Avoid splashing water on your uniform.
3. Apply a palm-sized amount of hand soap.
4. Perform hand hygiene using plenty of lather and friction for at least 15 seconds:
    - Rub hands palm to palm
    - Back of right and left hand (fingers interlaced)
    - Palm to palm with fingers interlaced
    - Rotational rubbing of left and right thumbs
    - Rub your fingertips against the palm of your opposite hand
    - Rub wrists
    - Repeat sequence at least 2 times
    - Keep fingertips pointing downward throughout
5. Clean under your fingernails with disposable nail cleaner (if applicable).
6. Wash for a minimum of 20 seconds.
7. Keep your hands and forearms lower than your elbows during the entire washing.
8. Rinse your hands with water, keeping your fingertips pointing down so water runs off your fingertips. Do not shake water from your hands.
9. Do not lean against the sink or touch the inside of the sink during the hand-washing process.
10. Dry your hands thoroughly from your fingers to wrists with a paper towel or air dryer.
11. Dispose of the paper towel(s).
12. Use a new paper towel to turn off the water.
13. Dispose of the paper towel.

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3.6: Checklist for Hand Hygiene with Alcohol-Based Hand Sanitizer

Use the checklist below to review the steps for completion of “Hand Hygiene with Alcohol-Based Hand Sanitizer.”

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

1. Gather supplies (antiseptic hand rub).
2. Remove jewelry according to agency policy; push your sleeves above your wrists.
3. Apply enough product into the palm of one hand and enough to cover your hands thoroughly, per product directions.
4. Rub your hands together, covering all surfaces of your hands and fingers with antiseptic until the alcohol is dry (a minimum of 30 seconds):
    - Rub hands palm to palm
    - Back of right and left hand (fingers interlaced)
    - Palm to palm with fingers interlaced
    - Rotational rubbing of left and right thumbs
    - Rub your fingertips against the palm of your opposite hand
    - Rub your wrists
5. Repeat hand sanitizing sequence a minimum of two times.
6. Repeat hand sanitizing sequence until the product is dry.

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3.7: Checklist for Personal Protective Equipment (PPE)

Use the checklist below to review the steps for completion of “Applying and Removing Personal Protective Equipment.”[1]

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

1. Check the provider’s order for the type of precautions.
2. Ensure that all supplies are available before check-off begins: isolation cart, gowns, gloves, mask, eye/face shields, shoes, and head cover.
3. Perform hand hygiene.
4. Apply PPE in the correct order:
   - 1st (GOWN): Gown should cover all outer garments. Pull the sleeves down to the wrists, and tie at neck & waist.
   - 2nd (MASK/RESPIRATOR): Apply surgical mask or N95 respirator if indicated by transmission-based precaution. Fit the mask around the nose and chin, securing bands around ears or tie straps at top of head and base of neck.
   - 3rd (EYE PROTECTION): Apply goggles/face shield if indicated for patient condition or transmission-based precautions.
   - 4th (CLEAN GLOVES): Pull on gloves to cover the wrist of the gown.
5. Remove PPE in the correct order:
   - 1st REMOVE GLOVES: REMEMBER: GLOVE TO GLOVE; SKIN TO SKIN. Do not touch contaminated gloves to your skin. Take off the contaminated glove with your gloved hand, wrapping the contaminated glove in the palm of your gloved hand. Take off the glove with your bare hand to the skin of your wrist, moving inside of the glove to remove the contaminated glove inside out over the other glove. Note: If the gown is tied in front, untie it prior to removing your glove.
   - 2nd REMOVE GOWN: Untie all ties (or unsnap all buttons). Some gown ties can be broken rather than untied. Do so in a gentle manner, avoiding a forceful movement. Reach up to the shoulders and carefully pull the gown down and away from the body. Rolling the gown down is an acceptable approach. Dispose in trash receptacle.
   - 3rd PERFORM HAND HYGIENE.
   - 4th REMOVE FACE SHIELD or GOGGLES: Carefully remove face shield or goggles by grabbing the strap and pulling upwards and away from head. Do not touch the front of face shield or goggles.
   - 5th REMOVE MASK or RESPIRATOR: Do not touch the front of the face shield or goggles.
     - Respirator: Remove the bottom strap by touching only the strap and bringing it carefully over the head. Grasp the top strap and bring it carefully over the head, and then pull the respirator away from the face without touching the front of the respirator.
     - Face mask: Carefully untie (or unhook from the ears) and pull it away from the face without touching the front.
   - 6th PERFORM HAND HYGIENE after removing the mask.

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1. Centers for Disease Control and Prevention. (2020, August 19). *Using personal protective equipment (PPE)*. https://www.cdc.gov/coronavirus/2019-ncov/hcp/using-ppe.html↵

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3.8: Checklist for Applying and Removing Sterile Gloves

Use the checklist below to review the steps for completion of “Applying and Removing Sterile Gloves.”

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

1. Gather the supplies: hand sanitizer and sterile gloves.
2. Perform hand hygiene.
3. Open the sterile gloves on a dry, flat, clean work surface.
4. Remove the outer package by separating and peeling apart the sides of the package.
5. Grasp the inner package and lay it on a clean, dry, flat surface at waist level.
6. Open the top flap away from your body; open the bottom flap toward your body.
7. Open the side flaps without contaminating the inside of the wrapper or allowing it to close.
8. With your nondominant hand, use your thumb and index finger to only grasp the inside surface of the cuff of the glove for your dominant hand.
9. Lift out the glove, being careful to not touch any surfaces and holding the glove no more than 12-18″ above the table without contaminating the sterile glove; carefully pull the glove over your hand.
10. Use your nondominant, nonsterile hand to grasp the flap of the package, and hold the package steady. With the sterile glove on your dominant hand, hold 4 fingers together of the gloved hand to reach in the outer surface of the cuff of the sterile glove, reaching under the folded cuff and with the thumb outstretched to not touch the second sterile glove. Lift the glove off the package without breaking sterility.
11. While holding the fingers of the nondominant hand outstretched and close together, tuck your thumb into the palm, and use the sterile dominant hand to pull the second sterile glove over the fingers of the nondominant hand.
12. After the second sterile glove is on, interlock the fingers of your sterile gloved hands, being careful to keep your hands above your waist.
13. Do not touch the inside of the package or the sterile part of the gloves with your bare hands during the process.
14. Maintain sterility throughout the procedure of donning sterile gloves.

Removing Sterile Gloves

1. Grasp the outside of one cuff with the other gloved hand. Avoid touching your skin.
2. Pull the glove off, turning it inside out and gather it in the palm of the gloved hand.
3. Tuck the index finger of your bare hand inside the remaining glove cuff and peel the glove off inside out and over the previously removed glove.
4. Dispose of contaminated wastes appropriately.
5. Perform hand hygiene.

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3.9: Asepsis Learning Activities

Learning Activities

(Answers to “Learning Activities” can be found in the “Answer Key” at the end of the book. Answers to interactive activity elements will be provided within the element as immediate feedback.)

You are caring for an elderly male patient who is experiencing urinary retention. The provider has just ordered an intermittent catheterization for the patient based on the results of a recent bladder scan of 375 mL. You gather the equipment and enter the patient’s room. Based on the five moments of hand hygiene, describe the instances in which you will sanitize your hands when working with the patient and performing the intermittent catheterization.

Based upon the information provided, which clinical scenarios require the use of soap and water (versus alcohol-based hand scrubs) for proper hand sanitization?

a. Entry into patient’s room with no contact precautions
b. Patient on *Clostridium Difficile* (C-Diff) contact precautions
c. Prior to Foley catheter insertion for a patient with no contact precautions
d. Hands are visibly soiled

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3.10: IV Glossary

Airborne precautions: Infection prevention and control interventions to be used in addition to standard precautions for diseases spread by airborne transmission, such as measles and tuberculosis.

Asepsis: A state of being free of disease-causing microorganisms.

Aseptic non-touch technique: A standardized technique, supported by evidence, to maintain asepsis and standardize practice.

Aseptic technique (medical asepsis): The purposeful reduction of pathogen numbers while preventing microorganism transfer from one person or object to another. This technique is commonly used to perform invasive procedures, such as IV starts or urinary catheterization.

Contact precautions: Infection prevention and control interventions to be used in addition to standard precautions for diseases spread by contact with the patient, their body fluids, or their surroundings, such as C-diff, MRSA, VRE, and RSV.

Doff: To take off or remove personal protective equipment, such as gloves or a gown.

Don: To put on equipment for personal protection, such as gloves or a gown.

Droplet precautions: Infection prevention and control interventions to be used in addition to standard precautions; used for diseases spread by large respiratory droplets such as influenza, COVID-19, or pertussis.

Five moments of hand hygiene: Hand hygiene should be performed during the five moments of patient care: immediately before touching a patient; before performing an aseptic task or handling invasive devices; before moving from a soiled body site to a clean body site on a patient; after touching a patient or their immediate environment; after contact with blood, body fluids, or contaminated surfaces (with or without glove use); and immediately after glove removal.

Hand hygiene: A way of cleaning one's hands to substantially reduce the number of pathogens and other contaminants (e.g., dirt, body fluids, chemicals, or other unwanted substances) to prevent disease transmission or integumentary harm, typically using soap, water, and friction. An alcohol-based hand rub solution may be appropriate hand hygiene for hands not visibly soiled.

Healthcare-Associated Infections (HAIs): Unintended infections caused by care received in a health care setting.

Key part: Any sterile part of equipment used during an aseptic procedure, such as needle hubs, syringe tips, dressings, etc.

Key site: The site contacted during an aseptic procedure, such as nonintact skin, a potential insertion site, or an access site used for medical devices connected to the patients. Examples of key sites include the insertion or access site for intravenous (IV) devices, urinary catheters, and open wounds.

Personal Protective Equipment (PPE): Personal protective equipment, such as gloves, gowns, face shields, goggles, and masks, used to prevent transmission of disease from patient to patient, patient to health care provider, and health care provider to patient.

Standard precautions: The minimum infection prevention practices that apply to all patient care, regardless of suspected or confirmed infection status of the patient, in any setting where health care is delivered.

Sterile technique (surgical asepsis): Techniques used to eliminate every potential microorganism in and around a sterile field while maintaining objects and areas as free from microorganisms as possible. This technique is the standard of care for surgical procedures, invasive wound management, and central line care.

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CHAPTER OVERVIEW

4: Oxygen Therapy

4.1: Oxygen Therapy Introduction
4.2: Basic Concepts of Oxygenation
4.3: Oxygenation Equipment
4.4: Nursing Process Related to Oxygen Therapy
4.5: Sample Documentation
4.6: Checklist for Oxygen Therapy
4.7: Supplementary Videos on Oxygen Therapy
4.8: Learning Activities
4.9: XI Glossary

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4.1: Oxygen Therapy Introduction

Learning Objectives

- Implement interventions to improve a patient's oxygenation status
- Correctly apply oxygen equipment
- Set flow rate using fixed and portable equipment
- Survey the environment for potential safety hazards
- Use pulse oximetry
- Assess patient response to oxygen therapy
- Adapt procedures to reflect variations across the life span
- Document actions and observations
- Recognize and report significant deviations from norms

The air we breathe contains 21% oxygen and is crucial for life. Several body systems must work collaboratively during the oxygenation process to take in oxygen from the air, carry it through the bloodstream, and adequately oxygenate tissues. First, the airway must be open and clear. The chest and lungs must mechanically move air in and out of the lungs. The bronchial airways must be open and clear so that air can reach the alveoli, where oxygen is absorbed into the bloodstream and carbon dioxide is released during exhalation. The heart must effectively pump this oxygenated blood to and from the lungs and through the systemic arteries. The hemoglobin in the blood must be in adequate amounts to sufficiently carry the oxygen to the tissues, where it is released and carbon dioxide is absorbed and carried back to the lungs.

Several medical conditions, such as asthma, chronic obstructive pulmonary disease (COPD), pneumonia, heart disease, and anemia can impair a person's ability to sufficiently complete this oxygenation process, thus requiring the administration of supplemental oxygen. This chapter will review basic concepts related to oxygenation, provide an overview of oxygenation equipment, and apply the nursing process to the administration of supplemental oxygen. Oxygen is considered a medication and, therefore, requires a prescription and continuous monitoring by the nurse to ensure its safe and effective use.

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4.2: Basic Concepts of Oxygenation

When assessing a patient's oxygenation status, it is important for the nurse to have an understanding of the underlying structures of the respiratory system to best understand their assessment findings. Visit the "Respiratory Assessment" chapter for more information about the structures of the respiratory system.

Note

For more information about common respiratory conditions and medications used to treat them, visit the "Respiratory" chapter in Open RN *Nursing Pharmacology*.

Video Review for Oxygenation Basics

View the TED-Ed Oxygen's Journey video on YouTube[1]

Breathing Mechanics[2]



Gas Exchange[3]



Carbon Dioxide Transport[4]



Assessing Oxygenation Status

A patient's oxygenation status is routinely assessed using pulse oximetry, referred to as **SpO2**. SpO2 is an estimated oxygenation level based on the saturation of hemoglobin measured by a pulse oximeter. Because the majority of oxygen carried in the blood is attached to hemoglobin within the red blood cell, SpO2 estimates how much hemoglobin is "saturated" with oxygen. The target range of SpO2 for an adult is 94-98%.[5] For patients with chronic respiratory conditions, such as COPD, the target range for SpO2 is often lower at 88% to 92%. Although SpO2 is an efficient, noninvasive method to assess a patient's oxygenation status, it is an estimate and not always accurate. For example, if a patient is severely anemic and has a decreased level of hemoglobin in the blood, the SpO2 reading is affected. Decreased peripheral circulation can also cause a misleading low SpO2 level.

A more specific measurement of oxygen and carbon dioxide in the blood is obtained through an **arterial blood gas (ABG)**. ABG results are often obtained for patients who have deteriorating or unstable respiratory status requiring urgent and emergency treatment. An ABG is a blood sample that is typically drawn from the radial artery by a respiratory therapist, emergency or critical care nurse, or health care provider. ABG results evaluate oxygen, carbon dioxide, pH, and bicarbonate levels. The partial pressure of oxygen in the blood is referred to as **PaO2**. The normal PaO2 level of a healthy adult is 80 to 100 mmHg. The PaO2 reading is more accurate than a SpO2 reading because it is not affected by hemoglobin levels. The **PaCO2** level is the partial pressure of carbon dioxide in the blood. The normal PaCO2 level of a healthy adult is 35-45 mmHg. The normal range of pH level for arterial blood is 7.35-7.45, and the normal range for the bicarbonate **(HCO3)** level is 22-26. The **SaO2** level is also obtained, which is the calculated arterial oxygen saturation level. See Table **4.2.1** for a summary of normal ranges of ABG values.[6]

Table **4.2.1**: Normal Ranges of ABG Values

Value	Description	Normal Range
pH	Acid-base balance of blood	7.35-7.45
PaO2	Partial pressure of oxygen	80-100 mmHg
PaCO2	Partial pressure of carbon dioxide	35-45 mmHg
HCO3	Bicarbonate level	22-26 mEq/L
SaO2	Calculated oxygen saturation	95-100%

Hypoxia and Hypercapnia

Hypoxia is defined as a reduced level of tissue oxygenation. Hypoxia has many causes, ranging from respiratory and cardiac conditions to anemia. **Hypoxemia** is a specific type of hypoxia that is defined as decreased partial pressure of oxygen in the blood (PaO2), measured by an arterial blood gas (ABG).

Early signs of hypoxia are anxiety, confusion, and restlessness. As hypoxia worsens, the patient's level of consciousness and vital signs will worsen, with increased respiratory rate and heart rate and decreased pulse oximetry readings. Late signs of hypoxia include bluish discoloration of the skin and mucous membranes called **cyanosis**. Cyanosis is most easily seen around the lips and in

the oral mucosa. A sign of chronic hypoxia is clubbing, a gradual enlargement of the fingertips (see Figure 4.2.1[1]). See Table 4.2.2 for symptoms and signs of hypoxia.[8]



Figure 4.2.1: Clubbing of Fingertips

Hypercapnia is an elevated level of carbon dioxide in the blood. This level is measured by the PaCO2 level in an ABG test and is indicated when the PaCO2 level is higher than 45. Hypercapnia is typically caused by hypoventilation or areas of the alveoli that are ventilated but not perfused. In a state of hypercapnia or hypoventilation, there is an accumulation of carbon dioxide in the blood. The increased carbon dioxide causes the pH of the blood to drop, leading to a state of respiratory acidosis. You can read more about respiratory acidosis in the "Fluids and Electrolytes" chapter of the Open RN *Nursing Fundamentals* book. Patients with hypercapnia can present with tachycardia, **dyspnea**, flushed skin, confusion, headaches, and dizziness. If the hypercapnia develops gradually over time, such as in a patient with chronic obstructive pulmonary disease (COPD), symptoms may be mild or may not be present at all. Hypercapnia is managed by addressing its underlying cause. A noninvasive positive pressure device such as a BiPAP may provide support to patients who are having trouble breathing normally, but if this is not sufficient, intubation may be required.[9]

Table 4.2.2: Symptoms and Signs of Hypoxia

Signs & Symptoms	Description
Restlessness	Patient may become increasingly fidgety, move about the bed, demonstrate signs of anxiety and agitation. Restlessness is an early sign of hypoxia.
Tachycardia	An elevated heart rate (above 100 beats per minute in adults) can be an early sign of hypoxia.
Tachypnea	An increased respiration rate (above 20 breaths per minute in adults) is an indication of respiratory distress.
Shortness of breath (Dyspnea)	Shortness of breath is a subjective symptom of not getting enough air. Depending on severity, dyspnea causes increased levels of anxiety.
Oxygen saturation level (SpO2)	Oxygen saturation levels should be above 94% for an adult without an underlying respiratory condition.
Use of accessory muscles	Use of neck or intercostal muscles when breathing is an indication of respiratory distress.
Noisy breathing	Audible noises with breathing are an indication of respiratory conditions. Assess lung sounds with a stethoscope for adventitious sounds such as wheezing, rales, or crackles. Secretions can plug the airway, thereby decreasing the amount of oxygen available for gas exchange in the lungs.
Flaring of nostrils or pursed lip breathing	Flaring is a sign of hypoxia, especially in infants. Pursed-lip breathing is a technique often used in patients with COPD. This breathing technique increases the amount of carbon dioxide exhaled so that more oxygen can be inhaled.
Position of patient	Patients in respiratory distress may sit up or lean over by resting arms on their legs to enhance lung expansion. Patients who are hypoxic may not be able to lie flat in bed.
Ability of patient to speak in full sentences	Patients in respiratory distress may be unable to speak in full sentences or may need to catch their breath between sentences.
Skin color (Cyanosis)	Changes in skin color to bluish or gray are a late sign of hypoxia.
Confusion or loss of consciousness (LOC)	This is a worsening sign of hypoxia.
Clubbing	Clubbing, a gradual enlargement of the fingertips, is a sign of chronic hypoxia.

Treating Hypoxia

Acute hypoxia is a medical emergency and should be treated promptly with oxygen therapy. Failure to initiate oxygen therapy when needed can result in serious harm or death of the patient. Although oxygen is considered a medication that requires a prescription, oxygen therapy may be initiated without a physician's order in emergency situations as part of the nurse's response to the "ABCs," a common abbreviation for airway, breathing, and circulation. Most agencies have a protocol in place that allows nurses to apply oxygen in emergency situations. After applying oxygen as needed, the nurse then contacts the provider, respiratory therapist, or rapid response team, depending on the severity of hypoxia. Devices such high flow oxymasks, CPAP, BiPAP, or mechanical ventilation may be initiated by the respiratory therapist or provider to deliver higher amounts of inspired oxygen. Various types of oxygenation devices are further explained in the "Oxygenation Equipment" section.

Prescription orders for oxygen therapy will include two measurements of oxygen to be delivered – the oxygen flow rate and the fraction of inspired oxygen (FiO2). The oxygen flow rate is the number dialed up on the oxygen flow meter between 1 L/minute

and 15 L/minute. **Fio2** is the concentration of oxygen the patient inhales. Room air contains 21% oxygen concentration, so the FiO2 for supplementary oxygen therapy will range from 21% to 100% concentration.

In addition to administering oxygen therapy, there are several other interventions the nurse should consider implementing to a hypoxic patient. Additional interventions used to treat hypoxia in conjunction with oxygen therapy are outlined in Table **4.2.3**.[10]

Table **4.2.3**: Interventions to Manage Hypoxia

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Interventions	Additional Information
Raise the Head of the Bed	Raising the head of the bed to high Fowler's position promotes effective chest expansion and diaphragmatic descent, maximizes inhalation, and decreases the work of breathing. Patients with COPD who are short of breath may gain relief by sitting upright or leaning over a bedside table while in bed.
Encourage Enhanced Breathing and Coughing Techniques	Enhanced breathing and coughing techniques such as using pursed-lip breathing, coughing and deep breathing, huffing technique, incentive spirometry, and flutter valves may assist patients to clear their airway while maintaining their oxygen levels. See the following "Enhanced Breathing and Coughing Techniques" section for additional information regarding these techniques.
Manage Oxygen Therapy and Equipment	If the patient is already on supplemental oxygen, ensure the equipment is turned on, set at the required flow rate, correctly positioned on the patient, and properly connected to an oxygen supply source. If a portable tank is being used, check the oxygen level in the tank. Ensure the connecting oxygen tubing is not kinked, which could obstruct the flow of oxygen. Feel for the flow of oxygen from the exit ports on the oxygen equipment. In hospitals where medical air and oxygen are used, ensure the patient is connected to the oxygen flow port. Hospitals in America follow the national standard that oxygen flow ports are green and air outlets are yellow.
Assess the Need for Respiratory Medications	Pharmacological management is essential for patients with respiratory disease such as asthma, COPD, or severe allergic response. Bronchodilators effectively relax smooth muscles and open airways. Glucocorticoids relieve inflammation and also assist in opening air passages. Mucolytics decrease the thickness of pulmonary secretions so that they can be expectorated more easily.
Provide Oral Suctioning if Needed	Some patients may have a weakened cough that inhibits their ability to clear secretions from the mouth and throat. Patients with muscle disorders or those who have experienced a cerebral vascular accident (CVA) are at risk for aspiration pneumonia, which is caused by the accidental inhalation of material from the mouth or stomach. Provide oral suction if the patient is unable to clear secretions from the mouth and pharynx. See the chapter on "Tracheostomy Care and Suctioning" for additional details on suctioning.
Provide Pain Relief If Needed	Provide adequate pain relief if the patient is reporting pain. Pain increases anxiety and may inhibit the patient's ability to take in full breaths.
Consider the Side Effects of Pain Medications	A common side effect of pain medication is sedation and respiratory depression. For more information about interventions to manage respiratory depression, see the "Oxygenation" chapter in the Open RN *Nursing Fundamentals* textbook.
Consider Other Devices to Enhance Clearance of Secretions	Chest physiotherapy and specialized devices assist with secretion clearance, such as handheld flutter valves or vests that inflate and

	vibrate the chest wall. Consider requesting a consultation with a respiratory therapist based on the patient's situation.
Plan Frequent Rest Periods Between Activities	Patients experiencing hypoxia often feel short of breath and fatigue easily. Allow the patient to rest frequently, and space out interventions to decrease oxygen demand in patients whose reserves are likely limited.
Consider Other Potential Causes of Dyspnea	If a patient's level of dyspnea is worsening, assess for other underlying causes in addition to the primary diagnosis. Are there other respiratory, cardiovascular, or hematological conditions such as anemia occurring? Start by reviewing the patient's most recent hemoglobin and hematocrit lab results. Completing a thorough assessment may reveal abnormalities in these systems to report to the health care provider.
Consider Obstructive Sleep Apnea	Patients with obstructive sleep apnea (OSA) are often not previously diagnosed prior to hospitalization. The nurse may notice the patient snores, has pauses in breathing while snoring, or awakens not feeling rested. These signs may indicate the patient is unable to maintain an open airway while sleeping, resulting in periods of apnea and hypoxia. If these apneic periods are noticed but have not been previously documented, the nurse should report these findings to the health care provider for further testing and follow-up. Testing consists of using continuous pulse oximetry while the patient is sleeping to determine if the patient is hypoxic during these episodes and if a CPAP device should be prescribed. See the box below for additional information regarding OSA.
Anxiety	Anxiety often accompanies the feeling of dyspnea and can worsen it. Anxiety in patients with COPD is chronically undertreated. It is important for the nurse to address the feelings of anxiety and dyspnea. Anxiety can be relieved by teaching enhanced breathing and coughing techniques, encouraging relaxation techniques, or administering antianxiety medications.

Note

Obstructive Sleep Apnea (OSA) is the most common type of sleep apnea. See Figure **4.2.2**[11] for an illustration of OSA. As soft tissue falls to the back of the throat, it impedes the passage of air (blue arrows) through the trachea and is characterized by repeated episodes of complete or partial obstructions of the upper airway during sleep. The episodes of breathing cessations are called "apneas," meaning "without breath." Despite the effort to breathe, apneas are associated with a reduction in blood oxygen saturation due to the obstruction of the airway. Treatment for OSA often includes the use of a CPAP device.

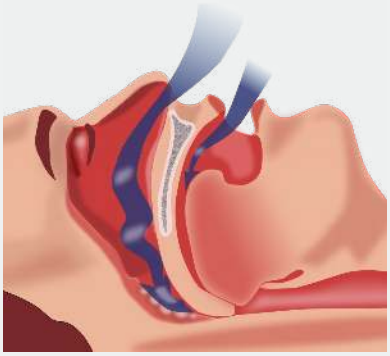


Figure 4.2.2: Obstructive Sleep Apnea

Enhanced Breathing and Coughing Techniques

In addition to oxygen therapy and the interventions listed in Table 4.2.3 to implement for a patient experiencing dyspnea and hypoxia, there are several techniques a nurse can teach a patient to use to enhance their breathing and coughing. These techniques include pursed-lip breathing, incentive spirometry, coughing and deep breathing, and the huffing technique.

Pursed-Lip Breathing

Pursed-lip breathing is a technique that allows people to control their oxygenation and ventilation. The technique requires a person to inspire through the nose and exhale through the mouth at a slow controlled flow. See Figure 4.2.3[12] for an illustration of pursed-lip breathing. This type of exhalation gives the person a puckered or pursed appearance. By prolonging the expiratory phase of respiration, a small amount of positive end-expiratory pressure (PEEP) is created in the airways that helps to keep them open so that more air can be exhaled, thus reducing air trapping that occurs in some conditions such as COPD. Pursed-lip breathing often relieves the feeling of shortness of breath, decreases the work of breathing, and improves gas exchange. People also regain a sense of control over their breathing while simultaneously increasing their relaxation.[13]



Figure 4.2.3: Pursed-Lip Breathing

Note

View the COPD Foundation's YouTube video to learn more about pursed-lip breathing:
Breathing Techniques[14]

Incentive Spirometry

An incentive spirometer is a medical device often prescribed after surgery to prevent and treat atelectasis. Atelectasis occurs when alveoli become deflated or filled with fluid and can lead to pneumonia. See Figure 4.2.4[15] for an image of a patient using an incentive spirometer. While sitting upright, the patient should breathe in slowly and deeply through the tubing with the goal of raising the piston to a specified level. The patient should attempt to hold their breath for 5 seconds, or as long as tolerated, and then rest for a few seconds. This technique should be repeated by the patient 10 times every hour while awake.[16] The nurse may

delegate this intervention to unlicensed assistive personnel, but the frequency in which it is completed and the volume achieved should be documented and monitored by the nurse.



Figure **4.2.4**: Using an Incentive Spirometer

Coughing and Deep Breathing

Teaching the coughing and deep breathing technique is similar to incentive spirometry but no device is required. The patient is encouraged to take deep, slow breaths and then exhale slowly. After each set of breaths, the patient should cough. This technique is repeated 3 to 5 times every hour.

Huffing Technique

The huffing technique is helpful for patients who have difficulty coughing. Teach the patient to inhale with a medium-sized breath and then make a sound like “Ha” to push the air out quickly with the mouth slightly open.

Vibratory PEP Therapy

Vibratory Positive Expiratory Pressure (PEP) therapy uses handheld devices such as “flutter valves” or “Acapella” devices for patients who need assistance in clearing mucus from their airways. These devices (see Figure **4.2.5**[17]) require a prescription and are used in collaboration with a respiratory therapist or advanced health care provider. To use Vibratory PEP therapy, the patient should sit up, take a deep breath, and blow into the device. A flutter valve within the device creates vibrations that help break up the mucus so the patient can cough it up and spit it out. Additionally, a small amount of positive end-expiratory pressure (PEEP) is created in the airways that helps to keep them open so that more air can be exhaled.



Figure 4.2.5: Flutter Valve Device

Note

Visit NHS University Hospitals Plymouth Physiotherapy's "Acapella" video on YouTube to review using a flutter valve device[18]

1. TED-Ed. (2017, April 13). *Oxygen's surprisingly complex journey through your body - Edna Butler.* [Video]. YouTube. All rights reserved. https://youtu.be/GVU_zANtroE ↵
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14. COPD Foundation. (2020, April 17). Breathing techniques. [Video]. YouTube. All rights reserved. https://youtu.be/ZJPJjZRHmy8↵
15. "Incentive Spirometer.pngsommeil.svg" by BruceBlaus is licensed under CC BY-SA 4.0↵
16. Cleveland Clinic. (2018, May 2). *Incentive spirometer.* https://my.clevelandclinic.org/health/articles/4302-incentive-spirometer↵

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4.3: Oxygenation Equipment

There are several types of equipment a nurse may use when providing oxygen therapy to a patient. Each device is described in detail below.

Pulse Oximeter

A pulse oximeter is a commonly used portable device used to obtain a patient's oxygen saturation level at the bedside or in a clinic. See Figure **4.3.1**[1] for an image of a portable pulse oximeter. The pulse oximeter, commonly referred to as a "Pulse Ox," is an electronic device that measures the oxygen saturation of hemoglobin in a patient's red blood cells, referred to as SpO2. The normal range for SpO2 for an adult without an underlying respiratory condition is above 92%. The pulse oximeter analyzes light produced by the probe as it passes through the finger to determine the saturation level of the hemoglobin molecule. Pulse oximeter probes can be attached to a patient's finger, forehead, nose, foot, ear, or toe. However, pulse oximetry readings can be inaccurate if the patient is wearing nail polish, has reduced perfusion of the extremities due to a cardiovascular condition, or has other molecules attached to hemoglobin such as in the case of carbon monoxide poisoning.[2]



Figure **4.3.1**: Portable Pulse Oximeter

Oxygen Flow Meter

In inpatient settings, rooms are equipped with wall-mounted oxygen supply outlets that are nationally standardized in a green color, whereas air outlets are standardized with a yellow color. Oxygen flow meters are attached to the green oxygen outlets, and then the oxygenation device is attached to the flow meter. See Figure **4.3.2**[3] for an image of an oxygen flow meter. An oxygen flow meter consists of a glass cylinder containing a steel ball with an opening through which oxygen from the supply source is injected through an adapter. This adapter is commonly referred to as a "tree" because of its appearance. Oxygen is turned on, and the flow rate of oxygen is controlled by turning the green valve on the side of the glass cylinder. The flow rate is set according to the location of a steel ball inside the cylinder and the numbered lines on the glass cylinder. For example, in Figure **4.3.2**, the flow rate is currently set at 2 liter per minute (L/min). It is essential to implement safety precautions whenever oxygen is used. Read more about "Safety with Oxygen Therapy" later in this section.



Figure **4.3.2**: Oxygen Flow Meter

Portable Oxygen Supply Devices

Portable oxygen tanks are commonly used when transporting a patient to procedures within the hospital or to other agencies. See Figure **4.3.3**[4] for an image of a portable oxygen tank. Oxygenation devices are connected to the tank in a similar manner as the wall-mounted oxygen flow meter. It is crucial for nurses and transporters to ensure the tank has an adequate amount of oxygen for use during transport, is turned on, and the appropriate flow rate is set.



Figure **4.3.3**: Portable Oxygen Tank

Instead of oxygen tanks, oxygen concentrators are commonly used by patients in their home environment. See Figure **4.3.4**[5] for an image of a home oxygen concentrator. Oxygen concentrators are also produced in portable sizes that are lightweight and easy for patient use while travelling and mobile in the community. See Figure **4.3.5**[6] for an image of a portable oxygen concentrator. Oxygen concentrators work by taking the 21% concentration of oxygen in the air, running it through a molecular sleeve to remove the nitrogen and concentrating the oxygen to a 96% level, thus producing between 1 and 6 liters per minute of oxygen. Oxygen concentrators may provide pulse flow or continuous flow. Pulse flow only occurs on inhalation, whereas continuous flow delivers

oxygen throughout the entire breath cycle. Pulse versions are the most lightweight because oxygen is provided only as needed by the patient.[7]



Figure **4.3.4**: Home Oxygen Concentrator



Figure **4.3.5**: Portable Oxygen Concentrator

Nasal Cannula

A nasal cannula is the simplest oxygenation device and consists of oxygen tubing connected to two short prongs that are inserted into the patient's nares. See Figure **4.3.6**[8] for an image of a nasal cannula. The tubing is connected to the flow meter of the oxygen supply source. To prevent drying out the patient's mucus membranes, humidification may be added for hospitalized patients receiving oxygen flow rates greater than 4 L/minute or for those receiving oxygen therapy for longer periods of time.[9]

Nasal cannulas are the most common type of oxygen equipment. They are used for short- and long-term therapy (i.e., COPD patients) and are best used with stable patients who require low amounts of oxygen.

Flow rate: Nasal cannulas can have a flow rate ranging from 1 to 5 liters per minute (L/min), with a 4% increase in FiO2 for every liter of oxygen, resulting in range of fraction of inspired oxygen (FiO2) levels of 24-44%.

Advantages: Nasal cannulas are easy to use, inexpensive, and disposable. They are convenient because the patient can talk and eat while receiving oxygen.

Limitations: The nasal prongs of nasal cannula are easily dislodged, especially when the patient is sleeping. The tubing placed on the face can cause skin breakdown in the nose and above the ears, so the nurse must vigilantly monitor these areas. Based on

agency policy, the nurse should add padding to the oxygen tubing as needed to avoid skin breakdown and may apply a water-based lubricant to prevent drying. However, petroleum-based lubricant should not be used due to the risk of flammability. Nasal cannulas are not as effective if the patient is a mouth breather or has blocked nostrils, a deviated septum, or nasal polyps.[10]



Figure 4.3.6: Nasal Cannula

High-Flow Nasal Cannula

High-flow nasal cannula therapy is an oxygen supply system capable of delivering up to 100% humidified and heated oxygen at a flow rate of up to 60 liters per minute.[11] Patients with high-flow nasal cannulas are generally in critical condition and require advanced monitoring. See Figure 4.3.7[12] for an illustration of a high-flow nasal cannula system that is initially set up by a respiratory therapist and then maintained by a nurse.

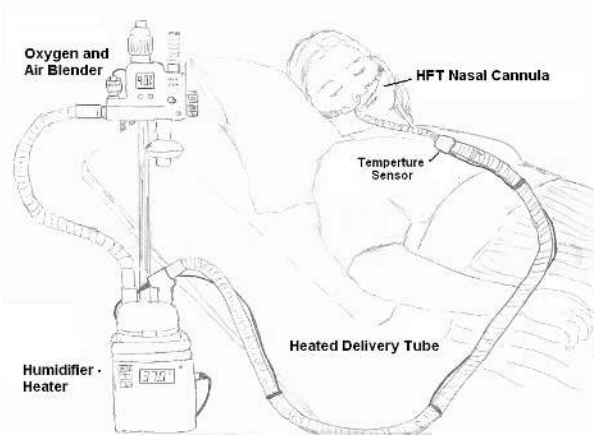


Figure 4.3.7: High-Flow Nasal Cannula System

Simple Mask

A simple mask fits over the mouth and nose of the patient and contains exhalation ports (i.e., holes on the side of the mask) through which the patient exhales carbon dioxide. These holes should always remain open. The mask is held in place by an elastic band placed around the back of the head. It also has a metal piece near the top that can be pinched and shaped over the patient's nose to create a better fit. Humidified air may be attached if the oxygen concentrations are drying for the patient. See Figure 4.3.8[13] for an image of a simple face mask.

Flow Rate: Simple masks should be set to a flow rate of 6 to 10 L/min, resulting in oxygen concentration (FiO2) levels of 35%-50%. The flow rate should never be set below 6 L/min because this can result in the patient rebreathing their exhaled carbon dioxide.

Advantages: Face masks are used to provide moderate oxygen concentrations. Their efficiency in oxygen delivery depends on how well the mask fits and the patient's respiratory demands.

Disadvantages: Face masks must be removed when eating, and they may feel confining for some patients who feel claustrophobic with the mask on.[14]



Figure **4.3.8**: Simple Face Mask

Non-Rebreather Mask

A non-rebreather mask consists of a mask attached to a reservoir bag that is attached with tubing to a flow meter. See Figure **4.3.9**[15] for an image of a non-rebreather mask. It has a series of one-way valves between the mask and the bag and also on the covers on the exhalation ports. The reservoir bag should never totally deflate; if the bag deflates, there is a problem and immediate intervention is required. The one-way valves function so that on inspiration, the patient only breathes in from the reservoir bag; on exhalation, carbon dioxide is directed out through the exhalation ports. Non-rebreather masks are used for patients who can breathe on their own but require higher concentrations of oxygen to maintain satisfactory blood oxygenation levels.

Flow rate: The flow rate for a non-rebreather mask should be set to deliver a **minimum** of 10 to 15 L/minute. The reservoir bag should be inflated prior to placing the mask on the patient. With a good fit, the non-rebreather mask can deliver between 60% and 80% FiO2.

Advantages: Non-rebreather masks deliver high levels of oxygen noninvasively to patients who can otherwise breathe unassisted.

Disadvantages: Due to the one-way valves in non-rebreather masks, there is a high risk of suffocation if the gas flow is interrupted. The mask requires a tight seal and may feel hot and confining to the patient. It will interfere with talking, and the patient cannot eat with the mask on.



Figure **4.3.9**: Non-Rebreather Mask

Partial Rebreather Mask

The partial rebreather mask looks very similar to the non-rebreather mask. The difference between the masks is a partial rebreather mask does not contain one-way valves, so the patient's exhaled air mixes with their inhaled air. A partial rebreather mask requires 10-15 L/min of oxygen, but only delivers 35-50% FiO2.

Venturi Mask

Venturi masks are indicated for patients who require a specific amount of supplemental oxygen to avoid complications, such as those with chronic obstructive pulmonary disease (COPD). Different types of adaptors are attached to a face mask that set the flow rate to achieve a specific FiO2 ranging from 24% to 60%. Venturi adapters are typically set up by a respiratory therapist, but in some facilities they may be set up by a nurse according to agency policy.

Flow rate: The flow rate depends on the adaptor and does not correspond to the flow meter. Consult with a respiratory therapist before changing the flow rate.

Advantages: A specific amount of FiO2 is delivered to patients whose breathing status may be affected by high levels of oxygen.

Continuous Positive Airway Pressure (CPAP)

A continuous positive airway pressure (CPAP) device is used for people who are able to breathe spontaneously on their own but need help in keeping their airway unobstructed, such as those with obstructive sleep apnea. (See Table 11.2.3 in the "Basic Concepts of Oxygenation" section for more information about obstructive sleep apnea.) The CPAP device consists of a special mask that covers the patient's nose, or nose and mouth, and is attached to a machine that continuously applies mild air pressure to keep the patient's airways from collapsing.

A prescription is required for a CPAP device in the hospital or patient's home environment. In the hospital, the FiO2 is set up with the CPAP mask by the respiratory therapist. In a home setting, an adapter is added so that oxygen is attached using a flowmeter with preprogrammed settings so the patient and/or nurse are only required to turn the machine on before sleeping and off upon awakening. It is important to keep the mask and tubing clean to prevent infection, so be sure to follow agency policy for cleaning the equipment regularly. If a humidifier is attached, distilled water or sterile water should be used to fill it, but never tap water. See Figure **4.3.10**[16] for an illustration of a patient wearing a CPAP device while sleeping.

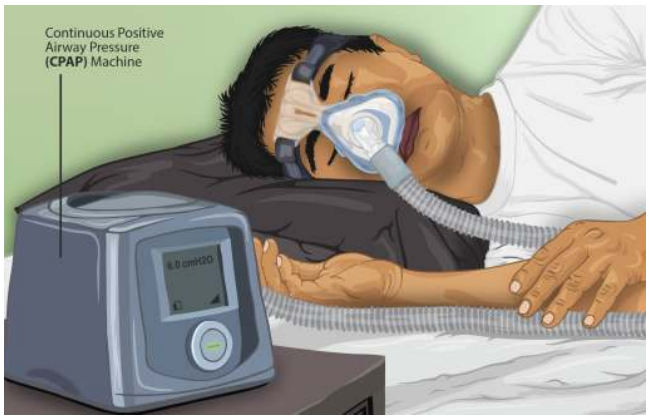


Figure **4.3.10**: CPAP Machine

Video Review of FDA Recommendations on How to Use a CPAP Mask[17]



BiPAP

A Bilevel Positive Airway Pressure (BiPAP) device is similar to a CPAP device in that it is used to prevent airways from collapsing, but BiPAP devices have two pressure settings. One setting occurs during inhalation and a lower pressure setting is used during exhalation. Patients using BiPAP devices in their home environment for obstructive sleep apnea often find these two pressures more tolerable because they don't have to exhale against continuous pressure. In acute-care settings, BiPAP devices are also used for patients in acute respiratory distress as a noninvasive alternative to intubation and mechanical ventilation and are managed by respiratory therapists. BiPAP devices in home settings are set up in a similar manner as CPAP machines for ease of use. See Figure **4.3.11**[18] for an image of a simulated patient wearing a BiPAP mask in a hospital setting with continuous pulse oximetry monitoring.



Figure **4.3.11**: Simulated Patient Wearing a BiPAP Mask

Bag Valve Mask (Ambu Bag)

A bag valve mask, commonly known as an “Ambu bag,” is a handheld device used in emergency situations for patients who are not breathing (respiratory arrest) or who are not breathing adequately (respiratory failure). In this manner, this device is different from the other devices because it assists with **ventilation**, the movement of air into and out of the lungs, as well as oxygenation. See Figure **4.3.12**[19] for an image of a bag valve mask. Bag valve masks are produced in different sizes for infants, children, and adults to prevent lung injury, so it is important to use the correct size for the patient.

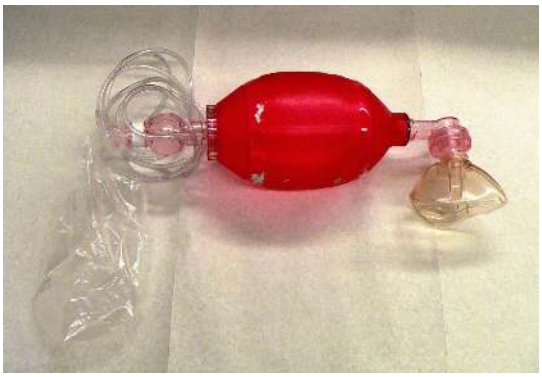


Figure **4.3.12**: Bag Valve Mask

When using a bag mask valve, the rescuer manually compresses the bag to force air into the lungs. Squeezing the bag once every 5 to 6 seconds for an adult or once every 3 seconds for an infant or child provides an adequate respiratory rate. In inpatient settings, the bag mask valve is attached to an oxygen supply to increase the concentration of oxygenation provided with each breath. See Figure **4.3.13**[20] for an illustration of operating a bag valve mask.

It is vital to obtain a tight seal of the mask to the patient’s face, but this is difficult for a single rescuer to achieve. Therefore, two rescuers are recommended; one rescuer performs a jaw thrust maneuver, secures the mask to the patient’s face with both hands, and focuses on maintaining a leak-proof mask seal, while the other rescuer squeezes the bag and focuses on the amount and the timing.

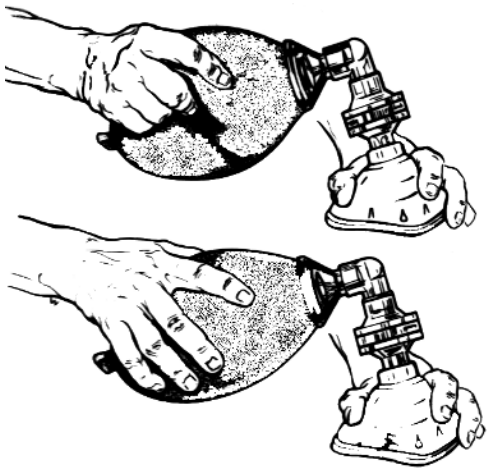


Figure **4.3.13**: Operation of a Bag Valve Mask

Flow rate: The flow rate for a bag valve mask attached to an oxygen source should be set to 15 L/minute, resulting in FiO2 of 100%.

Advantages: A bag valve mask is portable and provides immediate assistance to patients in respiratory failure or respiratory arrest. It also can be used to hyperoxygenate patients before procedures that can cause hypoxia, such as tracheal suctioning.

Disadvantages: The rate and depth of compression of the bag must be closely monitored to prevent injury to the patient. In the event of respiratory failure when the patient is still breathing, the bag compressions must be coordinated with the patient's inhalations to ensure that oxygen is delivered and asynchrony of breaths is prevented. Complications may also result from overinflating or overpressurizing the patient. Complications include lung injury or the inflation of the stomach that can lead to aspiration of stomach contents. Additionally, rescuers may tire after a few minutes of manually compressing the bag, resulting in less than optimal ventilation. Alternatively, an endotracheal tube (ET) can be inserted by an advanced practitioner to substitute for the mask portion of this device. See more information about endotracheal tubes below.

Endotracheal Intubation

When a patient is receiving general anesthesia prior to a procedure or surgery or is experiencing respiratory failure or respiratory arrest, an endotracheal tube (ET) is inserted by an advanced practitioner, such as a respiratory therapist, paramedic, or anesthesiologist, to maintain a secure airway. The ET tube is sealed within the trachea with an inflatable cuff, and oxygen is supplied via a bag valve mask or via mechanical ventilation. See Figure **4.3.14**[21] for an image of a cuffed endotracheal tube.



Figure **4.3.14**: An Endotracheal Tube

Mechanical Ventilator

A mechanical ventilator is a machine attached to an endotracheal tube to assist or replace spontaneous breathing. Mechanical ventilation is termed invasive because it requires placement of a device inside the trachea through the mouth, such as an endotracheal tube. Mechanical ventilators are managed by respiratory therapists via protocol or provider order. FiO2 can be set

from 21-100%. Nurses collaborate with respiratory therapists and the health care providers regarding the overall care of the patient on a mechanical ventilator. See Figure **4.3.15**[22] for an image of a simulated patient who is intubated with an endotracheal tube and attached to a mechanical ventilator.

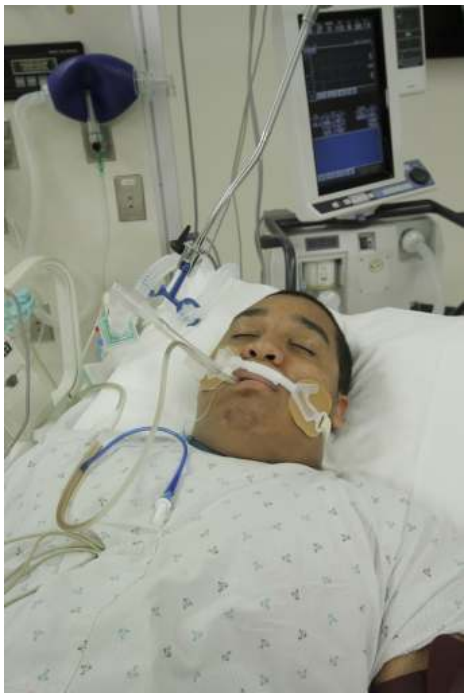


Figure **4.3.15**: Simulated Intubated Patient on a Mechanical Ventilator

Tracheostomy

A tracheostomy is a surgically-made hole called a stoma that goes from the front of the patient's neck into the trachea. A tracheostomy tube is placed through the stoma and directly into the trachea to maintain an open (patent) airway and to administer oxygen. A tracheostomy may be performed emergently or as a planned procedure. Read more about tracheostomies in the "Tracheostomy Care and Suctioning" chapter.

Flow Rates and Oxygen Percentages

When administering oxygen to a patient, it is important to ensure that oxygen flow rates are appropriately set according to the type of administration device. Review Table **4.3.1** to review appropriate settings for various types of oxygenation devices.

Table **4.3.1**: Settings of Oxygenation Devices

Device	Flow Rates and Oxygen Percentage
Nasal Cannula	Flow rate: 1-6 L/min
Bag Valve Mask	Flow rate: 15 L/min FiO2: 100% Squeeze the bag once every 5 to 6 seconds for an adult or once every 3 seconds for an infant or child.

Safety with Oxygen Therapy

Oxygen therapy supports life, but it also supports fire. While there are many benefits to oxygen therapy, there are also many hazards. Oxygen must be administered cautiously and according to the safety guidelines in Table **4.3.2**.[23]

Table **4.3.2**: Oxygen Therapy Safety Guidelines

Guideline	Additional Information
Remember that oxygen is a medication.	Oxygen is a medication and should not be adjusted without consultation with a physician or respiratory therapist.
Store oxygen cylinders correctly.	When using oxygen cylinders, store them upright, chained, or in appropriate holders so that they will not fall. Full oxygen tanks should be stored separately from partially-full or empty oxygen tanks.
Use tank holders appropriately.	When transporting a patient, proper tank holders must be used per Joint Commission guidelines. Tanks should never be placed on the patient's bed.
Do not allow smoking near the oxygen devices.	Oxygen supports combustion. No smoking is permitted around any oxygen delivery devices in the hospital or home environment.
Keep oxygen cylinders away from heat sources.	Keep oxygen delivery systems at least 5 feet from any heat source.
Check for electrical hazards in the home or hospital prior to use.	Determine that electrical equipment in the room or home is in safe working condition. A small electrical spark in the presence of oxygen will result in a serious fire. The use of a gas stove, kerosene space heater, or smoker is unsafe in the presence of oxygen. Avoid items that may create a spark (e.g., electrical razor, hair dryer, synthetic fabrics that cause static electricity, or mechanical toys) with nasal cannula in use. Petroleum-based lubricants should not be used on the lips or around the nasal cannula.
Check levels of oxygen in portable tanks.	Check oxygen levels of portable tanks before transporting a patient to ensure that there is enough oxygen in the tank.

1. "OxyWatch_C20_Pulse_Oximeter.png" by Thinkpaul is licensed under CC BY-SA 3.0↵
2. American Lung Association. (2020, May 27). *Pulse oximetry*. https://www.lung.org/lung-health-diseases/lung-procedures-and-tests/pulse-oximetry↵
3. "Oxygen Regulator3I3A1063.jpg" by Deanna Hoyord, Chippewa Valley Technical College is licensed under CC BY 4.0↵
4. "RECALLED_–_Portable_oxygen_cylinder_units_(8294127015).jpg" by The U.S. Food and Drug Administrationis in the Public Domain↵
5. "Invacare Perfecto 2 Oxygen Concentrator.JPG" by BrokenSphere / Wikimedia Commons is licensed under CC BY-SA 3.0↵
6. "Portable Oxygen Concentrator by Inogen.jpg" by Oxystore is licensed under CC BY-SA 4.0↵
7. Gibson, C. M. (Ed.). *Portable oxygen concentrator.* WikiDoc. https://www.wikidoc.org/index.php/Portable_oxygen_concentrator↵
8. "Image00011.jpg" by British Columbia Institute of Technology is licensed under CC BY 4.0. Access for free at https://opentextbc.ca/clinicalskills/chapter/5-5-oxygen-therapy-systems/↵
9. Duck, A. (2009, December 14). *Does oxygen need humidification?* https://www.nursingtimes.net/clinical-archive/respiratory-clinical-archive/does-oxygen-need-humidification-14-12-2009/↵
10. This work is a derivative of Clinical Procedures for Safer Patient Care by British Columbia Institute of Technology and is licensed under CC BY 4.0 ↵
11. This work is a derivative of StatPearls by Sharma, Danckers, Sanghavi, and Chakraborty and is licensed under CC BY 4.0↵
12. "HFT diagram.png" by Strangecow is in the Public Domain↵
13. "DSC_2086.jpg" by British Columbia Institute of Technology is licensed under CC BY 4.0. Access for free at https://opentextbc.ca/clinicalskills/chapter/5-5-oxygen-therapy-systems/↵
14. This work is a derivative of Clinical Procedures for Safer Patient Care by British Columbia Institute of Technology is licensed under CC BY 4.0 ↵

15. “DSC_2083.jpg” by British Columbia Institute of Technology is licensed under CC BY 4.0. Access for free at https://opentextbc.ca/clinicalskills/chapter/5-5-oxygen-therapy-systems/↵
16. “Depiction of a sleep apnea patient using a CPAP machine” by https://www.myupchar.com/en is licensed under CC BY 4.0↵
17. U.S. Food and Drug Administration. (2012, December 12). *CPAP tips from FDA.* [Video]. YouTube. https://youtu.be/B10ABypyGOo↵
18. “Simulated patient wearing a BiPAP mask” by Chippewa Valley Technical College is licensed under CC BY 4.0↵
19. “Ballon ventilation 1.jpg” by Rama is licensed under CC BY-SA 2.0 FR↵
20. “Resuscitator 3 - Operation (PSF).png” by Pearson Scott Foresman is in the Public Domain↵
21. “Sondeintubation.jpg” by bigomar2 is licensed under CC BY-SA 3.0↵
22. “Simulated intubated patient on a mechanical ventilator” by ARISE project is licensed under CC BY 4.0↵
23. This work is a derivative of Clinical Procedures for Safer Patient Care by British Columbia Institute of Technology and is licensed under CC BY 4.0 ↵

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4.4: Nursing Process Related to Oxygen Therapy

When administering oxygen therapy, it is important for the nurse to assess the patient before, during, and after the procedure and document the findings.

Subjective Assessment

Prior to initiating oxygen therapy, if conditions warrant, the nurse should briefly obtain a history of respiratory conditions and collect data regarding current symptoms associated with the patient's feeling of shortness of breath. The duration of this focused assessment should be modified based on the severity of the patient's dyspnea. See Table **4.4.1** for focused interview questions related to oxygen therapy. This information is used to customize the oxygen delivery device and flow rate for the patient. For example, supplemental oxygen is typically initiated in nonemergency situations with a nasal cannula at 1-2 liters per minute (L/min), but a patient with a history of chronic obstructive pulmonary disease (COPD) may require a different device such as a Venturi mask.

Table **4.4.1**: Focused Interview Questions for Subjective Assessment of Dyspnea

Interview Questions	Follow-up
Please rate your current feeling of shortness of breath from 0-10, "0" being no shortness of breath and "10" being the worst shortness of breath you have ever experienced.	Note: If the shortness of breath is severe, associated with chest pain, or if there are imminent signs of respiratory failure, discontinue the subjective assessment and obtain emergency assistance.
Are you experiencing any additional symptoms such as chest pain, cough, or a feeling of swelling in your throat or tongue?	Please describe. Note: If the patient describes severe symptoms that could indicate imminent blockage of the airway, obtain emergency assistance. When did it start? Is the cough productive of phlegm? If yes, what color and what is the amount? Does the chest pain radiate elsewhere?
Have you ever been diagnosed with respiratory conditions such as asthma or COPD?	Please describe.
Are you currently taking any medications, herbs, or supplements to help you breathe?	Please identify what you are taking and the dosage. If you are using inhalers on an as-needed basis, how often are you using them and has the frequency increased lately?
Have you received oxygen therapy previously?	Please describe. Do you use oxygen therapy at home? What is your normal flow rate? Do you use CPAP or BiPAP devices at home?
Do you smoke?	Have you considered quitting?

Objective Assessment

Prior to applying supplemental oxygen, objective data regarding patient status should quickly be obtained such as airway clearance, respiratory rate, pulse oximetry, and lung sounds. Signs of cyanosis in the skin or nail bed assessment should also be noted. Within a few minutes after initiating oxygen administration, the nurse should evaluate for improvement of these indicators, and if no improvement is noted, then additional actions should be taken. At any point, if the nurse feels that the patient's condition is deteriorating, emergency action should be taken such as calling the rapid response team or 911.

Depending upon the severity of patient condition, serial ABG results may also be monitored to determine effectiveness of oxygenation interventions.

After oxygen therapy is initiated, it is important to closely monitor for skin breakdown at pressure points. For example, nasal cannula tubing often causes skin breakdown in the nares or over the ears, so protective foam dressings may need to be applied.

Life Span Considerations

Children

Different sized oxygen equipment is used for infants and children. Additionally, oxygen tubing may need to be secured to a child's face with tape to prevent them from pulling it off. For infants, the pulse oximeter probe is usually attached to the palm or foot.

Older Adults

If a patient is oxygen-dependent, ensure that extension tubing is applied so the patient is able to reach the bathroom with the oxygen device in place. However, be aware of the increased risk for falls due to the excess tubing. Keeping the oxygen tubing coiled up at the head of the bed or on the bedside table closest to the bathroom will decrease the patient's risk of falling. Advise the patient to ask for assistance when getting up to use the restroom.



- Safety Tip: When oxygen is in use, teach the patient about safety considerations with oxygen use because it is very flammable. See the "Safety with Oxygen Therapy" section in "Oxygenation Equipment" for more details.
- After administering oxygen, instruct the patient to inhale through their nose with slow, deep breaths and to breathe out through their mouth.
- If a patient is experiencing worsening dyspnea with decreased oxygen saturation levels compared to their baseline levels, apply oxygen and stay with the patient until their oxygen saturation level increases and they report feeling less short of breath. Providing a physical presence is an important intervention for the associated anxiety that accompanies dyspnea. Consider asking a team member for assistance.
- Based on the patient's condition, it may be helpful to institute additional interventions to improve oxygenation. See Table 11.2.3 in the "Basic Concepts of Oxygenation" section for interventions to improve hypoxia.

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4.5: Sample Documentation

Sample Documentation of Expected Findings

Patient has a history of COPD and reported feeling short of breath after getting up to use the bathroom this morning. Respirations were 24/minute, pulse oximetry 88% on room air, and lungs sounds were diminished. Oxygen applied via nasal cannula at 2 Lpm, and the patient was encouraged to take slow deep breaths in through their nose and out of their mouth. After five minutes, the pulse oximetry was 94%, the respiratory rate decreased to 16/minute, and the patient reported the feeling of shortness of breath had subsided.

Sample Documentation of Unexpected Findings

Patient has a history of COPD and heart failure and reported feeling short of breath after getting up to use the bathroom this morning. Respirations were 30/minute, pulse oximetry was 88% on room air, and lungs had crackles in the lower posterior lobes. Oxygen was applied via nasal cannula at 2 Lpm and the patient was encouraged to cough and deep breathe. After five minutes, the respiratory rate and pulse oximetry readings did not improve. Dr. Smith was notified at 0715 and an order for a STAT chest X-ray was received, followed by an order for furosemide 40 mg IV STAT. Furosemide was administered, and 30 minutes later the pulse oximetry increased to 92%, respiratory rate decreased to 18/minute, and there was urine output of 500 mL with reduced crackles in the lower posterior lobes. Patient reported feeling less short of breath.

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4.6: Checklist for Oxygen Therapy

Use the checklist below to review the steps for “Managing Oxygen Therapy.”

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

1. Verify provider order or protocol.
2. Gather supplies: pulse oximeter, oxygen delivery device, and tubing.
3. Perform safety steps:
    - Perform hand hygiene.
    - Check the room for transmission-based precautions.
    - Introduce yourself, your role, the purpose of your visit, and an estimate of the time it will take.
    - 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.
4. Perform a focused respiratory assessment including airway, respiratory rate, pulse oximetry rate, and lung sounds.
5. Employ safety measures for oxygen therapy.
6. Connect flow meter to oxygen supply source.
7. Apply adapter for tubing.
8. Connect nasal cannula tubing to flow meter.
9. Set oxygen flow at prescribed rate.
10. When using a nasal cannula, place the prongs into the patient’s nares and fit the tubing around their ears. When using a mask, place the mask over the patient’s mouth and nose, secure a firm seal, and tighten the straps around the head. If using a non-rebreather mask, partially inflate the reservoir bag before applying the mask. Place the patient in an upright position as clinically appropriate.
11. Evaluate patient’s response to oxygen therapy including airway, respiratory rate, pulse oximetry reading, and reported dyspnea.
12. Institute additional interventions to improve oxygenation as needed.
13. Adapt this procedure to reflect variations across the life span.
14. Assist the patient to a comfortable position, ask if they have any questions, and thank them for their time.
15. Ensure safety measures when leaving the room:
    - CALL LIGHT: Within reach
    - BED: Low and locked (in lowest position and brakes on)
    - SIDE RAILS: Secured
    - TABLE: Within reach
    - ROOM: Risk-free for falls (scan room and clear any obstacles)
16. Perform hand hygiene.
17. Document the assessment findings. Report any concerns according to agency policy.

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4.7: Supplementary Videos on Oxygen Therapy

Video Review for Oxygen Therapy

Using an Incentive Spirometer[1]



View Oxford Medical Education's Oxygen Therapy and Delivery video on YouTube[2]

1. RegisteredNurseRN. (2016, October 18). *Incentive spirometry (spirometer) demonstration instruction | Incentive spirometer procedure*. [Video]. YouTube. All rights reserved. Video used with permission. https://youtu.be/pZxq6oroGhk↵
2. Oxford Medical Education. (2012, May 13). *Oxygen therapy and delivery - How to prescribe oxygen*. [Video]. YouTube. All rights reserved. This video is included on the basis of Fair Use. https://youtu.be/Nc2zl2SeQNo↵

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4.8: Learning Activities

Learning Activities

(Answers to “Learning Activities” can be found in the ‘”Answer Key'” at the end of the book. Answers to interactive activity elements will be provided within the element as immediate feedback.)

1. Your patient turns on their call light. Upon entering your patient’s room, they say they are short of breath. Prioritize your actions from first to sixth.

Institute actions to improve oxygenation

Apply oxygen as ordered

Reassess pulse oximetry

Teach oxygen safety

Assess lung sounds

Assess pulse oximetry

Priority	Actions
First	
Second	
Third	
Four	
Fifth	
Sixth	

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4.9: XI Glossary

Clubbing: A gradual enlargement of the fingertips in patients with respiratory conditions that cause chronic hypoxia.

Cyanosis: A bluish discoloration of the skin and mucous membranes caused by lack of oxygenation to the tissues.

Dyspnea: A subjective feeling of not being able to get enough air; also called shortness of breath.

FiO2: Fraction of inspired oxygen (i.e., the concentration of oxygen inhaled). Room air contains 21% oxygen levels, and oxygenation devices can increase the inhaled concentration of oxygen up to 100%. However, FiO2 levels should be decreased as soon as feasible to do so to prevent lung injury.

Hypercapnia: Elevated carbon dioxide levels in the blood, indicated by PaCO2 level greater than 45 in an ABG test.

Hypoxemia: Decreased dissolved oxygen in the arterial blood, indicated by a PaO2 level less than 80 mmHg in an ABG test.

Hypoxia: A reduced level of tissue oxygenation.

Obstructive Sleep Apnea (OSA): Characterized by repeated occurrences of complete or partial obstructions of the upper airway during sleep, resulting in apneic episodes.

PaO2: The partial pressure of dissolved oxygen in the blood measured by arterial blood gas samples.

SpO2: An estimated oxygenation level based on the saturation level of hemoglobin measured by a pulse oximeter.

Ventilation: The mechanical movement of air into and out of the lungs.

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CHAPTER OVERVIEW

5: Administration of Enteral Medications

5.1: Administration of Enteral Medications Introduction
5.2: Basic Concepts of Administering Medications
5.3: Assessments Related to Medication Administration
5.4: Checklist for Oral Medication Administration
5.5: Checklist for Rectal Medication Administration
5.6: Checklist for Enteral Tube Medication Administration
5.7: Supplementary Videos
5.8: Learning Activities
5.9: XV Glossary

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5.1: Administration of Enteral Medications Introduction

Learning Objectives

- Safely administer medication orally, rectally, and via enteral tubes
- Accurately check medication administration rights three times
- Calculate correct amount of medication to administer
- Explain medication information to patient
- Collect appropriate assessment data prior to and after medication administration
- Modify procedure to reflect variations across the life span
- Document actions and observations

“Enteral” means related to the intestines. The term **enteral medication** describes medications that are administered into the gastrointestinal tract including orally (PO), rectally (PR), or through a tube such as a nasogastric (NG) tube, nasointestinal (NI) tube, or percutaneous endoscopic gastrostomy (PEG) tube.

This chapter will review overall concepts related to safe medication administration, as well as specific information regarding the administration of oral medication, rectal medication, and medication via a gastric tube. Information regarding administering injections and intravenous medications can be found in “Administration of Parenteral Medications” and additional information about administering medications via other routes can be found in “Administration of Medications via Other Routes.”

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5.2: Basic Concepts of Administering Medications

The scope of practice regarding a nurse's ability to legally dispense and administer medication is based on each state's Nurse Practice Act. Registered Nurses (RNs) and Licensed Practical Nurses (LPNs/LVNs) may legally administer medications that are prescribed by a health care provider, such as a physician, nurse practitioner, or physician's assistant. Prescriptions are "orders, interventions, remedies, or treatments ordered or directed by an authorized primary health care provider."[1]

> **Note**
>
> For more information about the state Nurse Practice Act, visit the "Legal/Ethical" chapter in Open RN *Nursing Pharmacology*.

Types of Orders

Prescriptions are often referred to as orders in clinical practice. There are several types of orders, such as routine orders, PRN orders, standing orders, one-time orders, STAT orders, and titration orders.

- A **routine order** is a prescription that is followed until another order cancels it. An example of a routine order is "Lisinopril 10 mg PO daily."
- A **PRN** (or as-needed) order is a prescription for medication to be administered when it is requested by, or as needed by, the patient. PRN orders are typically administered based on patient symptoms, such as pain, nausea, or itching. An example of a PRN order for pain medication is "Acetaminophen 500 mg PO every 4-6 hours as needed for pain."
- A **standing order** is also referred to in practice as an "order set" or a "protocol." Standing orders are standardized prescriptions for nurses to implement to any patient in clearly defined circumstances without the need to initially notify a provider. An example of a standing order set/protocol for patients visiting an urgent care clinic reporting chest pain is to immediately administer four chewable aspirin, establish intravenous (IV) access, and obtain an electrocardiogram (ECG).
- A **one-time order** is a prescription for a medication to be administered only once. An example of a one-time order is a prescription for an IV dose of antibiotics to be administered immediately prior to surgery.
- A **STAT order** is a one-time order that is administered without delay due to the urgency of the circumstances. An example of a STAT order is "Benadryl 50 mg PO stat" for a patient having an allergic reaction.
- A **titration** order is an order in which the medication dose is either progressively increased or decreased by the nurse in response to the patient's status. Titration orders are typically used for patients in critical care as defined by agency policy. The Joint Commission requires titration orders to include the medication name, medication route, initial rate of infusion (dose/unit of time), incremental units to which the rate or dose can be increased or decreased, how often the rate or dose can be changed, the maximum rate or dose of infusion, and the objective clinical measure to be used to guide changes. An example of a titration order is "Norepinephrine 2-12 micrograms/min, start at 2 mcg/min and titrate upward by 1 mcg/min every 5 minutes with continual blood pressure monitoring until systolic blood pressure >90 mm Hg."

Components of a Medication Order

According to the Centers for Medicare & Medicaid Services, all orders for the administration of drugs and biologicals must contain the following information:[2]

- Name of the patient
- Age or date of birth
- Date and time of the order
- Drug name
- Dose, frequency, and route
- Name/Signature of the prescriber
- Weight of the patient to facilitate dose calculation when applicable. (Note that dose calculations are based on metric weight: kilograms for children/adults or grams for newborns)
- Dose calculation requirements, when applicable
- Exact strength or concentration, when applicable
- Quantity and/or duration of the prescription, when applicable

- Specific instructions for use, when applicable

When reviewing a medication order, the nurse must ensure these components are included in the prescription before administering the medication. If a pertinent piece of information is not included, the nurse must contact the prescribing provider to clarify and correct the order.

Drug Name

The name of the drug may be ordered by the generic name or brand name. The generic name is considered the safest method to use and allows for substitution of various brand medications by the pharmacist.

Dose

The dosage of a drug is prescribed using either the metric or the household system. The metric system is the most commonly accepted system internationally. Examples of standard dosage are 5 mL (milliliters) or 1 teaspoon. Standard abbreviations of metric measurement are frequently used regarding the dosage, such as mg (milligram), kg (kilogram), mL (milliliter), mcg (microgram), or L (liter). However, it is considered safe practice to avoid other abbreviations and include the full words in prescriptions to avoid errors. In fact, several abbreviations have been deemed unsafe by the Joint Commission and have been put on a "do not use" list. See the hyperlinks below to view the Joint Commission "Do Not Use List" and the Institute of Safe Medication Practices (ISMP) list of abbreviations to avoid. If a dosage is unclear or written in a confusing manner in a prescription, it is always best to clarify the order with the prescribing provider before administering the medication.

Note

View the Joint Commission's Do Not Use List of Abbreviations.
View the ISMP List of Error-Prone Abbreviations to Avoid.

Frequency

Frequency in prescriptions is indicated by how many times a day the medication is to be administered or how often it is to be administered in hours or minutes. Examples of frequency include verbiage such as once daily, twice daily, three times daily, four times daily, every 30 minutes, every hour, every four hours, or every eight hours. Medication times are typically indicated using military time (i.e., using a 24-hour clock). For example, 11 p.m. is indicated as "2300." Read more about military time in the "Math Calculations" chapter.

Some types of medications may be ordered "**around the clock (ATC)**." An around-the-clock frequency order indicates they should be administered at regular time intervals, such as every six hours, to maintain consistent levels of the drug in the patient's bloodstream. For example, pain medications administered at end of life are often prescribed ATC instead of PRN (as needed) to maintain optimal pain relief.

Route of Administration

Common routes of administration and standard abbreviations include the following:

- **Oral (PO)** – the patient swallows a tablet or capsule
- **Sublingual (SL)** – applied under the tongue
- **Enteral (NG or PEG)** – administered via a tube directly into the GI tract
- **Rectal (PR)** – administered via rectal suppository
- **Inhalation (INH)** – the patient breathes in medication from an inhaler
- **Intramuscular (IM)** – administered via an injection into a muscle
- **Subcutaneous** – administered via injection into the fat tissue beneath the skin (Note that "subcutaneous" is on ISMP's recommended list of abbreviations to avoid due to common errors.)
- **Transdermal (TD)** – administered by applying a patch on the skin

Note

For more information about routes of administration and considerations regarding absorption, visit the "Kinetics and Dynamics" chapter in Open RN *Nursing Pharmacology*.

Provider Name/Signature

Signature of the prescribing provider is required on the order and can be electronic or handwritten. Verbal orders from a prescriber are not recommended, but may be permitted in some agencies for urgent situations. Verbal orders require the nurse to "repeat back" the order to the prescriber for confirmation.

Rights of Medication Administration

Each year in the United States, 7,000 to 9,000 people die as a result of a medication error. Hundreds of thousands of other patients experience adverse reactions or other complications related to a medication. The total cost of caring for patients with medication-associated errors exceeds $40 billion each year. In addition to the monetary cost, patients experience psychological and physical pain and suffering as a result of medication errors.[3] Nurses play a vital role in reducing the number of medication errors that occur by verifying several rights of medication.

The Centers for Medicare & Medicaid Services requires nurses to verify specific information prior to the administration of medication to avoid errors, referred to as verifying the rights of medication administration.[4] These rights of medication administration are the vital last safety check by nurses to prevent errors in the chain of medication administration that includes the prescribing provider, the pharmacist, the nurse, and the patient.

It is important to remember that if a medication error occurs resulting in harm to a patient, a nurse can be held liable even if "just following orders." It is absolutely vital for nurses to use critical thinking and clinical judgment to ensure each medication is safe for each specific patient before administering it. The consequences of liability resulting from a medication error can range from being charged with negligence in a court of law, to losing one's job, to losing one's nursing license.

The six rights of medication administration must be verified by the nurse at least three times before administering a medication to a patient. These six rights include the following:

1. Right Patient
2. Right Drug
3. Right Dose
4. Right Time
5. Right Route[5]
6. Right Documentation

Recent literature indicates that up to ten rights should be completed as part of a safe medication administration process. These additional rights include Right History and Assessment, Right Drug Interactions, Right to Refuse, and Right Education and Information. Information for each of these rights is further described below.[6], [7]

Right Patient

Acceptable patient identifiers include, but are not limited to, the patient's full name, an identification number assigned by the hospital, or date of birth. A patient's room number must never be used as an identifier because a patient may change rooms. Identifiers must be confirmed by the patient wristband, patient identification card, patient statement (when possible), or other means outlined in the agency policy such as a patient picture included on the MAR. The nurse must confirm the patient's identification matches the **medication administration record** (MAR) and medication label prior to administration to ensure that the medication is being given to the correct patient.[8] See Figure **5.2.1**[9] for an illustration of the nurse verifying the patient's identify by scanning their identification band and asking for their date of birth. See Figure **5.2.2**[10] for a close-up image of a patient identification wristband.

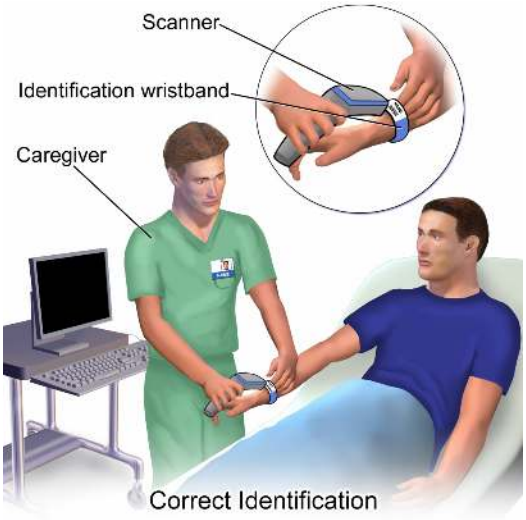


Figure 5.2.1: Patient Identification by Scanning Armband



Figure 5.2.2: Patient Identification Band

If barcode scanning is used in an agency, this scanning is not intended to take the place of confirming two patient identifiers, but is intended to add another layer of safety to the medication administration process. The National Patient Safety Goals established by the Joint Commission state that whenever administering patient medications, at least two patient identifiers should be used.[11]

Right Drug

During this step, the nurse ensures the medication to be administered to the patient matches the order or Medication Administration Record (MAR) and that the patient does not have a documented allergy to it.[12] The Medication Administration Record (MAR), or **eMAR**, an electronic medical record, is a specific type of documentation found in a patient's chart. See Figure **5.2.3**[13] for an image of a MAR and its components. Beware of look-alike and sound-alike medication names, as well as high-alert medications that bear a heightened risk of causing significant patient harm if they are used in error. The nurse should also be aware of what medication can be crushed and those that cannot be crushed. Read more information about these concerns using the hyperlinks below.

Note

View the ISMP Frequently Confused Medication List.

View the ISMP High-Alert Medications List.

View the ISMP Do Not Crush List.

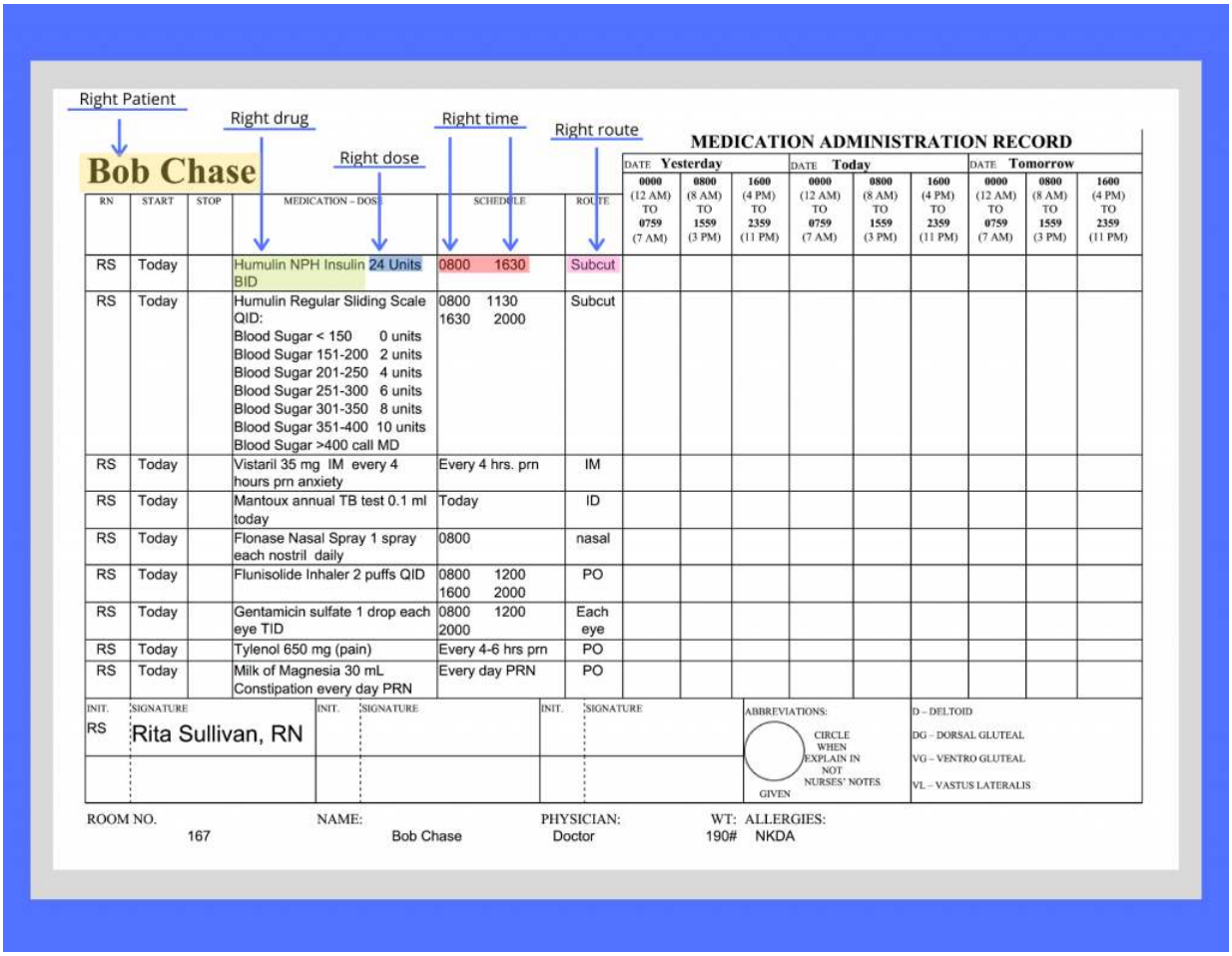


Figure **5.2.3**: Medication Administration Record

Right Dose

During this step, the nurse ensures the dosage of the medication matches the prescribed dose, verifies the correct dosage range for the age and medical status of the patient, and also confirms that the prescription itself does not reflect an unsafe dosage level (i.e., a dose that is too high or too low).[14] For example, medication errors commonly occur in children, who typically receive a lower dose

of medication than an adult. Medication errors also commonly occur in older patients who have existing kidney or liver disease and are unable to metabolize or excrete typical doses of medications.

Right Time and Frequency

During this step, the nurse verifies adherence to the prescribed frequency and scheduled time of administration of the medication.[15] This step is especially important when PRN medications are administered because it is up to the nurse to verify the time of the previous dose and compare it to the ordered frequency.

Medications should be administered on time whenever possible. However, when multiple patients are scheduled to receive multiple medications at the same time, this goal of timeliness can be challenging. Most facilities have a policy that medications can be given within a range of 30 minutes before or 30 minutes after the medication is scheduled. For example, a medication ordered for 0800 could be administered anytime between 0730 and 0830. However, some medications must be given at their specific ordered time due to pharmacokinetics of the drug. For example, if an antibiotic is scheduled every eight hours, this time frame must be upheld to maintain effective bioavailability of the drug, but a medication scheduled daily has more flexibility with time of actual administration.

Right Route

During this step, the nurse ensures the route of administration is appropriate for the specific medication and also for the patient.[16] Many medications can potentially be administered via multiple routes, whereas other medications can only be given safely via one route. Nurses must administer medications via the route indicated in the order. If a nurse discovers an error in the order or believes the route is unsafe for a particular patient, the route must be clarified with the prescribing provider before administration. For example, a patient may have a PEG tube in place, but the nurse notices the medication order indicates the route of administration as PO. If the nurse believes this medication should be administered via the PEG tube and the route indicated in the order is an error, the prescribing provider must be notified and the order must be revised indicating via PEG tube before the medication is administered.

Right Documentation

After administering medication, it is important to immediately document the administration to avoid potential errors from an unintended repeat dose.

In addition to checking the basic rights of medication administration and documenting the administration, it is also important for nurses to verify the following information to prevent medication errors.

Right History and Assessment

The nurse should be aware of the patient's allergies, as well as any history of any drug interactions. Additionally, nurses collect appropriate assessment data regarding the patient's history, current status, and recent lab results to identify any contraindications for the patients to receive the prescribed medication.[17]

Right Drug Interactions

The patient's history should be reviewed for any potential interactions with medications previously given or with the patient's diet. It is also important to verify the medication's expiration date before administration.

Right Education and Information

Information should be provided to the patient about the medication, including the expected therapeutic effects, as well as the potential adverse effects. The patient should be encouraged to report suspected side effects to the nurse and/or prescribing provider. If the patient is a minor, the parent may also have a right to know about the medication in many states, depending upon the circumstances.

Right of Refusal

After providing education about the medication, the patient has the right to refuse to take medication in accordance with the Nurses Code of Ethics and respect for individual patient autonomy. If a patient refuses to take the medication after proper education has been performed, the event should be documented in the patient chart and the prescribing provider notified.

Medication Dispensing

Medications are dispensed for patients in a variety of methods. During inpatient care, unit dose packaging is a common method for dispensing medications. See Figure 5.2.4[18] for an image of unit dose packaging.

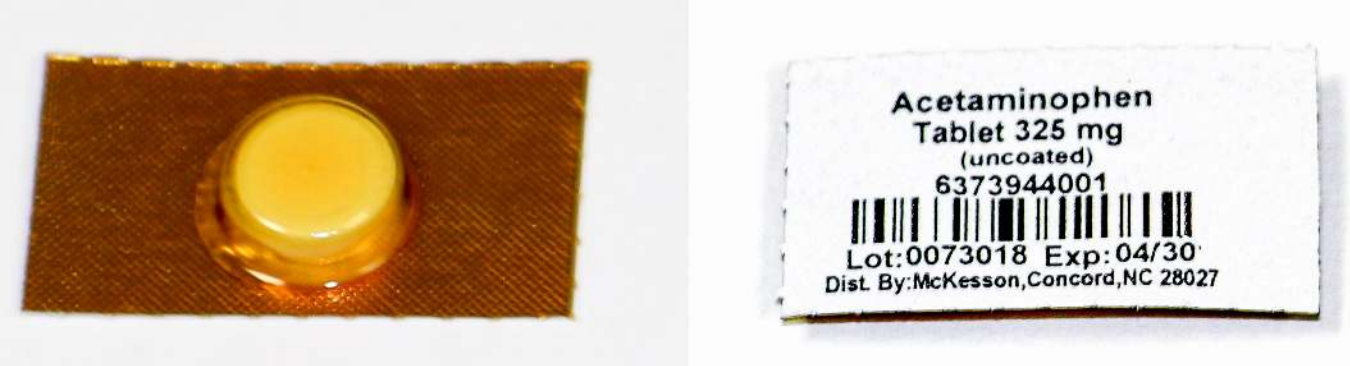


Figure 5.2.4: Unit Dose Packaging

Unit dose dispensing is typically used in association with a medication dispensing system, sometimes referred to in practice with brand names such as “Pyxis” or “Omnicell.” Medication dispensing systems help keep medications secure by requiring a user sign-in and password. They also reduce medication errors by only allowing medications prescribed for a specific patient to be removed unless additional actions are taken. However, it is important to remember that medication errors can still occur when using a medication dispensing system if the incorrect medication is erroneously stocked in a compartment. See Figure 5.2.5[19] for an image of a medication dispensing system.



Figure 5.2.5: Medication Dispensing System

Bar codes are often incorporated with unit dose medication dispensing as an additional layer of safety to prevent medication errors. Each patient and medication is identified with a unique bar code. The nurse scans the patient’s identification wristband with a bedside portable device and then scans each medication to be administered. The portable device will display error messages if an incorrect medication is scanned or if medication is scanned at an incorrect time. It is vital for nurses to stop and investigate the medication administration process when an error is received. The scanning device is typically linked to an electronic MAR and the medication administered is documented immediately in the patient’s chart.

In long-term care agencies, weekly blister cards may be used that contain a specific patient’s medications for each day of the week. See Figure 5.2.6[20] for an image of a blister pack.



Figure **5.2.6**: Blister Pack of Medications

Agencies using blister cards or pill bags typically store medications in a locked medication cart to keep them secure. Supplies used to administer medications are also stored on the cart. The MAR is available in printed format or electronically with a laptop computer. See Figure **5.2.7**[21] for an image of a medication cart.



Figure **5.2.7**: Medication Cart

Process of Medication Administration

No matter what method of medication storage and dispensing is used in a facility, the nurse must continue to verify the rights of medication administration to perform an accurate and safe medication pass. Using a medication dispensing system or bar coding does not substitute for verifying the rights, but are used to add an additional layer of safety to medication administration. Nurses can also avoid medication errors by creating a habitual process of performing medication checks when administering medication. The rights of medication administration should be done in the following order:

1. Perform the first check as the unit dose package, blister pack, or pill bag is removed from the dispensing machine or medication cart. Also, check the expiration date of the medication.
2. A second check should be performed after the medication is removed from the dispensing machine or medication cart. This step should be performed prior to pouring or removing from a multidose container. Note: Some high-alert medications, such as insulin, require a second nurse to perform a medication check at this step due to potentially life-threatening adverse effects that can occur if an error is made.

3. The third check should be performed immediately before administering the medication to the patient at the bedside or when replacing the multidose container back into the drawer.

See Figure 5.2.8[22] for an image of a nurse comparing medication information on the medication packet to information on the patient's MAR.



Figure 5.2.8: Comparing Medication Information to the MAR

When performing these three checks, the nurse should ensure this is the right medication, right patient, right dosage, right route, and right time. See Figure 5.2.9[23] for an image of the nurse performing patient identification prior to administering the medication. The sixth right, correct documentation, should be done immediately after the medication is administered to the patient to avoid an error from another nurse inadvertently administering the dose a second time. These six rights completed three times have greatly reduced medication errors.

As discussed earlier, other rights to consider during this process are as follows:

- Is the patient receiving this medication for the right reason?
- Have the right assessments been performed prior to giving the medication?
- Has the patient also received the right education regarding the medications?
- Is the patient exhibiting the right response to the medication?
- Is the patient refusing to take the medication? Patients have the right to refuse medication. The patient's refusal and any education or explanation provided related to the attempt to administer the medication should be documented by the nurse and the prescribing provider should be notified.



- Listen to the patient if they verbalize any concerns about medications. Explore their concerns, verify the order, and/or discuss their concerns with the prescribing provider before administering the medication to avoid a potential medication error.
- If a pill falls on the floor, it is contaminated and should not be administered. Dispose the medication according to agency policy.
- Be aware of absorption considerations of the medications you are administering. For example, certain medications such as levothyroxine should be administered on an empty stomach because food and other medications will affect its absorption.
- Nurses are often the first to notice when a patient has difficulty swallowing. If you notice a patient coughs immediately after swallowing water or has a "gurgling" sound to their voice, do not administer any medications, food, or fluid until you have reported your concerns to the heath care provider. A swallow evaluation may be needed and the route of medication may need to be changed from oral to another route to avoid aspiration.
- If your patient has a nothing by mouth (NPO) order, verify if this includes all medications. This information may be included on the MAR or the orders, and if not, verify this information with the provider. Some medications, such as diabetes medication, may be given with a sip of water in some situations where the patient has NPO status.

- If the route of administration is not accurately listed on the MAR, contact the prescribing provider before administering the medication. For example, a patient may have a PEG tube but the medication is erroneously listed as “PO” on the order.

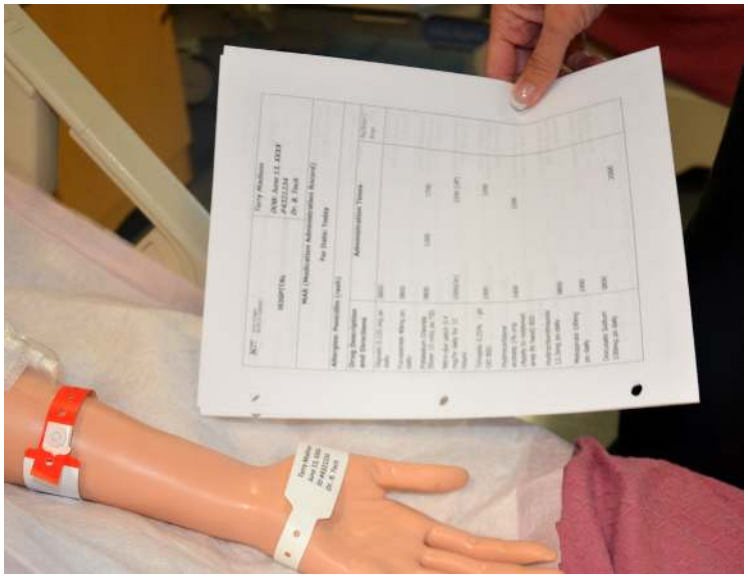


Figure **5.2.9**: Identifying the Patient Prior to Medication Administration

Note

For more information regarding classes of medications, administration considerations, and adverse effects to monitor, visit Open RN *Nursing Pharmacology*.

For information about specific medications, visit *DailyMed*, a current, evidence-based medication reference.

Special Considerations for Administering Controlled Substances

Controlled substances, also called Scheduled Medications, are kept in a locked system and accounted for using a checks and balance system. Removal of a controlled substance from a medication dispensing system must be verified and documented by a second nurse witness. Removal of a controlled substance from a medication cart needs to be documented on an additional controlled substance record with the patient’s name, the actual amount of substance given, the time it was given, associated pre-assessment data, and the name of the nurse administering the controlled substance.

Controlled substances stored in locked areas of medication carts must also be counted at every shift change by two nurses and then compared to the controlled substance administration record. If the count does not match the documentation record, the discrepancy must be reported immediately according to agency policy.

Additionally, if a partial dose of a controlled substance is administered, the remainder of the substance must be discarded in front of another nurse witness to document the event. This process is called “wasting.” Follow agency policy regarding wasting of controlled substances.

These additional safety measures help to prevent drug diversion, the use of a prescription medication for other than its intended purpose.

Note

For more information about scheduled medications, drug diversion, and substance abuse in health care personnel, visit the “Legal/Ethical” chapter in Open RN *Nursing Pharmacology*.

Oral Medication Administration

Most medications are administered orally because it is the most convenient and least invasive route for the patient. Medication given orally has a slower onset, typically about 30-60 minutes. Prior to oral administration of medications, ensure the patient has no contraindications to receiving oral medication, is able to swallow, and is not on gastric suction. If the patient has difficulty swallowing (**dysphagia**), tablets are typically crushed and placed in a substance like applesauce or pudding for easier swallowing (based on the patient's prescribed diet). However, it is important to verify that a tablet may be crushed by consulting a drug reference or a pharmacist. For example, medications such as enteric-coated tablets, capsules, and sustained-release or long-acting drugs should never be crushed because doing so will affect the intended action of the medication. In this event, the provider must be contacted for a change in route. [24]

> **Note**
>
> View the ISMP Do Not Crush List.

Position the patient receiving oral medication in an upright position to decrease the risk of aspiration. Patients should remain in this position for 30 minutes after medication administration, if possible. If a patient is unable to sit, assist them into a side-lying position. See Figure 5.2.10 [25] for an image of a nurse positioning the patient in an upright position prior to medication administration. Offer a glass of water or other oral fluid (that is not contraindicated with the medication) to ease swallowing and improve absorption and dissolution of the medication, taking any fluid restrictions into account. [26]

Remain with the patient until all medication has been swallowed before documenting to verify the medication has been administered. [27]

If any post-assessments are required, follow up in the appropriate time frame. For example, when administering oral pain medication, follow up approximately 30 minutes to an hour after medication is given to ensure effective pain relief.

If medication is given sublingual (under the tongue) or buccal (between the cheek and gum) the mouth should be moist. Offering the patient a drink of water prior to giving the medication can help with absorption. Instruct the patient to allow the medication to completely dissolve, and reinforce the importance of not swallowing or chewing the medication.

Liquid medications are available in multidose vials or single-dose containers. It may be necessary to shake liquid medications if they are suspensions prior to pouring. Make sure the label is clearly written and easy to read. When pouring a liquid medication, it is ideal to place the label in the palm of your hand so if any liquid medication runs down the outside of the bottle it does not blur the writing and make the label unidentifiable. When pouring liquid medication, read the dose at eye level measuring at the meniscus of the poured fluid. Always follow specific agency policy and procedure when administering oral medications.



Figure 5.2.10: Placing the Patient in an Upright Position Prior to Medication Administration

Rectal Medication Administration

Drugs administered rectally have a faster action than the oral route and a higher bioavailability, meaning a higher amount of effective drug in the bloodstream because it has not been influenced by upper gastrointestinal tract digestive processes. Rectal administration also reduces side effects of some drugs, such as gastric irritation, nausea, and vomiting. Rectal medications may also be prescribed for their local effects in the gastrointestinal system (e.g., laxatives) or their systemic effects (e.g., analgesics when oral route is contraindicated). Rectal medications are contraindicated after rectal or bowel surgery, with rectal bleeding or prolapse, and with low platelet counts.[28]

Rectal medications are often formulated as suppositories. Suppositories are small, cone-shaped objects that melt inside the body and release medication. When administering rectal suppositories, the patient should be placed on their left side in the Sims position. See Figure **5.2.11**[29] for an image of patient positioning during rectal medication administration. The suppository and gloved index finger placing the suppository should be lubricated for ease of placement. Suppositories are conical and should be placed into the rectum rounded side first. The suppository should be inserted past the sphincter along the wall of the rectum. After placement, the patient should remain on their side while the medication takes effect. This time period is specific to each medication, but typically is at least 5 minutes. Make sure to avoid placing the suppository into stool. It is also important to monitor for a vasovagal response when placing medications rectally. A vasovagal response can occur when the vagus nerve is stimulated, causing the patient's blood pressure and heart rate to drop, and creating symptoms of dizziness and perspiration. Sometimes the patient can faint or even have a seizure. Patients with a history of cardiac arrhythmias should not be administered rectal suppositories due to the potential for a vasovagal response. Always follow agency policy and procedure when administering rectal medications.[30],[31]

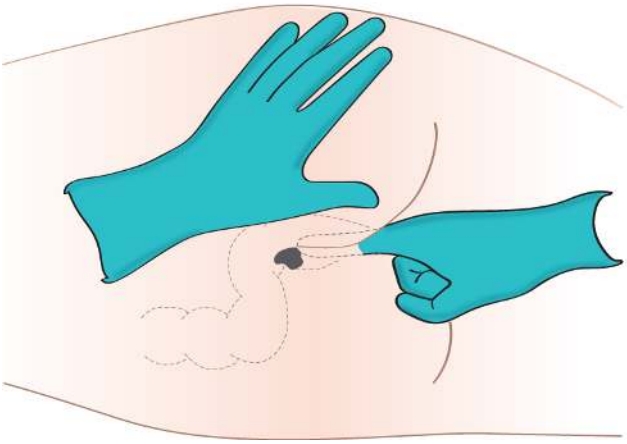


Figure **5.2.11**: Administering a Rectal Suppository

Another type of rectal medication is an enema. An enema is the administration of a substance in liquid form into the rectum. Many enemas are formulated in disposable plastic containers. Warming the solution to body temperature prior to administration may be beneficial because cold solution can cause cramping. It is also helpful to encourage the patient to empty their bladder prior to administration to reduce feelings of discomfort. Place an incontinence pad under the patient and position them on their left side in the Sims position. Lubricate the nozzle of the container and expel air. Insert the lubricated nozzle into the rectum slowly and gently expel the contents into the rectum. Ask the patient to retain the enema based on manufacturer's recommendations.

Enteral Tube Medication Administration

Medication is administered via an enteral tube when the patient is unable to orally swallow medication. Medications given through an enteral feeding tube (nasogastric, nasointestinal, percutaneous endoscopic gastrostomy {PEG}, or jejunostomy {J} tube) should be in liquid form whenever possible to avoid clogging the tube. If a liquid form is not available, medications that are safe to crush should be crushed finely and dissolved in water to keep the tube from becoming clogged. If a medication is not safe to crush, the prescribing provider should be notified and a prescription for alternative medication obtained. Capsules should be opened and emptied into liquid as indicated prior to administration, and liquids should be administered at room temperature. Keep in mind that some capsules are time-released and should not be opened. In this case, contact the provider for a change in order.[32],[33]

As always, follow agency policy for this medication administration procedure. Position the patient to at least 30 degrees and in high Fowler's position when feasible. If gastric suctioning is in place, turn off the suctioning. See Figure **5.2.12**[34] for an image of a nurse positioning the patient prior to administration of medications via a PEG tube. Follow the tube to the point of entry into the patient to ensure you are accessing the correct tube.[35],[36]

Prior to medication administration, verify tube placement. Placement is initially verified immediately after the tube is placed with an X-ray, and the nurse should verify these results. Additionally, bedside placement is verified by the nurse before every medication pass. There are multiple evidence-based methods used to check placement. One method includes aspirating tube contents with a 60-mL syringe and observing the fluid. Fasting gastric secretions appear grassy-green, brown, or clear and colorless, whereas secretions from a tube that has perforated the pleural space typically have a pale yellow serous appearance. A second method used to verify placement is to measure the pH of aspirate from the tube. Fasting gastric pH is usually 5 or less, even in patients receiving gastric acid inhibitors. Fluid aspirated from a tube in the pleural space typically has a pH of 7 or higher.[37],[38] Note that installation of air into the tube while listening over the stomach with a stethoscope is no longer considered a safe method to check tube placement according to evidence-based practices.[39]

After tube placement is checked, a clean 60-mL syringe is used to flush the tube with a minimum of 15 mL of water (5-10 mL for children) before administering the medication. Follow agency policy regarding flushing amount. Liquid medication, or appropriately crushed medication dissolved in water, is administered one medication at a time. Medication should not be mixed because of the risks of physical and chemical incompatibilities, tube obstruction, and altered therapeutic drug responses. Between each medication, the tube is flushed with 15 mL of water, keeping in mind the patient's fluid volume status. After the final medication is administered, the tube is flushed with 15 mL of water. The tube is then clamped, or if the patient is receiving tube feeding, it can be restarted. If the patient is receiving gastric suctioning, it can be restarted 30 minutes after medication administration.[40],[41],[42] See Figure **5.2.13**[43] for an image of a nurse administering medication via an enteral tube.

Special considerations during this procedure include the following:

- If the patient has fluid restrictions, the amount of fluid used to flush the tube between each medication may need to be modified to avoid excess fluid intake.
- If the tube is attached to suctioning, the suctioning should be left off for 20 to 30 minutes after the medication is given to promote absorption of the medication.
- If the patient is receiving tube feedings, review information about the drugs that are being administered. If they cannot be taken with food or need to be taken on an empty stomach, the tube feeding running time will need to be adjusted.
- Be sure to document the amount of water used to flush the tube during the medication pass on the fluid intake record.
- If the patient has a chronic illness or is immunosuppressed, sterile water is suggested for use of mixing and flushing instead of tap water.
- Enteric-coated medications and other medications on the "Do Not Crush List" should not be crushed for this procedure. Instead, the prescribing provider must be notified and an order for a different form of the medication must be obtained.
- If the tube becomes clogged, attempt to flush it with water. If unsuccessful, notify the provider and a pancreatic enzyme solution or kit may be ordered before a new tube is placed.[44]



Figure **5.2.12**: Position Patient at 30 Degrees Prior to Administering Medications via a Tube

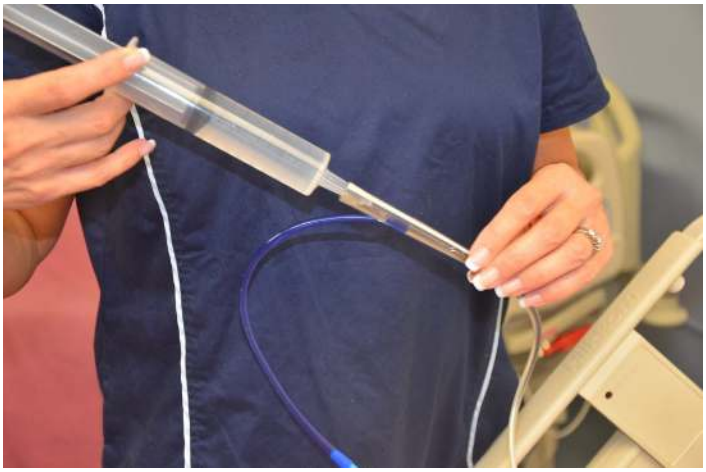


Figure **5.2.13**: Administering Medication via a Gastric Tube

Video Review for Crushing Medications[45]

Preventing Medication Errors

Medication errors can occur at various stages of the medication administration process, beginning with the prescribing provider, to the pharmacist preparing the medication, to the pharmacy technician stocking the medication, to the nurse administering the medication. Medication errors are most common at the ordering or prescribing stage. Typical errors include the prescribing

provider writing the wrong medication, wrong route or dose, or the wrong frequency. These ordering errors account for almost 50% of medication errors. Data shows that nurses and pharmacists identify anywhere from 30% to 70% of medication-ordering errors.[46]

One of the major causes for medication errors is a distraction. Nearly 75% of medication errors have been attributed to this cause.[47] To minimize distractions, hospitals have introduced measures to reduce medication errors. For example, some hospitals set a "no-interruption zone policy" during medication dispensing and preparation and ask health care team members to only disrupt the medication administration process for emergencies. To reduce medication errors, agencies are also adopting many initiatives developed by the World Health Organization (WHO),[48] the Institute for Safe Medication Practices (ISMP), the Institute of Medicine (IOM),[49] and several other organizations. Initiatives include measures such as avoiding error-prone abbreviations, being aware of commonly confused medication names, and instituting additional safeguards for high-alert medications. Student nurses must also be aware of conditions that may contribute to making a medication error during their clinical courses. Read more about initiatives to prevent medication errors in the hyperlinks and videos provided below.

Note

For more information about preventing medication errors as a student nurse, visit IMSP's Error-Prone Conditions that Lead to Student Nurse-Related Errors. When you prepare to administer medications to your patients during clinical, your instructor will ask you questions to ensure safe medication administration.

Watch a video of an instructor asking a student typical medication questions.

Video Review of Administering Medications Without Harm[50]



Reporting Medication Errors

Despite multiple initiatives that have been instituted to prevent medication errors, including properly checking the rights of medication administration, medication errors happen. Examples of common errors include administering the wrong dose or an unsafe dose, giving medication to the wrong patient, administering medication by the wrong route or at the incorrect rate, and giving a drug that is expired. If a medication error occurs, the nurse must follow specific steps of reporting according to agency policy. In the past when medication errors occurred, the individual who caused it was usually blamed for the mishap and disciplinary action resulted. However, this culture of blame has shifted, and many medication errors by well-trained and careful nurses and other health care professions are viewed as potential symptoms of a system-wide problem. This philosophy is referred to as an institution's **safety culture**. Thus, rather than focusing on disciplinary action, agencies are now trying to understand how the system failed causing the error to occur. This approach is designed to introduce safeguards at every level so that a mistake can be caught before the drug is given to the patient, which is often referred to as a "near miss." For an agency to effectively institute a safety culture, all medication errors and near misses must be reported.

When a medication error occurs, the nurse's first response should be to immediately monitor the patient's condition and watch for any side effects from the medication. Secondly, the nurse must notify the nurse manager and prescribing provider of the error. The provider may provide additional orders to counteract the medication's effects or to monitor for potential adverse reactions. In some

situations, family members of the patient who are legal guardians or powers of attorney should also be notified. Lastly, a written report should be submitted documenting the incident, often referred to as an **incident report**. Incident reports are intended to identify if patterns of errors are occurring due to system-wide processes that can be modified to prevent future errors.

> **Note**
>
> For more information about safety culture, visit the following section of the "Legal/Ethical" chapter in Open RN *Nursing Pharmacology*.

Life Span Considerations

Children

It can be difficult to persuade children to take medications. It is often helpful for medications to be prescribed in liquid or chewable form. For example, droppers are used for infants or very young children; the medication should be placed between the gum and cheek to prevent aspiration. Mixing medication with soft foods can also be helpful to encourage the child to swallow medications, but it is best to avoid mixing the medication with a staple food in the child's diet because of potential later refusal of the food associated with medication administration. It can be helpful to offer the child a cool item, such as a popsicle or frozen fruit bar, prior to medication administration to numb the child's tongue and decrease the taste of the medication. Other clinical tips for medication administration include asking the caregiver how the child takes medications at home and mimicking this method or asking the caregiver to administer the medication if the child trusts them more than the nurse. Oral syringes (without needles attached) may be used to administer precise dosages of medication to children. See Figure **5.2.14**[51] of a nurse administering oral medication to a child with an oral syringe. When administering medication with an oral syringe, remember to remove the cap prior to administration because this could be a choking hazard. It is also important to educate the caregiver of the child how to properly administer the medication at the correct dosage at home.



Figure **5.2.14**: Administering Oral Medication Using an Oral Syringe to a Child

Older Adults

Many older adults have a "polypharmacy," meaning many medications to keep track of and multiple times these medications need to be taken per day. Nurses should help patients set up a schedule to remember when to take the medications. Organizing medications in medication boxes by day and time is a very helpful strategy. See Figure **5.2.15**[52] of a medication box. Nurses can suggest to patients to have all medications filled at the same pharmacy to avoid drug-drug interactions that can occur when multiple providers are prescribing medications.

Older adults often have difficulty swallowing, so obtaining a prescription for liquid medication or crushing the medication when applicable and placing it in applesauce or pudding is helpful. Allow extra time when administering medication to an older adult to give them time to ask questions and to swallow multiple pills. Monitor for adverse effects and drug interactions in older adults, who are often taking multiple medications and may have preexisting kidney or liver dysfunction.

Be sure to address the economic needs of an older adult as it relates to their medications. Medications can be expensive and many older adults live on a strict budget. Nurses often advocate for less expensive alternatives for patients, such as using a generic brand

instead of a name brand or a less expensive class of medication. Be aware that an older adult with financial concerns may try to save money by not taking medications as frequently as prescribed. Also, the older adult may “feel good” on their medications and think they don’t need to monitor or take medications because they are “cured.” Reinforce that “feeling good” usually means the medication is working as prescribed and should continue to be taken. Finally, empower patients to take control of managing their health by providing education and ongoing support.



Figure **5.2.15**: Medication Box

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5.3: Assessments Related to Medication Administration

This section will review assessments to be performed prior to, during, and after a medication pass to ensure safe medication administration.

Pre-Administration

In addition to verifying the rights of medication administration three times, the nurse should also perform focused assessments of the patient's current status and anticipate actions of the medications and potential side effects. Here are some examples of pre-assessments before administering medication:

- **Check Vital Signs.** Before administering cardiac medication, the patient's blood pressure and heart rate are typically assessed to ensure they are within range of parameters for administration. For example, a patient is scheduled to receive a blood pressure medication, but their current blood pressure is 90/50, so the medication is withheld based on parameters stated on the MAR to withhold the medication if the systolic blood pressure is less than 100. If parameters are not provided, it is the nurse's responsibility to use clinical judgment and follow up with the prescribing provider with concerns before administering the medication.
- **Perform a Focused Respiratory Assessment.** Before administering inhaled respiratory medications such as albuterol for asthma or chronic pulmonary disease, the O2 saturation, heart rate, respiratory rate, and lungs sounds are typically assessed. The patient's response to the medication is then compared to pre-assessment data to determine effectiveness.
- **Review Lab Results.** Before administering a diuretic such as furosemide, the nurse assesses the patient's potassium level in recent lab work results. If the potassium level is lower than normal range, the nurse withholds the medication and notifies the prescribing provider.
- **Perform a Pain Assessment.** Before administering pain medication, the nurse performs a thorough pain assessment based on the mnemonic PQRSTU. (See more information about the PQRSTU mnemonic in the "Health History" chapter.) The patient's response to the medication after it is received is then compared to pre-assessment data to determine effectiveness.

During Administration

The nurse continues to assess safety during administration of medication, such as sudden changes in condition or difficulty swallowing. For example, if a patient suddenly becomes dizzy, the administration of cardiac medication is postponed until further assessments are performed. If a patient starts to cough, choke, or speak in a gurgly voice during oral or tube administration of medication, the procedure should be stopped and further assessments performed.

Table 5.3.1: Summary of Safe Medication Administration Guidelines

Guidelines	Additional Information
Be cautious and focused when preparing medications.	Avoid distractions. Some agencies have a no-interruption zone (NIZ) where health care providers can prepare medications without interruptions.[1]
Check and verify allergies.	Always ask the patient about their medication allergies, types of reactions, and severity of reactions. Verify the patient's medical record for documented allergies.
Use two patient identifiers and follow agency policy for patient identification.	Use at least two patient identifiers before administration and compare information against the medication administration record (MAR).[2]
Perform appropriate patient assessments before medication administration.	Assess the patient prior to administering medications to ensure the patient is receiving the correct medication, for the correct reason, and at the correct time. For example, a nurse reviews lab values and performs a cardiac assessment prior to administering cardiac medication. See more information regarding specific patient assessments during parenteral medication administration in the "Applying the Nursing Process" section.
Be diligent and perform medication calculations accurately.	Double-check and verify medication calculations. Incorrect calculation of medication dosages causes medication errors that can compromise patient safety.
Use standard procedures and evidence-based references.	Follow a standardized procedure when administering medication for every patient. Look up current medication information in evidence-based sources because information changes frequently.
Communicate with the patient before and after administration.	Provide information to the patient about the medication before administering it. Answer their questions regarding usage, dose, and special considerations. Give the patient an opportunity to ask questions and include family members if appropriate.
Follow agency policies and procedures regarding medication administration.	Avoid work-arounds. A work-around is a process that bypasses a procedure or policy in a system. For example, a nurse may "borrow" medication from one patient's drawer to give to another patient while waiting for an order to be filled by the pharmacy. Although performed with a good intention to prevent delay, these work-arounds fail to follow policies in place that ensure safe medication administration and often result in medication errors.
Ensure medication has not expired.	Check all medications' expiration dates before administering them. Medications can become inactive after their expiration date.
Always clarify an order or procedure that is unclear.	Always verify information whenever you are uncertain or unclear about an order. Consult with the pharmacist, charge nurse, or health care provider, and be sure to resolve all questions before proceeding with medication administration.
Use available technology to administer medications.	Use available technology, such as bar code scanning, when administering medications. Bar code scanning is linked to the patient's eMAR and provides an extra level of patient safety to prevent wrong medications, incorrect doses, or wrong timing of administration. If error messages occur, it is important to follow up appropriately according to agency policy and not override them. Additionally, it is important to remember that this technology

	provides an additional layer of safety and should not be substituted for the checking the five rights of medication administration.
Be a part of the safety culture.	Report all errors, near misses, and adverse reactions according to agency policy. Incident reports improve patient care through quality improvement identification, analysis, and problem solving.
Be alert.	Be alert to error-prone situations and high-alert medications. High-alert medications are those that can cause significant harm. The most common high-alert medications are anticoagulants, opiates, insulins, and sedatives. Read more about high-alert medications in the "Basic Concepts of Administering Medications" section.
Address patient concerns.	If a patient questions or expresses concern regarding a medication, stop the procedure and do not administer it. Explore the patient's concerns, review the provider's order, and, if necessary, notify the provider.

Post-Administration: Right Response

In addition to documenting the medication administration, the nurse evaluates the patient after medications have been administered to monitor the efficacy of the drug. For example, if a patient reported a pain level of "8" before PRN pain medication was administered, the nurse evaluates the patient's pain level after administration to ensure the pain level is decreasing and the pain medication was effective. This evaluation data is documented in the patient's chart.

Additionally, the nurse continually monitors for adverse effects from all of a patient's medications. For example, the first dose of an antibiotic was administered to a patient during a previous shift, but the nurse notices the patient has developed a rash. The nurse notifies the prescribing provider of the change in condition and anticipates new orders or changes in the existing orders.

1. Institute for Safe Medication Practices. (2012, November 29). *Side tracks on the safety express. Interruptions lead to errors and unfinished… Wait, what was I doing?* https://www.ismp.org/resources/side-tracks-safety-express-interruptions-lead-errors-and-unfinished-wait-what-was-i-doing?id=37↵
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5.4: Checklist for Oral Medication Administration

Use the checklist below to review the steps for completion of "Oral Medication Administration."[1]

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

Special Considerations:

- **Plan medication administration to avoid disruption.**
- **Dispense medication in a quiet area.**
- **Avoid conversation with others.**
- **Follow agency's no-interruption zone policy.**
- **Perform hand hygiene prior to medication preparation.**
- **Prepare medications for ONE patient at a time.**

1. Gather supplies: MAR/eMAR.
2. Know the actions, special nursing considerations, safe dose ranges, purpose of administration, and potential adverse effects of the medications to be administered. Consider the appropriateness of the medication for this patient at this time.
3. Read the eMAR/MAR and select the proper medication from the medication supply system or the patient's medication drawer. Perform the first of three checks of the six rights of medication administration plus two (allergies and expiration dates). Perform necessary calculations to verify correct dosage.
    - **The right patient:** Check that you have the correct patient using two patient identifiers (e.g., name and date of birth).
    - **The right medication (drug):** Check that you have the correct medication and that it is appropriate for the patient in the current context.
    - **The right dose:** Check that the dose is safe for the age, size, and condition of the patient. Different dosages may be indicated for different conditions.
    - **The right route:** Check that the route is appropriate for the patient's current condition.
    - **The right time:** Adhere to the prescribed dose and schedule.
    - **The right documentation:** Always verify any unclear or inaccurate documentation prior to administering medications.
4. The medication label must be checked for name, dose, and route, and compared with the MAR at least three different times:
    - When the medication is taken out of the drawer.
    - When the medication is being prepared.
    - At the bedside, prior to medication administration to the patient.
5. Prepare the required medications:
    - **Unit dose packages:** Do not open the wrapper until you are at the patient's bedside. Keep opioids and medications that require special nursing assessments separate from other medication packages.
    - **Multi-dose containers:** When removing tablets or capsules from a multi-dose bottle, pour the necessary number into the bottle cap and then place the tablets or capsules in a medication cup. Cut scored tablets, if necessary, to obtain the proper dosage. If it is necessary to touch the tablets, wear gloves.
    - **Liquid medication in a multi-dose bottle:** When pouring liquid medications out of a multi-dose bottle, hold the bottle so the label is against the palm to avoid dripping on the label. Use an appropriate measuring device when pouring liquids, and read the amount of medication at the bottom of the meniscus at eye level. Wipe the lip of the bottle with a paper towel.
6. Depending on agency policy, the third check of the label may occur at this point. If so, after all medications for one patient have been prepared, recheck the medication labels against the eMAR/MAR before taking the medications to the patient. However, many agencies require the third check to be performed at the bedside after obtaining two patient identifiers and scanning the barcode of the patient.
7. Replace any multi-dose containers in the patient's drawer or medication supply system. Lock the medication supply system before leaving it.
8. Transport the medications to the patient's bedside carefully, and keep the medications in sight at all times.
9. Perform safety steps:

- Perform hand hygiene.
- Check the room for transmission-based precautions.
- Introduce yourself, your role, the purpose of your visit, and an estimate of the time it will take.
- 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.

10. When identifying the patient, compare the information with the eMAR/MAR. The patient should be identified using at least two of the following methods:
    - Check the name on the patient's identification band.
    - Check the identification number on the patient's identification band.
    - Check the birth date on the patient's identification band.
    - Ask the patient to state his or her name and birth date, based on facility policy.
    - If a patient is unable to verbalize their name and date of birth and patient identification bands are not used, use alternative methods of identification such as a second staff member and/or a patient picture in the MAR.
11. Complete all necessary assessments before administering the medications. Check the patient's allergy bracelet or ask the patient about allergies. Explain the purpose and action of each medication to the patient.
12. Based on facility policy, the third check of the medication label typically occurs at this point. If so, recheck the label with the eMAR/MAR before administering the medications to the patient. Scan the patient's bar code on the identification band, if bar scanning is used. If an error occurs during bar code scanning, obtain assistance before administering the medication. Most error messages are intended to warn the nurse of a potential medication error.
13. Assist the patient to an upright (or a side-lying) position if they are unable to be positioned upright:
    - Offer water or other permitted fluids with pills, capsules, tablets, and some liquid medications.
    - Ask if the patient prefers to take the medications by hand or in a cup and if they prefer all medications at once or individually.
14. Remain with the patient until each medication is swallowed. Never leave medication at the patient's bedside.
    - Note: If the patient is confused or has been known to hoard pills, have the patient open their mouth and check under the tongue.
15. Assist the patient to a comfortable position, ask if they have any questions, and thank them for their time.
16. Ensure safety measures when leaving the room:
    - CALL LIGHT: Within reach
    - BED: Low and locked (in lowest position and brakes on)
    - SIDE RAILS: Secured
    - TABLE: Within reach
    - ROOM: Risk-free for falls (scan room and clear any obstacles)
17. Perform hand hygiene.
18. Document medication administration and related assessment findings. Report any concerns according to agency policy.
19. Evaluate the patient's response to the medication within the appropriate time frame. Note: Most sublingual medications act in 15 minutes, and most oral medications act in 30 minutes. If patient presents with any adverse effects:
    - Withhold further doses.
    - Assess vital signs.
    - Notify prescriber.
    - Notify pharmacy.
    - Document as per agency policy.

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5.5: Checklist for Rectal Medication Administration

Use the checklist below to review the steps for completion of “Rectal Medication Administration” using a rectal suppository.[1]

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

Follow Steps 1 through 12 in the “Checklist for Oral Medication Administration.”

1. If possible, have the patient defecate prior to rectal medication administration.
2. Ensure that you have water-soluble lubricant available for medication administration.
3. Explain the procedure to the patient. If a patient prefers to self-administer the suppository/enema, give specific instructions to the patient on correct procedure.
4. Raise the bed to working height:
    - Position the patient on left side with the upper leg flexed over the lower leg toward the waist (Sims position).
    - Provide privacy and drape the patient with only the buttocks and anal area exposed.
    - Place a drape underneath the patient’s buttocks.
5. Apply clean, nonsterile gloves.
6. Assess the patient for diarrhea or active rectal bleeding.
7. Remove the wrapper from the suppository/tip of enema and lubricate the rounded tip of the suppository and index finger of the dominant hand with lubricant. If administering an enema, lubricate the tip of the enema.
8. Separate the buttocks with the nondominant hand and, using the gloved index finger of dominant hand, insert the suppository (rounded tip toward patient) into the rectum toward the umbilicus while having the patient take a deep breath, exhale through the mouth, and relax the anal sphincter. Insert the suppository against the rectal mucosa for optimal absorption, about 3 to 4 inches for an adult and 1 to 2 inches for a child. Do not insert the suppository into feces. If administering an enema, expel the air from the enema and then insert the tip of the enema into the rectum toward the umbilicus while having the patient take a deep breath, exhale through the mouth, and relax the anal sphincter. Roll the plastic bottle from bottom to tip until all solution has entered the rectum and colon. Remove the bottle.
9. Monitor the patient for signs of dizziness. Unintended vagal stimulation may occur, resulting in bradycardia in some patients. Be aware that the rectal route may not be suitable for certain cardiac conditions.
10. When administering a suppository, ask the patient to remain on side for 5 to 10 minutes.
    - When administering an enema, ask the patient to retain the enema until the urge to defecate is strong, usually about 5 to 15 minutes.
11. Discard gloves by turning them inside out before disposing them. Discard used supplies as per agency policy and perform hand hygiene.
12. Assist the patient to a comfortable position, ask if they have any questions, and thank them for their time.
13. Ensure safety measures when leaving the room:
    - CALL LIGHT: Within reach
    - BED: Low and locked (in lowest position and brakes on)
    - SIDE RAILS: Secured
    - TABLE: Within reach
    - ROOM: Risk-free for falls (scan room and clear any obstacles)
14. Perform hand hygiene.
15. Document medication administration and the related assessment findings. Report any unexpected findings according to agency policy.
16. Evaluate the patient’s response to the medication within the appropriate time frame.

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5.6: Checklist for Enteral Tube Medication Administration

Use the checklist below to review the steps for completion of “Enteral Tube Medication Administration.”[1]

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

Follow Steps 1 through 12 in the “Checklist for Oral Medication Administration.”

1. Prepare each medication individually in its own cup. Crush pills, open capsules, and pour liquid medication into a medication cup. Dilute the medication in 5 to 10 mL of water.
2. If administering medication to a patient who is receiving intermittent or continuous tube feeding, stop the feeding based on the following guidelines:
   - 1-2 hours prior to medication administration if medication is incompatible with feeding
   - 1 hour prior to medication administration if placement is to be assessed via the pH method
   - 30 minutes prior to medication administration if the medication should be given on an empty stomach
   - Immediately before medication administration if medication can be given with food
3. If the enteral tube is attached to suction for gastric decompression, disconnect.
4. Perform an abdominal assessment.
5. Elevate the head of the bed at least 30-45 degrees, preferably to high Fowler’s position, to prevent aspiration.
6. Verify tube placement according to agency policy. (For more information on verifying tube placement, review the “Enteral Tube Management” chapter.)
7. Using a 60-mL syringe, flush the tube with at least 15 mL of water to verify patency.
8. Administer diluted medication. When administering multiple medications, each medication should be administered separately to prevent tube clogging. Flush between each medication with 15 mL of room-temperature water (unless contraindicated for the patient). For more information about preventing tube clogging, see the “Enteral Tube Management” chapter.
9. After all medications are administered, flush the tube with at least 15 mL of tepid water. If there is a risk of fluid overload, the amount of fluid used to flush between medications may be modified according to agency policy. However, it is essential to flush the tube when beginning and ending medication administration to prevent tube clogging.
10. If the tube is to be reattached to suction, clamp the enteral tube for 20-30 minutes (or the amount of time specified in the order) to permit medication absorption. If the enteral tube is attached to a continuous tube feeding, the feeding should be resumed when appropriate.
11. Elevate the head of the bed for 60 minutes after medication administration or at all times if continuous feeding is being given.
12. Record the total amount of water used to flush the tube on the client’s intake and output record.
13. Document medication administered on the MAR/eMAR.
14. Assist the patient to a comfortable position, ask if they have any questions, and thank them for their time.
15. Ensure safety measures when leaving the room:
    - CALL LIGHT: Within reach
    - BED: Low and locked (in lowest position and brakes on)
    - SIDE RAILS: Secured
    - TABLE: Within reach
    - ROOM: Risk-free for falls (scan room and clear any obstacles)
16. Perform hand hygiene.
17. Document the medication administration and related assessment findings. Report any concerns according to agency policy.
18. Evaluate the patient’s response to the medication within the appropriate time frame.

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5.7: Supplementary Videos

Video Reviews of Crushing Medications, Pill Splitting, and Administering Rectal Suppositories:

Crushing Medications[1]



Splitting Pill in Half[2]



View Agrace Hospice Care's Giving Meds by Suppository video on YouTube[3]

1. RegisteredNurseRN. (2017, March 22). *Crushing medications for tube feeding and oral administration | How to crush pills for nurses.* [Video]. YouTube. All rights reserved. Video used with permission. https://youtu.be/86RzAgHu75U↵
2. RegisteredNurseRN. (2017, March 18). *How to split in half | Cut a pill in half | Nursing medication administration*. [Video]. YouTube. All rights reserved. Video used with permission. https://youtu.be/uuC4jWcbamE↵
3. Agrace HospiceCare. (2017, August 23). *Giving meds by suppository*. [Video]. YouTube. All rights reserved. https://youtu.be/hLDyZ4QW9Fo↵

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5.8: Learning Activities

Learning Activities

(Answers to “Learning Activities'” can be found in the ‘”Answer Key'” at the end of the book. Answers to interactive activity elements will be provided within the element as immediate feedback.)

1. A physician has ordered nafcillin 750 mg IM q 6 h. On hand is a 2 gram vial that states: “Add 6.8 mL of sterile water to provide a total solution of 8 mL.” **How many milliliters should the nurse draw up to give the patient the ordered dose?**

2. What are the steps the nurse should follow if the medication is given to the wrong patient?

Check your knowledge using this flashcard activity:

Use this drag and drop activity to check your knowledge about different types of medication orders.

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5.9: XV Glossary

Around the Clock (ATC) order: An order that reflects that medication should be administered at regular time intervals, such as every six hours, to maintain consistent levels of the drug in the patient's bloodstream

Dysphagia: Difficulty swallowing.

eMAR: Electronic medication administration record contained in a patient's electronic chart.

Enteral medications: Medications that are administered directly into the gastrointestinal tract orally, rectally, or through a tube such as a nasogastric (NG) tube, nasointestinal (NI) tube, or percutaneous endoscopic gastrostomy (PEG) tube.

Incident report: A report submitted per agency policy used to document the events surrounding a medication error.

MAR: Medication administration record contained in a patient's chart.

One-time order: A prescription for a medication to be administered only once. An example of a one-time order is a prescription for an IV dose of antibiotics to be administered immediately prior to surgery.

Prescriptions: Orders, interventions, remedies, or treatments ordered or directed by an authorized primary health care provider.

PRN (as needed) order: A prescription for medication to be administered when it is requested by, or as needed by, the patient. PRN orders are usually administered based on patient symptoms such as pain medications. An example of a PRN order is a prescription for pain medication, such as "Acetaminophen 500 mg PO every 4-6 hours as needed for pain."

Routine order: A written prescription that is followed until another order cancels it. An example of a routine order is a prescription for daily medication such as "Lisinopril 10 mg PO daily."

Safety culture: A culture established in health care agencies to empower staff to speak up about risks to patients and to report errors and near misses, all of which drive improvement in patient care and reduce the incident of patient harm.

Standing order: Standing orders are standard prescriptions for nurses to implement for patients in clearly defined circumstances without the need to notify a provider. They may also be referred to as an "order set" or a "protocol." An example of a standing order/protocol is a standard prescription for all patients coming into an urgent care reporting chest pain to immediately receive four chewable aspirin, the placement of an IV, and an electrocardiogram (ECG).

STAT order: A one-time prescription that is administered without delay. An example of a STAT order is the prescription for a dose of Benadryl to be administered to a patient having an allergic reaction.

Titration order: An order in which the medication dose is either progressively increased or decreased by the nurse in response to the patient's status.

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CHAPTER OVERVIEW

6: Administration of Medications Via Other Routes

6.1: Administration of Medications Via Other Routes Introduction

6.2: Basic Concepts

6.3: Checklist for Transdermal, Eye, Ear, Inhalation, and Vaginal Routes Medication Administration

6.4: Learning Activities

6.5: XVI Glossary

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6.1: Administration of Medications Via Other Routes Introduction

Learning Objectives

- Safely administer medications and irrigations for the eye, ear, inhalation, and vaginal routes
- Select the appropriate equipment
- Calculate correct amount to administer
- Select appropriate site
- Modify the procedure to reflect variations across the life span
- Document actions and observations
- Recognize and report significant deviations from norms

This chapter will review specific information related to administering medications via the topical, transdermal, eye, ear, inhalation, and vaginal routes. Read additional information about administering medications in the "Administration of Enteral Medications" and "Administration of Parenteral Medications" chapters.

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6.2: Basic Concepts

Topical and Transdermal Medications

Topical medications are medications that are administered via the skin or mucous membranes for direct local action, as well as for systemic effects. An **innunction** is a medication that is massaged or rubbed into the skin and includes topical creams such as nystatin antifungal cream. The **transdermal route** of medication administration includes patches or disks applied to the skin that deliver medication over an extended period of time. Common types of transdermal medications are analgesics (such as fentanyl), cardiac medications (such as nitroglycerin), hormones (such as estrogen), and nicotine patches (for smoking cessation). See Figure **6.2.1**[1] for an image of typical packaging of a topical patch. Medications delivered transdermally provide a consistent level of the drug in the bloodstream for distribution. The transdermal route is also helpful for patients who are nauseated or having difficulty swallowing.

Heat may be applied with the administration of some inunctions. Heat causes vasodilation that enhances blood flow and improves absorption of some medication. However, heat should never be applied over patches, such as the fentanyl or nitroglycerin patches, because it increases the release of the drug and can cause overdose and death. Be sure to reference manufacturer recommendations regarding the application of heat.[2]



Figure **6.2.1**: Topical Patch

When applying transdermal patches, the nurse should always wear gloves and check the rights of medication administration as is done with other types of medication. Before applying a new patch, the old patch should be removed, the skin around the old patch should be assessed, and the site for the patch cleansed and dried thoroughly. The skin around the patch should be monitored for any irritation or reaction to the medication or patch adhesive. Patches should not be applied to broken or irritated skin.

When applying a new patch, the nurse should remove the clear plastic backing and take care to not touch the medication surface of the patch while placing it on the patient's skin. Patches should be placed on an appropriate skin area per manufacturer guidelines, such as the upper arms or on the chest. The patch should be pressed firmly to the skin for ten seconds to ensure adhesion to the skin. For documentation purposes, the nurse should initial, date, and time a piece of tape that is applied close to the patch. The patch should not be written on directly because this may puncture the patch and cause it to become ineffective. Based on the onset of the medication, the patient should be evaluated to ensure they are responding appropriately to the therapeutic effects of the medication and not experiencing any adverse effects.

Patch placement should be routinely assessed for dislodgement per agency policy. For example, for some opioid patches like fentanyl, the nurse is required to assess and document that the patch is present during every shift. The nurse should also be aware that patches with aluminum backing can cause issues with defibrillation and MRI scans, so this type of patch should be removed prior to either of these actions.

To remove a patch, the nurse should wear gloves and remove the patch carefully so as not to tear the skin. The patch should be disposed of in the proper waste receptacle per agency policy. For example, some agencies have specific receptacles for

nitroglycerin patches. Additionally, agencies have specific policies for disposal of fentanyl patches to prevent drug diversion of used patches. Patch removal should be documented in the patient's record.

Eye Instillations and Irrigations

Eye Drops

Eye drops are administered for a local effect on the eye. Examples of eye drop medications include antibiotic drops for conjunctivitis, glaucoma medication to reduce intraocular pressure, and saline drops to relieve dry eyes. The amount of drops to administer per eye is indicated on the provider order. When instilling eye drops, the nurse should perform hand hygiene, apply gloves, and check the same rights of medication administration as done with other types of medication. Prior to administration of eye medication, the patient's eyes should be assessed for new or unusual redness or drainage. If discharge is present, the eyelids should be cleansed with gauze saturated with warm water or normal saline to remove any dirt or debris that could be carried into the eye during instillation. When cleaning the eyelids, the nurse should clean from the inner canthus toward the outer canthus so as not to introduce debris or dirt into the lacrimal ducts that could cause an infection. A new gauze pad is used for each stroke. The nurse should remove gloves after cleansing, perform hand hygiene, and apply new gloves prior to medication administration.

When administering the drops, the patient should be instructed to tilt their head backwards or be positioned in a supine position with their head on a pillow looking up. When the cap of the medication is removed, it should be placed on a clean surface with care taken to keep the inside of the cap sterile and to not contaminate the dropper tip. The patient should look up and away while the nurse gently uses pressure to pull the lower lid down and expose the lower conjunctival sac. By holding the dropper close to the sac without touching it, the nurse should squeeze the bottle and allow the drop to fall into the sac, taking care to not touch the dropper to the eye. After the eye drop has been instilled, the patient should close their eye. The nurse should apply gentle pressure to the inner canthus, when appropriate, to prevent the medication from entering the lacrimal duct and causing a possible systemic reaction to the medication. This procedure should be repeated in the other eye as ordered. The patient should be instructed to not to rub their eye(s). During the procedure, the nurse evaluates the patient's tolerance of the medication and the procedure and documents it. See Figure **6.2.2**[3] for an image of a nurse administering eye drops.



Figure **6.2.2**: Administering Eye Drops

Video Review of Administering Eye Drops[4]



Eye Ointment

Administering eye ointment follows the same procedure as administering eye drops, except that instead of drops, ½ inch of ointment is placed in the lower conjunctival sac. When applying the ointment, the nurse should start at the inner canthus and move outward. After application, the patient should be instructed to close their eyelid and move the eye to spread the ointment so it is absorbed. They should be advised they may experience blurry vision for a few minutes until the medication is absorbed.

Eye Irrigations

Eye irrigations are used to flush foreign bodies from the eye, such as debris or chemicals, using large amounts of saline. The amount of solution and length of time used to irrigate the eye depends on the contaminant. Follow agency policy when performing eye irrigation. For example, some emergency eye flush stations provide a 15-minute flush to the eye. Care should be taken to not contaminate the other eye while removing the debris unless it is necessary to flush both eyes.

Ear Instillations and Irrigations

Medications and fluids may be instilled into the ear for local effect, including antibiotics, analgesics, wax softeners, and irrigation fluid to remove foreign objects or wax buildup. Medications and fluids are instilled into the outer ear canal, with the tympanic membrane forming a thin barrier to the middle and inner ear. However, if the tympanic membrane is ruptured, instillation of ear drops is generally contraindicated unless a sterile, no-touch technique is used. However, if a patient has a surgical opening in the tympanic membrane (i.e., tympanostomy tubes have been placed), ear drops may be prescribed but caution must be taken not to introduce debris into the middle or inner air.

Ear Drops

When administering ear drops, the nurse should carefully follow the dosage and amount of drops per ear according to the provider order. The nurse should perform hand hygiene, apply gloves, and check the same rights of medication administration as is completed with other types of medication. The external ear should be cleaned of debris prior to drops being instilled. The patient should be positioned so the affected ear is tilted in the uppermost position. If the patient is lying in bed, position the patient so they are lying with the unaffected ear against the pillow and the affected ear upward. When removing the cap of the medication, caution should be used to not touch the dropper or the inside of the cap to avoid contamination. The pinna of the ear should be grasped and pulled backwards and upwards for an adult. For children, the pinna should be pulled straight back, and for infants, it should be pulled down and back. This movement straightens the auditory canal and prepares it for instillation. The nurse should squeeze the bottle so that the drops of medication fall onto the side of the auditory canal and not directly onto the tympanic membrane. The medication should run towards the tympanic membrane after it is instilled. The tragus can be massaged to help move the medication into place. The patient should remain in this lying position for five minutes. After five minutes, this procedure can be repeated on the other ear, if ordered. Evaluation of the patient should be performed post administration to assess if the patient tolerated the procedure and if anticipated therapeutic effects occurred. When instilling medication or fluids into the ear, monitor for side effects such as dizziness or nausea. See Figure **6.2.3**[5] for an image of a nurse administering ear drops.



Figure 6.2.3: Administering Ear Drops

Ear Irrigations

Ear irrigations are typically performed to remove wax buildup or foreign bodies from the external ear canal. Normal saline at room temperature is typically used, although a mixture of saline and hydrogen peroxide can also be used. A 60-cc needleless syringe is typically used to irrigate the ear, or a spray bottle with a soft angio catheter can also be used. Ask the patient to hold an emesis basin under the ear to catch the expelled irrigant. During and after the irrigation, the patient should be evaluated for side effects such as dizziness, nausea or pain.

Nasal Instillation

Medications administered via the nasal passage are typically used to treat allergies, sinus infections, and nasal congestion. Nasal spray or drops should be administered via the nasal passage using a clean technique. The nurse should perform hand hygiene, apply gloves, and perform the same rights of medication administration as is completed with other types of medications. The patient should be given tissues and asked to blow their nose. Position the patient with their head tilted backwards while sitting or lying supine looking upwards. The nurse should insert the tip of the spray bottle or the nasal dropper into one nare while occluding the other nare and then activate the spray as the patient inhales. The bottle should remain compressed as it is removed from the nose to prevent contamination. The patient should be instructed to hold their breath for a few seconds and then breathe through their mouth. Repeat this procedure in the other nare if ordered. Wipe the outside of the bottle with clean tissue before storing it, and advise the patient to avoid blowing their nose for 5-10 minutes after nasal instillation. Note any unexpected situations such as nosebleeds or increased congestion.[6]

Vaginal Instillations

Vaginal instillations are typically used to administer hormone therapy and antifungal treatment. Vaginal applications can be supplied in foams, suppositories that melt with body heat, creams, and tablets. The patient should be asked to void prior to placement. The nurse should perform hand hygiene, apply gloves, perform the same rights of medication administration as is completed with other types of medications, and provide privacy. Position the patient on their back with knees flexed. Perineal care should be performed by the nurse prior to administration of the medication. After perineal care, remove gloves, perform hand hygiene, and apply new gloves. Fill a vaginal applicator with cream or foam or open the suppository to be placed. Lubricate the applicator or your gloved finger with water-based lubricant. With the nondominant hand, spread the labia and place the applicator into the full length of the vagina, push the plunger, and then remove the applicator. If a suppository is being placed, insert the rounded end of the suppository with your index finger, placing it along the posterior wall of the vagina. Ask the patient to remain in the supine position for 5-10 minutes for optimal absorption. If possible, administer the medication at bedtime so the patient can remain in the supine position for an extended period of time to enhance absorption. Assess the patient for any unexpected situations, such as the suppository coming out. See Figure 6.2.4[7] for an illustration of vaginal administration of cream medication.

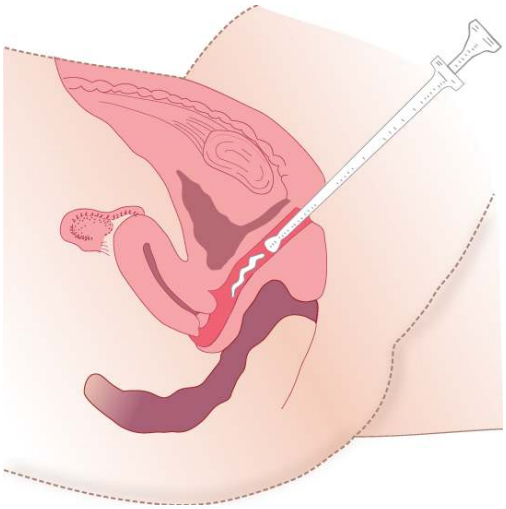


Figure **6.2.4**: Administering Vaginal Medication

Inhaled Medications

The lungs have a large surface area with an increased amount of blood flow, so medications are easily absorbed. Medications inhaled from the mouth into the lungs can be administered using a **Metered Dose Inhaler** (MDI), a **Dry Powder Inhaler** (DPI), or a **small-volume nebulizer**. A metered dose inhaler (MDI) provides a mist of medication that is inhaled through the mouth into the lungs. See Figure **6.2.5**[8] for an image of an albuterol MDI. However, during inhalation from an MDI, small medication particles can get trapped on the tongue or aerosolize into the air and not make it into the lungs, so a spacer is optimally used for full absorption of medication.



Figure **6.2.5**: Albuterol Metered Dose Inhaler (MDI)

A DPI is medication provided in a powder form that is inhaled from the mouth into the lungs using a quick breath to activate the medication and move it into the lungs from the inhaler. An example of Advair Diskus DPI is illustrated in Figure **6.2.6**.[9]

Hand-held, small-volume nebulizers provide a fine mist using oxygen or compressed air to transport the liquid medication from the nebulizer cup into the mouth and into the lungs as the patient breathes normally. See Figure **6.2.7**[10] for an image of medication packaged for use with nebulizers.[11]



Figure **6.2.6**: Advair Dry Powder Inhaler (DPI)



Figure **6.2.7**: Medication for Nebulizer Inhalation

Before administering an inhaler, the nurse should perform hand hygiene and check medication rights as with all medication. If the patient is self-administering the medication, advise them to wash their hands. The patient's respiratory system should be assessed and documented before and after the administration of inhaled medications, including assessment of respiratory rate, pulse oximetry, heart rate, and lung sounds.

When administering an MDI, the nurse should shake the inhaler and add a spacer onto the mouthpiece. The use of spacers with MDIs is considered best practice because they help ensure the medication is inhaled rather than inadvertently placed in the mouth. They also reduce waste by ensuring the patient receives the full amount of medication. The patient should be instructed to exhale while placing the spacer's mouthpiece into their mouth. The inhaler is depressed to move the aerosolized medication into the spacer, and the patient should breathe in normally through the spacer to receive the medication. If a spacer is not available, the patient should exhale and hold the inhaler mouthpiece about 1 to 2 inches away from their mouth to help ensure the medication is inhaled via the larynx and not sprayed onto the posterior pharynx. As the inhaler is depressed, the patient should inhale the medication deeply through their mouth and into their lungs. The patient should be advised to hold their breath for 5 to 10 seconds after inhaling the medication and then exhale through pursed lips. The patient should wait for 1 to 5 minutes between each puff of medication. When administering inhaled corticosteroids via MDI, the patient should rinse their mouth with water afterwards to prevent fungal infection.

When using a DPI, the nurse should load the medication into the devices as required and then activate the inhaler per the manufacturer's guidelines. The patient should be instructed to exhale and then place their lips around the mouthpiece and inhale strongly and deeply. After they have inhaled, they should hold their breath for 10 seconds or as long as comfortable and then exhale through pursed lips. The patient should wait 1 to 5 minutes between puffs of medication. If the DPI contains a corticosteroid medication, the patient should gargle and rinse with tap water to decrease the risk of developing a fungal infection.[12]

When using a small-volume nebulizer, the nurse pours the liquid medication into the medication cup of the nebulizer. When possible, the patient should be sitting or positioned in high Fowler's position to enhance deep breaths and absorption of medication. The bottom end of the tubing is attached to the oxygen flowmeter, and the flow rate should be set between 6-10 L/minute, based on the manufacturer's recommendations. The top end of the tubing is connected to either a nebulizer mask or mouthpiece. The patient should be instructed to inhale slowly through the device into their mouth and hold each breath for a slight pause before exhaling. Remain with the patient during the nebulizer treatment, which usually takes about 15 minutes. After treatment, the patient should be encouraged to cough and perform oral care. The patient's respiratory system should be reevaluated after the administration of inhaled medications to document therapeutic effects, as well as to monitor for adverse effects.[13]

Inhalers should be cleaned after use per the manufacturer's directions. Most MDI and DPI inhalers track how much medication is left in the canister. Patients should be advised to obtain refills of these medications before the inhaler runs out of doses.

Video Review of Administering Inhaled Medication with a Spacer[14]



1. "DSC_17661.jpg" by British Columbia Institute of Technology is licensed under CC BY 4.0. Access for free at https://opentextbc.ca/clinicalskills/chapter/administering-topical-medication/. ↵
2. Institute for Safe Medication Practices. (2015). Transdermal patches and heat sources. *NurseAdviseERR, 13*(4). https://www.ismp.org/sites/default/files/attachments/2018-04/NurseAdviseERR201504.pdf↵
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4. RegisteredNurseRN. (2017, March 24). *Eye drop administration nursing | Instill eye drops punctal occlusion for glaucoma*. [Video.] YouTube. All rights reserved. Video used with permission. https://youtu.be/TLhnsABDtco↵
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7. "Administering-med-vaginally-appliator.png" by British Columbia Institute of Technology is licensed under CC BY 4.0. Access for free at https://opentextbc.ca/clinicalskills/chapter/6-4-rectal-and-vaginal-medications /. ↵

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10. "Ipratropium_Bromide_(1).JPG" by Intropin is licensed under CC BY-SA 3.0↵
11. Ari, A. & Restrepo, R. D. (2012). Aerosol delivery device selection for spontaneously breathing patients: 2012. *Respiratory Care*, *57*(4), 613-626. http://rc.rcjournal.com/content/respcare/57/4/613.full.pdf↵
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13. Gregory, K. L., Wilken, L., & Hart, M. K. (2017). *Pulmonary disease aerosol delivery devices: A guide for physicians, nurses, pharmacists, and other health care professionals* (3rd ed.). American Association for Respiratory Care. https://www.aarc.org/wp-content/uploads/2018/03/aersol-guides-for-hcp.pdf↵
14. ARISE. (2016). *Inhaler with spacer MVI_7500-ARISE.mp4*. [Video]. Licensed under CC BY 3.0↵

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6.3: Checklist for Transdermal, Eye, Ear, Inhalation, and Vaginal Routes Medication Administration

Use the checklist below to review the steps for completion of "Transdermal, Eye, Ear, Inhalation, and Vaginal Routes for Medication Administration."

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

Follow Steps 1 through 12 in 15.4 "Checklist for Oral Medication Administration."

1. A. Transdermal Patch:
    - Perform hand hygiene and apply clean gloves
    - Remove the old patch (if present).
    - Clean the skin with mild soap and water. Dry the area completely.
    - Assess the skin for any breaks or rashes. Do not use these areas.
    - Apply a new patch wearing gloves. Rotate application site based on manufacturer recommendations. Be careful not to touch the medication surface.
    - Press firmly to the patient's skin for about ten seconds.
    - Date, time, and initial a piece of tape and place this next to the patch.
    - Perform hand hygiene.

    B. Eye Drops:
    - Perform hand hygiene.
    - Clean the eyes from the inner canthus to the outer canthus using water or normal saline.
    - Tilt the patient's head back or have them lying supine with their head on a pillow.
    - Remove the cap and keep inside sterile. Do not touch the dropper.
    - Pull the lower conjunctival sac open.
    - Squeeze the ordered drops into the conjunctival sac.
    - Apply gentle pressure over the inner canthus.
    - Repeat in the other eye if ordered.
    - Perform hand hygiene.

    C. Ear Drops:
    - Perform hand hygiene.
    - Clean the external ear of debris.
    - Tilt the patient's head so the affected ear is uppermost.
    - Remove the cap and keep inside sterile. Do not touch the dropper.
    - Straighten the auditory canal properly for the age of the patient:
        - Adult: Pinna pulled up and back
        - Child: Pinna pulled straight back
        - Infant and child under three: Pinna pulled back and down
    - Squeeze the bottle and allow drop(s) to fall on the side of the auditory canal.
    - Release the pinna and massage the tragus to help with movement of the drop into the canal.
    - Keep the patient in a lying position with the affected ear up for 5 minutes.
    - Repeat in the other ear if ordered.
    - Perform hand hygiene.

    D. Nose Spray:
    - Perform hand hygiene.
    - Have the patient blow their nose.
    - Have the patient tilt their head back.

- Instruct the patient to inhale with administration if necessary.
- Close the opposite nare.
- Place a bottle or dropper in the affected nare.
- Squeeze the bottle or dropper and have the patient inhale.
- Keep the bottle or dropper compressed and remove from the nare.
- Instruct the patient to hold their breath for a few seconds and then breath out through the mouth.
- Repeat in other nare if ordered.
- Clean tip of bottle with tissue or cloth.
- Perform hand hygiene.

E. Vaginal Cream or Suppository:

- Have the patient void prior to medication administration.
- Position the patient on their back with their knees flexed.
- Perform perineal care. Dispose gloves and perform hand hygiene.
- Put on new gloves.
- Fill the vaginal applicator with the correct dose and lubricate the applicator, OR open the suppository and lubricate dominant index finger and suppository.
- With the nondominant hand spread the labia.
- Insert the applicator completely OR insert the suppository along the posterior vaginal wall.
- Instruct the patient to remain in supine position for 5-10 minutes.
- Perform hand hygiene.

F. Metered-Dose Inhaler (MDI):

- Perform hand hygiene.
- Shake the inhaler.
- IF SPACER IS USED: Attach the inhaler opposite to the mouthpiece.
- Have the patient place the mouthpiece of the spacer into their mouth and grasp with teeth and seal lips around the mouthpiece.
- Push down on inhaler to release medication.
- Instruct the patient to inhale slowly and deeply through the mouthpiece of the spacer.
- IF NO SPACER USED: Patient should exhale out breath and hold the inhaler one to two inches from their mouth and inhale slowly and deeply as they push down on the inhaler to release the medication. The patient will then hold their breath for 5 to 10 seconds and release their breath through pursed lips. This can be repeated for a second puff after 1-5 minutes.
- Instruct the patient to rinse mouth after finishing with the inhaler.

G. Dry Powder Inhaler (DPI):

- Perform hand hygiene.
- Remove the mouthpiece cover and load the medication if necessary.
- Activate the inhaler per manufacturer directions.
- Have the patient exhale out slowly and completely.
- Instruct the patient to place the mouthpiece of the inhaler in their mouth and inhale deeply and forcefully for at least 2-3 seconds.
- Remind the patient to hold their breath for 10 seconds and then breath out through pursed lips.
- Instruct the patient rinse mouth after finishing with the inhaler.

2. Assist the patient to a comfortable position, ask if they have any questions, and thank them for their time.
3. Ensure safety measures when leaving the room:
    - CALL LIGHT: Within reach
    - BED: Low and locked (in lowest position and brakes on)
    - SIDE RAILS: Secured
    - TABLE: Within reach
    - ROOM: Risk-free for falls (scan room and clear any obstacles)

4. Perform hand hygiene.
5. Document medication administration and related assessment findings. Report any concerns according to agency policy.

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6.4: Learning Activities

Learning Activities

(Answers to “Learning Activities” can be found in the “Answer Key” at the end of the book. Answers to interactive activity elements will be provided within the elements as immediate feedback.)

1. You are caring for an elderly patient who is complaining of pain, severe nausea, and who has difficulty swallowing. **In addition to intravenous medication administration, what route of medication delivery might be beneficial for this patient? Please provide rationale for your selection.**

2. Which of the following transdermal medication administration actions are correct? (Select all that apply).

a. The nurse may apply heat to all medication patches to help aid absorption of the medication.
b. When placing a patch, the nurse should press the patch firmly to the skin to ensure adequate adherence.
c. Gloves are required for patch application and removal.
d. Transdermal patches may be placed directly into the trash.
e. Date and location of patch application should be promptly documented in the medication administration record (MAR).

Check your knowledge with this flashcard learning activity:

Check your knowledge with these quiz questions:

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6.5: XVI Glossary

Dry Powder Inhaler (DPI): An inhaler with medication provided in a powder form that is inhaled from the mouth into the lungs using a quick breath to activate the medication and move it into the lungs. An example of a DPI is tiotropium (Spiriva).

Innunction: A medication that is massaged or rubbed into the skin.

Metered Dose Inhaler (MDI): An inhaler that provides a mist of medication that is inhaled through the mouth into the lungs. An example of an MDI is albuterol. Optimal administration is achieved with a spacer attached to the inhaler.

Small-volume nebulizers: Devices that provide a fine mist using oxygen or compressed air to transport the medication from a nebulizer cup into the mouth and into the lungs as the patient breathes normally through a mask or pipe device.

Topical medications: Medications administered via the skin or mucous membranes for direct local action, as well as for systemic effects.

Transdermal route: Patches or disks applied to the skin that deliver medication over an extended period of time.

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CHAPTER OVERVIEW

7: Enteral Tube Management

7.1: Enteral Tube Management Introduction
7.2: Basic Concepts of Enteral Tubes
7.3: Assessments Related to Enteral Tubes
7.4: Sample Documentation
7.5: Checklist for NG Tube Enteral Feeding By Gravity with Irrigation
7.6: Checklist for NG Suction
7.7: Learning Activities
7.8: XVII Glossary

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7.1: Enteral Tube Management Introduction

Learning Objectives

- Administer enteral nutrition
- Perform irrigation and suctioning of enteral tubes
- Select appropriate equipment
- Explain the procedure to the patient
- Assess tube placement
- Implement measures to prevent displacement of tube
- Modify procedures to reflect variations across the life span
- Document actions and observations
- Recognize and report significant deviations from norms

Enteral tubes are tubes placed in the gastrointestinal tract. Enteral tubes are used as an alternate route for feeding and medication administration, as well as for stomach decompression. **Stomach decompression** is a medical term that refers to removing stomach contents by using suctioning. Stomach decompression is commonly used after surgery or trauma to reduce pressure from fluids and gas that cause pain, nausea, vomiting, and potential aspiration of stomach contents into the lungs.

The nurse's responsibilities when caring for a patient with an enteral tube include the following:

- assessing tube placement and patency
- assessing and cleansing the insertion site
- administering tube feeding
- administering medication
- irrigating/flushing the tube
- suctioning the tube
- monitoring for complications

Administering enteral medication is discussed in "Administration of Enteral Medications." The remaining responsibilities related to maintaining enteral tubes will be discussed in this chapter.

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7.2: Basic Concepts of Enteral Tubes

Gastrointestinal Function

It is important to understand the anatomy and functioning of the gastrointestinal system before administering feedings or medications through an enteral tube. See Figure **7.2.1**[1] for an illustration of the anatomy of the gastrointestinal system.

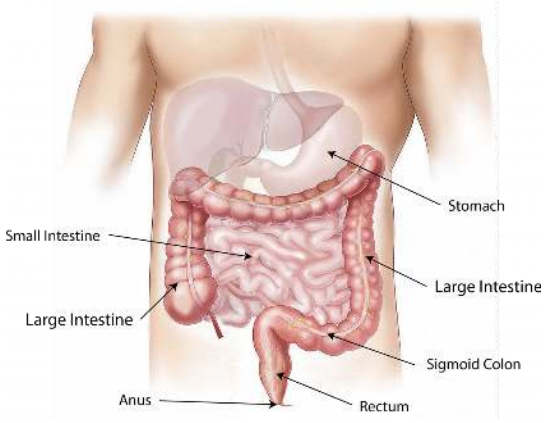


Figure **7.2.1**: Anatomy of the Gastrointestinal System

Note

For more information about the digestive function of the gastrointestinal system, visit the "Gastrointestinal System" chapter in *Open RN Nursing Pharmacology*.

Enteral Nutrition

Enteral nutrition is indicated for patients who need nutritional supplementation and have a functioning gastrointestinal tract, but cannot swallow food safely. Feedings can be administered via enteral tubes placed into the stomach or into the small intestine (usually the jejunum). For example, enteral feeding is commonly used for patients with the following conditions:

- Impaired swallowing (such as from a stroke or Parkinson's disease)
- Decreased level of consciousness
- Respiratory distress requiring mechanical ventilation
- Oropharyngeal or esophageal obstruction (such as in head or neck cancer)
- Hypercatabolic states (such as in severe burns)[2]

For short-term feeding, NG tubes are used. If the duration of feeding is longer than four weeks or if access through the nose is contraindicated, a surgery is performed to place the tube directly through the gastrointestinal wall (for example, PEG or PEJ tubes).

Patients who are not candidates for enteral nutrition are prescribed parenteral nutrition. Parenteral nutrition is a concentrated intravenous solution containing glucose, amino acids, minerals, electrolytes, and vitamins. A lipid solution is typically administered as a separate infusion. This combination of solutions is called total parenteral nutrition because it supplies complete nutritional support. Parenteral nutrition is administered via a large central intravenous line, typically the subclavian or internal jugular vein, because it is irritating to the blood vessels.

Types of Enteral Tubes

There are several different types of enteral tubes based on their location in the gastrointestinal system, as well as their function. Three commonly used enteral tubes are the nasogastric tube, the percutaneous endoscopic gastrostomy (PEG) tube, and the percutaneous endoscopic jejunostomy (PEJ) tube. See Figure **7.2.2**[3] for an illustration of common enteral tubes. NG tubes are typically used for a short period of time (less than four weeks), whereas PEG and PEJ tubes are inserted for long-term enteral nutrition. Some institutions also place nasoduodenal (ND) tubes to provide long-term enteral nutrition.[4]

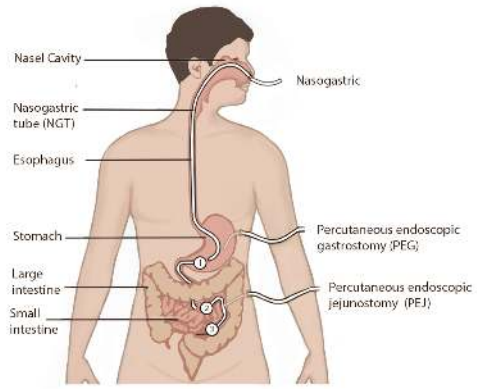


Figure **7.2.2**: Types and Placement of Enteral Tubes

A nasogastric (NG) tube is a single- or double-lumen tube that is inserted into the nasopharynx 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 on 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. See Figure **7.2.3**[5] for an image of a small bore feeding tube.

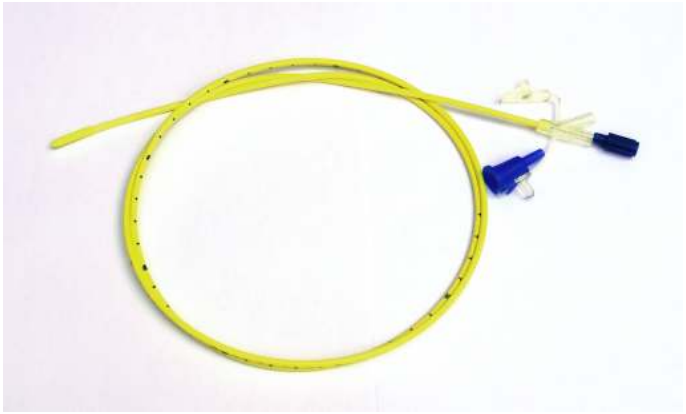


Figure **7.2.3**: Small Bore NG Tube

An example of a large bore nasogastric tube is the Salem Sump. Large bore nasogastric tubes, such as the Salem Sump, are used for gastric decompression. The Salem Sump has a double lumen that includes a venting system. One lumen is used to empty the stomach, and the other lumen is used to provide a continuous flow of air. The continuous flow of air reduces negative pressure and prevents gastric mucosa from being drawn into the catheter, which causes mucosal damage. This terminal end also has an anti-reflux valve to prevent gastric secretions from traveling through the wrong lumen. See Figure **7.2.4**[6] for an example of a double-lumen enteral tube.

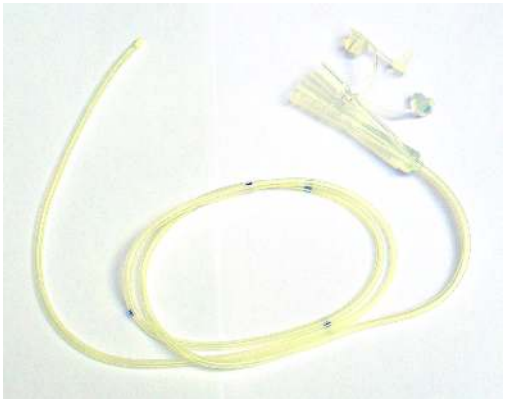


Figure **7.2.4**: Double-Lumen Enteral Tube

Other types of tubes are placed through the patient's abdominal wall and are used for long-term enteral feeding. A percutaneous endoscopic gastrostomy (PEG) tube is placed via an endoscopic procedure into the stomach. Alternatively, a percutaneous endoscopic jejunostomy (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. See Figure **7.2.5**[7] for an image of a PEG tube insertion kit and the appearance of an enteral tube as it exits from a patient's abdomen.

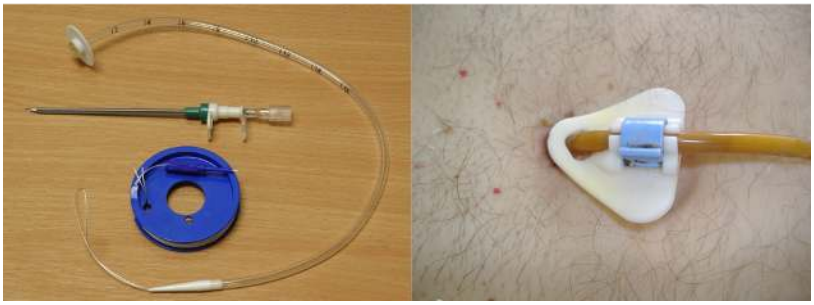


Figure **7.2.5**: PEG Tube

Assessing Tube Placement

Feedings or medications administered into an incorrectly placed enteral tube result in life-threatening aspiration pneumonia. The placement of an enteral tube is immediately verified after insertion by an X-ray to ensure it has not been inadvertently placed into the trachea and down into the bronchi. See Figure **7.2.6**[8] for an image of an X-ray demonstrating correct placement of an enteral tube in the stomach as indicated by the lower red arrow. (This X-ray also demonstrates an endotracheal tube correctly placed in the trachea as indicated by the top arrow.) After X-ray verification, the tube should be marked with adhesive tape and/or a permanent marker to indicate the point on the tube where the feeding tube enters the nares or penetrates the abdominal wall. This number on the tube at the entry point should be documented in the medical record and communicated during handoff reports. At the start of every shift, nurses evaluate if the incremental marking or external tube length has changed. If a change is observed, bedside tests such as visualization or pH testing of tube aspirate can help determine if the tube has become dislocated. If in doubt, a radiograph should be obtained to determine tube location. [9]

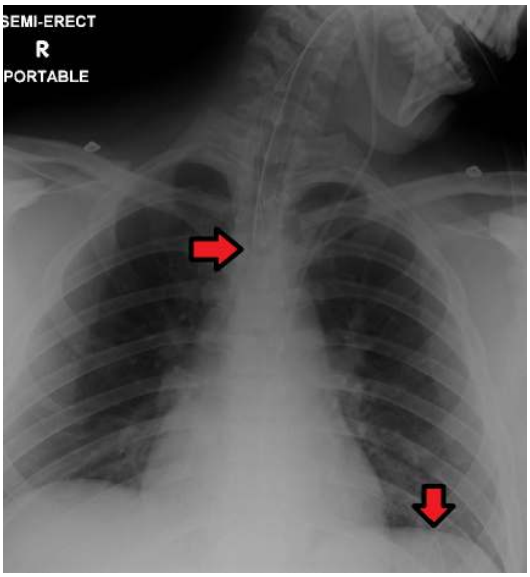


Figure 7.2.6: Placement Verification by X-Ray

After the initial verification of tube placement by X-ray, it is possible for the tube to migrate out of position due to the patient coughing, vomiting, and moving. For this reason, the nurse must routinely check tube placement before every use. The American Association of Critical-Care Nursing recommends that the position of a feeding tube should be checked and documented every four hours and prior to the administration of enteral feedings and medications by measuring the visible tube length and comparing it to the length documented during X-ray verification.[10],[11],[12]

Older methods of checking tube placement included observing aspirated GI contents or the administration of air with a syringe while auscultating (commonly referred to as the "whoosh test"). However, research has determined these methods are unreliable and should no longer be used to verify placement.[13],[14]

Checking the pH of aspirated gastric contents is an alternative method to verify placement that may be used in some agencies. Gastric aspirate should have a pH of less than or equal to 5.5 using pH indicator paper that is marked for use with human aspirate. However, caution should be used with this method because enteral formula and some medications alter the gastric pH.[15]

Follow agency policy for assessing and documenting tube placement. Additionally, if the patient develops respiratory symptoms that indicate potential aspiration, immediately notify the provider and withhold enteral feedings and medications until the placement is verified.

Assessing and Cleaning the Tube Insertion Site

The area of tube insertion should be assessed daily for signs of pressure damage. For NG tubes, the adhesive used to secure the tube can be irritating and cause skin breakdown. PEG and PEJ tubes may have fluid seepage around the insertion point that can cause skin breakdown if not cleaned regularly. Follow agency policy for cleansing the external insertion site for PEG and PEJ tubes. Cleansing is typically performed using gauze moistened with water or saline and then allowed to air dry before the fixation plate is repositioned. Because skin surrounding the insertion site is prone to breakdown, barrier cream or dressings may be prescribed to prevent breakdown.[16],[17]

Tube Feeding

Enteral Nutrition (EN) refers to nutrition provided directly into the gastrointestinal (GI) tract through an enteral tube that bypasses the oral cavity. Each year in the United States, over 250,000 hospitalized patients from infants to older adults receive EN. It is also used widely in rehabilitation, long-term care, and home settings. EN requires a multidisciplinary team approach, including a registered dietician, health care provider, pharmacist, and bedside nurses. The registered dietician performs a nutrition assessment and determines what type of enteral nutrition is appropriate to promote improved patient outcomes. The health care provider writes the order for the enteral nutrition. Prescriptions for enteral nutrition should be reviewed by the nurse for the following components: type of enteral nutrition formula, amount and frequency of free water flushes, route of administration, administration method, and

rate. Any concerns about the components of the prescription should be verified with the provider before tube feeding is administered.[18]

Tube feeding can be administered using gravity to provide a bolus feeding or via a pump to provide continuous or intermittent feeding. Feedings via a pump are set up in mL/hr, with the rate prescribed by the health care provider. See Figure **7.2.7**[19] for an image of an enteral tube feeding pump and the associated tubing. Note that tubing used for enteral feeding is indicated by specific colors (such as purple in Figure **7.2.7**). A global safety initiative, referred to as "EnFit," is in progress to ensure all devices used with enteral feeding, such as extension sets, syringes, PEG tubes, and NG tubes have specific EnFit ends that can only be used with tube feeding sets. This new safety design will avoid inadvertent administration of enteral feeding into intravenous tubing that can cause life-threatening adverse effects.

Review the "Checklist for NG Tube Enteral Feeding by Gravity with Irrigation" section for additional information regarding administering bolus feedings by gravity.

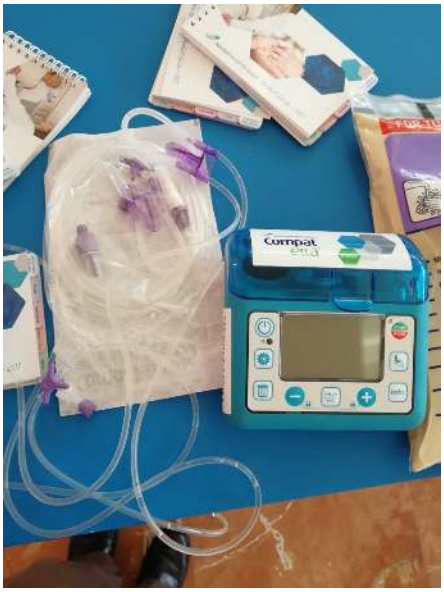


Figure **7.2.7**: Enteral Feeding Pump and Tubing

Life Span Considerations

Enteral feeding is administered to infants and children via a syringe, gravity feeding set, or feeding pump. The method selected is dependent on the nature of the feeding and clinical status of the child.[20]

Complications of Enteral Feeding

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 of enteral feeding.[21]

Reducing Risk of Aspiration

In addition to verifying tube placement as discussed in an earlier section, nurses perform additional interventions to prevent aspiration. The American Association of Critical-Care Nurses recommends the following guidelines to reduce the risk for aspiration:

- Maintain the head of the bed at 30°-45° unless contraindicated
- Use sedatives as sparingly as possible
- Assess feeding tube placement at four-hour intervals
- Observe for change in the amount of external length of the tube
- Assess for gastrointestinal intolerance at four-hour intervals[22]

Measurement of **gastric residual volume (GRV)** is performed by using a 60-mL syringe to aspirate stomach contents through the tube. It has traditionally been used to assess aspiration risk with associated interventions such as slowing or stopping the enteral feeding. GRVs in the range of 200–500 mL cause interventions such as slowing or stopping the feeding to reduce risk of aspiration. However, according to recent research, it is not appropriate to stop enteral nutrition for GRVs less than 500 mL in the absence of other signs of intolerance because of the impact on the patient's overall nutritional status. Additionally, the aspiration of gastric residual volumes can contribute to tube clogging.[23] Follow agency policy regarding measuring gastric residual volume and implementing interventions to prevent aspiration.

Managing Tube Clogging

Feeding tubes are prone to clogging for a variety of reasons. The risk of clogging may result from tube properties (such as narrow tube diameter), the tube tip location (stomach vs. small intestine), insufficient water flushes, aspiration for gastric residual volume (GRV), contaminated formula, and incorrect medication preparation and administration. A clogged feeding tube can result in decreased nutrient delivery or delayed administration of medication, and, if not corrected, the patient may require additional surgical intervention to replace the tube.[24]

Research supports using water as the best choice for initial declogging efforts. Instill warm water into the tube using a 60-mL syringe, and apply a gentle back-and-forth motion with the plunger of the syringe. Research shows that the use of cranberry juice and carbonated beverages to flush the tube can worsen tube occlusions because the acidic pH of these fluids can cause proteins in the enteral formula to precipitate within the tube. 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.[25]

To prevent enteral tubes from clogging, it is important to follow these guidelines:

- 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 gastric residual volume checks because the acidic gastric contents may cause protein in enteral formulas to precipitate within the lumen of the tube.[26]

Preventing Tubing Misconnections

In April 2006, The Joint Commission issued a Sentinel Event Alert on tubing misconnections due to enteral feedings being inadvertently infused into intravenous lines with life-threatening results. A color-coded enteral tubing connection design was developed to visually communicate the difference between enteral tubing and intravenous tubing. In addition to tubing design, follow these guidelines to prevent tubing misconnection errors:

- 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 that they are secure.
- As part of a hand-off process, recheck connections and trace all tubes back to their origins.[27]

Managing Intolerances and Imbalances

Patients should be monitored daily for signs of tube feeding intolerance, such as abdominal bloating, nausea, vomiting, diarrhea, cramping, and constipation. If cramping occurs during bolus feedings, it can be helpful to administer the enteral nutritional formula at room temperature to prevent symptoms.[28] Notify the provider of signs of intolerance with anticipated changes in the prescription regarding the type of formula or the rate of administration. Electrolytes and blood glucose levels should also be monitored, as ordered, for signs of imbalances.[29],[30]

Tube Irrigation

Enteral tubes are routinely flushed to maintain patency. Follow agency policy when flushing a tube. Typically, tap water and a 60-mL syringe are used to flush enteral tubes.[31] See Figure 7.2.8[32] for an image of a nurse irrigating an NG tube.

The steps for irrigating enteral tubes are typically the following:

- Draw the required amount of water into the 60-mL syringe and dispel excess air.
- If the tube has a clamp, close it.
- Open the distal end of the tube and connect the syringe.
- Open the clamp.
- Administer the water.
- Close the clamp.
- Remove the syringe and refill it with water if indicated.
- Repeat as needed to obtain the desired flushing volume.
- Once completed, remove the syringe, close the tube cap, and reopen the clamp.[33]



Figure **7.2.8**: Irrigating an NG Tube

Tube Suctioning

NG tubes may be used to remove gastric content, referred to as gastric decompression. In these situations, the stomach is drained by gravity or by connection to a suction pump to prevent nausea, vomiting, gastric distension, or to wash the stomach of toxins. This procedure is commonly used for post-operative patients who have not yet regained peristalsis or for patients with a small bowel obstruction to remove the accumulation of stomach bile. It is also used in the emergency department for patients with some types of poisonings or overdoses and is commonly referred to as "pumping out the stomach."

For patients receiving suctioning via enteral tubes, the drainage amount and color should be documented every shift.

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1. "abdomen-intestine-large-small-1698565" by bodymybody is licenced under CCO↵
2. Wireko, B. M., & Bowling, T. (2010). Enteral tube feeding. *Clinical Medicine*, *10*(6), 616–619. https://doi.org/10.7861/clinmedicine.10-6-616↵
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7.3: Assessments Related to Enteral Tubes

When caring for patients with enteral tubes, it is important for the nurse to routinely assess and document the patient's condition.

Subjective Assessment

When a patient is receiving enteral feeding, the nurse should assess the patient's tolerance of tube feeding.

Table **7.3.1**: Focused Interview Questions for Tube Feeding

Interview Questions	Follow-up
How long have you been receiving tube feeding?	Tell me more about why you are receiving tube feeding and how you feel about the tube feeding. (Patients may experience psychosocial reactions to receiving tube feeding that can be addressed with therapeutic communication.)
Are you experiencing symptoms of stomach cramping, nausea, vomiting, excess gas, diarrhea, or constipation?	Please describe.
Are you experiencing any discomfort where the tube is inserted?	Please describe.
Have you noticed any coughing or respiratory symptoms after receiving tube feeding?	Please describe.

Objective Assessment

Objective assessments for patients with enteral tubes include assessing skin integrity, tube placement, gastrointestinal function, and for signs of complications:

- Assess the tube insertion site daily for signs of pressure injury and skin breakdown. Cleanse and protect the area as indicated.
- Assess tube placement every four hours and prior to administration of feedings or medications according agency policy. Verify the visible tube length and compare it to the length documented after X-ray verification.
- Trace the tubing from the insertion site to prevent tubing misconnections.
- Assess the abdomen. If tube suctioning is in place, the suction should be turned off prior to auscultation. Bowel sounds should be present in all four quadrants, and the abdomen should be soft and nondistended.
- Monitor the patient's weight and overall nutritional status in collaboration with the multidisciplinary team.
- Monitor serum electrolytes and blood glucose as indicated.

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7.4: Sample Documentation

Sample Documentation of Expected Findings

Tube Feeding

Patient's abdomen is soft, nondistended, and bowel sounds are present in all four quadrants. Head of the bed elevated to 45 degrees. Placement of tube verified with measurement of the tube at the nares at 55 cm and gastric aspirate had a pH 4. Patient tolerated 240 mL of tube feeding by gravity followed by a 30-mL water flush.

Tube Irrigation

Irrigated NG tube with 30 mL of water with no resistance. Patient tolerated flush without symptoms.

Tube Suctioning

NG tube connected to low-intermittent suction (LIS) at 60 mmHg. Output from the NGT is green with a volume of 100 mLs in eight hours.

Sample Documentation of Unexpected Findings

Tube Feeding

Patient's abdomen is soft, nondistended, and bowel sounds are present in all four quadrants. Head of the bed elevated to 45 degrees. Placement of tube verified with measurements of tube at nares at 55 cm and gastric aspirate with a pH of 4. After 100 mLs of tube feeding was infused, the patient complained of feeling full and nauseated. Tube feeding infusion stopped and the head of the bed maintained at a 45-degree angle. Will reassess gastric volume residual in one hour and determine if tube feeding will be resumed.

Tube Irrigation

Attempted to irrigate NG tube with 30 mLs of water, but resistance was felt with procedure. Unable to inject water flush into the NGT. Dr. Smith notified of findings at 1320.

Tube Suctioning

Patient's abdomen is slightly distended and bowel sounds are hypoactive in all four quadrants. Patient reports increased nausea over the last two hours. NGT connected to low-intermittent suction (LIS) at 60 mmHg. Output from the NGT is mahogany colored with a volume of 800 mLs in eight hours. Dr. Smith notified of findings at 1640.

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7.5: Checklist for NG Tube Enteral Feeding By Gravity with Irrigation

Use the checklist below to review the steps for completion of the “NG Tube Enteral Feeding by Gravity with Irrigation.”

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

1. Verify the provider’s order.
2. Gather supplies: stethoscope, gloves, towel, irrigating solution (usually water), and irrigation set with irrigating syringe, pH tape, and prescribed tube feeding.
3. Perform safety steps:
    - Perform hand hygiene.
    - Check the room for transmission-based precautions.
    - Introduce yourself, your role, the purpose of your visit, and an estimate of the time it will take.
    - 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.
4. Don the appropriate PPE as indicated.
5. Perform abdominal and nasogastric tube assessment:
    - Assess skin integrity on the nose and ensure the tube is securely attached.
    - Use a flashlight to look in the nares to assess swelling, redness, or bleeding.
    - Ask the patient to open their mouth and look for curling of the tube in the patient’s mouth. The tube should go straight down into the esophagus.
    - Lower the blankets and move the gown up to expose the abdomen. Inspect from two locations.
    - Auscultate bowel sounds and then palpate the abdomen. If the patient is receiving NG suctioning, turn off the suction prior to auscultation.
6. Check for tube placement:
    - Verify tube measurement at insertion site based on documentation.
    - If agency policy dictates, test the pH of the aspirate. The pH should be equal or less than 5.5.
    - If agency policy dictates, measure and document residual amount. Instill residual back into gastric tube if placement was confirmed.
7. Draw up 30 mL of water in a 60-mL syringe. (If applicable, use sterile water according to agency policy.)
8. Connect the syringe to the tubing port (not the blue pigtail).
9. Instill 30 mL water.
10. Reconnect the plug tube or clamp tube.
11. Remove the plunger from the syringe and attach the syringe to the NG tube.
12. Complete tube feeding administration:
    - Verify the order for the type of formula, amount, method of administration, and rate.
    - Check the expiration date on the formula.
    - Verify if the tops of the containers need cleaning or if feeding needs mixing/shaking.
    - Add the formula to the syringe until the ordered amount is administered. Hold the syringe above the insertion site and allow it to enter via gravity.
    - Assess the patient for tolerance of the feeding. Slow infusion as necessary. Do not allow air to enter the tube when refilling the syringe.
    - After formula is administered, flush the NG tube with 30 mL of water.

- If a patient is unable to tolerate the feeding, slow or stop the infusion. Document and report the intolerance.

13. Disconnect the syringe and plug the NG tube.
14. Maintain the patient at or above a 30-degree angle for a minimum of one hour to prevent aspiration. Ask the patient if they have any questions and thank them for their time.
15. Perform hand hygiene.
16. Ensure safety measures when leaving the room:
    - CALL LIGHT: Within reach
    - BED: Low and locked (in lowest position and brakes on)
    - SIDE RAILS: Secured
    - TABLE: Within reach
    - ROOM: Risk-free for falls (scan room and clear any obstacles)
17. Document assessment findings and report any concerns according to agency policy. When documenting the procedure, include the following:
    - Time performed
    - Irrigation solution used
    - Quantity instilled
    - Residual amount, color, odor, and consistency
    - Method for checking the placement (including pH of gastric contents, if performed)
    - Related assessments
    - Amount of tube feeding
    - Patient tolerance for the procedure

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7.6: Checklist for NG Suction

Use the checklist below to review the steps for completion of the “NG Suction.”

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

1. Verify the provider’s order.
2. Gather supplies: nonsterile gloves.
3. Perform safety steps:
   - Perform hand hygiene.
   - Check the room for transmission-based precautions.
   - Introduce yourself, your role, the purpose of your visit, and an estimate of the time it will take.
   - 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.
4. Don the appropriate PPE as indicated.
5. Perform abdominal and nasogastric tube assessment:
   - Assess skin integrity on the nose and ensure the tube is securely attached.
   - Use a flashlight to look in the nares to assess swelling, redness, or bleeding.
   - Ask the patient to open their mouth and look for curling of the tube in the patient’s mouth. The tube should go straight down into the esophagus.
   - Lower the blankets and move the gown up to expose the abdomen. Inspect from two locations.
   - Auscultate bowel sounds and then palpate the abdomen.

   Rationale: Performing a nasogastric and abdominal assessment is important for determining signs of complications such as skin breakdown and necessity for suction.
6. Don gloves.
7. Attach the NG tube to the suction canister.
8. Set the rate of suction according to provider order:
   - Low intermittent suction is usually ordered. Low range on the suction device is from 0 to 80 mmHg. Starting between 40-60 mmHg is recommended. The suction level should not exceed 80 mmHg.
   - Observe for the gastric content to flow into the tubing and then the canister.
9. Monitor canister output and document color, odor, consistency, and amount.
10. Perform hand hygiene.
11. Ensure safety measures when leaving the room:
    - CALL LIGHT: Within reach
    - BED: Low and locked (in lowest position and brakes on)
    - SIDE RAILS: Secured
    - TABLE: Within reach
    - ROOM: Risk-free for falls (scan room and clear any obstacles)
12. Document the procedure and related assessment findings. Report any concerns according to agency policy.

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7.7: Learning Activities

Learning Activities

(Answers to “Learning Activities” can be found in the “Answer Key” at the end of the book. Answers to interactive activity elements will be provided within the element as immediate feedback.)

1. As you are administering tube feeding to your patient, they complain of feeling full. **What is the next step to take?**

a. Continue with administering the tube feeding.
b. Stop the tube feeding and check the gastric residual.
c. Stop the tube feeding and waste the remaining feeding.
d. Slow or stop the infusion based on the patient’s response.

Video Review of Tube Feeding Calculations[1]



1. RegisteredNurseRN. (2020, May 18). *Tube feeding nursing calculations problems dilution enteral.* [Video]. YouTube. All rights reserved. Video used with permission. https://youtu.be/CwfJ-sQ-xOQ↵

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7.8: XVII Glossary

Enteral Nutrition (EN): Nutrition provided directly into the gastrointestinal (GI) tract through an enteral tube that bypasses the oral cavity.

Gastric Residual Volume (GRV): Stomach contents aspirated with a 60-mL syringe, typically performed for patients receiving enteral feeding to assess aspiration risk with associated interventions such as slowing or stopping tube feeding. GRVs in the range of 200–500 mL should raise concern and lead to the implementation of measures to reduce risk of aspiration.

Stomach Decompression: Using suctioning through a nasogastric tube to remove the contents of the stomach.

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CHAPTER OVERVIEW

8: Administration of Parenteral Medications

8.1: Administration of Parenteral Medications Introduction
8.2: Basic Concepts
8.3: Evidence-Based Practices for Injections
8.4: Administering Intradermal Medications
8.5: Administering Subcutaneous Medications
8.6: Administering Intramuscular Medications
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8.8: Checklists for Parenteral Medication Administration
8.9: Sample Documentation
8.10: Learning Activities
8.11: XVIII Glossary

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8.1: Administration of Parenteral Medications Introduction

Learning Objectives

- Safely administer medication via the intradermal, subcutaneous, and intramuscular routes
- Maintain aseptic technique
- Select appropriate equipment
- Calculate correct amount of medication to administer
- Correctly select site using anatomical landmarks
- Modify procedure to reflect variations across the life span
- Document actions and observations
- Recognize and report significant deviations from norms

Administering medication by the parenteral route is defined as medications placed into the tissues and the circulatory system by injection. There are several reasons why medications may be prescribed via the parenteral route. Medications administered parenterally are absorbed more quickly compared to oral ingestion, meaning they have a faster onset of action. Because they do not undergo digestive processes in the gastrointestinal tract, they are metabolized differently, resulting in a stronger effect than oral medications. The parenteral route may also be prescribed when patients are nauseated or unable to swallow.

Although an injectable medication has many benefits, there are additional safety precautions the nurse must take during administration because an injection is considered an invasive procedure. Injections cause a break in the protective barrier of the skin, and some are administered directly into the bloodstream so there is increased risk of infection and rapid development of life-threatening adverse reactions.

There are four potential routes of parenteral injections, including intradermal (IM), subcutaneous (SQ), intramuscular (IM), and intravenous (IV). An **intradermal** injection is administered in the dermis just below the epidermis. A **subcutaneous** injection is administered into adipose tissue under the dermis. An **intramuscular** injection is administered into a muscle. **Intravenous** medications are injected directly into the bloodstream. Administering medication via the intravenous (IV) route is discussed in the "IV Therapy Management" chapter. This chapter will describe several evidence-based guidelines for safe administration of parenteral medications.

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8.2: Basic Concepts

Syringes

Syringes are used to administer parenteral medications. A disposable syringe is a sterile device that is available in various sizes ranging from 0.5 mL to 60 mL. A syringe consists of a plunger, a barrel, and a needle hub. Syringes may be supplied individually or with a needle and protective cover attached. See Figure **8.2.1**[1] for an illustration of the parts of a syringe.

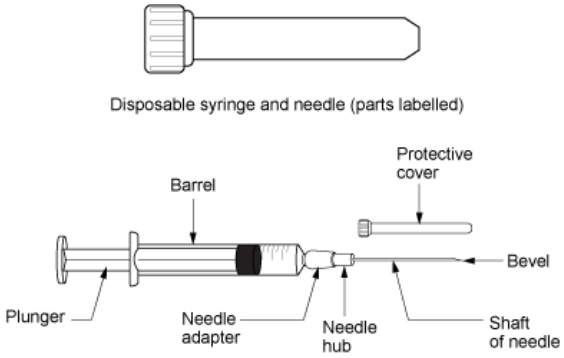


Figure **8.2.1**: Parts of a Syringe

Luer lock syringes have threads in the needle hub that provide a secure connection of needles, tubing, or other devices. See Figure **8.2.2**[2] for an image of a Luer lock syringe with a barrel and a readable scale. This image shows a syringe that holds 12 cc, also referred to as 12 mL. When withdrawing medication, match up the top of the plunger and the line on the barrel scale with the amount of medication you need to administer. In this image, 3 mL of medication is contained in the syringe.



Figure **8.2.2**: Luer Lock Syringe

Video Review of How to Read a Syringe[3]



Insulin is administered using a specific insulin syringe. Insulin syringes are marked in units, not milliliters (mL), because insulin is prescribed by providers in units, not mLs. A regular syringe marked in milliliters should never be used to administer insulin. All

insulin syringes have orange caps for quick identification, but verify the markings are in units to prevent a medication error. See Figure 8.2.3[4] for an image of a 50-unit insulin syringe with a white safety shield attached.



Figure 8.2.3: Insulin Syringe

Needles

Needles are made out of stainless steel. They are sterile and disposable and are available in various lengths and sizes. A needle is made up of the hub, shaft, and bevel. The hub fits onto the tip of the syringe. All three parts must remain sterile at all times. The bevel is the tip of the needle that is slanted to create a slit into the skin. See Figure 8.2.4[5] for an image of a bevel.

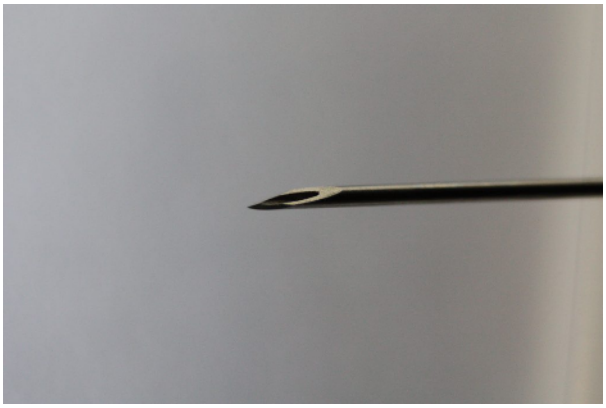


Figure 8.2.4: Bevel of a Needle

Gauge and Length

The **gauge** of a needle refers to its diameter. Needles range in various sized gauges from small diameter (25 to 29 gauge) to large diameter (18 to 22 gauge). Note that the larger the diameter of a needle, the smaller the gauge number. Larger diameter needles (18-22 gauge) are typically used to administer thicker medications or blood products. See Figure 8.2.5[6] for an image comparing various needle lengths and gauges. Read more about needle gauges according to type of injection in Table 8.2.1 in the “Anatomic Location” subsection.



Figure 8.2.5: Needle Lengths and Gauges

Gauge and length are marked on the outer packaging of needles. Needle length varies from 1/8 inches to 3 inches and is selected based on the type of injection. Nurses select the appropriate gauge and length according to the medication ordered, the anatomical location selected, and the patient's body mass and age. For example, an intramuscular injection requires a longer needle to reach muscle tissue than an intradermal injection that is inserted just under the epidermis. Read more about needle length according to type of injection in Table 8.2.1 in the "Anatomic Location" section.

Many needles have safety shields attached to prevent needlestick injuries. See Figure 8.2.6[7] for an image of a syringe inserted into a vial of medication with a needle and a type of safety shield attached.



Figure 8.2.6: Safety Shield on Needle

Needle Insertion Angle and Removal

When administering an injection, the syringe should be held like a dart to prevent inadvertent release of medication as the needle is inserted. The needle should be inserted at the proper angle depending on the type of injection. See Table 8.2.1 for additional details regarding angles of insertion for each type of injection. The needle should be inserted all the way to the hub smoothly and quickly to reduce discomfort of the injection. See Figure 8.2.7[8] for an illustration of angles of insertion for each type of injection. After the needle is inserted, it is important to hold the syringe steady to prevent tissue damage. The needle should be removed at the same angle used for insertion.[9]

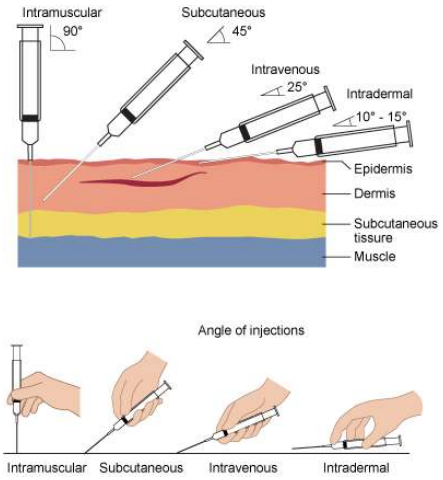


Figure 8.2.7: Angles of Insertion

Anatomical Location

It is important for the nurse to select the correct anatomical location for parenteral medication administration according to the type of injection prescribed and for optimal absorption of the medications. Injection of medication into the correct location also prevents injury to the tissues, nerves, blood vessels, and bones. Table 8.2.1 summarizes anatomical locations, needle sizes, amount of fluid, and the degree of angle of the needle insertion for each type of parenteral injection with life span and other considerations provided. Additional details regarding each type of injection are discussed later in this chapter.

Table 8.2.1: Summarized Injection Information

Injection Types	Locations	Needle Gauge and Length	Total Amount of Injectable Fluid	Degree of Angle When Injecting	Considerations
Intradermal	● Upper third of the forearm Up to 0.5 mL in infants and small children	45-90 degree	The older patient's skin is less elastic, and subcutaneous tissue may be reduced in the skinfolds. The upper abdomen should be used for patients with less subcutaneous tissue.		
Intramuscular	●Ventrogluteal ●Vastus lateralis ●Deltoid	●18 to 25G ● 1/2" to 1 1/2" (based on age/size of patient and site used)	0.5-1 mL (infants and children) 2-5 mL (adults)	90 degree	The vastus lateralis site is preferred for infants because that muscle is most developed. The ventrogluteal site is recommended in adults. The deltoid site is recommended for vaccinations in adults.

Preparing Medications

Ampules

Parenteral medications are supplied in sterile vials, ampules, and prefilled syringes. **Ampules** are small glass containers containing liquid medication ranging from 1 mL to 10 mL sizes. They have a scored neck to indicate where to break the ampule. See Figure 8.2.8[10] for an image of an ampule of epinephrine.



Figure 8.2.8: Ampule of Epinephrine

Medication is withdrawn from an ampule using a syringe with a special needle called a blunt fill filter needle. These needles have a blunt end to prevent needlestick injuries and a filter to prevent glass particles from being drawn up into the syringe. See Figure 8.2.9[11] for an image of a blunt fill filter needle. Filter needles should never be used to inject medication into a patient. The filter needle should be removed and replaced with a needle appropriate in size and gauge for the type of injection and the anatomical location of the patient.



Figure 8.2.9: Blunt Fill Filter Needle

When breaking open an ampule, it is important to use appropriate steps to avoid injury. First, tap the ampule while holding it upright to move fluid down out of the neck. Place a piece of gauze around the neck, and then snap the neck away from your hands. See Figure 8.2.10[12] for an illustration of how to safely open an ampule.

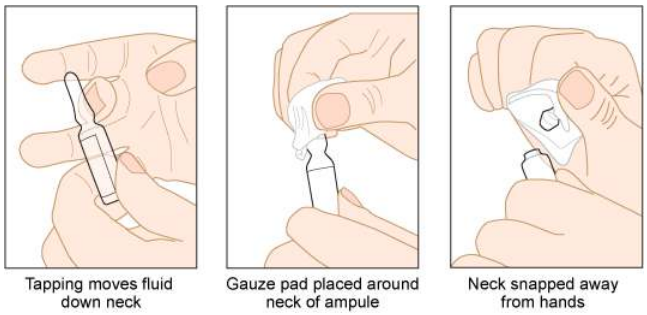


Figure 8.2.10: Opening an Ampule

Video Review of Withdrawing Medication from an Ampule[13]



Vials

A vial is a single- or multi-dose plastic container with a rubber seal top. Most rubber seals are covered by a plastic cap. See Figure 8.2.11[14] for an image of a medication dispensed in a vial. A single-use vial must be discarded after one use. Multi-dose vials are used for medications like insulin and must be labelled with the date it was opened. Refer to agency policy regarding how long an open vial may be used and how it should be stored. For example, insulin is typically refrigerated until the vial is opened, and then it can be stored at room temperature for 28 days.



Figure 8.2.11: Vial

A vial is a closed system. Air must be injected prior to medication withdrawal to maintain a pressure gradient so that solution can be removed from the vial. It is also important to closely observe and maintain the tip of the needle within the level of medication inside the vial as it is removed. See Figure 8.2.12[15] for an image of removing medication from a vial.

To remove medication from a vial, pull air into the syringe to match the amount of medication you plan to remove. Hold the syringe like a pencil and insert the needle into the rubber stopper on the top of the vial. Push the plunger down until all of the air is in the bottle. This helps to keep the right amount of pressure in the bottle and makes it easier to draw up the medication. With the needle still in the vial, turn the bottle and syringe upside down (vial above syringe). Pull the plunger to fill the syringe to the desired amount. Check the syringe for air bubbles. If you see any large bubbles, push the plunger until the air is purged out of the syringe. Pull the plunger back down to the desired dose. Remove the needle from the bottle. Be careful to not let the needle touch anything until you are ready to inject.[16]



Figure 8.2.12: Removing Medication From a Vial

Prefilled Syringes

Prefilled syringes can provide greater patient safety by reducing the potential for inadvertent needlesticks and exposure to toxic products that can occur while withdrawing medication from vials. Prefilled syringes, with pre-measured dosage, can reduce dosing errors and waste. They are especially useful during emergent situations that require rapid administration of medication. See Figure 8.2.13[17] for an image of a prefilled syringe.



Figure 8.2.13: Prefilled Syringe

1. "Labeled syringe.png" by British Columbia Institute of Technology is licensed under CC BY 4.0.opentextbc.ca/clinicalskills/chapter/safe-injection-administration-and-preparing-medication-from-ampules-and-vials/↵
2. "Syringe.jpg" by Erich Schulz, Brisbane is in the Public Domain↵
3. RegisteredNurseRN. (2017, June 12). *How to read a syringe 3 ml, 1 ml, insulin, & 5 ml/cc | Reading a syringe plunger.* [Video]. YouTube. All rights reserved. Video used with permission. https://youtu.be/_TnDr8cKums↵
4. "Insulin Syringe 3I3A0783.jpg" by Deanna Hoyord, for Chippewa Valley Technical College is licensed under CC BY 4.0.↵
5. "Beveled tip of a hypodermic needle 20090714 005.JPG" by Politikaner is licensed under CC BY-SA 3.0↵
6. "HypodermicNeedles.jpg" by Zephyris is licensed under CC BY-SA 3.0↵

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8. “Needle-insertion-angles-1.png” by British Columbia Institute of Technology is licensed under CC BY 4.0. Access for free at opentextbc.ca/clinicalskills/chapter/safe-injection-administration-and-preparing-medication-from-ampules-and-vials/↵
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10. “Epinephrine 1-1000 (1).JPG” by Intropin is licensed under CC BY 3.0↵
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12. “Preparing-an-ampule-1.png” by British Columbia Institute of Technology is licensed under CC BY 4.0. Access for free at https://opentextbc.ca/clinicalskills/chapter/safe-injection-administration-and-preparing-medication-from-ampules-and-vials/↵
13. RegisteredNurseRN. (2019, September 5). *Ampule medication administration nursing clinical skills.* [Video]. YouTube. All rights reserved. Video used with permission. youtu.be/mFKj3_Wk8m8↵
14. “Depo-Estradiol (estradiol cypionate) vials.jpg” by Medgirl131 is licensed under CC BY-SA 4.0↵
15. “ Syringe-1973129__340.jpg” by Myriams Zilles from Pixabay is licensed under CC0↵
16. American Association of Diabetes Educators. (n.d.). *Insulin injection know-how.* https://www.diabeteseducator.org/docs/default-source/legacy-docs/_resources/pdf/general/Insulin_Injection_How_To_AADE.pdf↵
17. "Naloxone_5.jpg" by Intropin (Mark Oniffrey) is licensed under CC BY-SA 4.0↵

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8.3: Evidence-Based Practices for Injections

It is important to follow evidence-based practices regarding parenteral medication administration to provide safe and effective care. Evidence-based practices include the following:

- Guidelines for preventing medication errors
- Recommendations to prevent infection from injections
- Guidelines for patient safety and comfort
- Recommendations to prevent needlestick injuries

Each of these practices is further described in the following sections.

Guidelines for Preventing Medication Errors

Medication errors can occur at various steps of the medication administration process. It is important to follow a standardized method for parenteral medication administration. Agency policies on medication preparation, administration, and documentation may vary, so it is important to receive agency training on using their medication system to avoid errors. See Table **8.3.1** for a summary of guidelines for safe medication administration.[1]

Additional details about preventing medication errors can be found in the "Administration of Enteral Medications" chapter.

Table **8.3.1**: Summary of Safe Medication Administration Guidelines

Guidelines	Additional Information
Be cautious and focused when preparing medications.	Avoid distractions. Some agencies have a no-interruption zone (NIZ) where health care providers can prepare medications without interruptions.[2]
Check and verify allergies.	Always ask the patient about their medication allergies, types of reactions, and severity of reactions. Verify the patient's medical record for documented allergies.
Use two patient identifiers and follow agency policy for patient identification.	Use at least two patient identifiers before administration and compare information against the medication administration record (MAR).[3]
Perform appropriate patient assessments before medication administration.	Assess the patient prior to administering medications to ensure the patient is receiving the correct medication, for the correct reason, and at the correct time. For example, a nurse reviews lab values and performs a cardiac assessment prior to administering cardiac medication. See more information regarding specific patient assessments during parenteral medication administration in the "Applying the Nursing Process" section.
Be diligent and perform medication calculations accurately.	Double-check and verify medication calculations. Incorrect calculation of medication dosages causes medication errors that can compromise patient safety.
Use standard procedures and evidence-based references.	Follow a standardized procedure when administering medication for every patient. Look up current medication information in evidence-based sources because information changes frequently.
Communicate with the patient before and after administration.	Provide information to the patient about the medication before administering it. Answer their questions regarding usage, dose, and special considerations. Give the patient an opportunity to ask questions and include family members if appropriate.
Follow agency policies and procedures regarding medication administration.	Avoid work-arounds. A work-around is a process that bypasses a procedure or policy in a system. For example, a nurse may "borrow" medication from one patient's drawer to give to another patient while waiting for an order to be filled by the pharmacy. Although performed with a good intention to prevent delay, these work-arounds fail to follow policies in place that ensure safe medication administration and often result in medication errors.
Ensure medication has not expired.	Check all medications' expiration dates before administering them. Medications can become inactive after their expiration date.
Always clarify an order or procedure that is unclear.	Always verify information whenever you are uncertain or unclear about an order. Consult with the pharmacist, charge nurse, or health care provider, and be sure to resolve all questions before proceeding with medication administration.
Use available technology to administer medications.	Use available technology, such as bar code scanning, when administering medications. Bar code scanning is linked to the patient's eMAR and provides an extra level of patient safety to prevent wrong medications, incorrect doses, or wrong timing of administration. If error messages occur, it is important to follow up appropriately according to agency policy and not override them. Additionally, it is important to remember that this technology

	provides an additional layer of safety and should not be substituted for the checking the five rights of medication administration.
Be a part of the safety culture.	Report all errors, near misses, and adverse reactions according to agency policy. Incident reports improve patient care through quality improvement identification, analysis, and problem-solving.
Be alert.	Be alert to error-prone situations and high-alert medications. High-alert medications are those that can cause significant harm. The most common high-alert medications are anticoagulants, opiates, insulins, and sedatives. Read more about high-alert medications in the "Administration of Enteral Medications" chapter.
Address patient concerns.	If a patient questions or expresses concern regarding a medication, stop the procedure and do not administer it. Explore the patient's concerns, review the provider's order, and, if necessary, notify the provider.

Preventing Infection

Administering parenteral medications is considered an invasive procedure. It is imperative to take additional measures when administering parenteral medications to prevent health care associated infections. The Centers for Disease Control and Prevention provides several recommendations for safe injection practices to prevent contamination and spread of pathogens. These recommendations include hand hygiene, prevention of needle/syringe contamination, preparation of the patient's skin, prevention of contamination of the solution, and use of new, sterile equipment for each injection.[4] [5] [6] Each of these recommendations is discussed below.

Perform Hand Hygiene

Always perform hand hygiene before preparing and after administering the injection with facility-approved, alcohol-based hand sanitizer. See more information about performing effective hand hygiene in the "Aseptic Technique" chapter.

Prevent Needle/Syringe Contamination

Keep the parts of the needle and syringe sterile. Keep the tip of the syringe sterile and keep it covered with a cap or needle. Avoid letting the needle touch unsterile surfaces, such as the outer edges of the ampule or vial, the surface of the needle cap, or the counter. Always keep the needle covered with a cap when not in use and avoid touching the length of the plunger.

After administration, use the scoop-cap method to recap the needle to avoid needlestick injuries and place the used syringe/needle immediately in the sharps container.

Video Review of Scoop-Cap Technique[7]



Prepare Patient's Skin

Wash the patient's skin with soap and water if it is soiled. Follow agency policy for skin preparation. When using an alcohol swab, use a circular motion to rub the area for 15 seconds, and then let the area dry for 30 seconds. If cleaning a site, move from the center of the site outward in a 5-cm (2 in.) radius.

Prevent Contamination of Solution

Use single-dose vials or ampules whenever possible. Do not keep multi-dose vials in patient treatment areas. Discard a container if sterility is compromised or questionable. Medications from ampules should be used immediately and then discarded appropriately. Additional information about ampules is provided in the "Basic Concepts" section.

Use New Sterile Equipment

Use a new, sterile syringe and needle with each patient. Inspect packaging for intactness and discard if there are rips or torn corners. If single-use equipment is not available, use syringes and needles designed for steam sterilization.

Guidelines for Patient Safety and Comfort During Injections

With proper preparation and technique, injections can be given safely and effectively to patients to prevent harm. It is essential to use correct needle sizes and angles of insertion and select appropriate anatomical locations based on patient age, size, and type of injection to avoid complications.[8] For example, for intramuscular injections the ventrogluteal site is preferred in adults because it has the greatest muscle thickness, is free of nerves and blood vessels, and has a small layer of fat, resulting in less painful administration and optimal absorption of the medication.

Use the correct needle length according to the type of injection to ensure delivery of medication into the correct layer of tissue and to reduce complications such as abscesses, pain, and bruising. Needle selection should be based on the patient's size, gender, and injection site. Be aware that women tend to have more adipose tissue around the buttocks and deltoid fat pad, which means a longer needle is required. Larger diameter (smaller gauge) needles have been found to reduce pain, swelling, and redness after an injection because less pressure is required to depress the plunger.

Removing medication residue on the tip of the needle has been shown to reduce pain and discomfort of the injection. To remove residue from the needle, change needles after medication is removed from a vial and before it is administered to the patient. Additionally, place the bevel side of the needle up on the patient's skin for quick and smooth injection of the needle into the tissue.

Proper positioning of the patient will facilitate proper landmarking of the site and may reduce perception of pain from the injection. Position the patient's limbs in a relaxed, comfortable position to reduce muscle tension. For example, when giving an intramuscular injection in the deltoid, have the patient relax their arm by placing their hand in their lap.

The nurse can also encourage relaxation techniques to help decrease the patient's anxiety-heightened pain. For example, divert the patient's attention away from the injection procedure by chatting about other topics.[9]

Recommendations for Preventing Needlestick Injuries

Nurses are at high risk for needlestick injuries when administering injections. Needlestick injuries can result in the transmission of blood-borne pathogens and should always be reported according to agency policy for appropriate follow-up. Table **8.3.2** outlines guidelines for preventing needlestick injuries.[10]

Table **8.3.2**: Guidelines for Preventing Needlestick Injuries

Practice Guidelines	Additional Information
. Do not recap needles with both hands.	Recapping needles with two hands creates high risk for needlestick injuries. Use the scoop-cap method by laying the cap on a hard surface and using one hand to hold the syringe and scoop up the cap from the surface. Whenever possible, use devices with safety features such as a safety shield on needles so that recapping is not necessary.
. Dispose of the needle immediately after injection.	Immediately dispose of used needles in an approved sharps disposal container that is puncture-proof and leakproof.
. Reduce or eliminate all hazards related to needles.	Use a needleless system and engineered safety devices for prevention of needlestick injuries when preparing injectable medications whenever possible.
. Plan disposal of sharps before injection.	Plan for the safe handling and disposal of needles and other sharp objects before beginning the procedure. Locate the sharps container before administration, so that you can quickly dispose of the sharps after injection.
. Follow all standard policies related to prevention or treatment of injury.	Follow all agency policies regarding infection control, hand hygiene, standard precautions, and blood and body fluid exposure management.
. Report all injuries.	Report all needlestick injuries and sharp-related injuries immediately. Know how to manage needlestick injuries and follow agency policy regarding exposure to blood-borne pathogens. These policies help decrease the risk of contracting a blood-borne illness.
. Participate in required training and education.	Attend training on injury-prevention strategies related to needles and safety devices per agency policy.

1. This work is a derivative of Clinical Procedures for Safer Patient Care by British Columbia Institute of Technology (BCIT) and is licensed under CC BY 4.0↵
2. Institute for Safe Medication Practices. (2012, November 29). *Side tracks on the safety express. Interruptions lead to errors and unfinished… Wait, what was I doing?* https://www.ismp.org/resources/side-tracks-safety-express-interruptions-lead-errors-and-unfinished-wait-what-was-i-doing?id=37↵
3. The Joint Commission. (n.d.). *2020 Hospital national patient safety goals.* https://www.jointcommission.org/standards/national-patient-safety-goals/↵
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5. Centers for Disease Control and Prevention. (2019, June 20). *Injection safety*. https://www.cdc.gov/injectionsafety/providers/provider_faqs.html↵
6. Centers for Disease Control and Prevention. (2011, April 1). *Safe injection practices to prevent transmission of infections to patients.* https://www.cdc.gov/injectionsafety/ip07_standardprecaution.html↵
7. RegisteredNurseRN. (2021, February 25). *Recap a needle using the one-hand scoop technique nursing skill | Medication administration*. [Video]. YouTube. All rights reserved. Video used with permission. youtu.be/bEeAo2jCJjw↵
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8.4: Administering Intradermal Medications

Intradermal injections (ID) are administered into the dermis just below the epidermis. See Figure **8.4.1**[1] for an image of the layers of the skin. Intradermal (ID) injections have the longest absorption time of all parenteral routes because there are fewer blood vessels and no muscle tissue. These types of injections are used for sensitivity testing because the patient's reaction is easy to visualize and the degree of reaction can be assessed. Examples of intradermal injections include tuberculosis (TB) and allergy testing.[2]

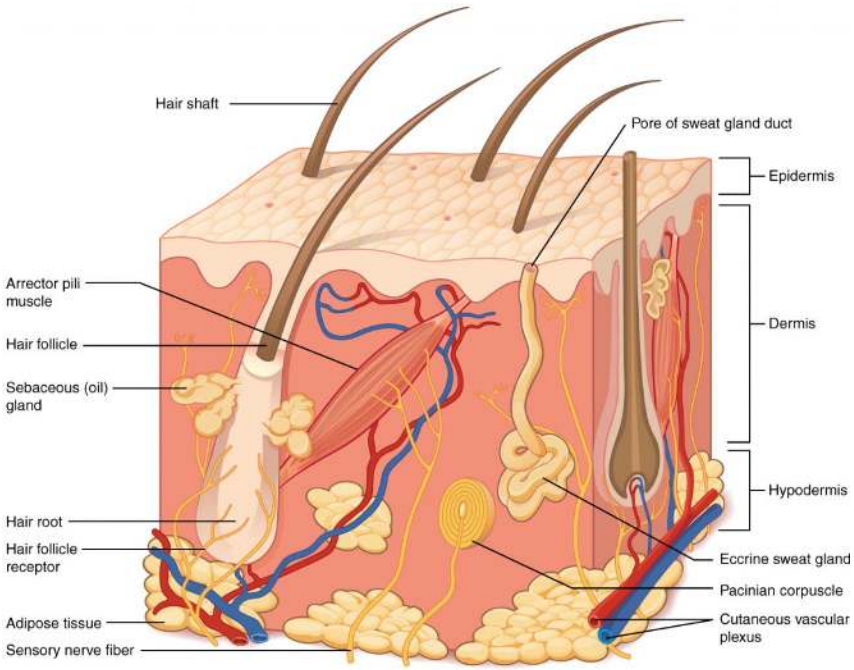


Figure **8.4.1**: Layers of Skin

Anatomic Sites

The most common anatomical sites used for intradermal injections are the inner surface of the forearm and the upper back below the scapula. The nurse should select an injection site that is free from lesions, rashes, moles, or scars that may alter the visual inspection of the test results. See Figure **8.4.2**[3] for an image of the nurse inspecting a patient's forearm site prior to injection.



Figure 8.4.2: Inspecting the Forearm Site Prior to Injection

Description of Procedure

Clean the site with an alcohol swab or antiseptic swab for 30 seconds using a firm, circular motion. Allow the site to dry. Allowing the skin to dry prevents introducing alcohol into the tissue, which can be irritating and uncomfortable.[4]

Use a tuberculin syringe, calibrated in tenths and hundredths of a milliliter, with a needle length of 1/4 inches to 1/2 inches and a gauge of 26 or 27.[5] See Figure 8.4.3[6] for an image of a tuberculin syringe. Remove the cap from the needle by pulling it off in a straight motion. A straight motion helps prevent needlestick injury.



Figure 8.4.3: Tuberculin Syringe

The dosage of an intradermal injection is usually under 0.5 mL, and the angle of administration for an ID injection is 5 to 15 degrees. Using your nondominant hand, spread the skin taut over the injection site. Taut skin provides easy entrance for the needle and is also important to do for older adults, whose skin is less elastic. See Figure 8.4.4[7] of an image of a nurse holding the skin taut prior to injection.[8]



Figure 8.4.4: Holding Skin Taut

Hold the syringe in the dominant hand between the thumb and forefinger, with the bevel of the needle up at a 5- to 15-degree angle at the selected site. Place the needle almost flat against the patient's skin, bevel side up, and insert the needle into the skin. Keeping the bevel side up allows for smooth piercing of the skin and induction of the medication into the dermis. Advance the needle no more than an eighth of an inch to cover the bevel. Once the syringe is in place, use the thumb of the nondominant hand to push on the plunger to slowly inject the medication.[9] See Figure **8.4.5**[10] for an image of a nurse administering an intradermal injection.

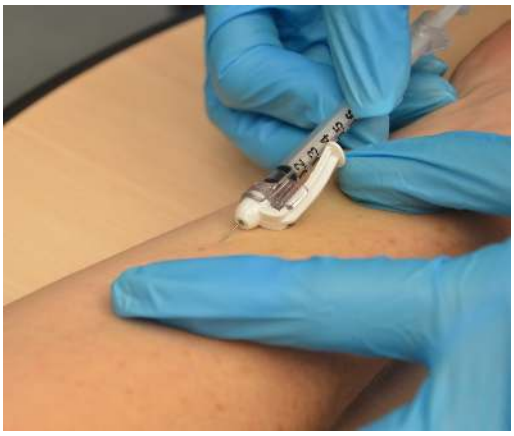


Figure **8.4.5**: Intradermal Injection

After the ID injection is completed, a **bleb** (small blister) should appear under the skin. The presence of the bleb indicates that the medication has been correctly placed in the dermis. See Figure **8.4.6**[11] for an image of a bleb.

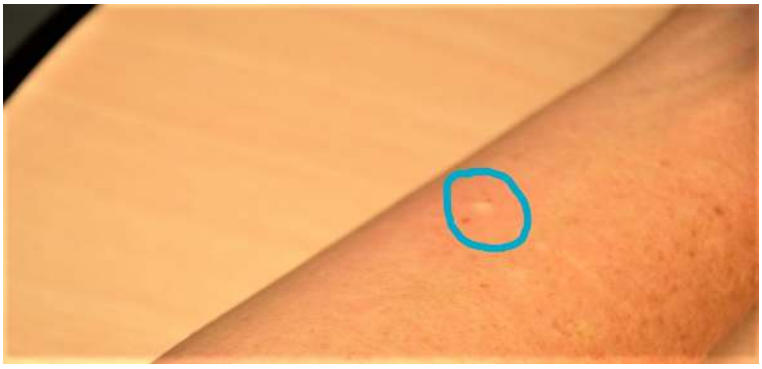


Figure **8.4.6**: Bleb

Carefully withdraw the needle out of the insertion site using the same angle it was placed so as not to disturb the bleb. Withdrawing at the same angle as insertion also minimizes discomfort to the patient and damage to the tissue. Do not massage or cover the site. Massaging the area may spread the solution to the underlying subcutaneous tissue. Discard the syringe in the sharps container. If administering a TB test, advise the patient to return for a reading in 48-72 hours. Discard used supplies, remove gloves, perform hand hygiene, and document.[12]

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1. "501 Structure of the skin.jpg" by OpenStax is licensed under CC BY 3.0. Access for free at https://openstax.org/books/anatomy-and-physiology/pages/5-1-layers-of-the-skin.↵
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10. “Intradermal_injection.jpg“ by British Columbia Institute of Technology is licensed under CC BY 4.0. Access for free at https://opentextbc.ca/clinicalskills/chapter/6-7-intradermal-subcutaneous-and-intramuscular-injections/. ↵
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8.5: Administering Subcutaneous Medications

Subcutaneous injections are administered into the adipose tissue layer called “subcutis” below the dermis. See an image of the subcutis (hypodermis) layer in Figure 8.5.1.[1] Medications injected into the subcutaneous layer are absorbed at a slow and steady rate.

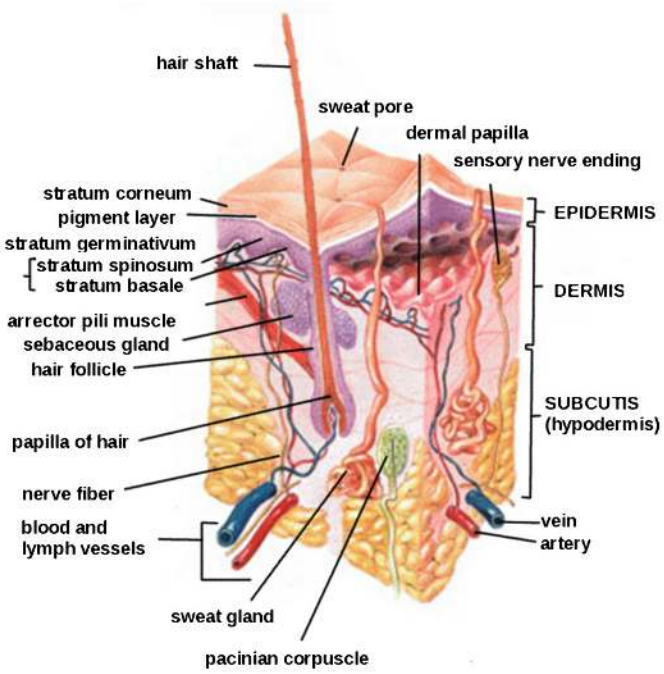


Figure 8.5.1: Subcutis Layer of Skin

Anatomic Sites

Sites for subcutaneous injections include the outer lateral aspect of the upper arm, the abdomen (from below the costal margin to the iliac crest and more than two inches from the umbilicus), the anterior upper thighs, the upper back, and the upper ventral gluteal area.[2] See Figure 8.5.2[3] for an illustration of commonly used subcutaneous injection sites. These areas have large surface areas that allow for rotation of subcutaneous injections within the same site when applicable.

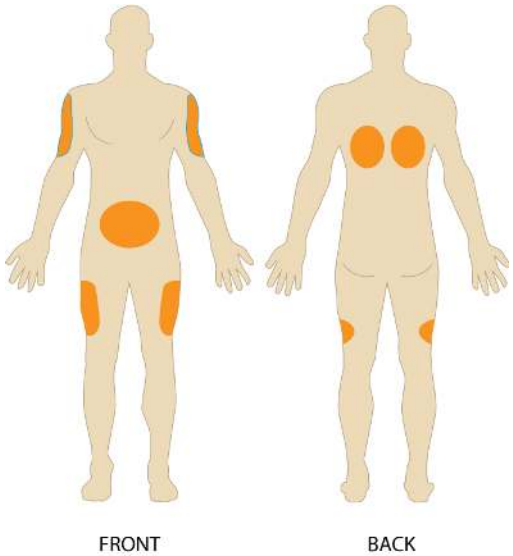


Figure 8.5.2: Common Subcutaneous Injection Sites

Prior to injecting the medication, inspect the skin area. Avoid skin areas that are bruised, open, scarred, or over bony prominences. Medical conditions that impair the blood flow to a tissue area contraindicate the use of subcutaneous injections in that area. For example, if a patient has an infection in an area of their skin called “cellulitis,” then subcutaneous injections should not be given in that area.

Description of Procedure

Nurses select the appropriate needle size for subcutaneous injection based on patient size. Subcutaneous needles range in gauge from 25-31 and in length from ½ inch to ⅝ inch. Prior to administering the injection, determine the amount of subcutaneous tissue present and use this information to select the needle length. A 45- or 90-degree angle is used for a subcutaneous injection. A 90-degree angle is used for normal-sized adult patients or obese patients, and a 45-degree angle is used for patients who are thin or have with less adipose tissue at the injection site. The volume of solution in a subcutaneous injection should be no more than 1 mL for adults and 0.5 mL for children. Larger amounts may not be absorbed appropriately and may cause increased discomfort for the patient.[4]

When administering a subcutaneous injection, assess the patient for any contraindications for receiving the medication. Apply nonsterile gloves after performing hand hygiene to reduce your risk of exposure to blood. Position the patient in a comfortable position and select an appropriate site for injection. Cleanse the site with an alcohol swab or antiseptic swab for 30 seconds using a firm, circular motion, and then allow the site to dry. Allowing the skin to dry prevents introducing alcohol into the tissue, which can be irritating and uncomfortable. Remove the needle cap with the nondominant hand, pulling it straight off to avoid needlestick injury. Grasp and pinch the area selected as an injection site.[5] See Figure **8.5.3**[6] for an image of a nurse grasping the back of a patient’s upper arm with the nondominant hand in preparation of a subcutaneous injection at the anatomical site indicted with an “X.”



Figure **8.5.3**: Grasping and Pinching Area

Hold the syringe in the dominant hand between the thumb and forefinger like a dart. Insert the needle quickly at a 45- to 90-degree angle, depending on the size of the patient and the amount of adipose tissue. After the needle is in place, release the tissue with your nondominant hand. With your dominant hand, inject the medication at a rate of 10 seconds per mL. Avoid moving the syringe.[7] See Figure **8.5.4**[8] for an image of a subcutaneous injection.

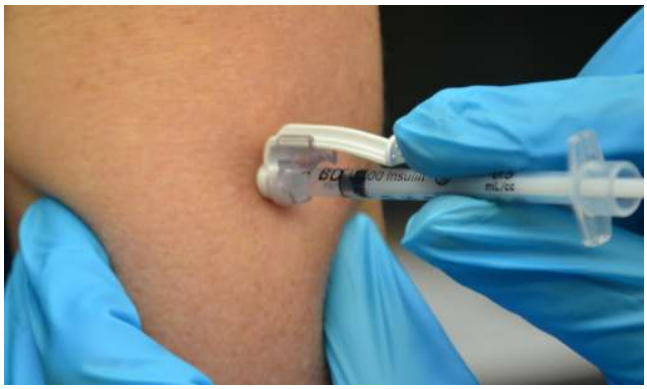


Figure 8.5.4: Subcutaneous Injection

When injecting heparin or when using an insulin pen, continue pinching the skin during the injection and release the skinfold immediately before withdrawing the needle.

Withdraw the needle quickly at the same angle at which it was inserted. Using a sterile gauze, apply gentle pressure at the site after the needle is withdrawn. Do not massage the site. Massaging after a heparin injection can contribute to the formation of a hematoma. Do not recap the needle to avoid puncturing oneself. Apply the safety shield and dispose of the syringe/needle in a sharps container. See Figure 8.5.5[9] for an image of a needle after the safety shield has been applied. Remove gloves and perform hand hygiene.[10]

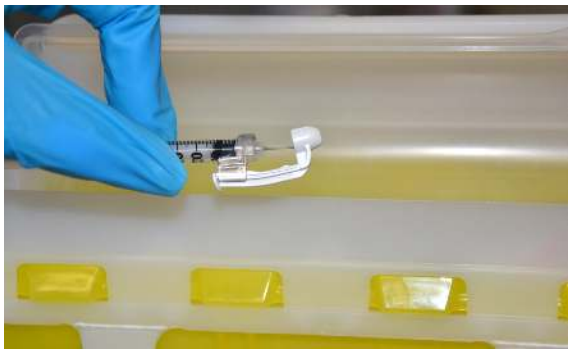


Figure 8.5.5: Needle with Safety Shield Applied

Examples of common medications administered via subcutaneous injection include insulin and heparin. Special considerations for each of these medications are discussed below.

Insulin Injections

Insulin is considered a high-alert medication requiring special care to prevent medication errors. Care must be taken to ensure the correct type and amount of insulin are administered at the correct time. It is highly recommended to have insulin dosages double-checked by another nurse before administration because of the potential for life-threatening adverse effects that can occur due to medication errors. Some agencies require this second safety check.

Only insulin syringes should be used to administer insulin injection. Insulin syringes are supplied in 30-, 50-, or 100-unit measurements, so read the barrel increments (calibration) carefully. Insulin is always ordered and administered in unit dosage. Insulin dosage may be based on the patient's pre-meal blood sugar reading and a sliding scale protocol that indicates the number of units administered based on the blood sugar reading.[11],[12]

There are rapid-, short-, intermediate-, and long-acting insulins. For each type of insulin, it is important to know the onset, peak, and duration of the insulin so that it can be timed appropriately with the patient's food intake. It is essential to time the

administration of insulin with food intake to avoid hypoglycemia. When administering insulin before a meal, always ensure the patient is not nauseated and is able to eat. Short- or rapid-acting insulin may be administered up to 15-30 minutes before meals. Intermediate insulin is typically administered twice daily, at breakfast and dinner, and long-acting insulin is typically administered in the evening.[13],[14]

When administering cloudy insulin preparations such as NPH insulin (Humulin-N), gently roll the vial between the palms of your hands to resuspend the medication before withdrawing it from the vial.[15],[16] See Figure 8.5.6[17] for an image of insulin NPH that is cloudy in color.



Figure 8.5.6: NPH Insulin

Preparing Insulin in a Syringe

When withdrawing insulin from a vial, check the insulin vial to make sure it is the right kind of insulin and that there are no clumps or particles in it. Also, make sure the insulin is not past its expiration date. Pull air into the syringe to match the amount of insulin you plan to remove. Hold the syringe like a pencil and insert the needle into the rubber stopper on the top of the vial. Push the plunger down until all of the air is in the bottle. This helps to keep the right amount of pressure in the bottle and makes it easier to draw up the insulin. With the needle still in the vial, turn the bottle and syringe upside down (vial above syringe). Pull the plunger to fill the syringe to the desired amount. Check the syringe for air bubbles. If you see any large bubbles, push the plunger until the air is purged out of the syringe. Pull the plunger back down to the desired dose. Remove the needle from the bottle. Be careful to not let the needle touch anything until you are ready to inject.[18]

Mixing Two Types of Insulin

If a patient is ordered two types of insulin, some insulins may be mixed together in one syringe. For example, insulin NPH (Novolin-N) can be mixed with insulin regular (Humulin-R), insulin aspart (Novolog), or insulin lispro (Humalog). However, some types of insulin cannot be mixed with other insulin, such as insulin glargine (Lantus) or insulin detemir (Levemir).[19],[20]

When mixing insulin, gather your insulin supplies. Check the insulin vials to make sure they are the right kinds of insulin, there are no clumps or particles in them, and the expiration dates have not passed. Gently mix intermediate or premixed insulin by turning the vial on its side and rolling it between the palms of your hands. Prepare the insulin vials by injecting air into the intermediate insulin vial. Remove the cap from the needle. With the vial of insulin below the syringe, inject an amount of air equal to the dose of intermediate insulin that you will be taking. Do not draw out the insulin into the syringe yet. Remove the needle from the vial. Inject air into the rapid-acting insulin vial equal to the rapid-acting insulin dose. With the needle still in the vial, turn the vial upside down (vial above the syringe) and pull the plunger to fill the syringe with the desired dose. Check the syringe for air bubbles. If you see any large bubbles, push the plunger until the air is purged out of the syringe. Pull the plunger back down to the desired dose. Remove the needle from the vial and recheck your dose. Insert the needle into the vial of cloudy insulin. Turn the vial upside down (vial above syringe) and pull the plunger to draw the dose of intermediate-acting insulin. Because the short-acting insulin is already in the syringe, pull the plunger to the total number of units you need. Do not inject any of the insulin back into the vial because the syringe now contains a mixture of intermediate- and rapid-acting insulin. Remove the needle from the vial and be careful to not let the needle touch anything until you are ready to inject.[21]

When mixing insulin, it is important to always draw up the short-acting insulin first to prevent it from being contaminated with the long-acting insulin. See Figure 8.5.7[22] for an illustration of the order to follow when mixing insulin.

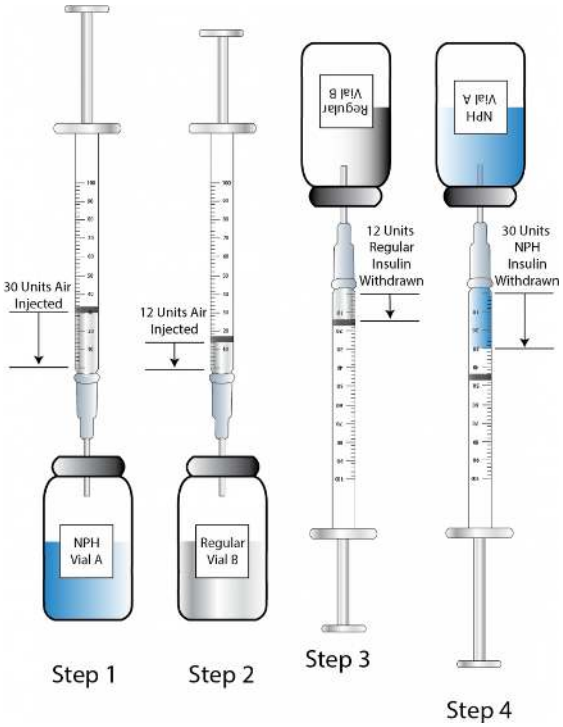


Figure 8.5.7: Mixing Insulin

One anatomic region should be selected for a patient's insulin injections to maintain consistent absorption, and then sites should be rotated within that region. The abdomen absorbs insulin the fastest, followed by the arms, thighs, and buttocks. It is no longer necessary to rotate anatomic regions, as was once done, because newer insulins have a lower risk for causing hypertrophy of the skin.[23],[24]

Insulin Pens

Insulin pens are a newer technology designed to be used multiple times for a single person, using a new needle for each injection. See Figure 8.5.8[25] for an image of an insulin pen. Insulin pens must never be used for more than one person. Regurgitation of blood into the insulin cartridge can occur after injection, creating a risk of blood-borne pathogen transmission if the pen is used for more than one person, even when the needle is changed.[26] Prefilled insulin pens consist of a prefilled cartridge of insulin to which a special, single-use needle is attached. When using an insulin pen for subcutaneous insulin administration, a few additional steps must be taken according to manufacturer guidelines. The needle should be primed with two units of insulin, and then the dosage should be dialed in the dose window. The pen should be held with the hand using four fingers so that the thumb can be used to fully depress the plunger button. The pen should be left in place for ten seconds after the insulin is injected to aid in absorption.[27]

Insulin pens are often prescribed for home use because of their ease of use. Patients and family members must be educated on how to correctly use an insulin pen before discharge. To evaluate a patient's knowledge of how to correctly administer insulin, ask them to "return demonstrate" the procedure to you.[28],[29]



Figure 8.5.8: Insulin Pen A) tip, B) medication chamber, C) plunger, D) dose window, E) dose selection dial, F) plunger button

Special Considerations for Insulin

- Insulin vials are stored in the refrigerator until they are opened. When removed, it should be labelled with an open date and expiration date according to agency policy. When a vial is in use, it should be at room temperature. Do not inject cold insulin because this can cause discomfort.

- Patients who take insulin should monitor their blood sugar (glucose) levels as prescribed by their health care provider.
- Vials of insulin should be inspected prior to use. Any change in appearance may indicate a change in potency. Check the expiration date and do not use it if it has expired.
- All health care workers should be aware of the signs and symptoms of hypoglycemia. Signs and symptoms of hypoglycemia include fruity breath, restlessness, agitation, confusion, slurring of words, clammy skin, inability to concentrate or follow commands, hunger, and nausea. Follow agency policy regarding hypoglycemic reactions.[30]

Note

For more information about injecting insulin, read the following American Association of Diabetes Educators PDF:
Insulin Injection Know-How

For additional details about different types of insulin, hypoglycemia, and safety considerations when administering insulin, visit the "Antidiabetics" section of the "Endocrine" chapter in Open RN *Nursing Pharmacology*.

Video Review of Mixing Insulin[31]



Heparin Injections

Heparin is an anticoagulant medication used to treat or prevent blood clots. It comes in various strengths and can be administered subcutaneously or intravenously. Heparin is also considered a high-alert medication because of the potential life-threatening harm that can result from a medication error. See Figure 8.5.9[32] for an image of a prefilled syringe of enoxaparin (Lovenox), a low-molecular weight heparin, that is typically dispensed in prefilled syringes. Review specific guidelines regarding heparin administration in Table 8.5.1.[33]



Figure 8.5.9: Low-Molecular Weight Heparin

Note

For more information about heparin, visit the "Blood Coagulation Modifiers" section of the "Cardiovascular and Renal System" chapter in Open RN *Nursing Pharmacology*.

Table **8.5.1**: Specific Guidelines for Administering Heparin[34]

Guidelines	Additional Information
Remember that heparin is considered a high-alert medication.	Heparin is available in vials and prefilled syringes in a variety of concentrations. Because of the dangerous adverse effects of the medication, it is considered a high-alert medication. Always follow agency policy regarding the preparation and administration of heparin.
Rotate heparin injection sites.	It is important to rotate heparin sites to avoid bruising in one location. Heparin is absorbed best in the abdominal area, at least 2 inches (5 cm.) away from the umbilicus.
Know the risks associated with heparin.	There are many risks associated with the administration of heparin, including bleeding, hematuria, hematemesis, bleeding gums, and melena. Monitor, document, and report these side effects when a patient is receiving heparin.
Review lab values.	Review lab values (PTT and aPTT) before and after heparin administration. If injecting low-molecular weight heparin (enoxaparin), review platelet count because heparin can cause thrombocytopenia.
Follow administration standards for prepackaged heparin and enoxaparin syringes.	Many agencies use prepackaged heparin and enoxaparin syringes. Always follow the standards for safe medication administration when using prefilled syringes.
Assess patient conditions prior to administration.	Some medical conditions increase the patient's risk for hemorrhage (severe bleeding), such as recent childbirth, severe kidney and liver disease, cerebral or aortic aneurysm, and cerebral vascular accidents (CVA).
Assess other medications and diet.	Over-the-counter (OTC) herbal medications, such as garlic, ginger, and horse chestnut, may interact with heparin. Additional medications that may interact or cause increased risk of bleeding include aspirin, NSAIDs, cephalosporins, antithyroid agents, thrombolytics, and probenecids. Foods like green leafy vegetables can alter the therapeutic effect of heparin.

Device Technology

A jet injector is a medical device used for vaccinations and other subcutaneous injections that uses a high-pressure, narrow stream of fluid to penetrate the skin instead of a hypodermic needle. An example of a flu vaccine approved for administration to adults aged 18-64 is AFLURIA © Quadrivalent. The most common injection-site adverse reactions of the jet injector flu vaccine up to seven days post-vaccination were tenderness, swelling, pain, redness, itching, and bruising.[35] Insulin can also be successfully administered via a jet injector, with research demonstrating improved glucose control because the insulin is spread out over a larger area of tissue and enters the bloodstream faster than when administered by an insulin pen or needle. Patients have indicated preference for insulin delivered by the jet injector compared to the insulin pen or syringe because it is needle-free with less tissue injury and pain as compared to the needle injection.[36] See Figure **8.5.10**[37] for an image comparing insulin delivery devices.



Figure **8.5.10**: Insulin Delivery Devices

Another type of new technology used to continuously deliver subcutaneous insulin is the insulin pump. Pumps are a computerized device attached to the body, either with tubing or attached to the skin. They are programmed to release small doses of insulin (continuously or as a surge bolus dose) close to mealtime to control the rise in blood sugar after a meal. They work by closely mimicking the body's normal release of insulin. Insulin doses are delivered through a flexible plastic tube called a catheter. With the aid of a small needle, the catheter is inserted through the skin into the fatty tissue and is taped in place.[38] See Figure **8.5.11**[39] for an image of an insulin pump infusion set attached to a patient.

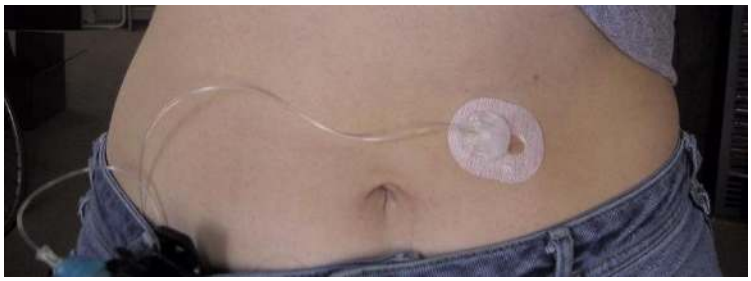


Figure **8.5.11**: Insulin Pump

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12. American Diabetes Association. (n.d.). *Insulin basics.* https://www.diabetes.org/diabetes/medication-management/insulin-other-injectables/insulin-basics↵
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14. American Diabetes Association. (n.d.). *Insulin basics.* https://www.diabetes.org/diabetes/medication-management/insulin-other-injectables/insulin-basics↵

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16. American Diabetes Association. (n.d.). *Insulin basics*. https://www.diabetes.org/diabetes/medication-management/insulin-other-injectables/insulin-basics↵
17. "insulin-syringe" by biologycorner is licensed under CC BY-NC 2.0↵
18. American Association of Diabetes Educators. (n.d.). *Insulin injection know-how.* https://www.diabeteseducator.org/docs/default-source/legacy-docs/_resources/pdf/general/Insulin_Injection_How_To_AADE.pdf↵
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20. American Diabetes Association. (n.d.). *Insulin basics*. https://www.diabetes.org/diabetes/medication-management/insulin-other-injectables/insulin-basics↵
21. American Association of Diabetes Educators. (n.d.). *Insulin injection know-how.* https://www.diabeteseducator.org/docs/default-source/legacy-docs/_resources/pdf/general/Insulin_Injection_How_To_AADE.pdf↵
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24. American Diabetes Association. (n.d.). *Insulin basics*. https://www.diabetes.org/diabetes/medication-management/insulin-other-injectables/insulin-basics↵
25. "Insulin_pen_(labeled).jpg" by User:Wesalius is licensed under CC BY 4.0↵
26. Centers for Disease Control and Prevention. (2012, January 4). *CDC clinical reminder: Insulin pens must never be used for more than one person*. https://www.cdc.gov/injectionsafety/clinical-reminders/insulin-pens.html↵
27. American Association of Diabetes Educators. (n.d.). *Insulin injection know-how*. https://www.diabeteseducator.org/docs/default-source/legacy-docs/_resources/pdf/general/Insulin_Injection_How_To_AADE.pdf↵
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29. American Diabetes Association. (n.d.). *Insulin basics*. https://www.diabetes.org/diabetes/medication-management/insulin-other-injectables/insulin-basics↵
30. American Diabetes Association. (n.d.). *Insulin basics*. https://www.diabetes.org/diabetes/medication-management/insulin-other-injectables/insulin-basics↵
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32. "syringe-103060_1920.jpg" by Stux from Pixabay is licensed under CC0 . ↵
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35. Centers for Disease Control and Prevention. (2020, August 20). *Flu vaccination by jet injector*. https://www.cdc.gov/flu/prevent/jet-injector.htm↵
36. Guo, L., Xiao, X., Sun, X., & Qi, C. (2017). Comparison of jet injector and insulin pen in controlling plasma glucose and insulin concentrations in type 2 diabetic patients. *Medicine*, *96*(1), e5482. doi.org/10.1097/MD.0000000000005482↵
37. "Insulin_Delivery_Devices.png" by BruceBlaus is licensed under CC BY-SA 4.0↵
38. American Diabetes Association. (n.d.). *Device technology*. https://www.diabetes.org/diabetes/device-technology↵
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8.6: Administering Intramuscular Medications

The intramuscular (IM) injection route is used to place medication in muscle tissue. Muscle has an abundant blood supply that allows medications to be absorbed faster than the subcutaneous route.

Factors that influence the choice of muscle to use for an intramuscular injection include the patient's size, as well as the amount, viscosity, and type of medication. The length of the needle must be long enough to pass through the subcutaneous tissue to reach the muscle, so needles up to 1.5 inches long may be selected. However, if a patient is thin, a shorter needle length is used because there is less fat tissue to advance through to reach the muscle. Additionally, the muscle mass of infants and young children cannot tolerate large amounts of medication volume. Medication fluid amounts up to 0.5-1 mL can be injected in one site in infants and children, whereas adults can tolerate 2-5 mL. Intramuscular injections are administered at a 90-degree angle. Research has found administering medications at 10 seconds per mL is an effective rate for IM injections, but always review the drug administration rate per pharmacy or manufacturer's recommendations.[1]

Anatomic Sites

Anatomic sites must be selected carefully for intramuscular injections and include the ventrogluteal, vastus lateralis, and the deltoid. The vastus lateralis site is preferred for infants because that muscle is most developed. The ventrogluteal site is generally recommended for IM medication administration in adults, but IM vaccines may be administered in the deltoid site. Additional information regarding injections in each of these sites is provided in the following subsections.

Ventrogluteal

This site involves the gluteus medius and minimus muscle and is the safest injection site for adults and children because it provides the greatest thickness of gluteal muscles, is free from penetrating nerves and blood vessels, and has a thin layer of fat. To locate the ventrogluteal site, place the patient in a supine or lateral position. Use your right hand for the left hip or your left hand for the right hip. Place the heel or palm of your hand on the greater trochanter, with the thumb pointed toward the belly button. Extend your index finger to the anterior superior iliac spine and spread your middle finger pointing towards the iliac crest. Insert the needle into the "V" formed between your index and middle fingers. This is the preferred site for all oily and irritating solutions for patients of any age.[2] See Figure **8.6.1**[3] for an image demonstrating how to accurately locate the ventrogluteal site using your hand.

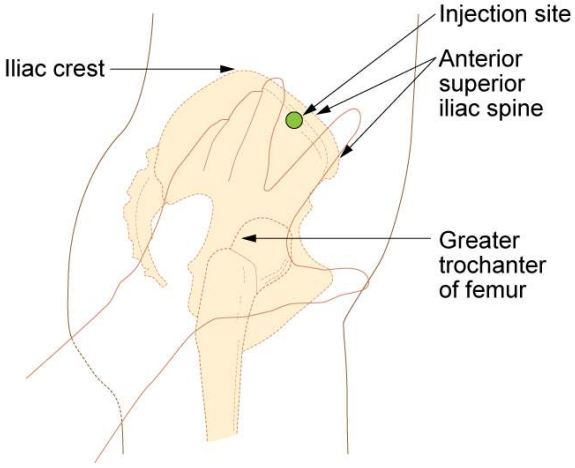


Figure **8.6.1**: Locating the Ventrogluteal Site

The needle gauge used at the **ventrogluteal** site is determined by the solution of the medication ordered. An aqueous solution can be given with a 20- to 25-gauge needle, whereas viscous or oil-based solutions are given with 18- to 21-gauge needles. The needle length is based on patient weight and body mass index. A thin adult may require a 5/8-inch to 1-inch (16 mm to 25 mm) needle, while an average adult may require a 1-inch (25 mm) needle, and a larger adult (over 70 kg) may require a 1-inch to 1½-inch (25 mm to 38 mm) needle. Children and infants require shorter needles. Refer to agency policies regarding needle length for infants, children, and adolescents. Up to 3 mL of medication may be administered in the ventrogluteal muscle of an average adult and up to 1 mL in children. See Figure **8.6.2**[4] for an image of locating the ventrogluteal site on a patient.



Figure **8.6.2**: Ventrogluteal Site

Vastus Lateralis

The **vastus lateralis** site is commonly used for immunizations in infants and toddlers because the muscle is thick and well-developed. This muscle is located on the anterior lateral aspect of the thigh and extends from one hand's breadth above the knee to one hand's breadth below the greater trochanter. The outer middle third of the muscle is used for injections. To help relax the patient, ask the patient to lie flat with knees slightly bent or have the patient in a sitting position. See Figure **8.6.3**[5] for an image of the vastus lateralis injection site.

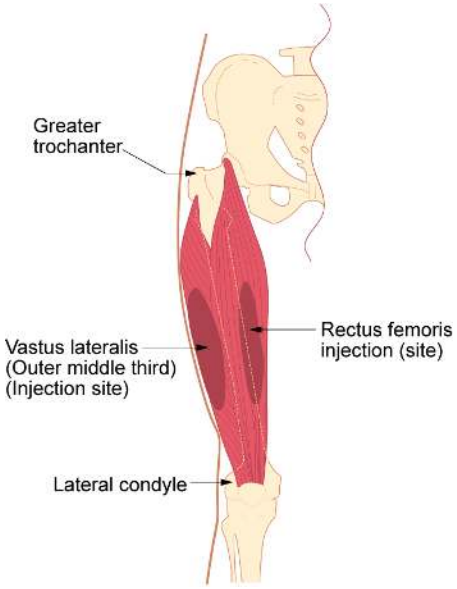


Figure **8.6.3**: Vastus Lateralis Site

The length of the needle used at the vastus lateralis site is based on the patient's age, weight, and body mass index. In general, the recommended needle length for an adult is 1 inch to 1 ½ inches (25 mm to 38 mm), but the needle length is shorter for children. Refer to agency policy for pediatric needle lengths. The gauge of the needle is determined by the type of medication administered. Aqueous solutions can be given with a 20- to 25-gauge needle; oily or viscous medications should be administered with 18- to 21-gauge needles. A smaller gauge needle (22 to 25 gauge) should be used with children. The maximum amount of medication for a

single injection in an adult is 3 mL. See Figure 8.6.4[6] for an image of an intramuscular injection being administered at the vastus lateralis site.



Figure 8.6.4: Intramuscular Injection at Vastus Lateralis Site

Deltoid

The **deltoid** muscle has a triangular shape and is easy to locate and access. To locate the injection site, begin by having the patient relax their arm. The patient can be standing, sitting, or lying down. To locate the landmark for the deltoid muscle, expose the upper arm and find the acromion process by palpating the bony prominence. The injection site is in the middle of the deltoid muscle, about 1 inch to 2 inches (2.5 cm to 5 cm) below the acromion process. To locate this area, lay three fingers across the deltoid muscle and below the acromion process. The injection site is generally three finger widths below in the middle of the muscle. See Figure 8.6.5[7] for an illustration for locating the deltoid injection site.

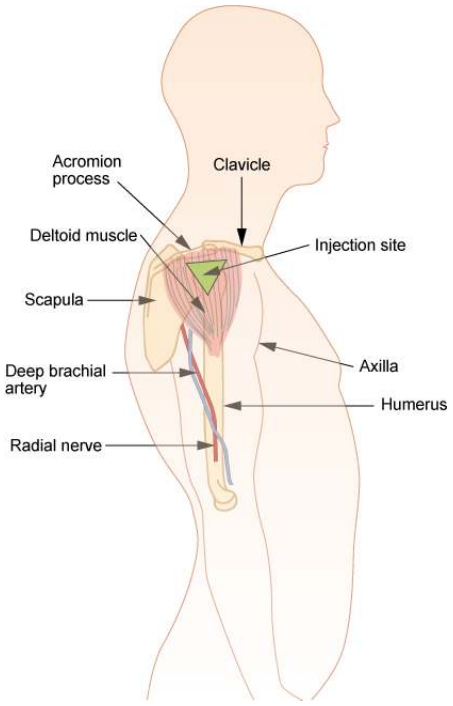


Figure **8.6.5**: Locating the Deltoid Injection Site

Select the needle length based on the patient's age, weight, and body mass. In general, for an adult male weighing 60 kg to 118 kg (130 to 260 lbs), a 1-inch (25 mm) needle is sufficient. For women under 60 kg (130 lbs), a ⅝-inch (16 mm) needle is sufficient, while for women between 60 kg and 90 kg (130 to 200 lbs) a 1-inch (25 mm) needle is required. A 1 ½-inch (38 mm) length needle may be required for women over 90 kg (200 lbs) for a deltoid IM injection. For immunizations, a 22- to 25-gauge needle should be used. Refer to agency policy regarding specifications for infants, children, adolescents, and immunizations. The maximum amount of medication for a single injection is generally 1 mL. See Figure **8.6.6**[8] for an image of locating the deltoid injection site on a patient.

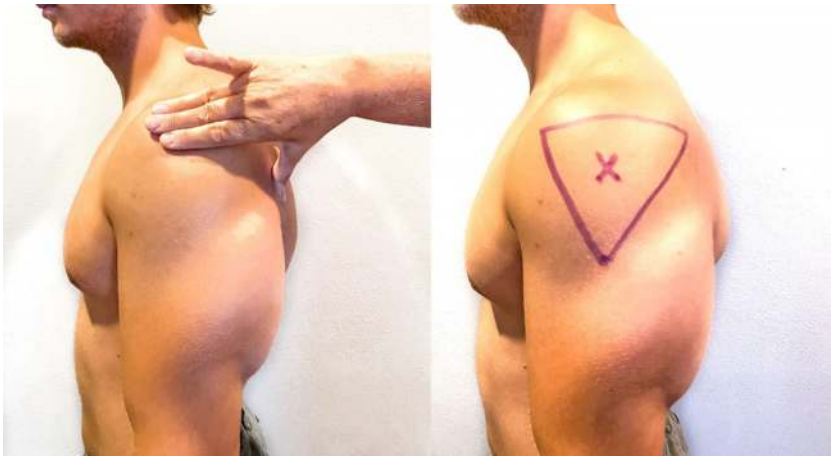


Figure **8.6.6**: The Deltoid Injection Site

Description of Procedure

When administering an intramuscular injection, the procedure is similar to a subcutaneous injection, but instead of pinching the skin, stabilize the skin around the injection site with your nondominant hand. With your dominant hand, hold the syringe like a dart and inject the needle quickly into the muscle at a 90-degree angle using a steady and smooth motion. After the needle pierces the skin, use the thumb and forefinger of the nondominant hand to hold the syringe. If aspiration is indicated according to agency policy and manufacturer recommendations, pull the plunger back to aspirate for blood. If no blood appears, inject the medication slowly and steadily. If blood appears, discard the syringe and needle and prepare the medication again. See Figure **8.6.7**[9] for an

image of aspirating for blood. After the medication is completely injected, remove the needle using a smooth, steady motion. Remove the needle at the same angle at which it was inserted. Cover the injection site with sterile gauze using gentle pressure and apply a Band-Aid if needed.[10]

Because the injection sites recommended for immunizations do not contain large blood vessels, the CDC recommends there is no longer the need to aspirate when administering vaccines.[11]



Figure **8.6.7**: Aspirating for Blood

Z-track Method for IM injections

Evidence-based practice supports using the **Z-track method** for administration of intramuscular injections. This method prevents the medication from leaking into the subcutaneous tissue, allows the medication to stay in the muscles, and can minimize irritation.[12]

The Z-track method creates a zigzag path to prevent medication from leaking into the subcutaneous tissue. This method may be used for all injections or may be specified by the medication.

Displace the patient's skin in a Z-track manner by pulling the skin down or to one side about 1 inch (2 cm) with your nondominant hand before administering the injection. With the skin held to one side, quickly insert the needle at a 90-degree angle. After the needle pierces the skin, continue pulling on the skin with the nondominant hand, and at the same time, grasp the lower end of the syringe barrel with the fingers of the nondominant hand to stabilize it. Move your dominant hand and pull the end of the plunger to aspirate for blood, if indicated. If no blood appears, inject the medication slowly. Once the medication is given, leave the needle in place for ten seconds. After the medication is completely injected, remove the needle using a smooth, steady motion, and then release the skin. See Figure **8.6.8**[13] for an illustration of the Z-track method.

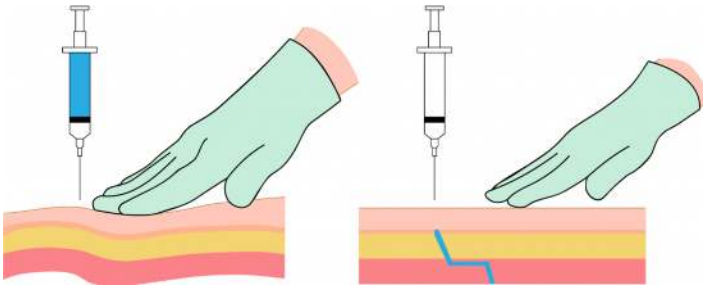


Figure **8.6.8**: Z-track Method

Special Considerations for IM Injections

- Avoid using sites with atrophied muscle because they will poorly absorb medications.
- If repeated IM injections are given, sites should be rotated to decrease the risk of hypertrophy.

- Older adults and thin patients may only tolerate up to 2 milliliters in a single injection.
- Choose a site that is free from pain, infection, abrasions, or necrosis.
- The dorsogluteal site should be avoided for intramuscular injections because of the risk for injury. If the needle inadvertently hits the sciatic nerve, the patient may experience partial or permanent paralysis of the leg.

Video Reviews of Administering Intramuscular Injections:

Z-Track Method[14]



IM injection Ventrogluteal Site[15]



IM injection Dorsogluteal Site[16]



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3. "Im-ventrogluteal-300x244.png" by British Columbia Institute of Technology is licensed under CC BY 4.0. Access for free at https://opentextbc.ca/clinicalskills/chapter/6-8-iv-push-medications-and-saline-lock-flush/↵
4. "Injection Site Image1.heic" by Meredith Pomietlo for Chippewa Valley Technical College is licensed under CC BY 4.0↵
5. "Im-vastus-lateralis.png" by British Columbia Institute of Technology is licensed under CC BY 4.0. Access for free at https://opentextbc.ca/clinicalskills/chapter/6-7-intradermal-subcutaneous-and-intramuscular-injections/↵
6. "Vastus Lateralis Site" by Meredith Pomietlo for Chippewa Valley Technical College is licensed under CC BY 4.0↵
7. "Im-deltoid.png" by British Columbia Institute of Technology is licensed under CC BY 4.0. Access for free at https://opentextbc.ca/clinicalskills/chapter/6-7-intradermal-subcutaneous-and-intramuscular-injections/↵
8. "Injection Site Image 3.jpg" and "Injection Site Image 2.jpg" by Meredith Pomietlo for Chippewa Valley Technical College are licensed under CC BY 4.0↵
9. "Sept-22-2015-111.jpg" by British Columbia Institute of Technology is licensed under CC BY 4.0. Access for free at https://opentextbc.ca/clinicalskills/chapter/6-8-iv-push-medications-and-saline-lock-flush/↵
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11. Centers for Disease Control and Prevention. (2019, April 15). *Vaccine administration*. https://www.cdc.gov/vaccines/pubs/pinkbook/vac-admin.html↵
12. Yilmaz, D., Khorshid, L., & Dedeoğlu, Y. (2016). The effect of the z-track technique on pain and drug leakage in intramuscular injections. *Clinical Nurse Specialist*, *30*(6), E7-E12. https://doi.org/10.1097/nur.0000000000000245↵
13. "Z-track-process-1.png" and "Z-track-process-3.png" by British Columbia Institute of Technology are licensed under CC BY 4.0. Access for free at https://opentextbc.ca/clinicalskills/chapter/6-8-iv-push-medications-and-saline-lock-flush/↵
14. RegisteredNurseRN. (2018, November 19). *Intramuscular injection in deltoid muscle with Z-Track Technique*. [Video]. YouTube. All rights reserved. Video used with permission. https://youtu.be/DBHnd3N-5Ns↵
15. RegisteredNurseRN. (2014, August 8). *How to give an IM intramuscular injection ventrogluteal buttock muscle*. [Video]. YouTube. All rights reserved. Video used with permission. https://youtu.be/wKCPiSnYqwA↵
16. RegisteredNurseRN. (2014, August 8). *How to give an IM intramuscular injection in the buttocks | Dorsogluteal hip injection technique*. [Video]. YouTube. All rights reserved. Video used with permission. https://youtu.be/v_pRjbM2sV8↵

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8.7: Applying the Nursing Process

Assessments Prior to Injection Administration

When administering any parenteral injection, the nurse assesses the patient prior to administration for safe medication administration. See Table 8.7.1 to review assessments prior to medication administration.

Table 8.7.1: Assessments Prior to Injection Administration

Assessment	Rationale/Considerations
Check the MAR with the written medication prescription for accuracy and completeness.	Prevent medication errors.
Perform the rights of medication administration, including patient's name, medication name and dose, route, time of administration, and verify the expiration date. Label syringes with medication names as you prepare them.	Prevent medication errors. Discard medication if expired. Label syringes during the procedure to administer medications safely according to the Joint Commission.[1]
Assess and review a patient's current medical condition, past medical history, and medication history.	Identify the need for the medication, as well as any possible contraindications for the administration of prescribed medication to the specific patient.
Assess the patient's history of medication allergies or nondrug allergies that may interfere with the medication. If there is a history of allergic reactions, document the type of reaction if possible (e.g., hives, rash, swelling, difficulty breathing). If there is an allergy to prescriber medication, do not prepare it and notify the prescribing provider.	Safely administer medication.
Review a current, evidence-based drug reference to determine medication action, indication for medication, normal dosage range, and potential side effects. Identify peak and onset times, as well as any nursing considerations.	Safely administer medication and plan to monitor the patient's response. For example, by knowing the peak onset of fast-acting insulin, the nurse anticipates when the patient may be most at risk for a hypoglycemic reaction.
Review and assess pertinent laboratory results (i.e., blood glucose, prothrombin times). Be aware of abnormal kidney and liver function results because they may affect metabolism of medication. Notify the prescriber of any concerns.	Collect data to determine if the medication should be withheld to ensure proper dosage and to establish a baseline for measuring the patient's response to the drug.
Observe the patient's verbal and nonverbal reactions to the injection.	Be aware of the patient's level of anxiety and use distractions and other therapeutic techniques to reduce pain and anxiety.
Perform patient assessments, such as vital signs, lung sounds, or pain level, as indicated, prior to medication administration.	Obtain baseline data to ensure medication administration is appropriate at this time and to establish a baseline for measuring the patient's response to the medication.
Assess for contraindications to subcutaneous or intramuscular injections such as muscle atrophy or decreased blood flow to the tissue.	Assess for contraindications because reduced muscle and blood flow interfere with the drug absorption and distribution.
Assess the patient's knowledge of the medication.	Perform patient education about the medication as needed.
Assess the skin and tissue quality around the area of the intended injection site. Note any bruising, nonintact skin, abrasions, masses, or scar tissue. Avoid these areas and choose another recommended location.	Assess skin and tissue quality to avoid unnecessary or further injury to the already compromised skin integrity. Areas that are scarred or atrophied can affect the absorption and distribution of the medication.

Evaluation

Nurses evaluate for possible complications of parenteral medication administration that may occur as a result of a medication error or as an adverse reaction. Complications may occur if a medication is prepared incorrectly, if the medication is injected incorrectly, or if an adverse effect occurs after the medication is injected. Unexpected outcomes can occur such as nerve or tissue damage, ineffective absorption of the medication, pain, bleeding, or infection.

An adverse reaction may develop as a result of an injected medication. An adverse reaction may also occur despite appropriate administration of medication and can happen for various reasons. A reaction may be evident within minutes or days after the exposure to the injectable medication. An unexpected outcome may range from a minor reaction, like a skin rash, to serious and life-threatening events such as anaphylaxis, hemorrhaging, and even death.

If a suspected complication occurs during administration, immediately stop the injection. Assess and monitor vital signs, notify the health care provider, and document an incident report.

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1. The Joint Commission. (n.d.). *2020 Hospital national patient safety goals.* https://www.jointcommission.org/standards/national-patient-safety-goals/↵

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8.8: Checklists for Parenteral Medication Administration

Checklist for Parenteral Site Identification

Use the checklist below to review the steps for completion of "Parenteral Site Identification."

Directions: Identify parenteral injection sites, needle size/gauge, injection angle, and the appropriate amount that can be administered in each of the parenteral routes: intradermal, subcutaneous, and intramuscular.

1. Describe the appropriate needle gauge, length, number of cc's, and angle for an intradermal injection:
   - 25-27G
   - 3/8″ to 5/8″
   - 0.1 mL (for TB testing)
   - 5 to 15 degree angle
2. Demonstrate locating the intradermal injection sites on a peer:
   - Upper third of the forearm
   - Outer aspects upper arms
   - Between scapula
3. Describe the appropriate needle gauge, length, number of mL, and angle for a subcutaneous injection:
   - 25-31G
   - ½" to 5/8″
   - Up to 1 mL
   - 45 to 90 degree angle
4. Demonstrate locating the subcutaneous injection sites on a peer:
   - Anterior thighs
   - Abdomen
5. Describe the appropriate needle gauge, length, number of mL, and angle for an adult intramuscular:
   - 18-25G
   - ½" – 1 ½" (based on age/size of patient and site used)
   - <0.5 – 1 mL (infants and children), 2-5 mL (adults)
   - 90-degree angle
6. Demonstrate locating the intramuscular injection sites on a peer:
   - Ventrogluteal
   - Vastus laterus
   - Deltoid
7. Explain how you would modify assessment techniques to reflect variations across the life span and body size variations.

Checklist for Parenteral Medication Injections

Use the checklist below to review the steps for completion of "Parenteral Medication Injections."

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

Special Considerations:

- Plan medication administration to avoid disruption.
- Dispense medication in a quiet area.
- Avoid conversation with others.
- Follow agency's no-interruption zone policy.
- Prepare medications for ONE patient at a time.

- Plan for disposal of sharps in an appropriate sharps disposal container.

1. Check the orders and MAR for accuracy and completeness; clarify any unclear orders.
2. Review pertinent information related to the medications: labs, last time medication was given, and medication information: generic name, brand name, dose, route, time, class, action, purpose, side effects, contraindications, and nursing considerations.
3. Gather available supplies: correctly sized syringes and needles appropriate for medication, patient's size, and site of injection; diluent (if required); tape or patient label for each syringe; nonsterile gloves; sharps container; and alcohol wipes.
4. Perform hand hygiene.
5. While withdrawing medication from the medication dispensing system, perform the first check of the six rights of medication administration. Check expiration date and perform any necessary calculations.
6. Select the correct type of syringe and needle size appropriate for the medication, patient size, and site of injection.

Preparing the Medication for Administration

1. Scrub the top of the vial of the correct medication. State the correct dose to be drawn.
2. Remove the cap from the needle. Pull back on the plunger to draw air into the syringe equal to the dose.
3. With the vial on a flat surface, insert the needle. Invert the vial and withdraw the correct amount of the medication. Expel any air bubbles. Remove the needle from the vial.
4. Using the scoop method, recap the needle.
5. Perform the second check of the six rights of medication administration, looking at the vial, syringe, and MAR.
6. Label the syringe with the name of the drug and dose.

Additional Preparation Steps When Mixing Two Types of Insulin in One Syringe

Intermediate-Acting (NPH) and Short-Acting (Regular) insulins

a. Place the vials side by side on a flat surface: NPH on left and regular insulin on the right.
b. With an alcohol pad, scrub off the vial top of the NPH insulin. Using a new alcohol pad, scrub the vial top of the regular insulin. Discard any prep pads.
c. Select the correct insulin syringe that will exactly measure the TOTAL dose of the amount of NPH and regular doses (30- and 50-unit syringes measure single units; 100-unit syringes only measure even numbered doses).
d. Pull back on the plunger to draw air into the syringe equal to the dose of NPH insulin.
e. With the NPH vial on a flat surface, remove the cap from the syringe, insert the needle into the NPH vial, and inject air. Do not let the tip of the needle touch the insulin solution. Withdraw the needle.
f. Pull back on the plunger to draw air into the syringe equal to the dose of the regular insulin.
g. With the regular vial on a flat surface, remove the cap from the syringe, insert the needle into the regular vial, and inject air.
h. With the needle still in the vial, invert the regular insulin vial and withdraw the correct dose. Remove the needle from the vial. Cap the needle using the scoop method.
i. Roll the NPH insulin vial between your hands to mix the solution. Uncap the needle and insert the needle into the NPH insulin vial. Withdraw the correct amount of NPH insulin. Withdraw the needle and recap using the scoop method.
j. Perform the second medication check of the combined dose looking at the vial, syringe, and MAR, verifying all the rights.
k. Label the syringe with the name of the combined medications and doses.

Alternative Preparation Using an Insulin Pen

a. Select the correct insulin pen to be used for the injection. Identify the dose to be given.
b. Remove the cap from the insulin pen and clean the top (hub) with an alcohol prep pad. Attach the insulin pen needle without contaminating the needle or pen hub.
c. Turn the dial to two units and push the injection button to prime the pen.
d. Turn the dial to the correct dose.
e. Perform the second medication check looking at the insulin pen and MAR, verifying all the rights.

Administration of Parenteral Medication

1. Knock, enter the room, greet the patient, and provide for privacy.
2. Perform safety steps:

- Perform hand hygiene.
- Check the room for transmission-based precautions.
- Introduce yourself, your role, the purpose of your visit, and an estimate of the time it will take.
- 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. Perform the third check of the six rights of medication administration at the patient's bedside after performing patient identification.
4. Perform the following steps according to the type of parenteral medication.

INTRADERMAL – Administration of a TB Test

a. Correctly identify the sites and verbalize the landmarks used for intradermal injections.
b. Select the correct site for the TB test, verbalizing the anatomical landmarks and skin considerations.
c. Put on nonsterile gloves if contact with blood or body fluids is likely or if your skin or the patient's skin isn't intact.
d. Use an alcohol swab in a circular motion to clean the skin at the site; place the pad above the site to mark the site, if desired.
e. Using the nondominant hand, gently pull the skin away from the site.
f. Insert the needle with the bevel facing upward, slowly at a 5- to 15-degree angle, and then advance no more than an eighth of an inch to cover the bevel.
g. Use the thumb of the nondominant hand to push on the plunger to slowly inject the medication. Inspect the site, noting if a small bleb forms under the skin surface.
h. Carefully withdraw the needle straight back out of the insertion site so not to disturb the bleb (do not massage or cover the site).
i. Activate the safety feature of the needle and place the syringe in the sharps container.
j. Teach the patient to return for a TB skin test reading in 48-72 hours and not to press on the site or apply a Band-Aid.

SUBCUTANEOUS – Administration of Insulin in a Syringe

a. Correctly identify the sites and verbalize the landmarks used for subcutaneous injections. Ask the patient regarding a preferred site of medication administration.
b. Put on nonsterile gloves if contact with blood or body fluids is likely or if your skin or the patient's skin isn't intact.
c. Select an appropriate site and clean with an alcohol prep in a circular motion. Place the pad above the site to mark the location, if desired. Remove the cap from the needle without contaminating the needle.
d. Pinch approximately an inch of subcutaneous tissue, creating a skinfold.
e. Inject the needle at 90-degree angle, release the patient's skin, and inject the medication. Withdraw the needle.
f. Activate the safety feature of the needle and place the syringe in a sharps container.

SUBCUTANEOUS – Administration with an Insulin Pen

a. Select the site and clean with an alcohol prep in a circular motion. Place the pad above the site to mark the location, if desired. Remove the cap from the needle without contaminating the needle.
b. Put on nonsterile gloves if contact with blood or body fluids is likely or if your skin or the patient's skin isn't intact.
c. Pinch approximately an inch of subcutaneous tissue, creating a skinfold.
d. Inject the needle quickly at a 90-degree angle, continue to hold the skinfold, and inject the medication. After the medication is injected, count to 10, remove the needle, and release the skinfold.
e. Dispose of the needle in a sharps container. Replace the top cap to the insulin pen.

INTRAMUSCULAR – Deltoid

a. Correctly identify the site and verbalize the landmarks used for a deltoid injection.
b. Put on nonsterile gloves if contact with blood or body fluids is likely or if your skin or the patient's skin isn't intact.

c. Use an alcohol swab in a circular motion to clean the skin at the site. Place a pad above the site to mark the location. Remove the cap from the needle without contaminating the needle.
d. Depending on the muscle mass of the deltoid, either grasp the body of the muscle between the thumb and forefingers of the nondominant hand or spread the skin taut.
e. Inject the needle at a 90-degree angle.
f. Follow agency policy and manufacturer recommendations regarding aspiration.
g. Continue to hold the muscle fold and inject the medication. After the medication is injected, count to 10, remove the needle, and release the muscle fold.
h. Activate the safety on the syringe. Place the syringe in a sharps container.

INTRAMUSCULAR – Vastus Lateralis

a. Correctly identify the site and verbalize the landmarks to locate the vastus lateralis site.
b. Put on nonsterile gloves if contact with blood or body fluids is likely or if your skin or the patient's skin isn't intact.
c. Use an alcohol swab in a circular motion to clean the skin at the site. Place the pad above the site to mark the location. Remove the cap from the needle without contaminating the needle.
d. Depending on the muscle mass of the vastus lateralis, either grasp the body of the muscle between the thumb and forefingers of the nondominant hand or spread the skin taut.
e. Inject the needle at a 90-degree angle.
f. Follow agency policy and manufacturer recommendations regarding aspiration.
g. Continue to hold the muscle fold and inject the medication. After the medication is injected, count to 10, remove the needle, and release the muscle fold.
h. Activate the safety on the syringe. Put the needle in a sharps container.

INTRAMUSCULAR – Ventrogluteal (Using the Z-track Technique)

a. Correctly identify and verbalize the landmarks used to locate the ventrogluteal site.
b. Put on nonsterile gloves if contact with blood or body fluids is likely or if your skin or the patient's skin isn't intact.
c. Use an alcohol swab in a circular motion to clean the skin at the site and place a pad above the site to mark the location. Remove the cap from the needle without contaminating the needle.
d. Place the ulnar surface of the hand approximately 1 – 3 inches from the selected site; press down and pull the skin and subcutaneous tissue to the side or downward.
e. Maintaining tissue traction, hold the syringe like a dart and insert the needle into the skin at 90 degrees.
f. Maintaining tissue traction, use the available thumb and index finger to help stabilize the syringe.
g. Follow agency policy and manufacturer recommendations regarding aspiration. If aspiration is required, pull back the plunger and observe for blood return. If there is no blood return, inject the medication. If blood return is observed, remove the needle, and prepare a new medication.
h. Maintaining tissue traction, wait 10 seconds with the needle still in the skin to allow the muscle to absorb the medication. Withdraw the needle from the site and then release traction. Do not rub/massage the site.
i. Activate the safety feature of the needle; place in a sharps container.

Following Conclusion of All Injections

1. Assess site; apply Band-Aid if necessary and appropriate.
2. Remove gloves. Perform hand hygiene.
3. Ensure safety measures before leaving the room:
   - CALL LIGHT: Within reach
   - BED: Low and locked (in lowest position and brakes on)
   - SIDE RAILS: Secured
   - TABLE: Within reach
   - ROOM: Risk-free for falls (scan room and clear any obstacles)
4. Document medication administered, including the site used for the injection.

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8.9: Sample Documentation

Patient reports post-surgical pain at a level of 8/10. Patient is grimacing when moving in the bed and describes pain as a dull constant ache located in the right lower abdomen surgical incision area that is aggravated by moving or repositioning. Blood pressure 146/80, heart rate 94 bpm, respirations 22 per minute, temperature (tympanic) 98.8°F, pulse oximetry 98%. Last pain medication Ketorolac 30 mg (IM) given 8 hours ago. Incision site is dry and intact. Ketorolac 30mg IM administered per health provider's prescription in the left ventrogluteal area with 22-gauge needle, length 1 ½ inches. Patient tolerated the procedure without difficulty or increased pain. Injection site post-procedure without bleeding or hematoma.

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8.10: Learning Activities

Learning Activities

(Answers to “Learning Activities” can be found in the “Answer Key” at the end of the book. Answers to interactive activity elements will be provided within the element as immediate feedback.)

1. An older, frail patient is prescribed a flu vaccine that is an aqueous or water-based solution. The patient’s deltoid muscle is not very prominent, and the patient has very little fat over the deltoid. The needles available are 23 G 5⁄8 inch, 22 G 1 inch, and 20 G 1 1⁄2 inch.

a. **What needle size/length would work best for this particular medication and patient?** *Give the reason for your selection.*

2. A patient is hospitalized on the surgical floor. Pain medication is prescribed to be given by intramuscular route. After calculating, the volume to be administered is 2 mL. The patient has a large amount of adipose tissue around her hips and buttocks region and weighs 253 pounds. The needle sizes available include 27 G 3⁄8 inch, 25 G 5⁄8 inch, 22 G 1 inch, 21 G 1 1⁄2 inch, and 20 G 2 inches.

a. **What needle size/length and injection site would work best for this particular medication and patient?** *Give the reason for your selection.*

3. The nurse is teaching a patient how to mix 5 units of regular insulin and 15 units of NPH insulin in the same syringe. **The nurse determines further instruction is needed if the patient does which of the following?**

a. Injects 5 units of air into the regular insulin vial first and withdraws 5 units of regular insulin
b. Injects 15 units of air into the NPH insulin vial but does not withdraw the medication
c. Withdraws 5 units of regular insulin before withdrawing 15 units of NPH insulin
d. Calculates the combined total insulin dose as 20 units after withdrawing the regular insulin from the vial

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8.11: XVIII Glossary

Ampules: Small glass containers of liquid medication ranging from 1 mL to 10 mL sizes.

Bleb: A small, raised circle that appears after administration of an intradermal medication indicating correct placement into the dermis.

Deltoid: Commonly used for intramuscular vaccinations in adults because it has a triangular shape and is easy to locate and access. The injection site is in the middle of the deltoid muscle, about 1 to 2 inches below the acromion process.

Gauge: Refers to the diameter of a needle. Gauges can vary from very small diameter (25 to 29 gauge) to large diameter (18 to 22 gauge).

Intradermal injection: Medication administered in the dermis just below the epidermis.

Intramuscular injection: Medication administered into a muscle.

Intravenous injection: Medication administered directly into the bloodstream.

Subcutaneous injection: Medication administered into the subcutaneous tissue just under the dermis.

Vastus lateralis: A muscle located on the anterior lateral aspect of the thigh and extends from one hand's breadth above the knee to one hand's breadth below the greater trochanter. It is commonly used for immunizations in infants and toddlers because the muscle is thick and well-developed.

Ventrogluteal: The safest intramuscular injection site for adults and children because it provides the greatest thickness of gluteal muscles, is free from penetrating nerves and blood vessels, and has a thin layer of fat.

Z-track method: A method for administering intramuscular injections that prevents the medication from leaking into the subcutaneous tissue, allows the medication to stay in the muscles, and minimizes irritation.

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CHAPTER OVERVIEW

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9.1: Specimen Collection Introduction

Learning Objectives

- Accurately collect specimens for blood glucose monitoring, nasal swabs, and oropharyngeal swabs
- Modify procedure to reflect variations across the life span
- Maintain standard and transmission-based precautions
- Select appropriate equipment
- Explain procedure to patient
- Document actions and observations
- Recognize and report significant deviations from norms

This chapter will describe specimen collection for blood glucose monitoring, nasal swabs, oropharyngeal swabs, sputum, and stool.

Additional information regarding obtaining wound cultures can be found in "Wound Care," and information about obtaining urine cultures can be found in the "Facilitation of Elimination."

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9.2: Blood Glucose Monitoring

Blood glucose monitoring is performed on patients with diabetes mellitus and other conditions that cause elevated blood sugar levels. Diabetes mellitus is a common medical condition that affects the body's ability to produce insulin in the pancreas and use insulin at the cellular level. There are two types of diabetes mellitus, type 1 and type 2. Type 1 diabetes mellitus 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. It typically begins in childhood or adolescence. Type 2 diabetes mellitus accounts for approximately 95 percent of all cases and is highly correlated with obesity and inactivity. During type 2 diabetes, the cells of the body become resistant to the effects of insulin, and the pancreas increases its production of insulin. However, over time, the pancreas may no longer be able to produce insulin. In many cases, type 2 diabetes can be managed by moderate weight loss, regular physical activity, and a healthy diet. However, if blood glucose levels cannot be controlled with healthy lifestyle choices, oral diabetic medication is prescribed and eventually, the administration of insulin may be required.[1] Prediabetes is a medical condition where blood sugar levels are higher than normal, but not high enough yet to be diagnosed as type 2 diabetes. Approximately one in three American adults have prediabetes. Gestational diabetes is a type of diabetes that occurs during pregnancy in women who did not have diabetes before they were pregnant.

Diabetic patients require frequent blood glucose monitoring to administer customized medication therapy to prevent long-term complications from occurring. Hospitalized patients who do not have diabetes may also require frequent blood glucose monitoring due to elevations that can occur as a result of the stress of hospitalization, surgical procedures, and side effects of medications. Additionally, patients receiving enteral feedings typically have their blood glucose monitored every six hours. Health care providers prescribe the frequency of blood glucose monitoring; testing is typically performed before meals and at bedtime. For some patients, a **standardized sliding-scale insulin** protocol may be prescribed with instructions on the medication administration record (MAR) for administration of insulin based on their blood glucose results.[2],[3] See Table **9.2.1** for an example of a sliding-scale insulin protocol.

Table **9.2.1**: Sample Sliding-Scale Insulin Protocol

Instructions: Check patient's blood sugar before meals, at bedtime, and as needed for symptoms of hypoglycemia or hyperglycemia. Use the following table to administer insulin lispro PRN.

Blood Sugar Range	Lispro Insulin Instructions
Less than 70	Hold all insulin and initiate hypoglycemia protocol.
70-150	0 units
151-174	2 units
175-199	4 units
200-224	6 units
225-249	8 units
250-274	10 units
275-299	12 units
Greater than 300	Administer 14 units and call the provider.

Hypoglycemia

When caring for patients with diabetes mellitus and monitoring their blood glucose readings, it is important to continually monitor for signs of hypoglycemia. **Hypoglycemia** is defined as blood sugar readings less than 70 and signs and symptoms such as the following:

- Shakiness
- Feeling nervous or anxious

- Sweating, chills, and clamminess
- Irritability or impatience
- Confusion
- Fast heartbeat
- Feeling light-headed or dizzy
- Hunger
- Nausea
- Color draining from the skin (pallor)
- Feeling sleepy
- Feeling weak or having no energy
- Blurred/impaired vision
- Tingling or numbness in the lips, tongue, or cheeks
- Headaches
- Coordination problems or clumsiness
- Nightmares or crying out during sleep
- Seizures[4]

A low blood sugar level triggers the release of epinephrine (adrenaline), the "fight-or-flight" hormone. Epinephrine causes the symptoms of hypoglycemia such as a rapid heartbeat, sweating, and anxiety. If a patient's blood sugar level continues to drop, the brain has impaired functioning. This may lead to seizures and a coma.[5]

If a nurse suspects hypoglycemia is occuring, a blood sugar reading should be obtained and appropriate actions taken. Most agencies have a hypoglycemia protocol based on the "15-15 Rule." The **15-15 rule** is to provide 15 grams of carbohydrate and recheck the blood glucose after 15 minutes. If the reading is still below 70 mg/dL, another serving of 15 grams of carbohydrate should be provided and the process continued until the blood sugar is above 70 mg/dL. Fifteen grams of carbohydrate includes options like 4 ounces of juice or regular soda, hard candy, or glucose tablets. If a patient is experiencing severe hypoglycemia and cannot swallow, a glucagon injection or intravenous administration of dextrose may be required.[6]

Hyperglycemia

Hyperglycemia is defined as elevated blood glucose and often causes signs and symptoms such as frequent urination and increased thirst. Hyperglycemia occurs when the patient's body does not produce enough insulin or cannot use the insulin properly at the cellular level. There are many potential causes of hyperglycemia, such as not receiving enough medication to effectively control blood glucose, eating more than planned, exercising less than planned, or increased stress from an illness, surgery, hospitalization, or other life events.

If a patient's blood glucose is greater than 240 mg/dL, their urine is typically checked for ketones. Ketones indicate a condition called ketoacidosis may be occurring. Ketoacidosis occurs in patients whose pancreas is no longer creating insulin, so fats are broken down for energy and waste products called ketones are produced. If the kidneys cannot effectively eliminate ketones in the urine, they build up in the blood and cause ketoacidosis. **Ketoacidosis** is a life-threatening condition that requires immediate notification of the provider for treatment. Symptoms of ketoacidosis include fruity-smelling breath, nausea, vomiting, very dry mouth, and shortness of breath. Treatment of ketoacidosis often requires the administration of intravenous insulin while the patient is closely monitored in a critical care inpatient unit.[7]

> **Note**
>
> For more information about diabetes mellitus, measuring blood sugar levels, and diabetic medications, visit the "Endocrine" chapter in Open RN *Nursing Pharmacology*.

Glucometer Use

It is typically the responsibility of a nurse to perform bedside blood glucose readings, but in some agencies, this procedure may be delegated to trained nursing assistants or medical assistants. See Figure **9.2.1**[8] for an image of a standard bedside glucometer kit that contains a glucometer, lancets, reagent strips, and calibration drops. Prior to performing a blood glucose test, read the

manufacturer's instructions and agency policy because they may vary across devices and sites. Ensure the glucometer has been calibrated per agency policy.[9]

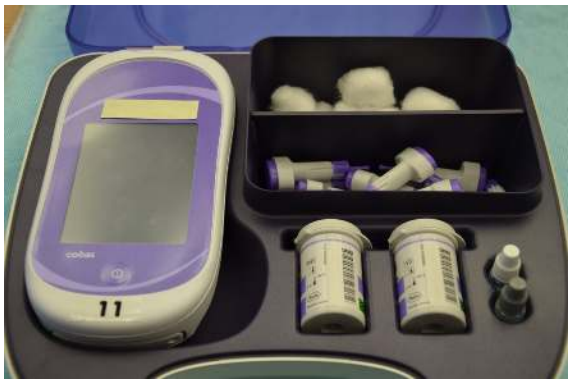


Figure **9.2.1**: Bedside Glucometer

Before beginning the procedure, determine if there are any conditions present that could affect the reading. For example, is the patient fasting? Has the patient already begun eating? Is the patient demonstrating any symptoms of hypoglycemia or hyperglycemia? Keep your patient safe by applying your knowledge of diabetes, the medication being administered, and the uniqueness of the patient to make appropriate clinical judgments regarding the procedure and associated medication administration.[10]

See the "Checklist for Blood Glucose Monitoring" for details regarding the procedure. It is often important to keep the patient's hand warm and in a dependent position to promote vasodilation and obtain a good blood sample. If necessary, warm compresses can be applied for 10 minutes prior to the procedure to promote vasodilation. Follow the manufacturer's instructions to prepare the glucometer for measurement. After applying clean gloves, clean the patient's skin with an alcohol wipe for 30 seconds, allow the site to dry, and then puncture the skin using the lancet. See Figure **9.2.2**[11] for an image of performing a skin puncture using a lancet.



Figure **9.2.2**: Using a Lancet to Perform a Skin Puncture

If needed, gently squeeze above the site to obtain a large drop of blood. Do not milk or massage the finger because it may introduce excess tissue fluid and hemolyze the specimen. Wipe away the first drop of blood and use the second drop for the blood sample. Follow agency policy and manufacturer instructions regarding placement of the drop of blood for absorption on the reagent strip. See Figure **9.2.3**[12] for an image of a nurse absorbing the patient's drop of blood on the reagent strip. Timeliness is essential in gathering an appropriate specimen before clotting occurs or the glucometer times out.

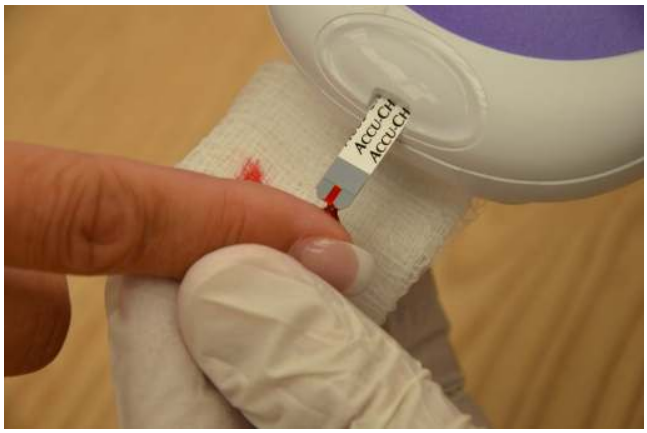


Figure **9.2.3**: Obtaining Drop of Blood

Cleanse the glucometer and document the blood glucose results according to agency policy. Report any concerns about patient symptoms or blood sugar results according to agency policy.

Life Span Considerations

Blood glucose samples should be taken from the heel of newborns and infants up to the age of six months. When obtaining a sample from the heel, the sample is taken from the medial or lateral plantar surface.

Video Review of Obtaining a Bedside Blood Sugar[13]



1. This work is a derivative of Nursing Pharmacology by Open RN licensed under CC BY 4.0. ↵
2. This work is a derivative of Clinical Procedures for Safer Patient Care by British Columbia Institute of Technology and is licensed under CC BY 4.0↵
3. Donihi, A. C., DiNardo, M. M., DeVita, M. A., & Korytkowski, M. T. (2006). Use of a standardized protocol to decrease medication errors and adverse events related to sliding scale insulin. *Quality & Safety in Health Care*, *15*(2), 89–91. doi.org/10.1136/qshc.2005.014381↵
4. American Diabetes Association. (n.d.). *Hypoglycemia (Low blood sugar)*. https://diabetes.org/living-with-diabetes/hypoglycemia-low-blood-glucose/symptoms-treatment↵
5. American Diabetes Association. (n.d.). *Hypoglycemia (Low blood sugar)*. https://diabetes.org/living-with-diabetes/hypoglycemia-low-blood-glucose/severe↵
6. American Diabetes Association. (n.d.). *Hypoglycemia (Low blood sugar)*. https://diabetes.org/living-with-diabetes/hypoglycemia-low-blood-glucose/severe↵
7. American Diabetes Association. (n.d.). *Hyperglycemia (High blood glucose)*. https://diabetes.org/about-diabetes/complications/ketoacidosis-dka/dka-ketoacidosis-ketones↵

8. “DSC_0718.jpg” by British Columbia Institute of Technology is licensed under CC BY 4.0. Access for free at https://opentextbc.ca/clinicalskills/chapter/8-2-glucometer-use/. ↵
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12. “DSC_1141.jpg” by British Columbia Institute of Technology is licensed under CC BY 4.0. Access for free at https://opentextbc.ca/clinicalskills/chapter/8-2-glucometer-use/. ↵
13. RegisteredNurseRN. (2015, August 12). *How to prick finger tips with a lancet device for checking a blood sugar | Nursing skills.* [Video]. YouTube. All rights reserved. Video used with permission. https://youtu.be/JPJ4l7QZ9eM↵

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9.3: Nasal Specimen Collection

Specimen collections from a patient's anterior nasal cavity and nasopharynx are used to test for multiple viral illnesses such as influenza and COVID-19. Nasal swabs can be performed by the nurse or the patient with proper education. It is vital to understand the anatomy of these areas to obtain an accurate sample so that patients receive the appropriate care they need. See Figure **9.3.1**[1] for an image of the anatomy of the head and neck.

Review the "Checklist for Obtaining a Nasal Swab" for details about performing a nasal swab procedure.

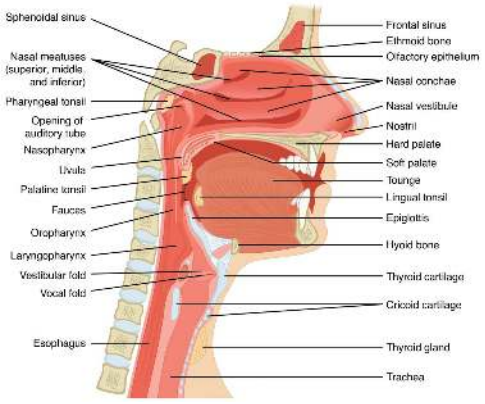


Figure **9.3.1**: Anatomy of the Head and Neck

Video Review of Nasopharyngeal Specimens and COVID-19 Testing:

Collection of Nasopharyngeal Specimens with the Swab Technique[2]



Introduction to COVID-19 Tests[3]



1. "2303 Anatomy of Nose-Pharynx-Mouth-Larynx.jpg" by OpenStax is licensed under CC BY 3.0. ↵
2. NEJMVideo. (2009, November 23). *NEJM procedure: Collection of nasopharyngeal specimens with the swab technique*. [Video]. YouTube. All rights reserved. This video is included on the basis of Fair Use. https://youtu.be/DVJNWefmHjE↵
3. U.S. Food and Drug Administration. (2020, June 4). *An introduction to COVID-19 tests.* [Video]. YouTube. All rights reserved. https://youtu.be/5hu7_xIsCRgt↵

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9.4: Oropharyngeal Specimen Collection

The **oropharynx** is the part of the throat at the back of the mouth behind the oral cavity. It includes the back third of the tongue, the soft palate, the side and back walls of the throat, and the tonsils.[1] When obtaining a specimen from this area, it is important to avoid the tongue and teeth. Depending on the test ordered, the nurse may obtain the specimen from the tonsils alone or the posterior pharynx (throat) and the tonsils. Keep in mind that if you are ever unsure about how to accurately obtain a specimen, lab technicians are a great resource.

See the "Checklist for Oropharyngeal Testing" for additional details about performing the procedure.

Life Span Considerations

Infants and Children

Specimen collection on infants and children may require the support of another health care provider or a parent. Educate the patient and the parent about the procedure and the expectations if the parent decides to assist with the specimen collection. During specimen collection, it's important that the patient is immobile to prevent injury to the nasal cavity, nasopharyngeal, or oropharynx.

Note

View Medscape's YouTube video to review oropharyngeal testing:[2]
How to Perform a Throat Swab

1. National Cancer Institute. (n.d.). *Oropharynx*. https://www.cancer.gov/publications/dictionaries/cancer-terms/def/oropharynx↵
2. Medscape. (2018, August 23). *How to perform a throat swab on a patient*. [Video]. YouTube. All rights reserved. https://youtu.be/-uyBJ0nv4oI↵

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9.5: Sputum Specimen Collection

Sputum specimens collected by expectoration are commonly used for cytology, culture and sensitivity, and acid-fast bacilli (AFB) testing. Cytologic examination identifies abnormal cells such as cancer. Culture and sensitivity testing identifies specific infectious microorganisms and their sensitivity to antibiotics. Optimally, sputum samples used for culture and sensitivity testing should be collected before initiating antibiotic therapy because antibiotics affect the results. AFB testing, along with culture and sensitivity testing, is used to diagnose tuberculosis (TB). When testing for TB, at least three consecutive samples are collected, with at least one being an early morning sample.

Prior to implementing the procedure, it is helpful to ensure the patient is well-hydrated. Hydration helps thin and loosen sputum and increases the likelihood of obtaining an adequate sample. If the patient is prescribed nebulizer treatments, it is helpful to administer this treatment prior to the procedure to help mobilize secretions. It is also important to assess if the patient is experiencing pain related to coughing. For example, pain following chest or abdominal surgery can inhibit the patient from taking deep breaths and expectorating. In this case, pain medication should be provided prior to performing the procedure. Patients can also be encouraged to support surgical wounds with a pillow while coughing to provide additional support and comfort.

It is best to obtain sputum samples in the early morning because secretions accumulate overnight. The patient can rinse their mouth with water prior to the procedure, but avoid mouthwash or toothpaste because these products can affect the microorganisms in the sample. Remove dentures if they are present.

Be aware that droplets and aerosols may be generated when collecting sputum specimens, so use appropriate personal protective equipment when entering the room and during the procedure based on the patient's condition. Explain the procedure to the patient, the type of specimen required, and the difference between oral secretions and sputum. Position the patient in a seated position in a chair or at the side of the bed, or place them in high Fowler's position.

Instruct the patient to take three slow, deep breaths and then cough deeply. Repeat this process until the patient has produced sputum, with rest periods between each maneuver.

When the patient has mobilized sputum, instruct them to expectorate directly into a sterile specimen container without touching the inside or rim of the container. The specimen should be at least 5 mL (one teaspoon); ask the patient to continue producing and expectorating sputum until this amount is achieved. Assess the sputum specimen to ensure it is sputum and not saliva. Sputum appears thick and opaque, whereas saliva appears thin, clear, and watery.

Cap the specimen container tightly and ensure it is labeled with the patient's name. Place the specimen in a transport bag and send it to the laboratory for analysis. Document the time and date the sputum specimen was collected and the characteristics of the sputum, including amount and color.

If a patient is unable to expectorate a sputum sample, other interventions may be required to mobilize secretions. It is often helpful to collaborate with a respiratory therapist for assistance in this situation. Interventions may include nebulizers, hydration, deep-breathing exercises, chest percussion, and postural drainage. If these interventions are not successful, a sputum sample may be obtained via oropharyngeal or endotracheal suctioning; these methods are used to obtain sputum samples for patients who are intubated.[1],[2],[3]

Note

Read South Dakota Department of Health's PDF with instructions for collecting a sputum sample:
Sputum Collection Instructions

1. Shepherd, E. (2017). Specimen collection 4: Procedure for obtaining a sputum specimen. *Nursing Times*, *113*(10), 49-51. https://www.nursingtimes.net/clinical-archive/assessment-skills/specimen-collection-4-procedure-for-obtaining-a-sputum-specimen-11-09-2017/↵
2. Sputum collection by expectoration. (2020). Lippincott procedures. http://procedures.lww.com↵
3. South Dakota Department of Health (2018, February). *Sputum collection instructions*. https://doh.sd.gov/documents/diseases/infectious/SputumCollection.pdf↵

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9.6: Stool Specimen Collection

Stool samples are collected from patients to test for cancer, parasites, or for occult blood (i.e., hidden blood). Follow specific instructions from the laboratory for collecting the sample.

The Guaiac-Based Fecal Occult Blood Test (gFOBT) is a commonly used test to find hidden blood in the stool that is not visibly apparent. As a screening test for colon cancer, it is typically obtained by the patient in their home using samples from three different bowel movements. Nurses may assist in gFOBT specimen collection during inpatient care.

Before the test, the patient should avoid red meat for three days and should not take aspirin or nonsteroidal anti-inflammatory drugs (NSAIDs), such as ibuprofen, for seven days prior to the test. (Blood from the meat can cause a false positive test, and aspirin and NSAIDS can cause bleeding, leading to a false positive result.) Vitamin C (more than 250 mg a day) from supplements, citrus fruits, or citrus juices should be avoided for 3 to 7 days before testing because it can affect the chemicals in the test and make the result negative, even if blood is present.

To perform a gFOBT in an inpatient setting, perform the following steps.

- Verify the patient has not consumed red meat for three days, has not taken aspirin or NSAIDs for seven days prior to the test, and has not had vitamin C greater than 250 mg daily for the past 3-7 days because these substances can affect the results.
- Explain the procedure to the patient. Instruct them to flush the toilet before defecating to remove any potential chemicals and to not place toilet paper in the toilet after defecating. Request they notify you when they have had a bowel movement.
- Review the manufacturer's instructions because different test kits may have different instructions. Contact the laboratory with any questions.
- Label the card with the patient's name and medical information per agency policy. Open the flap of the guaiac test card.
- Apply nonsterile gloves. Use the applicator stick to apply a thin smear of the stool specimen to one of the squares of filter paper on the card. Obtain a second specimen from a different part of the stool and apply it to the second square of filter paper on the card. (Occult blood isn't typically equally dispersed throughout the stool.)
- Place the labeled test card in a transport bag and send it to the laboratory for analysis.
- If you are working in an agency where nurses apply the guaiac developer solution to the card, allow the specimen to dry for 3 to 5 minutes. Open the reverse side of the card and apply two drops of guaiac developer solution to each square. A blue reaction will occur within 60 seconds if the test is positive. The absence of a blue color after 60 seconds is considered a negative test.
- Document the date and time of the test and any unusual characteristics of the stool sample.[1],[2]

1. American Cancer Society (2020, June 29). *Colorectal cancer screening tests*. www.cancer.org/cancer/colon-rectal-cancer/detection-diagnosis-staging/screening-tests-used.htm↵
2. A.D.A.M. Medical Encyclopedia [Internet]. Atlanta (GA): A.D.A.M., Inc.; c1997-2021. Stool guaiac test; [updated 2021, February 26]. https://medlineplus.gov/ency/article/003393.htm↵

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9.7: Sample Documentation

Sample Documentation of Expected Findings

Patient alert and oriented x 3, sitting in a wheelchair and awaiting breakfast. Patient denies symptoms of hypoglycemia or hyperglycemia. Bedside blood glucose obtained with results of 135 mg/dL. 2 units of regular insulin given per sliding scale. Breakfast delivered to the patient.

Sample Documentation of Unexpected Findings

0730: Patient alert and oriented x 3, sitting in a wheelchair and awaiting breakfast. Denies symptoms of hypoglycemia and hyperglycemia. Bedside blood glucose obtained with results of 185 mg/dL. 6 units of regular insulin given per sliding scale along with 34 units of scheduled NPH insulin as breakfast tray was delivered to patient.

0900: Patient only ate 25% of breakfast and complains of headache, fatigue, and dizziness. Patient is shaking and irritable but alert and oriented x 3. Blood glucose was rechecked and results were 65 mg/dL. 4 ounces of orange juice was provided.

0915: Blood glucose rechecked and results were 95 mg/dL. Patient states, "I'm feeling much better and not dizzy anymore." Shakiness has resolved. Provided a peanut butter sandwich per patient request. Will continue to monitor the patient for signs of hypoglycemia. Call light within reach.

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9.8: Checklist for Blood Glucose Monitoring

Use the checklist below to review the steps for completion of “Blood Glucose Monitoring.”

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

1. Prepare before completing the procedure:
    - Review the patient’s medical history and current medications.
        - Note if the patient is receiving anticoagulant therapy. Anticoagulant therapy may result in prolonged bleeding at the puncture site and require pressure to the site.
    - Assess the patient for signs and symptoms of hyperglycemia or hypoglycemia to correlate data to pursue acute action due to an onset of symptoms.
    - Determine if the test requires special timing, for example, before or after meals.
        - Blood glucose monitoring is typically performed prior to meals and the administration of antidiabetic medications.
2. Gather supplies: nonsterile gloves, alcohol swab, lancet, 2″ x 2″ gauze or cotton ball, reagent strips, and blood glucose meter.
    - Determine if the blood glucose meter needs to be calibrated according to agency policy to ensure accuracy of readings.
    - Read and understood the manufacturer’s instructions and agency policy for the blood glucose meters.
3. Perform safety steps:
    - Perform hand hygiene.
    - Check the room for transmission-based precautions.
    - Introduce yourself, your role, the purpose of your visit, and an estimate of the time it will take.
    - 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.
4. Have the patient wash their hands with soap and warm water, and position the patient comfortably in a semi-upright position in a bed or upright in a chair. Encourage the patient to keep their hands warm. Washing reduces transmission of microorganisms and increases blood flow to the puncture site.
    - Agency policy may require use of an alcohol swab to clean the puncture site.
    - Ensure that the puncture site is completely dry prior to skin puncture.
5. Remove a reagent strip from the container and reseal the container cap to keep the strips free from damage from environmental factors. Do not touch the test pad portion of the reagent strip.
6. Follow the manufacturer’s instructions to prepare the meter for measurement.
7. Place the unused reagent strip in the glucometer or on a clean, dry surface (e.g., paper towel) with the test pad facing up, based on manufacturer recommendations.
8. Apply nonsterile gloves.
9. Keep the area to be punctured in a dependent position. Do not milk or massage the finger site:
    - Dependent position will increase blood flow to the area.
    - Do not milk or massage the finger because it may introduce excess tissue fluid and hemolyze the specimen.
    - Warm water, dangling the hand for 15 seconds, and a warm towel stimulate the blood flow to the fingers.
    - Avoid having the patient stand during the procedure to reduce the risk of fainting.
10. Select the appropriate puncture site. Cleanse the site with an alcohol swab for 30 seconds and allow it to dry. Perform the skin puncture with the lancet, using a quick, deliberate motion against the patient’s skin:

- The patient may have a preference for the site used. For example, the patient may prefer not to use a specific finger for the skin puncture. However, keep in mind their preferred site may be contraindicated. For example, do not use the hand on the same side as a mastectomy.
- Avoid fingertip pads; use the sides of fingers.
- Avoid fingers that are calloused, have broken skin, or are bruised.

11. Gently squeeze above the site to produce a large droplet of blood.
    - Do not contaminate the site by touching it.
    - The droplet of blood needs to be large enough to cover the test pad on the reagent strip.
    - Wipe away the first drop of blood with gauze.
12. Transfer the second drop of blood to the reagent strip per manufacturer's instructions:
    - The test pad must absorb the droplet of blood for accurate results. Smearing the blood will alter results.
    - The timing and specific instructions for measurement will vary between blood glucose meters. Be sure to read the instructions carefully to ensure accurate readings.
13. Apply pressure, or ask the patient to apply pressure, to the puncture site using a 2″ x 2″ gauze pad or clean tissue to stop the bleeding at the site.
14. Read the results on the unit display.
15. Turn off the meter and dispose of the test strip, 2″ x 2″ gauze, and lancet according to agency policy. Use caution with the lancet to prevent an unintentional sharps injury.
16. Remove gloves.
17. Perform hand hygiene.
18. Assist the patient to a comfortable position, review test results with the patient, ask if they have any questions, and thank them for their time.
19. Ensure safety measures when leaving the room:
    - CALL LIGHT: Within reach
    - BED: Low and locked (in lowest position and brakes on)
    - SIDE RAILS: Secured
    - TABLE: Within reach
    - ROOM: Risk-free for falls (scan room and clear any obstacles)
20. Document the results and related assessment findings. Report critical values according to agency policy, such as values below 70 or greater than 300, and any associated symptoms. Read more about hypoglycemia and hyperglycemia in the "Blood Glucose Monitoring" section of this chapter.

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9.9: Checklist for Obtaining a Nasal Swab

Use the checklist below to review the steps for completion of “Obtaining a Nasal Swab.”

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

1. Gather supplies: N95 respirator (or face mask if respirators are not available), gloves, gown, eye protection (goggles or disposable face shields that cover the front and sides of the face), and physical barriers (e.g., plexiglass) if needed.
2. Apply appropriate PPE: gown, N95 respirator (or face mask if a respirator is not available), gloves, and eye protection are needed for staff collecting specimens or working within 6 feet of the person being tested.
3. Perform safety steps:
    - Perform hand hygiene.
    - Check the room for transmission-based precautions.
    - Introduce yourself, your role, the purpose of your visit, and an estimate of the time it will take.
    - 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.
4. Open the sampling kit using clean technique on a clean surface. The kit should contain a biohazard bag, specimen container, and a nasal swab.
5. Remove the swab from the container being careful not to touch the soft end with your gloved hand or any other surface, which could contaminate the swab and either obscure the results or infect the patient.
6. Insert the swab into the nostril:
    - Anterior Nasal Swab: Have the patient tilt their head back at a 70-degree angle. Do not insert the swab more than a half an inch into the nostril.
    - Nasopharyngeal Swab: Insert until resistance is encountered or the distance is equivalent to that from the ear to the nostril of the patient, indicating contact with the nasopharynx.
7. Leave the swab in place as directed:
    - Anterior Nasal Swab: Leave in place for 10 to 15 seconds.
    - Nasopharyngeal Swab: Leave the swab in place for several seconds to absorb secretions.
8. Gently remove the swab:
    - Anterior Nasal Swab: Gently remove the swab after repeating Steps 6 & 7 in the other nostril.
    - Nasopharyngeal Swab: Slowly remove the swab while rotating it.
9. Place the swab in the sterile tube and snap the end off the swab at the break line. Place the cap on the tube.
10. Label the tube with the patient’s name, date of birth, medical record number, today’s date, your initials, time, and specimen type.
11. Place the specimen into the biohazard bag.
12. Remove the nonsterile gloves and place them in the appropriate receptacle.
13. Perform hand hygiene.
14. Assist the patient to a comfortable position, ask if they have any questions, and thank them for their time.
15. Ensure safety measures when leaving the room:
    - CALL LIGHT: Within reach
    - BED: Low and locked (in lowest position and brakes on)
    - SIDE RAILS: Secured
    - TABLE: Within reach

- ROOM: Risk-free for falls (scan room and clear any obstacles)

16. Follow agency policy regarding transportation of the specimen to the lab. Report results appropriately when they are received.

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9.10: Checklist for Oropharyngeal Testing

Use the checklist below to review the steps for completion of “Oropharyngeal Testing.”

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

1. Gather supplies: testing kit or swab, gloves, tongue depressor, and mask. Other PPE such as a face shield, respiratory, or gown may be required based on the patient condition.
2. Perform safety steps:
   - Perform hand hygiene.
   - Check the room for transmission-based precautions.
   - Introduce yourself, your role, the purpose of your visit, and an estimate of the time it will take.
   - 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. Apply nonsterile gloves. Inform the patient the procedure may be uncomfortable and cause gagging.
4. Open the supplies.
5. Ask the patient to open their mouth wide and tilt their head back.
6. Insert the tongue blade to depress the tongue. If the patient can depress their tongue so that it is out of the way of the swab, the tongue blade may not be needed.
7. Insert the swab into the posterior pharynx and tonsillar areas. Rub the swab over both tonsillar pillars and posterior oropharynx and avoid touching the tongue, teeth, and gums.
8. Place the swab in the sterile tube and snap the end off swab at the break line. Place the cap on the tube.
9. Label the tube with the patient’s name, date of birth, medical record number, today’s date, your initials, time, and specimen type.
10. Place the specimen into the biohazard bag.
11. Remove nonsterile gloves and place them in the appropriate receptacle.
12. Perform hand hygiene.
13. Assist the patient to a comfortable position, ask if they have any questions, and thank them for their time.
14. Ensure safety measures when leaving the room:
    - CALL LIGHT: Within reach
    - BED: Low and locked (in lowest position and brakes on)
    - SIDE RAILS: Secured
    - TABLE: Within reach
    - ROOM: Risk-free for falls (scan room and clear any obstacles)
15. Follow agency policy regarding transportation of the specimen to the lab. Report results appropriately when they are received.

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9.11: Learning Activities

Learning Activities

(Answers to “Learning Activities” can be found in the “Answer Key” at the end of the book. Answers to interactive activity elements will be provided within the element as immediate feedback.)

You are caring for an elderly diabetic patient who requires a morning glucose check. You gather the calibrated glucometer and lancet, but have difficulty obtaining a capillary blood glucose from the patient’s fingerstick. **What strategies might you use to facilitate blood flow?**

Check your knowledge using this flash card activity:

Check your understanding of hypoglycemia with this activity:

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9.12: XIX Glossary

15-15 Rule: A rule in an agency's hypoglycemia protocols that includes providing 15 grams of carbohydrate, then repeating the blood glucose reading in 15 minutes, and then repeating as needed until the patient's blood glucose reading is above 70.

Hyperglycemia: Elevated blood glucose reading with associated signs and symptoms such as frequent urination and increased thirst.

Hypoglycemia: A blood glucose reading less than 70 associated with symptoms such as irritability, shakiness, hunger, weakness, or confusion. If not rapidly treated, hypoglycemia can cause seizures and a coma.

Ketoacidosis: A life-threatening complication of hyperglycemia that can occur in patients with type 1 diabetes mellitus that is associated with symptoms such as fruity-smelling breath, nausea, vomiting, severe thirst, and shortness of breath.

Oropharynx: The part of the throat at the back of the mouth behind the oral cavity. It includes the back third of the tongue, the soft palate, the side and back walls of the throat, and the tonsils.

Standardized sliding-scale insulin protocol: Standardized instructions for administration of adjustable insulin dosages based on a patient's premeal blood glucose readings.

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CHAPTER OVERVIEW

10: Wound Care

10.1: Wound Care Introduction
10.2: Basic Concepts Related to Wounds
10.3: Assessing Wounds
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10.6: Sample Documentation
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10.1: Wound Care Introduction

Learning Objectives

- Assess tissue condition, wounds, drainage, and pressure injuries
- Cleanse and irrigate wounds
- Apply a variety of wound dressings
- Obtain a wound culture specimen
- Use appropriate aseptic or sterile technique
- Explain procedure to patient
- Adapt procedures to reflect variations across the life span
- Recognize and report significant deviations in wounds
- Document actions and observations

Wound healing is a complex physiological process that restores function to skin and tissue that have been injured. The healing process is affected by several external and internal factors that either promote or inhibit healing. When providing wound care to patients, nurses, in collaboration with other members of the health care team, assess and manage external and internal factors to provide an optimal healing environment.[1]

Complex wounds often require care by specialists. Certified wound care nurses assess, treat, and create care plans for patients with complex wounds, ostomies, and incontinence conditions. They act as educators and consultants to staff nurses and other healthcare professionals. This chapter will discuss wound care basics for entry-level nurses. Request a consultation by a certified wound care nurse when caring for patients with complex or nonhealing wounds.

1. Cox, J. (2019). Wound care 101. *Nursing*, *49*(10). https://doi.org/10.1097/01.nurse.0000580632.58318.08↵

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10.2: Basic Concepts Related to Wounds

Phases of Wound Healing

When skin is injured, there are four phases of wound healing that take place: hemostasis, inflammatory, proliferative, and maturation.[1] See Figure **10.2.1**[2] for an illustration of the phases of wound healing.

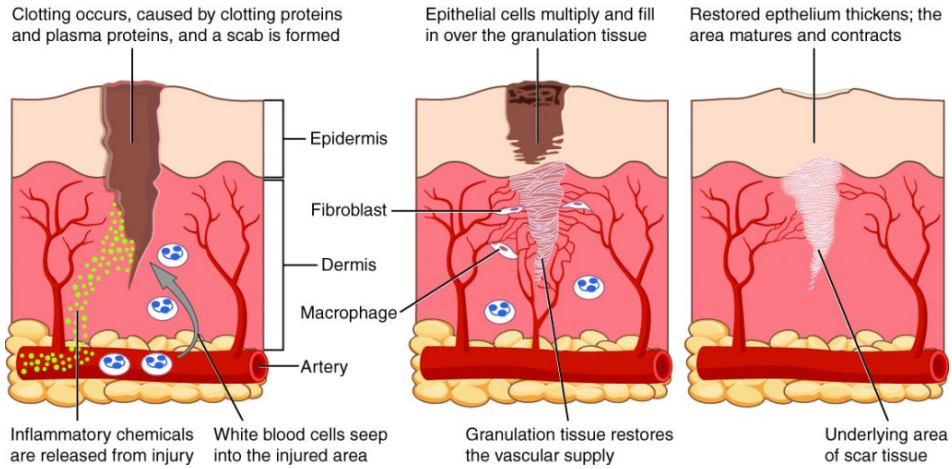


Figure **10.2.1**: Phases of Wound Healing

To illustrate the phases of wound healing, imagine that you accidentally cut your finger with a knife as you were slicing an apple. Immediately after the injury occurs, blood vessels constrict and clotting factors are activated. This is referred to as the hemostasis phase. Clotting factors form clots that stop the bleeding and act as a barrier to prevent bacterial contamination. Platelets release growth factors that alert various cells to start the repair process at the wound location. The **hemostasis phase** lasts up to 60 minutes, depending on the severity of the injury.[3],[4]

After the hemostasis phase, the **inflammatory phase** begins. Vasodilation occurs so that white blood cells in the bloodstream can move into the wound to start cleaning the wound bed. The inflammatory process appears to the observer as **edema** (swelling), **erythema** (redness), and exudate. **Exudate** is fluid that oozes out of a wound, also commonly called pus.[5],[6]

The **proliferative phase** begins within a few days after the injury and includes four important processes: epithelialization, angiogenesis, collagen formation, and contraction. **Epithelialization** refers to the development of new epidermis and granulation tissue. **Granulation tissue** is new connective tissue with new, fragile, thin-walled capillaries. Collagen is formed to provide strength and integrity to the wound. At the end of the proliferation phase, the wound begins to contract in size.[7],[8]

Capillaries begin to develop within the wound 24 hours after injury during a process called **angiogenesis**. These capillaries bring more oxygen and nutrients to the wound for healing. When performing dressing changes, it is essential for the nurse to protect this granulation tissue and the associated new capillaries. Healthy granulation tissue appears pink due to the new capillary formation. It is also moist, painless to the touch, and may appear “bumpy.” Conversely, unhealthy granulation tissue is dark red and painful. It bleeds easily with minimal contact and may be covered by shiny white or yellow fibrous tissue referred to as biofilm that must be removed because it impedes healing. Unhealthy granulation tissue is often caused by an infection, so wound cultures should be obtained when infection is suspected. The provider can then prescribe appropriate antibiotic treatment based on the culture results.[9]

During the **maturation phase**, collagen continues to be created to strengthen the wound. Collagen contributes strength to the wound to prevent it from reopening. A wound typically heals within 4-5 weeks and often leaves behind a scar. The scar tissue is initially firm, red, and slightly raised from the excess collagen deposition. Over time, the scar begins to soften, flatten, and become pale in about nine months.[10]

Types of Wound Healing

There are three types of wound healing: primary intention, secondary intention, and tertiary intention. Healing by **primary intention** means that the wound is sutured, stapled, glued, or otherwise closed so the wound heals beneath the closure. This type of

healing occurs with clean-edged lacerations or surgical incisions, and the closed edges are referred to as approximated. See Figure **10.2.2**[11] for an image of a surgical wound healing by primary intention.



Figure **10.2.2**: Primary Intention Wound Healing

Secondary intention occurs when the edges of a wound cannot be approximated (brought together), so the wound fills in from the bottom up by the production of granulation tissue. Examples of wounds that heal by secondary intention are pressure injuries and chainsaw injuries. Wounds that heal by secondary infection are at higher risk for infection and must be protected from contamination. See Figure **10.2.3**[12] for an image of a wound healing by secondary intention.



Figure **10.2.3**: Secondary Intention Wound Healing

Tertiary intention refers to a wound that has had to remain open or has been reopened, often due to severe infection. The wound is typically closed at a later date when infection has resolved. Wounds that heal by secondary and tertiary intention have delayed healing times and increased scar tissue.

Wound Closures

Lacerations and surgical wounds are typically closed with sutures, staples, or dermabond to facilitate healing by primary intention. See Figure **10.2.4**[13] for an image of sutures, Figure **10.2.5**[14] for an image of staples, and Figure **10.2.6**[15] for an image of a wound closed with dermabond, a type of sterile surgical glue. Based on agency policy, the nurse may remove sutures and staples based on a provider order. See Figure **10.2.7**[16] for an image of a disposable staple remover. See the checklists in the subsections later in this chapter for procedures related to surgical and staple removal.



Figure 10.2.4: Sutures



Figure 10.2.5: Staples



Figure 10.2.6: Dermabond

https://med.libretexts.org/@go/page/77022



Figure 10.2.7: Staple Remover

Common Types of Wounds

There are several different types of wounds. It is important to understand different types of wounds when providing wound care because each type of wound has different characteristics and treatments. Additionally, treatments that may be helpful for one type of wound can be harmful for another type. Common types of wounds include skin tears, venous ulcers, arterial ulcers, diabetic foot wounds, and pressure injuries.[17]

Skin Tears

Skin tears are wounds caused by mechanical forces such as shear, friction, or blunt force. They typically occur in the fragile, nonelastic skin of older adults or in patients undergoing long-term corticosteroid therapy. Skin tears can be caused by the simple mechanical force used to remove an adhesive bandage or from friction as the skin brushes against a surface. Skin tears occur in the epidermis and dermis but do not extend through the subcutaneous layer. The wound bases of skin tears are typically fragile and bleed easily.[18]

Venous Ulcers

Venous ulcers are caused by lack of blood return to the heart causing pooling of fluid in the veins of the lower legs. The resulting elevated hydrostatic pressure in the veins causes fluid to seep out, macerate the skin, and cause venous ulcerations. **Maceration** refers to the softening and wasting away of skin due to excess fluid. Venous ulcers typically occur on the medial lower leg and have irregular edges due to the maceration. There is often a dark-colored discoloration of the lower legs, due to blood pooling and leakage of iron into the skin called **hemosiderin staining**. For venous ulcers to heal, compression dressings must be used, along with multilayer bandage systems, to control edema and absorb large amounts of drainage.[19] See Figure 10.2.8[20] for an image of a venous ulcer.



Figure 10.2.8: Venous Ulcer

Arterial Ulcers

Arterial ulcers are caused by lack of blood flow and oxygenation to tissues. They typically occur in the distal areas of the body such as the feet, heels, and toes. Arterial ulcers have well-defined borders with a "punched out" appearance where there is a localized lack of blood flow. They are typically painful due to the lack of oxygenation to the area. The wound base may become **necrotic** (black) due to tissue death from ischemia. Wound dressings must maintain a moist environment, and treatment must include the removal of necrotic tissue. In severe arterial ulcers, vascular surgery may be required to reestablish blood supply to the area.[21] See Figure **10.2.9**[22] for an image of an arterial ulcer on a patient's foot.



Figure **10.2.9**: Arterial Ulcer

Diabetic Ulcers

Diabetic ulcers are also called neuropathic ulcers because peripheral neuropathy is commonly present in patients with diabetes. **Peripheral neuropathy** is a medical condition that causes decreased sensation of pain and pressure, especially in the lower extremities. **Diabetic ulcers** typically develop on the plantar aspect of the feet and toes of a patient with diabetes due to lack of sensation of pressure or injury. See Figure **10.2.10**[23] for an image of a diabetic ulcer. Wound healing is compromised in patients with diabetes due to the disease process. In addition, there is a higher risk of developing an infection that can reach the bone requiring amputation of the area. To prevent diabetic ulcers from occurring, it is vital for nurses to teach meticulous foot care to patients with diabetes and encourage the use of well-fitting shoes.[24]



Figure **10.2.10**: Diabetic Ulcer

Pressure Injuries

Pressure injuries are defined as "localized damage to the skin or underlying soft tissue, usually over a bony prominence, as a result of intense and prolonged pressure in combination with shear."[25] **Shear** occurs when tissue layers move over the top of each other, causing blood vessels to stretch and break as they pass through the subcutaneous tissue. For example, when a patient slides down in bed, the outer skin remains immobile because it remains attached to the sheets due to friction, but deeper tissue attached to the bone moves as the patient slides down. This opposing movement of the outer layer of skin and the underlying tissues causes the capillaries to stretch and tear, which then impacts the blood flow and oxygenation of the surrounding tissues.

Braden Scale

Several factors place a patient at risk for developing pressure injuries, including nutrition, mobility, sensation, and moisture. The Braden Scale is a tool commonly used in health care to provide an objective assessment of a patient's risk for developing pressure injuries. See Figure **10.2.11**[26] for an image of a Braden Scale. The six risk factors included on the Braden Scale are sensory perception, moisture, activity, mobility, nutrition, and friction/shear, and these factors are rated on a scale from 1-4 with 1 being "completely limited" to 4 being "no impairment." The scores from the six categories are added, and the total score indicates a patient's risk for developing a pressure injury. Ranges of scores indicate mild risk for scores 15-19, moderate risk for scores 13-14, high risk for scores 10-12, and severe risk for scores less than 9. Nurses create care plans using these scores to plan interventions that prevent or treat pressure injuries.

For more information about using the Braden Scale, go to the "Integumentary" chapter of the Open RN *Nursing Fundamentals* textbook.

BRADEN SCALE – For Predicting Pressure Sore Risk

SEVERE RISK: Total score ≤ 9 **HIGH RISK**: Total score 10-12 **MODERATE RISK**: Total score 13-14 **MILD RISK**: Total score 15-18 **DATE OF ASSESS ➡**

RISK FACTOR	SCORE/DESCRIPTION				1	2	3	4
SENSORY PERCEPTION Ability to respond meaningfully to pressure-related discomfort	**1. COMPLETELY LIMITED** – Unresponsive (does not moan, flinch, or grasp) to painful stimuli, due to diminished level of consciousness or sedation, **OR** limited ability to feel pain over most of body surface.	**2. VERY LIMITED** – Responds only to painful stimuli. Cannot communicate discomfort except by moaning or restlessness, **OR** has a sensory impairment which limits the ability to feel pain or discomfort over ½ of body.	**3. SLIGHTLY LIMITED** – Responds to verbal commands but cannot always communicate discomfort or need to be turned, **OR** has some sensory impairment which limits ability to feel pain or discomfort in 1 or 2 extremities.	**4. NO IMPAIRMENT** – Responds to verbal commands. Has no sensory deficit which would limit ability to feel or voice pain or discomfort.				
MOISTURE Degree to which skin is exposed to moisture	**1. CONSTANTLY MOIST**– Skin is kept moist almost constantly by perspiration, urine, etc. Dampness is detected every time patient is moved or turned.	**2. OFTEN MOIST** – Skin is often but not always moist. Linen must be changed at least once a shift.	**3. OCCASIONALLY MOIST** – Skin is occasionally moist, requiring an extra linen change approximately once a day.	**4. RARELY MOIST** – Skin is usually dry; linen only requires changing at routine intervals.				
ACTIVITY Degree of physical activity	**1. BEDFAST** – Confined to bed.	**2. CHAIRFAST** – Ability to walk severely limited or nonexistent. Cannot bear own weight and/or must be assisted into chair or wheelchair.	**3. WALKS OCCASIONALLY** – Walks occasionally during day, but for very short distances, with or without assistance. Spends majority of each shift in bed or chair.	**4. WALKS FREQUENTLY**– Walks outside the room at least twice a day and inside room at least once every 2 hours during waking hours.				
MOBILITY Ability to change and control body position	**1. COMPLETELY IMMOBILE** – Does not make even slight changes in body or extremity position without assistance.	**2. VERY LIMITED** – Makes occasional slight changes in body or extremity position but unable to make frequent or significant changes independently.	**3. SLIGHTLY LIMITED** – Makes frequent though slight changes in body or extremity position independently.	**4. NO LIMITATIONS** – Makes major and frequent changes in position without assistance.				
NUTRITION Usual food intake pattern [1]NPO: Nothing by mouth. [2]IV: Intravenously. [3]TPN: Total parenteral nutrition.	**1. VERY POOR** – Never eats a complete meal. Rarely eats more than 1/3 of any food offered. Eats 2 servings or less of protein (meat or dairy products) per day. Takes fluids poorly. Does not take a liquid dietary supplement, **OR** is NPO[1] and/or maintained on clear liquids or IV[2] for more than 5 days.	**2. PROBABLY INADEQUATE** – Rarely eats a complete meal and generally eats only about ½ of any food offered. Protein intake includes only 3 servings of meat or dairy products per day. Occasionally will take a dietary supplement **OR** receives less than optimum amount of liquid diet or tube feeding.	**3. ADEQUATE** – Eats over half of most meals. Eats a total of 4 servings of protein (meat, dairy products) each day. Occasionally refuses a meal, but will usually take a supplement if offered, **OR** is on a tube feeding or TPN[3] regimen, which probably meets most of nutritional needs.	**4. EXCELLENT** – Eats most of every meal. Never refuses a meal. Usually eats a total of 4 or more servings of meat and dairy products. Occasionally eats between meals. Does not require supplementation.				
FRICTION AND SHEAR	**1. PROBLEM**– Requires moderate to maximum assistance in moving. Complete lifting without sliding against sheets is impossible. Frequently slides down in bed or chair, requiring frequent repositioning with maximum assistance. Spasticity, contractures, or agitation leads to almost constant friction.	**2. POTENTIAL PROBLEM**– Moves feebly or requires minimum assistance. During a move, skin probably slides to some extent against sheets, chair, restraints, or other devices. Maintains relatively good position in chair or bed most of the time but occasionally slides down.	**3. NO APPARENT PROBLEM** – Moves in bed and in chair independently and has sufficient muscle strength to lift up completely during move. Maintains good position in bed or chair at all times.					
TOTAL SCORE	**Total score of 12 or less represents HIGH RISK**							

Figure **10.2.11**: Braden Scale. Used under Fair Use.

Staging

Pressure injuries commonly occur on the sacrum, heels, ischial tuberosity, and coccyx. The 2016 National Pressure Ulcer Advisory Panel (NPUAP) Pressure Injury Staging System now uses the term "pressure injury" instead of pressure ulcer because an injury can occur without an ulcer present. Pressure injuries are staged from 1 through 4 based on the extent of tissue damage. For example, Stage 1 pressure injuries have reddened but intact skin, and Stage 4 pressure injuries have deep, open ulcers affecting underlying tissue and structures such as muscles, ligaments, and tendons. See Figure **10.2.12**[27] for an image of the four stages of pressure injuries.[28] The NPUAP's definitions of the four stages of pressure injuries are described below:

- **Stage 1** pressure injuries are intact skin with a localized area of nonblanchable erythema where prolonged pressure has occurred. **Nonblanchable erythema** is a medical term used to describe skin redness that does not turn white when pressed.
- **Stage 2** pressure injuries are partial-thickness loss of skin with exposed dermis. The wound bed is viable and may appear like an intact or ruptured blister. Stage 2 pressure injuries heal by reepithelialization and not by granulation tissue formation.[29]
- **Stage 3** pressure injuries are full-thickness tissue loss in which fat is visible, but cartilage, tendon, ligament, muscle, and bone are not exposed. The depth of tissue damage varies by anatomical location. Undermining and tunneling may occur in Stage 3 and 4 pressure injuries. **Undermining** occurs when the tissue under the wound edges becomes eroded, resulting in a pocket

beneath the skin at the wound's edge. **Tunneling** refers to passageways underneath the surface of the skin that extend from a wound and can take twists and turns. Slough and eschar may also be present in Stage 3 and 4 pressure injuries. **Slough** is an inflammatory exudate that is usually light yellow, soft, and moist. **Eschar** is dark brown/black, dry, thick, and leathery dead tissue. See Figure **10.2.13** [30] for an image of eschar in the center of the wound. If slough or eschar obscures the wound so that tissue loss cannot be assessed, the pressure injury is referred to as **unstageable**.[31] In most wounds, slough and eschar must be removed by debridement for healing to occur.

- **Stage 4** pressure injuries are full-thickness tissue loss like Stage 3 pressure injuries, but also have exposed cartilage, tendon, ligament, muscle, or bone. **Osteomyelitis** (bone infection) may be present.[32]



Figure **10.2.12**: Stages of Pressure Wounds



Figure **10.2.13**: Eschar

Video Review of Pressure Injuries[33]

Factors Affecting Wound Healing

Multiple factors affect a wound's ability to heal and are referred to as local and systemic factors. Local factors refer to factors that directly affect the wound, whereas systemic factors refer to the overall health of the patient and their ability to heal. Local factors

include localized blood flow and oxygenation of the tissue, the presence of infection or a foreign body, and venous sufficiency. **Venous insufficiency** is a medical condition where the veins in the legs do not adequately send blood back to the heart, resulting in a pooling of fluids in the legs.[34]

Systemic factors that affect a patient's ability to heal include nutrition, mobility, stress, diabetes, age, obesity, medications, alcohol use, and smoking.[35] When a nurse is caring for a patient with a wound that is not healing as anticipated, it is important to further assess for the potential impact of these factors:

- **Nutrition.** Nutritional deficiencies can have a profound impact on healing and must be addressed for chronic wounds to heal. Protein is one of the most important nutritional factors affecting wound healing. For example, in patients with pressure injuries, 30 to 35 kcal/kg of calorie intake with 1.25 to 1.5g/kg of protein and micronutrients supplementation is recommended daily.[36] In addition, vitamin C and zinc deficiency have many roles in wound healing. It is important to collaborate with a dietician to identify and manage nutritional deficiencies when a patient is experiencing poor wound healing.[37]
- **Stress.** Stress causes an impaired immune response that results in delayed wound healing. Although a patient cannot necessarily control the amount of stress in their life, it is possible to control one's reaction to stress with healthy coping mechanisms. The nurse can help educate the patient about healthy coping strategies.
- **Diabetes.** Diabetes causes delayed wound healing due to many factors such as neuropathy, atherosclerosis (a buildup of plaque that obstructs blood flow in the arteries resulting in decreased oxygenation of tissues), a decreased host immune resistance, and increased risk for infection.[38] Read more about neuropathy and diabetic ulcers under the "Types of Wounds" section. Nurses provide vital patient education to patients with diabetes to effectively manage the disease process for improved wound healing.
- **Age.** Older adults have an altered inflammatory response that can impair wound healing. Nurses can educate patients about the importance of exercise for improved wound healing in older adults.[39]
- **Obesity.** Obese individuals frequently have wound complications, including infection, dehiscence, hematoma formation, pressure injuries, and venous injuries. Nurses can educate patients about healthy lifestyle choices to reduce obesity in patients with chronic wounds.[40]
- **Medications.** Medications such as corticosteroids impair wound healing due to reduced formation of granulation tissue.[41] When assessing a chronic wound that is not healing as expected, it is important to consider the side effects of the patient's medications.
- **Alcohol consumption.** Research shows that exposure to alcohol impairs wound healing and increases the incidence of infection.[42] Patients with impaired healing of chronic wounds should be educated to avoid alcohol consumption.
- **Smoking.** Smoking impacts the inflammatory phase of the wound healing process, resulting in poor wound healing and an increased risk of infection.[43] Patients who smoke should be encouraged to stop smoking.

Lab Values Affecting Wound Healing

When a chronic wound is not healing as expected, laboratory test results may provide additional clues regarding the causes of the delayed healing. See Table **10.2.1** for lab results that offer clues to systemic issues causing delayed wound healing.[44]

Table **10.2.1** Lab Values Associated with Delayed Wound Healing[45]

Abnormal Lab Value	Rationale
Low hemoglobin	Low hemoglobin indicates less oxygen is transported to the wound site.
Elevated white blood cells (WBC)	Increased WBC indicates infection is occurring.
Low platelets	Platelets are important during the proliferative phase in the creation of granulation tissue and angiogenesis.[46]
Low albumin	Low albumin indicates decreased protein levels. Protein is required for effective wound healing.
Elevated blood glucose or hemoglobin A1C	Elevated blood glucose and hemoglobin A1C levels indicate poor management of diabetes mellitus, a disease that impacts wound healing.
Elevated serum BUN and creatinine	BUN and creatinine levels are indicators of kidney function, with elevated levels indicating worsening kidney function. Elevated BUN (blood urea nitrogen) levels impact wound healing.
Positive wound culture	Positive wound cultures indicate an infection is present and provide additional information including the type and number of bacteria present, as well as identifying antibiotics to which the bacteria is susceptible. The nurse reviews this information when administering antibiotics to ensure the prescribed therapy is effective for the type of bacteria present.

Wound Complications

In addition to delayed wound healing, several other complications can occur. Three common complications are the development of a hematoma, infection, or dehiscence. These complications should be immediately reported to the health care provider.

Hematoma

A **hematoma** is an area of blood that collects outside of the larger blood vessels. A hematoma is more severe than **ecchymosis** (bruising) that 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.[47] See Figure 10.2.14[48] for an image of a hematoma.



Figure 10.2.14: Hematoma

Infection

A break in the skin allows bacteria to enter and begin to multiply. Microbial contamination of wounds can progress from localized infection to systemic infection, sepsis, and subsequent life- and limb-threatening infection. Signs of a localized wound infection

include redness, warmth, and tenderness around the wound. Purulent or malodorous drainage may also be present. Signs that a systemic infection is developing and requires urgent medical management include the following:[49]

- Fever over 101 F (38 C)
- Overall malaise (lack of energy and not feeling well)
- Change in level of consciousness/increased confusion
- Increasing or continual pain in the wound
- Expanding redness or swelling around the wound
- Loss of movement or function of the wounded area

Dehiscence

Dehiscence refers to the separation of the edges of a surgical wound. A dehisced wound can appear fully open where the tissue underneath is visible, or it can be partial where just a portion of the wound has torn open. Wound dehiscence is always a risk in a surgical wound, but the risk increases if the patient is obese, smokes, or has other health conditions, such as diabetes, that impact wound healing. Additionally, the location of the wound and the amount of physical activity in that area also increase the chances of wound dehiscence.[50] See Figure **10.2.15**[51] for an image of dehiscence in an abdominal surgical wound in a 50-year-old obese female with a history of smoking and malnutrition.

Wound dehiscence can occur suddenly, especially in abdominal wounds when the patient is coughing or straining. Evisceration is a rare but severe surgical complication when dehiscence occurs and the abdominal organs protrude out of the incision. Signs of impending dehiscence include redness around the wound margins and increasing drainage from the incision. The wound will also likely become increasingly painful. Suture breakage can be a sign that the wound has minor dehiscence or is about to dehisce.[52]

To prevent wound dehiscence, surgical patients must follow all post-op instructions carefully. The patient must move carefully and protect the skin from being pulled around the wound site. They should also avoid tensing the muscles surrounding the wound and avoid heavy lifting as advised.[53]



Figure **10.2.15**: Dehiscence

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10.3: Assessing Wounds

Wounds should be assessed and documented at every dressing change. Wound assessment should include the following components:

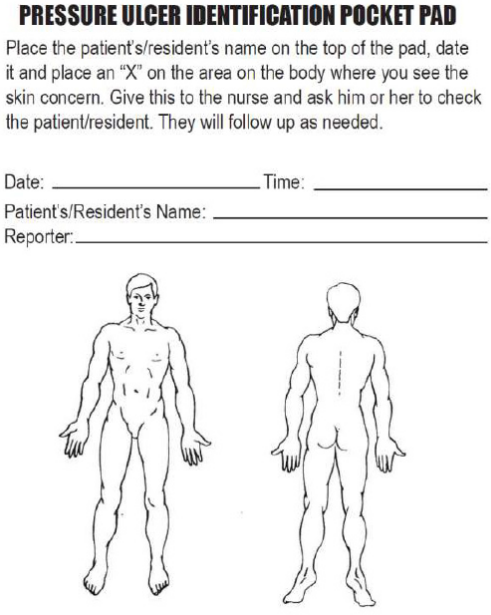
- Anatomic location
- Type of wound (if known)
- Degree of tissue damage
- Wound bed
- Wound size
- Wound edges and periwound skin
- Signs of infection
- Pain[1]

These components are further discussed in the following sections.

Anatomic Location and Type of Wound

The location of the wound should be documented clearly using correct anatomical terms and numbering. This will ensure that if more than one wound is present, the correct one is being assessed and treated. Many agencies use images to facilitate communication regarding the location of wounds among the health care team. See Figure **10.3.1**[2] for an example of facility documentation that includes images to indicate wound location.

The location of a wound also provides information about the cause and type of a wound. For example, a wound over the sacral area of an immobile patient is likely a pressure injury, and a wound near the ankle of a patient with venous insufficiency is likely a venous ulcer. For successful healing, different types of wounds require different treatments based on the cause of the wound.


PRESSURE ULCER IDENTIFICATION POCKET PAD

Place the patient's/resident's name on the top of the pad, date it and place an "X" on the area on the body where you see the skin concern. Give this to the nurse and ask him or her to check the patient/resident. They will follow up as needed.

Date: _____ Time: _____

Patient's/Resident's Name: _____

Reporter: _____

Figure **10.3.1**: Wound Documentation

Degree of Tissue Damage

It is important to continually assess the degree of tissue damage in pressure injuries because the level of damage can worsen if they are not treated appropriately. Refer to the "Staging" subsection of "Pressure Injuries" in the "Basic Concepts Related to Wounds" section for more information about tissue damage.

Wound Base

Assess the color of the wound base. Recall that healthy granulation tissue appears pink due to the new capillary formation. It is moist, painless to the touch, and may appear “bumpy.” Conversely, unhealthy granulation tissue is dark red and painful. It bleeds easily with minimal contact and may be covered with biofilm. The appearance of slough (yellow) or eschar (black) in the wound base should be documented and communicated to the health care provider because it likely will need to be removed for healing. Tunneling and undermining should also be assessed, documented, and communicated.

Type and Amount of Exudate

The color, consistency, and amount of exudate (drainage) should be assessed and documented at every dressing change. The amount of drainage from wounds is categorized as scant, small/minimal, moderate, or large/copious. Use the following descriptions to select the appropriate terms:[3]

- **No exudate:** The wound base is dry.
- **Scant amount of exudate:** The wound is moist but no measurable amount of exudate appears on the dressing.
- **Minimal amount of exudate:** Exudate covers less than 25% of the size of the bandage.
- **Moderate amount of drainage:** Wound tissue is wet, and drainage covers 25% to 75% of the size of the bandage.
- **Large or copious amount of drainage:** Wound tissue is filled with fluid, and exudate covers more than 75% of the bandage.[4]

The type of wound drainage should be described using medical terms such as serosanguinous, sanguineous, serous, or purulent.

- **Sanguineous:** Sanguineous exudate is fresh bleeding.[5]
- **Serous:** Serous drainage is clear, thin, watery plasma. It’s normal during the inflammatory stage of wound healing, and small amounts are considered normal wound drainage.[6]
- **Serosanguinous:** Serosanguineous exudate contains serous drainage with small amounts of blood present.[7]
- **Purulent:** Purulent exudate is thick and opaque. It can be tan, yellow, green, or brown. It is never considered normal in a wound bed, and new purulent drainage should always be reported to the health care provider.[8] See Figure **10.3.2**[9] for an image of purulent drainage.



Figure **10.3.2**: Purulent Drainage

Wound Size

Wounds should be measured on admission and during every dressing change to evaluate for signs of healing. Accurate wound measurements are vital for monitoring wound healing. Measurements should be taken in the same manner by all clinicians to maintain consistent and accurate documentation of wound progress. This can be difficult to accomplish with oddly shaped wounds because there can be confusion about how consistently to measure them. Wounds should be described by length by width, with the length of the wound based on the head-to-toe axis. The width of a wound should be measured from side to side laterally. If a wound is deep, the deepest point of the wound should be measured to the wound surface using a sterile, cotton-tipped applicator. Many facilities use disposable, clear plastic measurement tools to measure the area of a wound healing by secondary intention. Measurements are typically documented in centimeters. See Figure **10.3.3**[10] for an image of a wound measurement tool.

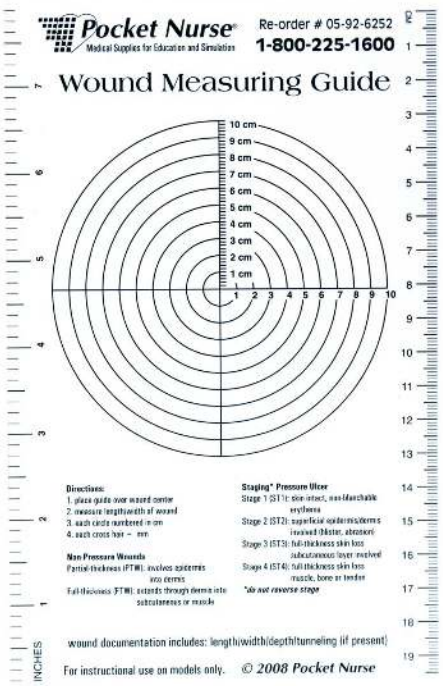


Figure 10.3.3: Wound Measurement Tool

Tunneling can occur in a full-thickness wound that can lead to abscess formation. The depth of a tunneling can be measured by gently probing the tunnelled area with a sterile, cotton-tipped applicator from the wound base to the end of the tract. When probing a tunnel, it is imperative to not force the swab but only insert until resistance is felt to prevent further damage to the area. The location of the tunnel in the wound should be documented using the analogy of a clock face, with 12:00 pointing toward the patient's head.[11]

Undermining occurs when the tissue under the wound edges becomes eroded, resulting in a pocket beneath the skin at the wound's edge. Undermining is measured by inserting a probe under the wound edge directed almost parallel to the wound surface until resistance is felt. The amount of undermining is the distance from the probe tip to the point at which the probe is level with the wound edge. Clock terms are also used to identify the area of undermining.[12]

Wound Edges and Periwound Skin

If the wound is healing by primary intention, it should be documented if the wound edges are well-approximated (closed together) or if there are any signs of dehiscence. The skin outside the outer edges of the wound, called the **periwound** skin, provides information related to wound development or healing. For example, a venous ulcer often has excess wound drainage that macerates the periwound skin, giving it a wet, waterlogged appearance that is soft and gray white in color.[13] See Figure 10.3.4[14] for an image of erythematous periwound with partial dehiscence.



Figure **10.3.4**: Periwound

Signs of Infection

Wounds should be continually monitored for signs of infection. Signs of localized wound infection include **erythema** (redness), **induration** (area of hardened tissue), pain, edema, purulent exudate (yellow or green drainage), and wound odor.[15] New signs of infection should be reported to the health care provider with an anticipated order for a wound culture.

Pain

The intensity of pain that a patient is experiencing with a wound should be assessed and documented. If a patient experiences pain during dressing changes, it should be managed with administration of pain medication before scheduled dressing changes. Be aware that the degree of pain may not correlate to the extent of tissue damage. For example, skin tears are often painful because the nerve endings are exposed in the dermal layer, whereas patients with severe diabetic ulcers on their feet may experience little or no pain because of existing neuropathic damage.[16]

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10.4: Wound Therapy

Wound therapy is often prescribed by a multidisciplinary team that can include the provider, a wound care nurse, a dietician, and the bedside nurse who performs dressing changes. Topical dressings should be selected that create an environment conducive to healing the specific type of wound and its causes. It is important to perform the following actions when providing wound care:

- Prevent and manage infection
- Cleanse the wound
- Debride the wound
- Maintain appropriate moisture in the wound
- Control odor
- Manage wound pain
- Consider the big picture[1]

Each of these objectives is further discussed in the following subsections.

Prevent and Manage Infection

One of the primary goals of wound dressings is to protect the wound base from bacteria and contaminants (i.e., urine and feces). If new signs of infection are present during a wound dressing change, wound swabs should be taken according to agency policy and the need for a wound culture and possible antibiotic therapy discussed with the primary provider.[2]

Silver sulfadiazine is an example of a common topical antibiotic prescribed for wounds. Topical antibiotics are covered with a secondary dressing.[3]

Cleanse the Wound

Routine cleansing should be performed at each dressing change with products that are physiologically compatible with wound tissue. Normal saline is the most gentle solution and is typically delivered using a syringe or commercial cleansers. See Figure 10.4.1[4] for an image of wound irrigation with a syringe. Commercial cleansers may be used, but hydrogen peroxide, betadine, and acetic acid should be avoided because these agents can be cytotoxic.[5]

> **Note**
>
> Visit the journal article in *American Nurse* titled "Is Your Wound-Cleansing Practice Up To Date?" to read more information about wound cleansing.

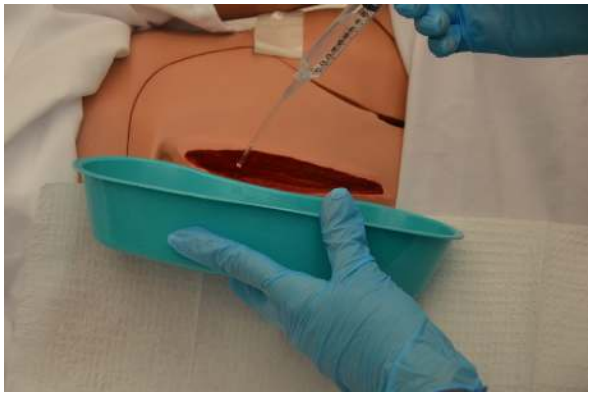


Figure 10.4.1: Irrigating a Wound

Debride the Wound

Debridement is the removal of nonviable tissue in a wound. If necrotic (black) tissue is present in the wound bed, it must be removed in most circumstances for the wound to heal. However, one exception is stable, dry eschar on a patient's heel that should be left in place until the patient's vascular status is determined.[6]

Wound debridement can be accomplished using several methods, such as autolytic, enzymatic, or sharp wound debridement. Autolytic debridement occurs when moist topical dressings foster the breakdown of necrotic tissue. Enzymatic debridement occurs when prescribed topical agents are directly applied to the wound bed.[7] Collagenase ointment is an example of a topical enzymatic debridement ointment that is applied daily (or more frequently if the dressing becomes soiled) and covered with sterile gauze or a foam dressing.[8] Sharp wound debridement is performed by a trained health care provider and may be at the bedside or in the operating room. Sharp debridement is an invasive procedure using a scalpel or scissors to remove necrotic tissue so that only viable tissue remains. See Figure **10.4.2**[9] for an image of a wound that has been surgically debrided of necrotic tissue.



Figure **10.4.2**: Wound Debridement

Maintain Appropriate Moisture in the Wound

Wound dressings should maintain a moist wound environment to facilitate the development of granulation tissue. However, excessive exudate must be managed with dressings that absorb excess moisture to avoid maceration of the surrounding tissue.[10] For example, dressings such as alginate or hydrofiber are used in wounds with large amounts of exudate to maintain an appropriate moisture level but also prevent maceration of tissue. Frequent dressing changes may also be required in wounds with heavy drainage.

Eliminate Dead Space

Deep wounds and tunneling should be packed with dressings to keep the wound bed moist. Sterile gauze dressings moistened with normal saline or hydrogel-impregnated dressings are examples of packing agents used to keep the wound bed moist. Packing material should be easy to remove from the wound base during each dressing change to avoid injuring the fragile granulation tissue. Keep in mind that dressings made of alginate have a slight greenish tint when removed and should not be confused with purulent drainage.

Control Odor

If odor is present in a wound, the nurse should consult with the health care provider about the frequency of dressing changes, wound cleansing agents, and the possible need for topical antimicrobial therapy or debridement. Room deodorants can be obtained for use after dressing changes.[11]

Manage Wound Pain

Wounds that are becoming increasingly painful should be assessed for potential infection or dehiscence. The nurse should plan on administering medication to the patient before performing dressing changes on wounds that are painful. If pain medication is not ordered, then the nurse should contact the health care provider for a prescription before performing the dressing change.[12]

Protect Periwound Skin

Heavily draining wounds or the improper use of moist dressings can cause maceration of the periwound skin. The nurse should apply dressings carefully to maintain wound bed moisture yet also protect the periwound skin. Skin barrier creams, skin protective wipes, or skin barrier wafers can also be used to protect the periwound skin.[13]

Consider the Big Picture

Most wounds do not occur in isolation but also have other systemic or local factors that impact wound healing. Be sure to consider the following points when caring for patients with wounds with delayed wound healing:

- Minimize pressure and shear for patients with pressure injuries. For example, a patient with a pressure injury should be repositioned at least every two hours to minimize pressure.
- Educate patients with neuropathy and decreased sensation about preventing further injury. For example, a patient with diabetes should wear well-fitting shoes and never go barefoot to prevent injuries.
- Control edema in patients with venous ulcers through the use of compression dressings.
- Promote adequate perfusion to patients with arterial ulcers. For example, in most cases, the extremity of a patient with an arterial ulcer should not be elevated.
- Protect fragile skin in patients with skin tears to prevent further injury.
- Manage blood sugar levels in patients with diabetes mellitus for optimal healing.
- Promote good nutrition and hydration for all patients with wounds. Consult a registered dietician to assess the patient's nutritional status and develop a nutrition plan if needed.[14]
- Document ongoing assessment findings and wound interventions for good communication and continuity of care across the multidisciplinary health care team.
- Concerns about the healing of a chronic wound or the dressings ordered should be communicated to the health care provider. Referral to a specialized wound care nurse is often helpful.

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10.5: Wound Dressings

Wound dressings should be selected based on the type of the wound, the cause of the wound, and the characteristics of the wound. A specially-trained wound care nurse should be consulted, when possible, for appropriate selection of dressings for chronic wounds. See Table **10.5.1** for commonly used wound dressings and associated nursing considerations.[1]

Table **10.5.1**: Wound Dressings[2]

Type of Dressing	Description	Nursing Considerations
Sterile gauze	Nonadherent dressing used on moderately to highly exudative wounds. Nontraumatic to wound bed and promotes a moist wound environment.	• Can be used for all types of wounds including skin tears. • Sacral and heel-shaped silicone dressings can be used to prevent pressure injuries.
Foam (see Figure **10.5.7**[9])	Nonadherent and absorptive.	• Can be used as a primary dressing. • Can be used under compression dressings for venous ulcers to manage exudate.
Alginate/hydrofibers (see Figure **10.5.8**[10])	Nonadherent and highly absorptive for highly exudative wounds. Used for wound packing in full-thickness wounds such as Stage 3 or 4 pressure injuries.	• Usually changed every 24-48 hours; left in place based on the saturation of wound drainage. • Can be used as a primary dressing for exudative wounds like venous ulcers and covered with a secondary dressing such as foam or silicone. • Do not use in dry wounds because it may injure the wound bed.



Figure **10.5.1**: Sterile Gauze



Figure 10.5.2: Kerlix



Figure 10.5.3: Nonadherent Dressing



Figure 10.5.4: Petroleum Gauze

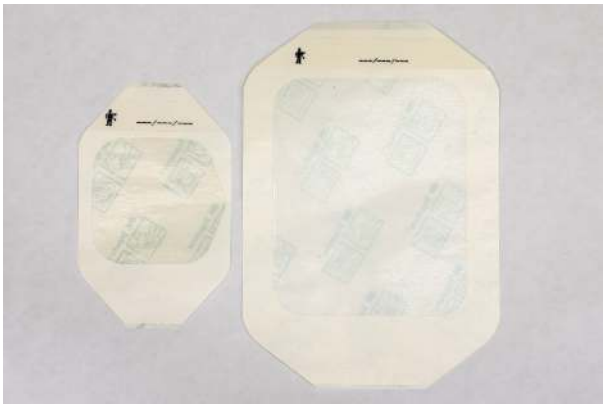


Figure 10.5.5: Transparent Film



Figure 10.5.6: Hydrocolloid



Figure 10.5.7: Foam Dressing



Figure 10.5.8: Alginate Dressing

Types of Tape

There are several types of tape that can be used to secure dressings. The most commonly used types of tape are medical transpore, micropore paper, cloth, and waterproof tape.

- **Medical transpore tape** (often referred to as “medi-pore”) is inexpensive, durable, and very sticky. It has tiny holes in it that allow air to reach the skin underneath and sweat and body fluid to pass through it without causing it to come off. However, it leaves residue and can damage sensitive skin.
- **Micropore papertape** is gentle on skin and doesn’t leave residue, but it is not waterproof and doesn’t work well on irregular areas. It allows air to reach the skin underneath.
- **Cloth tape** sticks well, allows air to reach the skin, and does not leave a residue. It has high strength so it can be used to secure a splint. However, it is not flexible or waterproof and can be difficult to tear.

- **Waterproof tape** is more expensive but it is flexible and doesn't leave residue. It sticks well to skin but does not stick well to hair. It is waterproof when applied to dry skin.

> **Note**
>
> Read Inside First Aid's webpage about different types of medical tape:
> 5 Different Types of Medical Tapes and How to Use Them.

Wound Vacs

The term **wound vac** refers to a device used with special foam dressings and suctioning to remove fluid and decrease air pressure around a wound to assist in healing. During a wound vac procedure, the nurse applies a special foam dressing over an open wound and seals it with a thin film layer. The film has an opening that rubber tubing fits through to connect to a vacuum pump. Once connected, the vacuum pump removes fluid from the wound while also helping to pull the edges of the wound together. A person with a wound vac typically wears the device 24 hours a day while the wound is healing.[11] See Figure **10.5.9**[12] for an image of a wound vac foam dressing attached to suctioning by a wound vac device. Figure **10.5.10**[13] demonstrates the progression of a wound healing with a wound vac from image A to D.



Figure **10.5.9**: Wound Vac



Figure **10.5.10**: Progression of Healing with a Wound Vac

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10.6: Sample Documentation

Sample Documentation of Expected Findings

3 cm x 2 cm Stage 3 pressure injury on the patient's sacrum. Dark pink wound base with no signs of infection. Cleansed with normal saline spray and hydrocolloid dressing applied.

Sample Documentation of Unexpected Findings

3 cm x 2 cm Stage 3 pressure injury on the patient's sacrum. Wound base is dark red with yellowish-green drainage present. Periwound skin is red, warm, and tender to palpation. Patient temperature is 36.8C. Cleansed with normal saline spray and wound culture specimen collected. Hydrocolloid dressing applied and Dr. Smith notified. Order received for wound culture.

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10.7: Checklist for Wound Assessment

Use the checklist below to review the steps for completion of “Wound Assessment.”

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

1. Gather supplies: gloves, wound measuring tool, and sterile cotton-tipped swab.
2. Perform safety steps:
    - Perform hand hygiene.
    - Check the room for transmission-based precautions.
    - Introduce yourself, your role, the purpose of your visit, and an estimate of the time it will take.
    - 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. Identify wound location. Document the anatomical position of the wound on the body using accurate anatomical terminology.
4. Identify the type and cause of the wound (e.g., surgical incision, pressure injury, venous ulcer, arterial ulcer, diabetic ulcers, or traumatic wound).
5. Note tissue damage:
    - If the wound is a pressure injury, identify the stage and use the Braden Scale to assess risk factors.
6. Observe wound base. Describe the type of tissue in the wound base (i.e., granulation, slough, eschar).
7. Follow agency policy to measure wound dimensions, including width, depth, and length. Assess for tunneling, undermining, or induration.
8. Describe the amount and color of wound exudate:
    - Serous drainage (plasma): clear or light yellowish
    - Sanguineous drainage (fresh bleeding): bright red
    - Serosanguineous drainage (a mix of blood and serous fluid): pink
    - Purulent drainage (infected): thick, opaque, and yellow, green, or other color
9. Note the presence or absence of odor, noting the presence of odor may indicate infection.
10. Assess the temperature, color, and integrity of the skin surrounding the wound. Assess for tenderness of periwound area.
11. Assess wound pain using PQRSTU. Note the need to premedicate before dressing changes if the wound is painful. (Read more about PQRSTU assessment in the “Health History” chapter.)
12. Assess for signs of infection, such as fever, change in level of consciousness, type of drainage, presence of odor, dark red granulation tissue, or redness, warmth, and tenderness of the periwound area.
13. Assist the patient back to a comfortable position, ask if they have any questions, and thank them for their time.
14. Ensure safety measures when leaving the room:
    - CALL LIGHT: Within reach
    - BED: Low and locked (in lowest position and brakes on)
    - SIDE RAILS: Secured
    - TABLE: Within reach
    - ROOM: Risk-free for falls (scan room and clear any obstacles)
15. Perform hand hygiene.
16. Document the assessment findings and report any concerns according to agency policy.

Note

View a supplementary video of a nurse performing a wound assessment in Wound Care: Assessing Wounds.[1]

1. Phillips, P. (2011, May 17). *Wound care: Assessing wounds*. [Video]. YouTube. All rights reserved. https://youtu.be/s76P1DdtBAA↵

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10.8: Checklist for Simple Dressing Change

Use this checklist to review the steps for completion of “Simple Dressing Change.”

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

1. Gather supplies: nonsterile gloves, sterile gloves per agency policy, wound cleansing solution or sterile saline, sterile 2″x 2″ gauze for wound cleansing, 4″ x 4″ sterile gauze for wound dressing, scissors, and tape (if needed).
    - Use the smallest size of dressing for the wound.
    - Take only the dressing supplies needed for the dressing change to the bedside.
2. Perform safety steps:
    - Perform hand hygiene.
    - Check the room for transmission-based precautions.
    - Introduce yourself, your role, the purpose of your visit, and an estimate of the time it will take.
    - 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. Assess wound pain using PQRSTU. Premedicate before dressing changes if the wound is painful.
4. Prepare the environment, position the patient, adjust the height of the bed, and turn on the lights. Ensure proper lighting to allow for good visibility to assess the wound. Ensure proper body mechanics for yourself and create a comfortable position for the patient. Premedicate, if indicated, to ensure patient’s comfort prior to and during the procedure.
5. Perform hand hygiene immediately prior to arranging the supplies at the bedside.
6. Place a clean, dry, barrier on the bedside table. Create a sterile field if indicated by agency policy.
7. Pour sterile normal saline into opened sterile gauze packaging to moisten the gauze.
    - Normal saline containers must be used for only one patient and must be dated and discarded within at least 24 hours of being opened.
    - Commercial wound cleanser may also be used.
8. Expose the dressing.
9. Perform hand hygiene and apply nonsterile gloves.
10. Remove the outer dressing.
11. Remove the inner dressing. Use transfer forceps, if necessary, to avoid contaminating the wound bed.
12. Remove gloves, perform hand hygiene, and put on new gloves.
    - Wrap the old inner dressing inside the glove as you remove it, if feasible, to prevent contaminating the environment.
13. Assess the wound:
    - See “Checklist for Wound Assessment” checklist for details.
14. Drape the patient with a water-resistant underpad, if indicated, to protect the patient’s clothing and linen.
15. Apply gloves and other PPE as indicated. Goggles, face shield, and/or mask may be indicated.
16. Cleanse the wound based on agency policy, using moistened gauze, commercial cleanser, or sterile irrigant. When using moistened gauze, use one moistened 2″ x 2″ sterile gauze per stroke. Work in straight lines, moving away from the wound with each 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.
17. Cleanse around the drain (if present):
    - Clean around the drain site using a circular stroke, starting with the area immediately next to the drain.

- Using a new swab with each stroke, cleanse immediately next to the drain in a circular motion. With the next stroke, move a little farther out from the drain. Continue this process with subsequent circular swabs until the skin surrounding the drain is cleaned.

18. Remove gloves, perform hand hygiene, and apply new gloves.
19. Apply sterile dressing (4″ x 4″ sterile gauze), using nontouch technique so that the dressing touching the wound remains sterile.
20. Apply outer dressing if required. Secure the dressing with tape as needed.
21. Remove gloves and perform hand hygiene.
22. Assist the patient to a comfortable position, ask if they have any questions, and thank them for their time.
23. Ensure safety measures when leaving the room:
    - CALL LIGHT: Within reach
    - BED: Low and locked (in lowest position and brakes on)
    - SIDE RAILS: Secured
    - TABLE: Within reach
    - ROOM: Risk-free for falls (scan room and clear any obstacles)
24. Perform hand hygiene.
25. Document the procedure and related assessment findings. Compare the wound assessment to previous documentation and analyze healing progress. Report any concerns according to agency policy.

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10.9: Checklist for Wound Culture

Wound cultures are obtained from wounds suspected to be infected. Results are used to determine treatment options. Wound culture results indicate the type and number of bacteria present, as well as the antibiotics to which bacteria are susceptible. When performing a wound culture, it is vital for the nurse to avoid contamination and to use evidence-based techniques to obtain a good specimen that the patient's treatment plan will be based upon.[1]

Use the checklist to review the steps to "Perform a Wound Culture."

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

1. Gather supplies: sterile wound swab, sterile normal saline, sterile irrigation kit with 30-60 mL syringe, and sterile 2″ x 2″ gauze.
2. Perform safety steps:
   - Perform hand hygiene.
   - Check the room for transmission-based precautions.
   - Introduce yourself, your role, the purpose of your visit, and an estimate of the time it will take.
   - 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, position the patient, adjust the height of the bed, and turn on the lights. Ensure proper body mechanics for yourself and create a comfortable position for the patient. Ensuring proper lighting allows for good visibility to assess the wound. Premedicate if indicated and ensure patient's comfort prior to and during the procedure.
4. Place a clean, dry barrier on the bedside table or create a sterile field per agency policy. Pour sterile saline into the irrigation tray.
5. Perform hand hygiene and apply nonsterile gloves.
6. Remove the dressing and expose the patient's wound. Dispose of the soiled dressing according to agency policy.
7. Remove gloves and perform hand hygiene.
8. Put on a new pair of nonsterile or sterile gloves, depending on the patient's condition and the type, location, and depth of the wound.
9. Irrigate the wound with sterile normal saline solution to remove surface debris or exudate and to prevent specimen contamination. Alternatively, cleanse the wound with a commercial wound irrigation device.
10. Wipe the surface of the wound with a sterile gauze pad moistened with normal saline solution to remove surface contaminants.
11. Gently blot excess normal saline solution from the wound bed with a dry sterile gauze pad.
12. Remove gloves and perform hand hygiene.
13. Put on new nonsterile gloves.
14. Open the swab specimen collection and transport system. Prepare the contents as needed following the manufacturer's instructions.
15. Use the culture swab(s) to collect the specimen according to agency policy.
    - Note that some agencies use swab collection and transport systems that contain specific swabs designed for anaerobic and aerobic specimen collection.
16. If the wound bed appears dry, moisten the swab with normal saline solution.
17. Identify a 1-cm^2 area of viable wound tissue at or near the center of the wound.
    - Note: The culture must be obtained from the cleanest tissue possible and not from pus, slough, eschar, or necrotic tissue.
18. Rotate the tip of the swab over the identified 1-cm^2 area of the wound for 5 seconds, applying sufficient pressure to express fluid from the wound.

19. Remove the swab from the wound.
20. Immediately insert the swab into the appropriate transport system following the manufacturer's instructions for use. Use caution to avoid contaminating the swab when placing it into the transport system:
    - Clinical alert: Note that the culture must come from the cleanest tissue possible and not from pus, slough, eschar, or necrotic material. Never collect exudate from the skin.
21. Remove gloves and perform hand hygiene.
22. Put on a new pair of nonsterile or sterile gloves depending on the patient's condition and the type, location, and depth of the wound.
23. Apply a new sterile dressing to the patient's wound using a sterile, no-touch technique.
24. Assist the patient to a comfortable position, ask if they have any questions, and thank them for their time.
25. Label the specimen in the presence of the patient (such as name, date, time, location of the wound, and site and source of the specimen) to prevent mislabeling:
    - Note the patient's recent or current antibiotic therapy on the laboratory request form because it might affect test results. If possible, obtain a culture specimen before starting antimicrobial therapy.
26. Ensure safety measures when leaving the room:
    - CALL LIGHT: Within reach
    - BED: Low and locked (in lowest position and brakes on)
    - SIDE RAILS: Secured
    - TABLE: Within reach
    - ROOM: Risk-free for falls (scan room and clear any obstacles)
27. Immediately send the specimen to the laboratory in a laboratory biohazard transport bag with a completed laboratory request form.
28. Document the procedure and related assessments in the patient's chart. Report any concerns according to agency policy.

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1. Wound specimen collection. (2020). Lippincott procedures. procedures.lww.com↵

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10.10: Checklist for Intermittent Suture Removal

Sutures are tiny threads, wire, or other material used to sew body tissue and skin together. They may be placed deep in the tissue and/or superficially to close a wound. The most commonly seen suture is the intermittent suture.

Sutures may be absorbent (dissolvable) or nonabsorbent (must be removed). Nonabsorbent sutures are usually removed within 7 to 14 days. Suture removal is determined by how well the wound has healed and the extent of the surgery. See Figure **10.10.1**[1] for an example of suture removal. Sutures must be left in place long enough to establish wound closure with enough strength to support internal tissues and organs. If sutures are removed too early in the wound healing process, dehiscence can occur. The wound line must be observed for separations during the process of suture removal and the procedure stopped if there are any concerns.

The health care provider must assess the wound to determine whether or not to remove the sutures and provide an order for the removal of sutures. Alternate sutures (every second suture) may be removed first, and then the remaining sutures removed after adequate approximation of the skin tissue is determined. If the wound is well-healed, all the sutures may be removed at the same time, but if there are concerns about approximation, the removal of the remaining sutures may be delayed for several days to avoid dehiscence. Steri-Strips may be applied prior to suture removal to lessen the chance of wound dehiscence. See Figure **10.10.2**.[2]

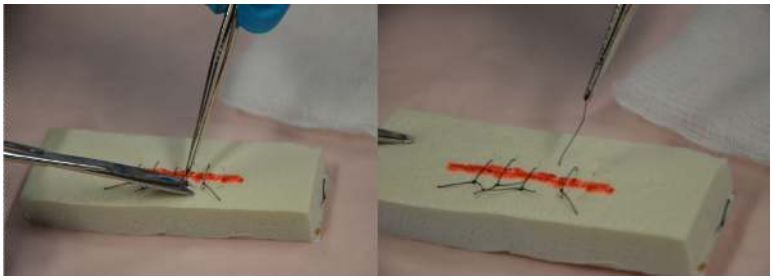


Figure **10.10.1**: Suture Removal from a Simulated Wound

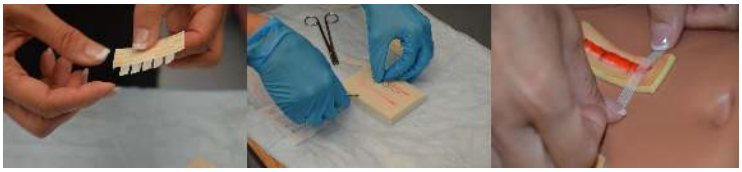


Figure **10.10.2**: Applying Steri-Strips to a Simulated Wound

Checklist for Intermittent Suture Removal

Use the checklist below to review the steps for completion of “Intermittent Suture Removal.”

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

1. Gather supplies: sterile suture scissors, sterile dressing tray (to clean incision site prior to suture removal), nonsterile gloves, normal saline, Steri-Strips, and sterile outer dressing.
2. Perform safety steps:
   - Perform hand hygiene.
   - Check the room for transmission-based precautions.
   - Introduce yourself, your role, the purpose of your visit, and an estimate of the time it will take.
   - 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. Confirm provider order and explain procedure to patient. Inform the patient that the procedure is not painful but they may feel some pulling of the skin during suture removal.
4. Prepare the environment, position the patient, adjust the height of the bed, and turn on the lights. Ensuring proper lighting allows for good visibility to assess the wound. Ensure proper body mechanics for yourself and create a comfortable position for the patient.
5. Perform hand hygiene and put on nonsterile gloves.
6. Place a clean, dry barrier on the bedside table. Add necessary supplies.
7. Remove dressing and inspect the wound. Visually assess the wound for uniform closure of the wound edges, absence of drainage, redness, and swelling. After assessing the wound, decide if the wound is sufficiently healed to have the sutures removed. If there are concerns, discuss the order with the appropriate health care provider.
8. Remove gloves and perform hand hygiene.
9. Put on a new pair of nonsterile or sterile gloves, depending on the patient's condition and the type, location, and depth of the wound.
10. Irrigate the wound with sterile normal saline solution to remove surface debris or exudate and to help prevent specimen contamination. Alternatively, commercial wound cleanser may be used. This step reduces risk of infection from microorganisms on the wound site or surrounding skin. Cleaning also loosens and removes any dried blood or crusted exudate from the sutures and wound bed.
11. To remove intermittent sutures, hold the scissors in your dominant hand and the forceps in your nondominant hand for dexterity with suture removal.
12. Place a sterile 2″ x 2″ gauze close to the incision site to collect the removed suture pieces.
13. Grasp the knot of the suture with the forceps and gently pull up the knot while slipping the tip of the scissors under the suture near the skin. Examine the knot.
14. Cut under the knot as close as possible to the skin at the distal end of the knot:
    - Never snip both ends of the knot as there will be no way to remove the suture from below the surface.
    - Do not pull the contaminated suture (suture on top of the skin) through tissue.
15. Grasp the knotted end of the suture with forceps, and in one continuous action pull the suture out of the tissue and place it on the sterile 2″ x 2″ gauze.
16. Remove every second suture until the end of the incision line. Assess wound healing after removal of each suture to determine if each remaining suture will be removed. If the wound edges are open, stop removing sutures, apply Steri-Strips (using tension to pull wound edges together), and notify the appropriate health care provider. Remove remaining sutures on the incision line if indicated.
17. Using the principles of no-touch technique, cut and place Steri-Strips along the incision line:
    - Cut Steri-Strips so that they extend 1.5 to 2 inches on each side of the incision.
18. Remove gloves and perform hand hygiene.
19. Assist the patient to a comfortable position, ask if they have any questions, and thank them for their time. Return the patient's bed to the lowest position to help prevent falls and maintain patient safety.
20. Ensure safety measures when leaving the room:
    - CALL LIGHT: Within reach
    - BED: Low and locked (in lowest position and brakes on)
    - SIDE RAILS: Secured
    - TABLE: Within reach
    - ROOM: Risk-free for falls (scan room and clear any obstacles)
21. Document the procedure and related assessment findings of the incision. Report any concerns according to agency policy.

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2. "DSC_1658.jpg" and "DSC_09811.jpg" by British Columbia Institute of Technology are licensed under CC BY 4.0. Access for free at https://opentextbc.ca/clinicalskills/chapter/4-3-suture-care-and-removal/↵

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10.11: Checklist for Staple Removal

Staples are made of stainless steel wire and provide strength for wound closure. Staples are strong, quick to insert, and simple to remove, but may cause more scarring than sutures.

Removal of staples is similar to the removal of sutures, but requires a sterile staple extractor instead of forceps and suture scissors. Typically every second staple is initially removed, and then the remaining staples are removed at a later time. In general, staples are removed within 7 to 14 days. See Figure **10.11.1**[1] for an example of staple removal.

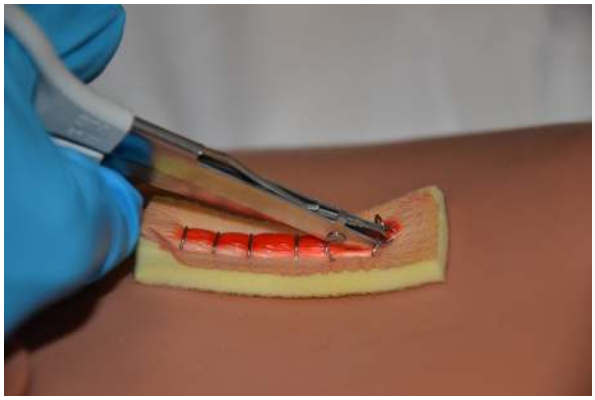


Figure **10.11.1**: Staple Removal from a Simulated Surgical Wound

Checklist for Staple Removal

Please follow the checklist below to review the steps for completion of “Staple Removal.”

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

1. Gather supplies: sterile staple extractors, sterile dressing tray, nonsterile gloves, normal saline, Steri-Strips, and sterile outer dressing.
2. Perform safety steps:
   - Perform hand hygiene.
   - Check room for transmission-based precautions.
   - Introduce yourself, your role, the purpose of your visit, and an estimate of the time it will take.
   - Confirm patient ID using two patient identifiers (e.g., name and date of birth).
   - 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. Confirm the provider order and explain the procedure to patient. Explanation helps prevent anxiety and increases compliance with the procedure. Inform the patient the procedure is not painful but they may feel some pulling or pinching of the skin during staple removal.
4. Prepare the environment, position the patient, adjust the height of the bed, and turn on the lights. Ensuring proper lighting allows for good visibility to assess the wound. Ensure proper body mechanics for yourself and create a comfortable position for the patient.
5. Place a clean, dry barrier on the bedside tables and add necessary supplies.
6. Perform hand hygiene and apply nonsterile gloves.
7. Remove the dressing and inspect the wound. Visually assess the wound for uniform closure of the wound edges, absence of drainage, redness, and swelling. After assessing the wound, decide if the wound is sufficiently healed to have the staples

removed. If there are concerns, discuss the status of the wound before proceeding with the health care provider. For safety purposes, count the number of staples before beginning the procedure.

8. Irrigate the wound with sterile normal saline solution to remove surface debris or exudate to reduce risk of infection from microorganisms on the wound site or surrounding skin and to help loosen and remove any dried blood or crusted exudate from the sutures and wound bed.
9. Remove gloves, perform hand hygiene, and apply nonsterile gloves.
10. Place a sterile 2″ x 2″ next to the wound to collect the staples.
11. Remove the staples (start with every second staple).
12. Place the lower tip of the staple extractor beneath the staple. Do not pull up while depressing the handle on the staple remover or change the angle of your wrist or hand. Close the handle, and then gently move the staple side to side to remove. The closed handle depresses the middle of the staple causing the two ends to bend outward and out of the top layer of skin.
13. When both ends of the staple are visible, move the staple extractor away from the skin and place the staple on a sterile piece of gauze by releasing the handles on the staple extractor. This avoids pulling the staple out prematurely and avoids putting pressure on the wound. It also prevents scratching the skin with the sharp staple.
14. Using the principles of no-touch technique, place Steri-Strips on the location of every removed staple along the incision line. Steri-Strips are supplied in pre-cut lengths. Cut the Steri-Strips to allow them to extend 1.5 to 2 cm on each side of the incision. Steri-Strips support wound tension across wounds and eliminate scarring. This allows wounds to heal by primary intention.
15. Remove the remaining staples as indicated, followed by applying Steri-Strips along the incision line. Count the number of removed staples and compare to the pre-count to ensure safety.
16. Apply a dry, sterile dressing on the incision site or leave it exposed to the air according to provider orders.
17. Discard the supplies according to agency policies for sharps disposal and biohazard waste:
    - The staple extractor may be disposed of or sent for sterilization according to agency policy.
18. Perform hand hygiene.
19. Complete patient teaching regarding Steri-Strips, bathing, and inspecting wound for separation. Instruct the patient to:
    - Take showers rather than bathe in a tub.
    - Avoid pulling off Steri-Strips but allow them to fall off naturally and gradually (usually takes one to three weeks).
    - Receive adequate rest, fluids, nutrition, and ambulation for optional wound healing
20. Assist the patient to a comfortable position, ask if they have any questions, and thank them for their time.
21. Ensure safety measures when leaving the room:
    - CALL LIGHT: Within reach
    - BED: Low and locked (in lowest position and brakes on)
    - SIDE RAILS: Secured
    - TABLE: Within reach
    - ROOM: Risk-free for falls (scan room and clear any obstacles)
22. Document the procedure and assessment findings regarding the appearance of the incision. Report any concerns according to agency policy.

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10.12: Checklist for Wound Cleansing, Irrigation, and Packing

Cleansing is an important step when changing dressings in wounds healing by secondary intention to remove surface debris and to provide optimal visualization for the wound assessment. See Figure **10.12.1**[1] for removal of dressing and wound assessment.



Figure **10.12.1**: Removal of Dressings and Wound Assessment

Follow agency policy and provider orders regarding cleansing solution and method. Many wounds can be cleansed with normal saline. See Figure **10.12.2**[2] for an example of wound irrigation.

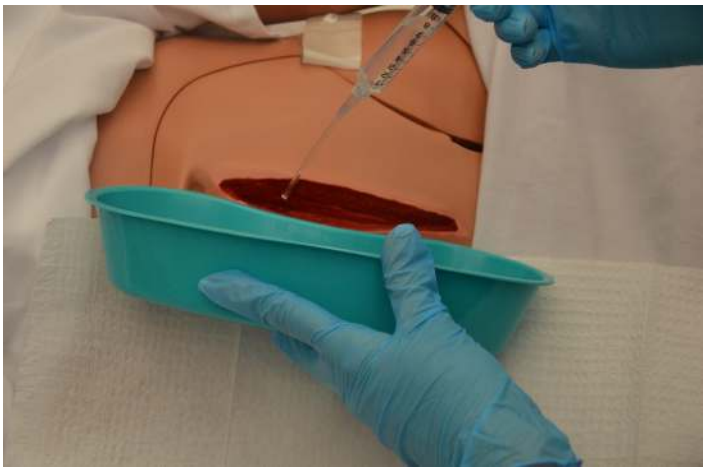


Figure **10.12.2**: Irrigating the Wound

Cleansing solution should be applied with sufficient pressure to cleanse the wound without damaging tissue or driving bacteria into the wound.[3] Following cleansing, the wound may be packed to allow for granulation of new tissue. See Figure **10.12.3**[4] for an example of wound packing.



Figure **10.12.3**: Packing the Wound

Checklist for Wound Cleansing, Irrigation, and Packing

Use the checklist below to review the steps for completion of “Wound Cleansing, Irrigation, and Packing.”

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

1. Gather supplies: syringe, cannula with needleless adaptor, irrigation fluid, basin, waterproof pad, dressing tray with sterile forceps, scissors, skin barrier/protectant, cotton tip applicators, measuring guide, outer sterile dressing, and packing gauze or packing as per physician's orders.
2. Perform safety steps:
    - Perform hand hygiene.
    - Check the room for transmission-based precautions.
    - Introduce yourself, your role, the purpose of your visit, and an estimate of the time it will take.
    - 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. Confirm the provider order and verify appropriateness of order according to wound assessment.
4. Prepare the environment, position the patient, adjust the height of the bed, and turn on the lights. Ensure proper lighting to allow for good visibility to assess the wound. Ensure proper body mechanics for yourself and create a comfortable position for the patient. Position the patient so the wound is vertical to the collection basin, if possible, to allow the solution to flow off the patient.
5. Place a waterproof pad under the patient to protect the patient's clothing and bedding from irrigation fluid.
6. Perform hand hygiene and apply clean gloves.
7. Remove outer dressing:
    - Using sterile forceps, remove the inner dressing (packing) from the wound.
    - If the packing sticks, gently soak the packing with normal saline or sterile water and gently lift off the packing. Removing packing that adheres to the wound bed without soaking can cause trauma to the wound bed tissue. If packing material cannot be removed, contact the provider. If packing adheres to the wound, reassess the amount of wound exudate and consider a different packing material. All packing must be removed with each dressing change.
    - Confirm the quantity and type of packing are the same as recorded on previous dressing change.
8. Assess the wound:
    - Note the location and type of wound.
    - Measure the wound's length, width, and depth.
    - If undermining or tunneling are present, note the location and measure the depth.
    - Determine if the level of tissue damage indicates wound healing or worsening.
    - Assess appearance of wound bed, noting color.
    - Note presence of odor after cleansing.
    - Assess appearance of periwound skin.
    - Wound assessment helps identify if the wound care is effective. Always compare the current wound assessment with the previous assessment to determine if the wound is healing, delayed, worsening, or showing signs of infection.
9. Apply nonsterile gloves, gown, and goggles or face shield according to agency policy.
10. If irrigation is indicated, fill a 35-mL syringe with sterile saline and attach a needleless cannula to the end of the syringe.
11. Hold the syringe about 1 inch above the wound and flush gently with continuous pressure until returned fluid is clear:
    - Irrigation should be drained into the basin because it is a medium for bacterial growth and subsequent infection.
    - Irrigation should not increase patient discomfort.
12. Dry wound edges with sterile gauze using sterile forceps to prevent maceration of surrounding tissue from excess moisture.
13. Remove goggles or face shield and gloves.
14. Perform hand hygiene and apply sterile gloves (if not using sterile forceps) or nonsterile gloves if using sterile forceps.
15. Apply a skin barrier/protectant on the periwound skin as needed to prevent saturated packing materials and/or wound exudate from macerating or irritating the periwound skin.

16. While maintaining sterility, moisten the gauze with sterile normal saline and wring it out so it is damp but not wet:
    - The wound must be moist, not wet, for optimal healing. Gauze packing that is too wet can cause tissue maceration and reduces the absorbency of the gauze.
    - Normal saline gauze packing needs to be changed at least once daily.
    - Ensure the wound is not overpacked or underpacked as either may diminish the healing process.
17. Open the gauze and gently pack it into the wound using sterile forceps or the tip of a sterile, cotton-tipped swab:
    - Continue until all wound surfaces are in contact with gauze.
    - Do not pack too tightly.
    - Do not overlap wound edges with wet packing.
18. Apply an appropriate outer dry dressing, depending on the frequency of the dressing changes and the amount of exudate from the wound:
    - The dressing on the wound must remain dry on the outside to avoid cross-contamination of the wound. If it becomes saturated before the next dressing change, it must be replaced.
19. Discard the supplies.
20. Remove gloves and perform hand hygiene.
21. Assist the patient to a comfortable position, ask if they have any questions, and thank them for their time.
22. Ensure safety measures when leaving the room:
    - CALL LIGHT: Within reach
    - BED: Low and locked (in lowest position and brakes on)
    - SIDE RAILS: Secured
    - TABLE: Within reach
    - ROOM: Risk-free for falls (scan room and clear any obstacles)
23. Document procedure, wound assessment, irrigation solution, and patient response to the irrigation and dressing change. Report any concerns according to agency policy.

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2. “DSC_1732.jpg” by British Columbia Institute of Technology is licensed under CC BY 4.0. Access for free at https://ecampusontario.pressbooks.pub/clinicalskills/chapter/4-5-complex-dressing-change/↵
3. National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel and Pan Pacific Pressure Injury Alliance. (2014). *Prevention and treatment of pressure ulcers: Quick reference guide.* Emily Haesler (Ed.). https://www.epuap.org/wp-content/uploads/2010/10/Quick-Reference-Guide-DIGITAL-NPUAP-EPUAP-PPPIA-16Oct2014.pdf↵
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10.13: Checklist for Drain Management

Drain management systems are commonly used during post-operative surgical management to remove drainage, prevent infection, and enhance wound healing. A drain may be superficial in the skin or deep in an organ, duct, or cavity, such as a hematoma. A patient may have several drains depending on the extent and type of surgery. A closed system uses a vacuum system to withdraw fluids and collect them in a reservoir. Closed systems must be emptied and drainage measured routinely according to agency policy.

Drainage tubes contain perforations to allow fluid to drain from the surgical wound site. The drainage is collected in a closed sterile collection system/reservoir, such as a Hemovac or Jackson-Pratt. The amount of drainage varies depending on location and type of surgery. A Hemovac drain (see Figure **10.13.1**[1]) can hold up to 500 mL of drainage. A Jackson-Pratt (JP) drain (see Figure **10.13.2**[2]) is used for smaller amounts of drainage, usually ranging from 25 to 50 mL. Drains are usually sutured to the skin to prevent accidental removal, and the drainage site is covered with a sterile dressing. The site and drain should be checked periodically throughout the shift to ensure the drain is functioning effectively and that no leaking is occurring.



Figure **10.13.1**: Hemovac Drain



Figure **10.13.2**: Jackson-Pratt Drain

Checklist for Drain Management

Use the checklist below to review the steps for completion of “Drain Management.”

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

1. Gather supplies: drainage measurement container, nonsterile gloves, waterproof pad, and alcohol swab.
2. Perform safety steps:
   - Perform hand hygiene.
   - Check the room for transmission-based precautions.
   - Introduce yourself, your role, the purpose of your visit, and an estimate of the time it will take.
   - 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. Apply nonsterile gloves and goggles or face shield according to agency policy to reduce the transmission of microorganisms and protect against an accidental body fluid exposure.
4. Maintaining a sterile technique, remove the plug from the pouring spout as indicated on the drain:
   - Open the plug pointing away from your face to avoid an accidental splash of contaminated fluid.
   - Maintain the plug's sterility.
   - Notice that the vacuum will be broken and the reservoir (drainage collection system) will expand.
5. Gently tilt the opening of the reservoir toward the measuring container and pour out the drainage away from you to prevent exposure to body fluids. Do not touch the measuring container with the reservoir opening.
6. Place the drainage container on the bed or hard surface, tilt it away from your face, and compress the drain to flatten it with one hand to remove all the air before closing the spout to establish the vacuum system.
7. Cleanse the plug with the alcohol swab per agency policy. Maintaining sterility, place the plug back into the pour spout of the drainage system to establish the vacuum system of the drainage system.
8. Secure the device onto the patient's gown using a safety pin; check patency and placement of tube. Ensure that enough slack is present in tubing and that the reservoir hangs lower than the wound. Proper placement of the reservoir allows gravity to facilitate wound drainage. Providing enough slack to accommodate patient movement prevents tension of the drainage system and pulling on the tubing and insertion site.
9. Note the characteristics of the drainage: color, consistency, odor, and amount. Drainage counts as patient fluid output and must be documented on the patient chart per agency policy.
   - Monitor and empty drains frequently in the post-operative period to reduce the weight of the reservoir and to assess drainage.
10. Remove gloves and perform hand hygiene.
11. Assist the patient to a comfortable position, ask if they have any questions, and thank them for their time.
12. Ensure safety measures when leaving the room:
    - CALL LIGHT: Within reach
    - BED: Low and locked (in lowest position and brakes on)
    - SIDE RAILS: Secured
    - TABLE: Within reach
    - ROOM: Risk-free for falls (scan room and clear any obstacles)
13. Document the procedure and assessment findings according to agency policy. Report any unusual findings or concerns to the health care provider. If the amount of drainage increases or changes, notify the appropriate health care provider according to agency policy.
    - If the amount of drainage significantly decreases, the drain may be ready to be assessed and removed.
    - Notify required health care provider if the wound appears infected.
    - Record the number of drains if there is more than one, and record each one separately.

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10.14: Learning Activities

Learning Activities

(Answers to “Learning Activities” can be found in the “Answer Key” at the end of the book. Answers to interactive activity elements will be provided within the element as immediate feedback.)

Mr. Jones is a 76-year-old patient admitted to the medical surgical floor with complications of a nonhealing foot ulcer. Mr. Jones has a history of diabetes, hypertension, and COPD. He has a BMI of 29. His daily medications include metformin, Lisinopril, and prednisone. His wife has recently passed away and he lives alone.

a. Based upon what is known about Mr. Jones, what factors might be contributing to his nonhealing wound?
b. What other factors that influence wound healing might be important to assess with Mr. Jones?

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10.15: XX Glossary

Angiogenesis: The development of new capillaries in a wound base.

Arterial ulcers: Ulcers caused by lack of blood flow and oxygenation to tissues and typically occur in the distal areas of the body such as the feet, heels, and toes.

Debridement: The removal of nonviable tissue in a wound.

Dehiscence: The separation of the edges of a surgical wound.

Diabetic ulcers: Ulcers that typically develop on the plantar aspect of the feet and toes of patients with diabetes due to lack of sensation of pressure or injury.

Ecchymosis: Bruising that occurs when small veins and capillaries under the skin break.

Edema: Swelling.

Epithelialization: The development of new epidermis and granulation tissue.

Erythema: Redness.

Eschar: Dark brown/black, dry, thick, and leathery dead tissue in a wound base that must be removed for healing to occur.

Exudate: Fluid that oozes out of a wound; also commonly called pus.

Granulation tissue: New connective tissue in a wound base with fragile, thin-walled capillaries that must be protected.

Hematoma: An area of blood that collects outside of larger blood vessels.

Hemosiderin staining: Dark-colored discoloration of the lower legs due to blood pooling.

Hemostasis phase: The first phase of wound healing that occurs immediately after skin injury. Blood vessels constrict and clotting factors are activated.

Induration: Area of hardened tissue.

Inflammatory phase: The second phase of wound healing when vasodilation occurs so that white blood cells in the bloodstream can move into the wound to start cleaning the wound bed.

Maceration: The softening and wasting away of skin due to excess fluid.

Maturation phase: The final phase of wound healing as collagen continues to be created to strengthen the wound, causing scar tissue.

Necrotic: Black tissue color due to tissue death from lack of oxygenation to the area.

Nonblanchable erythema: Skin redness that does not turn white when pressure is applied.

Osteomyelitis: Bone infection.

Peripheral neuropathy: A condition that causes decreased sensation of pain and pressure, typically in the lower extremities.

Periwound: The skin around the outer edges of a wound.

Pressure injuries: Localized damage to the skin or underlying soft tissue, usually over a bony prominence, as a result of intense and prolonged pressure in combination with shear.[1]

Primary intention: Wound healing that occurs with surgical incisions or clean-edged lacerations that are closed with sutures, staples, or surgical glue.

Proliferative phase: The third phase of wound healing that includes epithelialization, angiogenesis, collagen formation, and contraction.

Purulent drainage: Wound exudate that is thick and opaque and can be tan, yellow, green, or brown in color. It is never considered normal in a wound, and new purulent drainage should always be reported to the health care provider.

Sanguineous drainage: Wound drainage that is fresh bleeding.

Secondary intention: Wound healing that occurs when the edges of a wound cannot be approximated (brought together), so the wound fills in from the bottom up by the production of granulation tissue. Examples of wounds that heal by secondary intention are pressure injuries and chainsaw injuries.

Serosanguinous drainage: Wound exudate contains serous drainage with small amounts of blood present.

Serous drainage: Wound drainage that is clear, thin, watery plasma. It is considered normal in minimal amounts during the inflammatory stage of wound healing.

Shear: A mechanical force that occurs when tissue layers move over the top of each other, causing blood vessels to stretch and break as they pass through the subcutaneous tissue.

Skin tears: Wounds caused by mechanical forces, typically in the nonelastic skin of older adults.

Slough: Inflammatory exudate that is light yellow, soft, and moist and must be removed for wound healing to occur.

Tertiary intention: Wound healing that occurs when a wound must remain open or has been reopened, often due to severe infection.

Tunneling: Passageways underneath the surface of the skin that extend from a wound and can take twists and turns.

Undermining: A condition that occurs in wounds when the tissue under the wound edges becomes eroded, resulting in a pocket beneath the skin at the wound's edge.

Unstageable: Occurs when slough or eschar obscures the wound so that tissue loss cannot be assessed.

Venous insufficiency: A medical condition where the veins in the legs do not adequately send blood back to the heart, resulting in a pooling of fluids in the legs that can cause venous ulcers.

Venous ulcers: Ulcers caused by the pooling of fluid in the veins of the lower legs when the valves are not working properly, causing fluid to seep out, macerate the skin, and cause an ulcer.

Wound vac: A device used with special foam dressings and suctioning to remove fluid and decrease air pressure around a wound to assist in healing.

---

1. Edsberg, L. E., Black, J. M., Goldberg, M., McNichol, L., Moore, L., & Sieggreen, M. (2016). Revised national pressure ulcer advisory panel pressure injury staging system: Revised pressure injury staging system. *Journal of Wound, Ostomy, and Continence Nursing: Official Publication of The Wound, Ostomy and Continence Nurses Society*, *43*(6), 585–597. doi.org/10.1097/WON.0000000000000281↵

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CHAPTER OVERVIEW

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11.2: Basic Concepts
11.3: Preventing CAUTI
11.4: Inserting and Managing Indwelling Urinary Catheters
11.5: Obtaining Urine Specimen for Culture
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11.10: Checklist for Foley Catheter Insertion (Male)
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11.12: Checklist for Obtaining a Urine Specimen from a Foley Catheter
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11.1: Facilitation of Elimination Introduction

Learning Objectives

- Perform urinary catheterization, ostomy care, and urine specimen collection
- Manage urinary catheters to prevent complications
- Maintain aseptic or sterile technique
- Explain procedure to patient
- Modify assessment techniques to reflect variations across the life span
- Document actions and observations
- Recognize and report significant deviations from norms

Elimination is a basic human function of excreting waste through the bowel and urinary system. The process of elimination depends on many variables and intricate processes that occur within the body. Many medical conditions and surgeries can adversely affect the processes of elimination, so nurses must facilitate their patients' bowel and urinary elimination as needed. Common nursing interventions related to facilitating elimination include inserting and managing urinary catheters, obtaining urine specimens, caring for ostomies, providing patient education to promote healthy elimination, and preventing complications. In this chapter, we will discuss the technical skills used to support bowel and bladder function, as well as the application of the nursing process while doing so.

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11.2: Basic Concepts

Before discussing specific procedures related to facilitating bowel and bladder function, let's review basic concepts related to urinary and bowel elimination. When facilitating alternative methods of elimination, it is important to understand the anatomy and physiology of the gastrointestinal and urinary systems, as well as the adverse effects of various conditions and medications on elimination. Use the hyperlinks below to review information about these topics.

Note

For more information about the anatomy and physiology of the gastrointestinal system and medications used to treat diarrhea and constipation, visit the "Gastrointestinal" chapter of the Open RN *Nursing Pharmacology* textbook.

For more information about the anatomy and physiology of the kidneys and diuretic medications used to treat fluid overload, visit the "Cardiovascular and Renal System" chapter in Open RN *Nursing Pharmacology* textbook.

For more information about applying the nursing process to facilitate elimination, visit the "Elimination" chapter in Open RN *Nursing Fundamentals*.

Urinary Elimination Devices

This section will focus on the devices used to facilitate urinary elimination. **Urinary catheterization** is the insertion of a catheter tube into the urethral opening and placing it in the neck of the urinary bladder to drain urine. There are several types of urinary elimination devices, such as indwelling catheters, intermittent catheters, suprapubic catheters, and external devices. Each of these types of devices is described in the following subsections.

Indwelling Catheter

An **indwelling catheter**, often referred to as a "Foley catheter," refers to a urinary catheter that remains in place after insertion into the bladder for the continual collection of urine. It has a balloon on the insertion tip to maintain placement in the neck of the bladder. The other end of the catheter is attached to a drainage bag for the collection of urine. See Figure **11.2.1**[1] for an illustration of the anatomical placement of an indwelling catheter in the bladder neck.

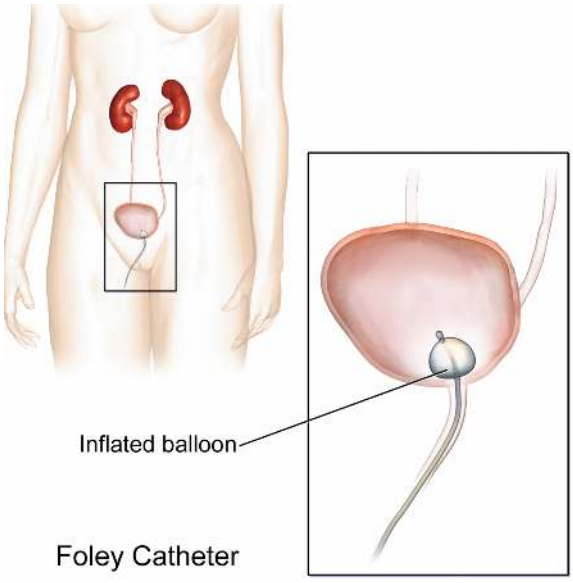


Figure **11.2.1**: Anatomical Placement of an Indwelling Catheter

The distal end of an indwelling catheter has a urine drainage port that is connected to a drainage bag. The size of the catheter is marked at this end using the French catheter scale. A balloon port is also located at this end, where a syringe is inserted to inflate the balloon after it is inserted into the bladder. The balloon port is marked with the amount of fluid required to fill the balloon. See Figure **11.2.2**[2] for an image of the parts of an indwelling catheter.

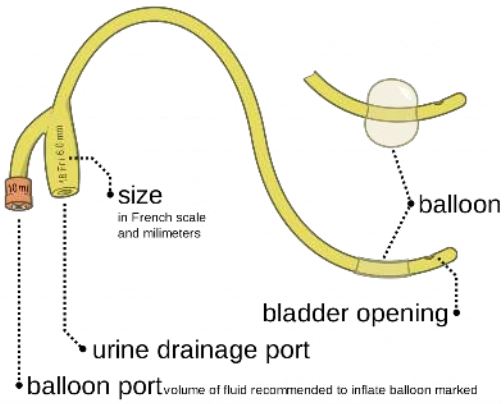


Figure **11.2.2**: Parts of an Indwelling Catheter

Catheters have different sizes, with the larger the number indicating a larger diameter of the catheter. See Figure **11.2.3**[3] for an image of the French Catheter Scale.

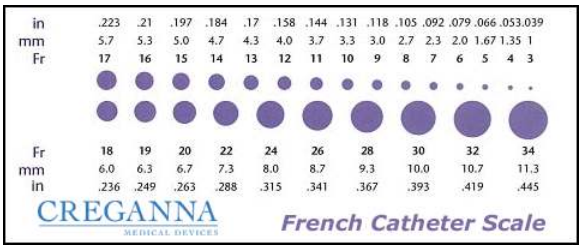


Figure **11.2.3**: French Catheter Scale

There are two common types of bags that may be attached to an indwelling catheter. During inpatient or long-term care, larger collection bags that can hold up to 2 liters of fluid are used. See Figure **11.2.4**[4] for an image of a typical collection bag attached to an indwelling catheter. These bags should be emptied when they are half to two-thirds full to prevent traction on the urethra from the bag. Additionally, the collection bag should always be placed below the level of the patient's bladder so that urine flows out of the bladder and urine does not inadvertently flow back into the bladder. Ensure the tubing is not coiled, kinked, or compressed so that urine can flow unobstructed into the bag. Slack should be maintained in the tubing to prevent injury to the patient's urethra. To prevent the development of a urinary tract infection, the bag should not be permitted to touch the floor.



Figure **11.2.4**: Urine Collection Bag

See Figure **11.2.5**[5] for an illustration of the placement of the urine collection bag when the patient is lying in bed.

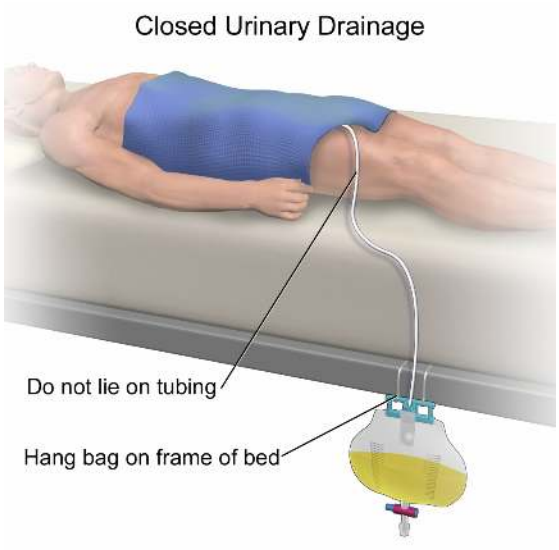


Figure **11.2.5**: Placement of Urine Collection Bag

A second type of urine collection bag is a leg bag. Leg bags provide discretion when the patient is in public because they can be worn under clothing. However, leg bags are small and must be emptied more frequently than those used during inpatient care. Figure **11.2.6**[6] for an image of leg bag and Figure **11.2.7**[7] for an illustration of an indwelling catheter attached to a leg bag.



Figure **11.2.6**: Leg Bag



Figure **11.2.7**: Indwelling Catheter Attached to Leg Bag

Straight Catheter

A **straight catheter** is used for intermittent urinary catheterization. The catheter is inserted to allow for the flow of urine and then immediately removed, so a balloon is not required at the insertion tip. See Figure **11.2.8**[8] for an image of a straight catheter. **Intermittent catheterization** is used for the relief of urinary retention. It may be performed once, such as after surgery when a patient is experiencing urinary retention due to the effects of anesthesia, or performed several times a day to manage chronic urinary retention. Some patients may also independently perform self-catheterization at home to manage chronic urinary retention caused by various medical conditions. In some situations, a straight catheter is also used to obtain a sterile urine specimen for culture when a patient is unable to void into a sterile specimen cup. According to the Centers for Disease Control and Prevention (CDC), intermittent catheterization is preferred to indwelling urethral catheters whenever feasible because of decreased risk of developing a urinary tract infection.[9]

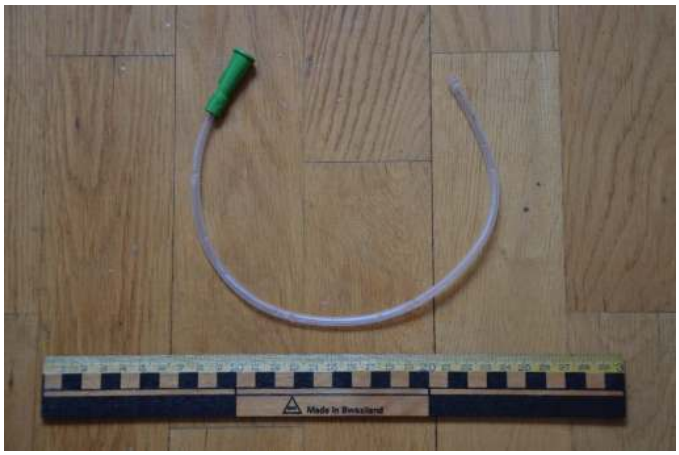


Figure 11.2.8: Straight Catheter

Other Types of Urinary Catheters

Coude Catheter Tip

Coude catheter tips are curved to follow the natural curve of the urethra during catheterization. They are often used when catheterizing male patients with enlarged prostate glands. See Figure 11.2.9[10] for an example of a urinary catheter with a coude tip. During insertion, the tip of the Coude catheter must be pointed anteriorly or it can cause damage the urethra. A thin line embedded in the catheter provides information regarding orientation during the procedure; maintain the line upwards to keep it pointed anteriorly.



Figure 11.2.9: Coude Tipped Catheter

Irrigation Catheter

Irrigation catheters are typically used after prostate surgery to flush the surgical area. These catheters are larger in size to allow for larger amounts of fluid to flush. See Figure 11.2.10[11] for an image comparing a larger 20 French catheter (typically used for irrigation) to a 14 French catheter (typically used for indwelling catheters).



Figure 11.2.10: Comparison of a 20 French and a 14 French Catheter

Suprapubic Catheters

Suprapubic catheters are surgically inserted through the abdominal wall into the bladder. This type of catheter is typically inserted when there is a blockage within the urethra that does not allow the use of a straight or indwelling catheter. Suprapubic catheters may be used for a short period of time for acute medical conditions or may be used permanently for chronic conditions. See Figure 11.2.11[12] for an image of a suprapubic catheter. The insertion site of a suprapubic catheter must be cleaned regularly according to agency policy with appropriate steps to prevent skin breakdown.



Figure 11.2.11: Suprapubic Catheter

Male Condom Catheter

A condom catheter is a noninvasive device used for males with incontinence. It is placed over the penis and connected to a drainage bag. This device protects and promotes healing of the skin around the perineal area and inner legs and is used as an alternative to an indwelling urinary catheter. See Figure 11.2.12[13] for an image of a condom catheter and Figure 11.2.13[14] for an illustration of a condom catheter attached to a leg bag.



Figure 11.2.12: Condom Catheter



Figure **11.2.13**: Condom Catheter Attached to Leg Bag

Female External Urinary Catheter

Female external urinary catheters (FEUC) have been recently introduced into practice to reduce the incidence of catheter-associated urinary tract infection (CAUTI) in women.[15] The external female catheter device is made of a purewick material that is placed externally over the female's urinary meatus. The wicking material is attached to a tube that is hooked to a low-suction device. When the wick becomes saturated with urine, it is suctioned into a drainage canister. Preliminary studies have found that utilizing the FEUC device reduced the risk for CAUTI.[16],[17]

View these supplementary videos on female external urinary catheters:

Students demonstrate use of Purewick Female External Catheter [18]
How to use the use the PureWick – a female external catheter [19]

1. "Foley Catheter.png" by BruceBlaus is licensed under CC BY-SA 4.0↵
2. "Foley catheter inflated and deflated EN.svg" by Olek Remesz (wiki-pl: Orem, commons: Orem) is licensed under CC BY-SA 3.0↵
3. "French catheter scale.gif" by Glitzy queen00 is licensed under CC BY-SA 3.0↵
4. "DSC_2104.jpg" by British Columbia Institute of Technology is licensed under CC BY 4.0. Access for free at https://ecampusontario.pressbooks.pub/clinicalskills/chapter/2-2-head-to-toe-assessment-checklist/↵
5. "Closed Urinary Drainage.png" by BruceBlaus is licensed under CC BY-SA 4.0↵
6. "Leg Bag_3I3A0667.jpg" by Deanna Hoyord, Chippewa Valley Technical College is licensed under CC BY 4.0↵
7. "Foley Catheter Drainage (cropped).png" by BruceBlaus is licensed under CC BY-SA 4.0↵
8. "Urinary catheter.JPG" by Bengt Oberger is licensed under CC BY-SA 3.0↵
9. Centers for Disease Control and Prevention. (2015, November 15). *Catheter-associated urinary tract infections (CAUTI)*. https://www.cdc.gov/infectioncontrol/guidelines/cauti/↵
10. "Self Cath_3I3A0676.jpg" by Deanna Hoyord, Chippewa Valley Technical College is licensed under CC BY 4.0↵
11. "Irrigation Catheter and a 14 Fr. Catheter - 3I3A0753.jpg" by Deanna Hoyord, Chippewa Valley Technical College is licensed under CC BY 4.0↵

12. "NewlyPlaceSubprapubic.jpg" by James Heilman, MD is licensed under CC BY-SA 4.0↵
13. "Male External Cath 1 .jpg" by Deanna Hoyord, Chippewa Valley Technical College is licensed under CC BY 4.0↵
14. "Condom Cather Drainage.png" by BruceBlaus is licensed under CC BY-SA 4.0↵
15. Eckert, L., Mattia, L., Patel, S., Okumura, R., Reynolds, P., & Stuiver, I. Reducing the risk of indwelling catheter-associated urinary tract infection in female patients by implementing an alternative female external urinary collection device: A quality improvement project. *Journal of Wound Ostomy Continence Nursing*, *47*(1), 50-53. https://doi.org/10.1097/won.0000000000000601↵
16. Eckert, L., Mattia, L., Patel, S., Okumura, R., Reynolds, P., & Stuiver, I. Reducing the risk of indwelling catheter-associated urinary tract infection in female patients by implementing an alternative female external urinary collection device: A quality improvement project. *Journal of Wound Ostomy Continence Nursing*, *47*(1), 50-53. https://doi.org/10.1097/won.0000000000000601↵
17. Glover, E., Bleeker, E., Bauermeister, A., Koehlmoos, A., & Van Whye, M. (2018). E*xternal catheters and reducing adverse effects in the female inpatient*. Northwestern College Department of Nursing. https://nwcommons.nwciowa.edu/cgi/viewcontent.cgi?article=1026&context=celebrationofresearch↵
18. Madrid, S. (2019, June 19). *Purewick.* [Video]. YouTube. All rights reserved. https://youtu.be/1rnQaHvIMBc↵
19. Newton, C. (2016, August 4). *PureWick User Instructions*. [Video]. YouTube. All rights reserved. https://youtu.be/xSOuvcShikw↵

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11.3: Preventing CAUTI

A catheter-associated urinary tract infection **(CAUTI)** is a common, life-threatening complication caused by indwelling urinary catheters. The development of a CAUTI is associated with patients' increased length of stay in the hospital, resulting in additional hospital costs and a higher risk of death. It is estimated that 17% to 69% of CAUTI cases are preventable, meaning that up to 380,000 infections and 9,000 patient deaths per year related to CAUTI can be prevented with appropriate nursing measures.[1]

Nurses can save lives, prevent harm, and lower health care costs by following interventions outlined in the document created by the American Nurses Association titled *Streamlined Evidence-Based RN Tool: Catheter Associated Urinary Tract Infection (CAUTI) Prevention*. Review the entire tool in the hyperlink provided below. Key interventions include the following:

- Ensure the patient meets CDC-approved indications prior to inserting an indwelling catheter. If the patient does not meet the approved indications, contact the provider and advocate for an alternative method to facilitate elimination.
  - According to the Centers for Disease Control and Prevention (CDC), appropriate indications for inserting an indwelling urinary catheter include the following[2]:
    - Urinary retention or bladder outlet obstruction
    - Hourly monitoring of urinary output in critically ill patients
    - Perioperative use for selected surgeries
    - Healing of open sacral and perineal wounds in patients with urinary incontinence
    - Prolonged immobilization
    - End-of-life care[3]
  - Inappropriate reasons for inserting an indwelling urinary catheter include the following:
    - Substitution of nursing care for a patient or resident with incontinence
    - A means for obtaining a urine culture when a patient can voluntarily void
    - Prolonged postoperative care without appropriate indications[4]
- After an indwelling urinary catheter is inserted, assess the patient daily to determine if the patient still meets the CDC criteria for an indwelling catheter and document the findings. If the patient no longer meets the approved criteria, follow agency policy for removal.
- When an indwelling catheter is in place, prevent CAUTI by following the maintenance steps outlined by the CDC.
- Continually monitor for signs of a CAUTI and report concerns to the health care provider.[5]
  - Signs and symptoms of CAUTI to urgently report to the health care provider include fever greater than 38 degrees Celsius, change in mental status such as confusion or lethargy, chills, malodorous urine, and suprapubic or flank pain. Flank pain can be assessed by assisting the patient to a sitting or side-lying position and percussing the costovertebral areas.[6]

Note

Read a nurse-driven, evidence-based PDF tool to prevent CAUTI from the American Nurses Association:[7]
Streamlined Evidence-Based RN Tool: Catheter Associated Urinary Tract Infection (CAUTI) Prevention

1. Centers for Disease Control and Prevention. (2015, November 15). *Catheter-associated urinary tract infections (CAUTI)*. https://www.cdc.gov/infectioncontrol/guidelines/cauti/↵
2. Centers for Disease Control and Prevention. (2015, November 15). *Catheter-associated urinary tract infections (CAUTI)*. https://www.cdc.gov/infectioncontrol/guidelines/cauti/↵
3. Centers for Disease Control and Prevention. (2015, November 15). *Catheter-associated urinary tract infections (CAUTI)*. https://www.cdc.gov/infectioncontrol/guidelines/cauti/↵
4. Centers for Disease Control and Prevention. (2015, November 15). *Catheter-associated urinary tract infections (CAUTI)*. https://www.cdc.gov/infectioncontrol/guidelines/cauti/↵
5. American Nurses Association. (n.d.). *Streamlined evidence-based RN tool: Catheter associated urinary tract infection (CAUTI) prevention*. https://www.nursingworld.org/~4aede8/globalassets/practiceandpolicy/innovation--evidence/clinical-practice-material/cauti-prevention-tool/anacautipreventiontool-final-19dec2014.pdf↵

6. Blodgett, T. J., Gardner, S. E., Blodgett, N. P., Peterson, L. V., & Pietraszak, M. (2015). A tool to assess the signs and symptoms of catheter-associated urinary tract infection: Development and reliability. *Clinical Nursing Research*, *24*(4), 341-356. https://doi.org/10.1177/1054773814550506↵
7. American Nurses Association. (n.d.). Streamlined evidence-based RN tool: Catheter associated urinary tract infection (CAUTI) prevention. https://www.nursingworld.org/~4aede8/globalassets/practiceandpolicy/innovation--evidence/clinical-practice-material/cauti-prevention-tool/anacautipreventiontool-final-19dec2014.pdf↵

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11.4: Inserting and Managing Indwelling Urinary Catheters

Safely and accurately placing an indwelling urinary catheter poses several challenges that require the nurse to use clinical judgment. Challenges can include anatomical variations in a specific patient, medical conditions affecting patient positioning, and maintaining sterility of the procedure with confused or agitated patients. See the checklists on Foley Catheter Insertion (Male) and Foley Catheter Insertion (Female) for detailed instructions.

Nursing interventions to prevent the development of a catheter-associated urinary tract infection (CAUTI) on insertion include the following[1]:

- Determine if insertion of an indwelling catheter meets CDC guidelines.
- Select the smallest-sized catheter that is appropriate for the patient, typically a 14 French.
- Obtain assistance as needed to facilitate patient positioning, visualization, and insertion. Many agencies require two nurses for the insertion of indwelling catheters.
- Perform perineal care before inserting a urinary catheter and regularly thereafter.
- Perform hand hygiene before and after insertion, as well as during any manipulation of the device or site.
- Maintain strict aseptic technique during insertion and use sterile gloves and equipment.
- Inflate the balloon after insertion per manufacturer instructions. It is not recommended to preinflate the balloon prior to insertion.
- Properly secure the catheter after insertion to prevent tissue damage.
- Keep the drainage bag below the bladder but not resting on the floor.
- Check the system to ensure there are no kinks or obstructions to urine flow.
- Provide routine hygiene of the urinary meatus during daily bathing, and cleanse the perineal area after every bowel movement. In uncircumcised males, gently retract the foreskin, cleanse the meatus, and then return the foreskin to the original position. Do not cleanse the periurethral area with antiseptics after the catheter is in place.[2] To avoid contaminating the urinary tract, always clean by wiping away from the urinary meatus.
- Empty the collection bag regularly using a separate, clean collecting container for each patient. Avoid splashing and prevent contact of the drainage spigot with the nonsterile collecting container or other surfaces. Never allow the bag to touch the floor.[3] [4]

Video Review of Thompson Rivers University's Urinary Catheterization:

Urinary Catheterization – Female video [5]

Urinary Catheterization – Male video [6]

1. American Nurses Association. (n.d.). *Streamlined evidence-based RN tool: Catheter associated urinary tract infection (CAUTI) prevention.* https://www.nursingworld.org/~4aede8/globalassets/practiceandpolicy/innovation--evidence/clinical-practice-material/cauti-prevention-tool/anacautipreventiontool-final-19dec2014.pdf↵
2. Centers for Disease Control and Prevention. (2015, November 15). *Catheter-associated urinary tract infections (CAUTI).* https://www.cdc.gov/infectioncontrol/guidelines/cauti/↵
3. Centers for Disease Control and Prevention. (2015, November 15). *Catheter-associated urinary tract infections (CAUTI).* https://www.cdc.gov/infectioncontrol/guidelines/cauti/↵
4. American Nurses Association. (n.d.). *Streamlined evidence-based RN tool: Catheter associated urinary tract infection (CAUTI) prevention*. https://www.nursingworld.org/~4aede8/globalassets/practiceandpolicy/innovation--evidence/clinical-practice-material/cauti-prevention-tool/anacautipreventiontool-final-19dec2014.pdf↵
5. Thomson Rivers Open Learning. (2018). *Urinary catheterization - female*. [Video]. All rights reserved. ↵
6. Thomson Rivers Open Learning. (2018). *Urinary catheterization - male*. [Video]. All rights reserved. ↵

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11.5: Obtaining Urine Specimen for Culture

If a small amount of a fresh urine is needed for specimen collection for urinalysis or culture, aspirate the urine from the needleless sampling port with a sterile syringe after cleansing the port with a disinfectant.[1] See the "Checklist for Obtaining a Urine Specimen from a Foley Catheter" for more detailed instructions. Do not collect the urine that is already in the collection bag because it is contaminated and will lead to an erroneous test result.

1. Centers for Disease Control and Prevention. (2015, November 15). *Catheter-associated urinary tract infections (CAUTI)*. https://www.cdc.gov/infectioncontrol/guidelines/cauti/ ↵

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11.6: Removing an Indwelling Urinary Catheter

It is the nurse's responsibility to assess for a patient's continued need for an indwelling catheter daily and to advocate for removal when appropriate.[1] Prolonged use of indwelling catheters increases the risk of developing CAUTIs. For patients who require an indwelling catheter for operative purposes, the catheter is typically removed within 24 hours or less. Some agencies have a protocol for the removal of indwelling catheters, whereas others require a prescription from a provider. For additional instructions about how to remove an indwelling catheter, see the "Checklist for Foley Removal."

When removing an indwelling urinary catheter, it is considered a standard of practice to document the time and track the time of the first void. This information is also communicated during handoff reports. If the patient is unable to void within 4-6 hours and/or complains of bladder fullness, the nurse determines if incomplete bladder emptying is occurring according to agency policy. The ANA has made the following recommendations to assess for incomplete bladder emptying:

- The patient should be prompted to urinate.
- If urination volume is less than 180 mL, the nurse should perform a bladder scan to determine the post-void residual. A **bladder scan** is a bedside test performed by nurses that uses ultrasonic waves to determine the amount of fluid in the bladder.
- If a bladder scanner is not available, a straight urinary catheterization is performed.[2]

When a urinary catheter is removed, instruct the patient on the following guidelines:

- Increase or maintain fluid intake (unless contraindicated).
- Void when able with the goal to urinate within six hours after removal of the catheter. Inform the nurse of the void so that the amount can be measured and documented.
- Be aware that there may be a mild burning sensation during the first void.
- Report any burning, discomfort, frequency, or small amounts of urine when voiding.
- Report an inability to void, bladder tenderness, or distension.

1. American Nurses Association. (n.d.). *Streamlined evidence-based RN tool: Catheter associated urinary tract infection (CAUTI) prevention.* https://www.nursingworld.org/~4aede8/globalassets/practiceandpolicy/innovation--evidence/clinical-practice-material/cauti-prevention-tool/anacautipreventiontool-final-19dec2014.pdf↵
2. American Nurses Association. (n.d.). *Streamlined evidence-based RN tool: Catheter associated urinary tract infection (CAUTI) prevention*. https://www.nursingworld.org/~4aede8/globalassets/practiceandpolicy/innovation--evidence/clinical-practice-material/cauti-prevention-tool/anacautipreventiontool-final-19dec2014.pdf↵

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11.7: Managing Ostomies

An **ostomy** is the surgical procedure that creates an opening (stoma) from an area inside the body to the outside of the body. In ostomies related to elimination, a stoma is an opening on the abdomen that is connected to the gastrointestinal or urinary system to allow waste (i.e., urine or feces) to be collected in a pouch. See Figure **11.7.1**[1] for an image of a stoma. A stoma can be permanent, such as when an organ is removed, or temporary, such as when an organ requires time to heal. Ostomies are created for patients with conditions such as cancer of the bowel or bladder, inflammatory bowel diseases, or perforation of the colon.



Figure **11.7.1**: Ileostomy Stoma

There are several different kinds of ostomies related to elimination. Common types of ostomies include the following:

- **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.
- **Urostomy:** The ureters (tubes that carry urine from the kidney to the bladder) are attached to a stoma to bypass the bladder.[2]

See Figure **11.7.2**[3] comparing the anatomical 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 impacts 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 to waste from an ostomy placed in the descending colon.

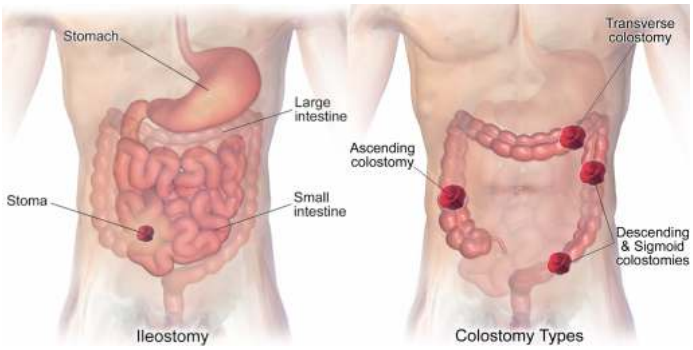


Figure **11.7.2**: Location of an Ileostomy Compared to Colostomies

The tissue of a **stoma** is very delicate. Immediately after surgery, a stoma is swollen, but it will shrink in size over several weeks. A healthy, healed stoma appears moist and dark red or pink in color. 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.[4]

Stoma appliances are supplied as a one- or two-piece set. 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 with 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 peristomal skin. The pouch has an end with an opening where the waste is drained and is closed using a plastic clip or Velcro™ strip.[5] In a one-piece stoma appliance set, the ostomy barrier and the pouch are one piece. See Figure **11.7.3**[6] for an image of a stoma with an ostomy barrier in place. See Figure **11.7.4**[7] for an image of a patient with an ileostomy appliance with a pouch attached.

Individuals with colostomies, ileostomies, and urostomies have no sensation and no control over the output of the stoma. Depending on the type of system, the ostomy appliance can last from four to seven 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.[8]



Figure **11.7.3**: Stoma with a Wafer Barrier



Figure **11.7.4**: Ileostomy Appliance with a Pouch Attached

When changing an ostomy appliance, the ostomy barrier is cut to fit closely around the stoma without impinging on it. See the "Checklist for Ostomy Appliance Change" for detailed instructions. The nurse measures the stoma with a template and then cuts and fits the ostomy barrier to a size that is 2 mm larger than the stoma.[9] See Figure **11.7.5**[10] for an image of a nurse measuring and cutting the ostomy barrier to fit around a stoma.

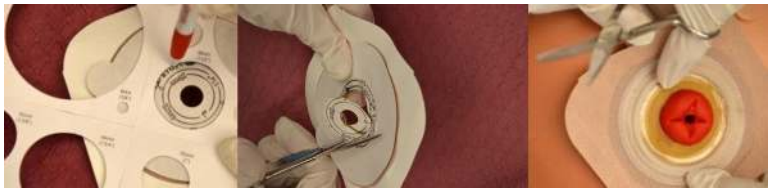


Figure **11.7.5**: Fitting Barrier to Stoma

After the skin barrier is applied to the skin, the pouch is snapped to the ostomy barrier. See Figure **11.7.6**[111] for an image of applying the pouch.



Figure **11.7.6**: Applying an Ostomy Pouch

The ostomy bag may become filled with gas from the intestine. A patient may “burp” the bag through the opening at the top of a two-piece system by opening a corner of the ostomy pouch from the flange to let the air out. As the patient becomes more comfortable with the ostomy appliance, dietary changes can also help reduce the amount of gas produced.

Physical and Emotional Assessment

Patients may have other medical conditions that affect their ability to manage their ostomy care. Conditions such as arthritis, vision changes, Parkinson’s disease, or post-stroke complications can hinder a patient’s coordination and ability to manage the ostomy. In addition, 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. 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 the patient has appropriate referrals to a wound/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.[12]

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 two or three days of home care or until ordered supplies are expected to arrive. Evaluate the patient’s and caregiver’s understanding of the signs of complications. Remind them to call the provider if the stoma becomes swollen, dry, discolored, or develops a malodorous discharge.

Video Review for Changing an Ostomy Pouch[13]



Urostomy Care

A urostomy is similar to a colostomy, but it is an artificial opening for passing urine. Urostomies are surgically created due to medical conditions such as bladder cancer, removal of the bladder, trauma, spinal cord injuries, or congenital abnormalities.

A urostomy patient has no voluntary control of urine, so the pouching system must be emptied regularly. Many patients empty their urostomy bag every two to four hours or when the pouch becomes one-third full. The pouch may also be attached to a drainage bag for overnight drainage. Patients with a urostomy are at risk for urinary tract infections (UTIs), so it is important to educate them regarding the signs and symptoms of an infection.

Some mucous in the urine is normal with a urostomy, but blood is not a normal or expected finding and should be reported to the health care provider.

1. "Ileostomy 2017-02-20 5351.jpg" by Salicyna is licensed under CC BY-SA 4.0↵
2. MedlinePlus [Internet]. Bethesda (MD): National Library of Medicine (US); [updated 2020, Apr 24]. Ostomy. [reviewed 2014, Jul 3; cited 2020, Nov 17]. https://medlineplus.gov/ostomy.html↵
3. "Ileostomy.png" by BruceBlaus is licensed under CC BY-SA 4.0 and "Blausen_0247_Colostomy.png" by CC BY 3.0↵
4. A.D.A.M. Medical Encyclopedia [Internet]. Atlanta (GA): A.D.A.M., Inc.; c1997-2020. Ileostomy - caring for your stoma; [updated 2020, Nov 3]. https://medlineplus.gov/ency/patientinstructions/000071.htm↵
5. A.D.A.M. Medical Encyclopedia [Internet]. Atlanta (GA): A.D.A.M., Inc.; c1997-2020. Ileostomy - caring for your stoma; [updated 2020, Nov 3]. https://medlineplus.gov/ency/patientinstructions/000071.htm↵
6. "Ostomy_wafer_being_worn_by_an_ileostomy_patient.jpg" by Eric Polsinelli (VeganOstomy) is licensed under CC BY 4.0↵
7. "Ileostomy_2016-09-09_4158.jpg" by Salicyna is licensed under CC BY-SA 4.0. ↵
8. This work is a derivative of Clinical Procedures for Safer Patient Care by British Columbia Institute of Technology and is licensed under CC BY 4.0↵
9. This work is a derivative of Clinical Procedures for Safer Patient Care by British Columbia Institute of Technology and is licensed under CC BY 4.0↵
10. "DSC_1284-e1442766479432.jpg" and "Assess-if-flange-is-the-correct-size-for-stoma-001.jpg" by British Columbia Institute of Technology are licensed under CC BY 4.0. Access for free at https://ecampusontario.pressbooks.pub/clinicalskills/chapter/10-6-ostomies/↵
11. "Removing-ostomy-bag-from-flange-001.jpg" by British Columbia Institute of Technology is licensed under CC BY 4.0. Access for free at https://ecampusontario.pressbooks.pub/clinicalskills/chapter/10-6-ostomies/↵

12. This work is a derivative of Clinical Procedures for Safer Patient Care by British Columbia Institute of Technology and is licensed under CC BY 4.0↵
13. RegisteredNurseRN. (2017, February 14). *Ostomy bag pouch change | Ostomy care nursing | Colostomy, ileostomy bag change*. [Video]. YouTube. All rights reserved. Video used with permission. https://youtu.be/h8CtsPAaa5Y↵

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11.8: Applying the Nursing Process to Catheterization

When preparing to insert an indwelling urinary catheter, it is important to use the nursing process to plan and provide care to the patient. Begin by assessing the appropriateness of inserting an indwelling catheter according to CDC criteria as discussed in the "Preventing CAUTI" section of this chapter. Determine if alternative measures can be used to facilitate elimination and address any concerns with the prescribing provider before proceeding with the provider order.

Subjective Assessment

In addition to verifying the appropriateness of the insertion of an indwelling catheter according to CDC recommendations, it is also important to assess for any conditions that may interfere with the insertion of a urinary catheter when feasible. See suggested interview questions prior to inserting an indwelling catheter and their rationale in Table 11.8.1.

Table 11.8.1: Suggested Interview Questions Prior to Urinary Catheterization

Interview Questions	Rationale
Do you have any history of urinary problems such as frequent urinary tract infections, urinary tract surgeries, or bladder cancer? For males: Do you have any history of prostate enlargement or prostate problems? For females: Have you had any gynecological surgeries?	Previous medical conditions and surgeries may interfere with urinary catheter placement. Information about a male patient's prostate will assist in determining the size and type of catheter used. (Recall that using a catheter with a Coude tip is helpful when a male patient has an enlarged prostate.) If a patient has a history of previous urinary tract infections, they may be at higher risk of developing CAUTI.
Have you ever had a urinary catheter placed in the past? If so, were there any problems with placement or did you experience any problems while the catheter was in place?	Questioning the patient about placement and prior catheterizations assists the nurse in identifying any problems with catheterization or if the patient has had the procedure before, he/she may know what to expect.
Do you have any questions about this procedure? How do you feel about undergoing catheterization?	The nurse should encourage patient involvement with their care and identify any fears or anxiety. Nurses can decrease or eliminate these fears and anxieties with additional information or reassurance.
Do you take any medications that increase urination such as diuretics or any medications that decrease urgency or frequency? If so, please describe.	Identifying medications that increase or decrease urine output is important to consider when monitoring urine output after the catheter is in place.
Have you had any orthopedic surgeries that may affect your ability to bend your knees or hips? Are you able to tolerate lying flat for a short period of time?	The patient may not be able to tolerate the positioning required for catheter insertion. If so, additional assistance from other staff may be required for patient comfort and safety.

Cultural Considerations

When inserting urinary catheters, be aware of and respect cultural beliefs related to privacy, family involvement, and the request for a same-gender nurse. Inserting a urinary catheter requires visualization and manipulation of anatomical areas that are considered private by most patients. These procedures can cause emotional distress, especially if the patient has experienced any history of abuse or trauma.

Objective Assessment

In addition to performing a subjective assessment, there are several objective assessments to complete prior to insertion. See Table 11.8.2 for a list of objective assessments and their rationale.

Table 11.8.2: Objective Assessment

Objective Data Collection	Rationale
Review the patient's medical record for any documented medical conditions the patient may not have reported, such as urethral strictures, structural problems with the bladder or urethra, or frequent urinary tract infections.	Any type of obstruction or scar tissue within these areas may prevent the catheter from advancing into the bladder.
Analyze the patient's weight and most recent electrolyte values.	Weight is used to determine a patient's fluid status, especially if they have fluid overload. Electrolyte levels are also affected by fluid balance and the use of diuretic medications. Establish a baseline to use to evaluate outcomes after placing the urinary catheter.
Determine the patient's level of consciousness, ability to cooperate, developmental level, and age.	Evaluate the patient's ability to follow directions and cooperate during the procedure and seek additional assistance during the procedure if needed. This data will impact how to explain the procedure to the patient.
Perform physical assessment of the bladder and perineum. Palpate the bladder for signs of fullness and discomfort. (Bladder emptying may also be assessed using a bladder scanner per agency policy). Inspect the perineum for erythema, discharge, drainage, skin ulcerations, or odor. Note the position of anatomical landmarks. For example, in females identify the urethra versus the vaginal opening.	A full bladder produces discomfort and urgency to void, especially on palpation. These symptoms should be relieved with the placement of a urinary catheter. Identify any abnormal physical signs in the perineal area that may interfere with comfort during insertion. Determining the urethral opening improves accuracy and ease of insertion.
When examining the perineal area, note the approximate diameter of the urinary meatus. Choose the smallest, appropriately-sized diameter catheter.	An appropriately-sized catheter is important to avoid unnecessary discomfort or trauma to the urinary tissue. Catheters that are 14 French diameter are typically used in adults.

Life Span Considerations

Children

It is often helpful to explain the catheterization procedure using a doll or toy. According to agency policy, a parent, caregiver, or other adult should be present in the room during the procedure. Asking a younger child to blow into a straw can help relax the pelvic muscles during catheterization.

Older Adults

The urethral meatus of older women may be difficult to identify due to atrophy of the urogenital tissue. The risk of developing a urinary tract infection may also be increased due to chronic disease and incontinence.

Expected Outcomes/Planning

Expected patient outcomes following urinary catheterization should be planned and then evaluated and documented after the procedure is completed. See Table 11.8.3 for sample expected outcomes related to urinary catheterization.

Table **11.8.3**: Expected Outcomes of Urinary Catheterization

Expected Outcomes	Rationale
The patient's bladder is nondistended and not palpable.	Verifies appropriate bladder emptying.
The patient reports no abdominal or bladder discomfort or pressure.	Verifies correct catheter placement by allowing urine flow and relieving discomfort or pressure.
Urine output is at least 30 mL/hr.	Verifies correct catheter placement and appropriate kidney functioning. If urine output is less than 30 mL/hour, check tubing for kinking and obstruction, and notify the provider if there is no improvement after manipulating the tubing.
Patient verbalizes understanding of the purpose of the catheter and signs of a urinary tract infection to report.	Verifies the patient's understanding of the procedure and signs of complications.



Safety is a priority! Acquire additional staff assistance to help support and position patients who are weak, obese, frail, confused, uncooperative, or have a fractured hip or pelvis.

Implementation

When inserting an indwelling urinary catheter, the expected finding is that the catheter is inserted accurately and without discomfort, and immediate flow of clear, yellow urine into the collection bag occurs. However, unexpected events and findings can occur. See Table **11.8.4** for examples of unexpected findings and suggested follow-up actions.

Table **11.8.4**: Unexpected Findings and Follow-Up Actions

Unexpected Findings	Follow-Up Action
Urine flow does not occur when catheterizing a female patient.	The catheter may have entered the vagina and not the urethral meatus. Leave the catheter in the vagina as a landmark to avoid incorrect reinsertion. Obtain a new catheter kit and cleanse the urinary meatus again before reinsertion. If reinsertion is successful into the bladder, remove the catheter that is in vagina after the second attempt.
Sterile field is broken during the procedure.	If supplies or the catheter become contaminated, obtain a new catheter kit and restart the procedure.
Patient reports continued bladder pain or discomfort although urinary flow indicates correct catheter placement.	Ensure there is no tension pulling at the catheter. It may be helpful to advance the catheter another 2-3 inches to ensure it is in the bladder and not the urethra. If these actions do not resolve the discomfort, notify the provider because it is possible the patient is experiencing bladder spasms. Continue to monitor urine output for clarity, color, and amount and for signs of urinary tract infection.
The nurse is unable to advance the catheter on a male patient with an enlarged prostate.	Do not force advancement because this may cause further damage. Ask the patient to take deep breaths and try again. If a second attempt is unsuccessful, obtain a Coude catheter and attempt to reinsert. If unsuccessful with a Coude catheter, notify the provider.
Urine is cloudy, concentrated, malodorous, dark amber in color, or contains sediment, blood, or pus.	Notify the health care provider of signs and symptoms of a possible urinary tract infection. Obtain a urine specimen as prescribed.

Evaluation

Evaluate the success of the expected outcomes established prior to the procedure.

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11.9: Sample Documentation

Sample Documentation for Expected Findings

A size 14F Foley catheter inserted per provider prescription. Indication: Prolonged urinary retention. Procedure and purpose of Foley catheter explained to patient. Patient denies allergies to iodine, orthopedic limitations, or previous genitourinary surgeries. Balloon inflated with 10 mL of sterile saline. Patient verbalized no discomfort or pain with balloon inflation or during the procedure. Peri-care provided before and after procedure. Catheter tubing secured to right upper thigh with stat lock. Drainage bag attached, tubing coiled loosely with no kinks, bag is below bladder level on bed frame. Urine drained with procedure 375 mL. Urine is clear, amber in color, no sediment. Patient resting comfortably; instructed the patient to notify the nurse if develops any bladder pain, discomfort, or spasms. Patient verbalized understanding.

Sample Documentation for Unexpected Findings

A size 14F Foley catheter inserted per provider prescription. Indication was for oliguria with accurate output measurements required. Procedure and purpose of Foley catheter explained to patient. Patient denies allergies to iodine, orthopedic limitations, or previous genitourinary surgeries. As the balloon was being inflated with saline, patient began to report discomfort. Saline removed, catheter further advanced one inch and balloon reinflated with 10 mL of normal saline. Patient denied discomfort after the catheter advancement. Catheter tubing secured to right upper thigh with stat lock. Drainage bag attached, tubing coiled loosely with no kinks, bag is below bladder level. Urine drained with procedure 100 mL. Urine drainage is dark amber, noticeable sediment in tubing, with foul odor. Patient resting comfortably, denies any bladder pain or discomfort. Instructed the patient to notify the nurse if develops any bladder pain, discomfort, or urinary spasms. Patient verbalized understanding. Notify the health care provider of urine assessment. Continue monitoring patient for any new or worsening symptoms such as change in mental status, fever, chills, or hematuria.

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11.10: Checklist for Foley Catheter Insertion (Male)

Use the checklist below to review the steps for completion of “Foley Catheter Insertion (Male).”
See Figure **11.10.1**[1] for an image of a Foley catheter kit.



Figure **11.10.1**: Foley Catheter Kit

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

1. Gather supplies: peri-care supplies, clean nonsterile gloves, Foley catheter kit, extra pair of sterile gloves, Velcro™ catheter securement device to secure Foley catheter to leg, linen bag, wastebasket, and light source (i.e., goose neck lamp or flashlight).
2. Perform safety steps:
   - Perform hand hygiene.
   - Check the room for transmission-based precautions.
   - Introduce yourself, your role, the purpose of your visit, and an estimate of the time it will take.
   - Confirm patient ID using two patient identifiers (e.g., name and date of birth).
   - Explain the process to the patient.
   - 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. Assess for latex/iodine allergies, enlarged prostate, joint limitations for positioning, and any history of previous issues with catheterization.
4. Prepare the area for the procedure:
   - Place hand sanitizer for use during/after procedure on the table near the bed.
   - Place the catheter kit and peri-care supplies on the over-the-bed table.
   - Secure the wastebasket and linen cart/bag near the bed for disposal.
   - Ensure adequate lighting. Enlist assistance for positioning if needed.
   - Raise the opposite side rail. Set the bed to a comfortable height.
5. Position the patient supine and drape the patient with a bath blanket, exposing only the necessary area to maintain patient privacy.
6. Apply clean nonsterile gloves and perform peri-care.
7. Remove gloves and perform hand hygiene.
8. Open the outer package wrapping. Remove the sterile wrapped box with the paper label facing upward to avoid spilling contents and place it on the bedside table or, if possible, between the patient’s legs. Place the plastic package wrapping at the end of the bed or on the side of the bed near you, with the opening facing you or facing upwards for waste.
9. Open the kit to create and position a sterile field (if on bedside table):

- Open first flap away from you.
- Open second flap toward you.
- Open side flaps.
- Only touch the outer 1” edge of the field to position the sterile field on the table.

10. Carefully remove the sterile drape from the kit. Touching only the outermost edges of the drape, unfold and place the touched side of the drape closest to linen, under the patient. Vertically position the drape between the patient’s legs to allow space for the sterile box and sterile tray. Do not reach over the drape as it is placed.
11. Wash your hands and apply sterile gloves.
12. OPTIONAL: Place the fenestrated drape over the patient’s perineal area with gloves on inside of the drape, away from the patient’s gown, with peri-area visible through the opening. Maintain sterility.
13. Empty the syringe or package of lubricant into the plastic tray. Place the empty syringe/package on the sterile outer package.
14. Simulate application (do not open) of the iodine cleanser to the cotton. Place package on sterile outer package.
15. Remove the sterile urine specimen container and cap and set them aside.
16. Remove the tray from the top of the box and place on sterile drape.
17. Carefully remove the plastic catheter covering, while keeping the catheter in the container. Attach the syringe filled with sterile water to the balloon port of the catheter; keep the catheter sterile.
18. Lubricate the tip of the catheter by dipping it in lubricant and replace it in the box. Maintain sterility.
19. If preparing the kit on a bedside table, place the plastic tray on top of the sterile box and carry it as one unit to the sterile drape between the patient’s legs, taking care not to touch your gloves on the patient’s legs or bed linens.
20. Place the top plastic tray on the sterile drape nearest to the patient. An alternate option is to leave the plastic tray on top of the box until after cleaning is complete.
21. Tell the patient that you are going to clean the catheterization area and they will feel a cold sensation.
22. With your nondominant hand, grasp the penis and retract the foreskin if present; position at a 90-degree angle. Your nondominant hand will now be nonsterile. This hand must remain in place throughout the procedure.
23. With your sterile dominant hand, use the forceps to pick up a cotton ball. Cleanse the glans penis with a saturated cotton ball in a circular motion from the center of the meatus outward. Discard the cotton ball after use into the plastic outer wrap, not crossing the sterile field. Repeat for a total of three times using a new cotton ball each time. Discard the forceps in the plastic bag without touching your sterile gloved hand to the bag.
24. Pick up the catheter with your sterile dominant hand. Instruct the patient to take a deep breath and exhale or “bear down” as if to void, as you steadily insert the catheter, maintaining sterility of the catheter, until urine is noted in the tube.
25. Once urine is noted, continue inserting to the catheter bifurcation.
26. With your nondominant/nonsterile hand, continue to hold the penis, and use your thumb and index finger to stabilize the catheter. With the dominant hand, inflate the retention balloon with the water-filled syringe to the level indicated on the balloon port of the catheter. With the plunger still pressed, remove the syringe and set it aside. Pull back on the catheter slightly until resistance is met, confirming the balloon is in place. Replace the foreskin, if retracted, for the procedure.



If the patient experiences pain during balloon inflation, deflate the balloon and insert the catheter farther into the bladder. If pain continues with the balloon inflation, remove the catheter and notify the patient’s provider.

27. Remove the sterile draping and supplies from the bed area and place them on the bedside table. Remove the bath blanket and reposition the patient.
28. Remove your gloves and perform hand hygiene.
29. Apply new gloves. Secure the catheter with the securement device, allowing room to not pull on the catheter.
30. Place the drainage bag below the level of the bladder and attach the bag to the bed frame.
31. Perform peri-care as needed; assist the patient to a comfortable position.
32. Dispose of waste and used supplies.

33. Remove your gloves and perform hand hygiene.
34. Assist the patient to a comfortable position, ask if they have any questions, and thank them for their time.
35. Ensure safety measures when leaving the room:
    - CALL LIGHT: Within reach
    - BED: Low and locked (in lowest position and brakes on)
    - SIDE RAILS: Secured
    - TABLE: Within reach
    - ROOM: Risk-free for falls (scan room and clear any obstacles)
36. Perform hand hygiene.
37. Document the procedure and related assessment findings. Report any concerns according to agency policy.

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1. ”Open Foley Kit 3I3A0654.jpg” by Deanna Hoyord, Chippewa Valley Technical College is licensed under CC BY 4.0↵

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11.11: Checklist for Foley Catheter Insertion (Female)

Use the checklist below to review the steps for completion of “Foley Catheter Insertion (Female).”

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

1. Gather supplies: peri-care supplies, clean gloves, Foley catheter kit, extra pair of sterile gloves, Velcro™ catheter securement device to secure Foley catheter to leg, linen bag, wastebasket, and light source (i.e., goose neck lamp or flashlight).
2. Perform safety steps:
    - Perform hand hygiene.
    - Check the room for transmission-based precautions.
    - Introduce yourself, your role, the purpose of your visit, and an estimate of the time it will take.
    - Confirm patient ID using two patient identifiers (e.g., name and date of birth).
    - Explain the process to the patient.
    - 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. Assess for latex/iodine allergies, GYN surgeries, joint limitations for positioning, and any history of previous difficulties with catheterization.
4. Prepare the area for the procedure:
    - Place hand sanitizer for use during/after procedure on the table near the bed.
    - Place the catheter kit and peri-care supplies on the over-the-bed table.
    - Secure the wastebasket and linen cart/bag near the bed for disposal.
    - Ensure adequate lighting. Enlist assistance for positioning if needed.
    - Raise the opposite side rail. Set the bed to a comfortable height.
5. Position the patient supine and drape the patient with a bath blanket, exposing only the necessary area for patient privacy.
6. Apply nonsterile gloves and perform peri-care.
7. Remove gloves and perform hand hygiene.
8. Create a sterile field on the over-the-bed table.
9. Open the outer package wrapping. Remove the sterile wrapped box with the paper label facing upward to avoid spilling contents and place it on the bedside table or, if possible, between the patient’s legs. Place the plastic package wrapping at the end of the bed or on the side of the bed near you, with the opening facing you or facing upwards for waste.
10. Open the kit to create and position a sterile field:
    - Open the first flap away from you.
    - Open the second flap toward you.
    - Open side flaps.
    - Only touch within the outer 1” edge to position the sterile field on the table.
11. Carefully remove the sterile drape from the kit. Touching only the outermost edges of the drape, unfold and place the touched side of drape closest to linen, under the patient. Vertically position the drape between the patient’s legs to allow space for the sterile box and sterile tray.
12. Wash your hands and apply sterile gloves.
13. OPTIONAL: Place the fenestrated drape over the patient’s perineal area with gloves on inside of the drape, away from the patient’s gown, with peri-area visible through the opening. Maintain sterility.
14. Empty the lubricant syringe or package into the plastic tray. Place the empty syringe/package on the sterile outer package.
15. Simulate application of iodine/antimicrobial cleanser to cotton balls.
16. Remove the sterile urine specimen container and cap and set them aside.

17. Remove the tray from the top of the box and place it on the sterile drape.
18. Carefully remove the plastic catheter covering, while keeping the catheter in the sterile box. Attach the syringe filled with sterile water to the balloon port of the catheter; keep the catheter sterile.
19. Lubricate the tip of the catheter by dipping it in lubricant and place it in the box while maintaining sterility.
20. If preparing the kit on the bedside table, prepare to move the items to the patient. Place the plastic tray on top of the sterile box and carry as one unit to the sterile drape between the patient's legs, taking care not to touch your gloves to the patient's legs or bed linens.
21. Place the plastic top tray on the sterile drape nearest to the patient. An alternate option is to leave the plastic tray on top of the box until after cleaning is complete.
22. Tell the patient that you are going to clean the catheterization area and they will feel a cold sensation.
23. With your nondominant hand, gently spread the labia minora and visualize the urinary meatus. Your nondominant hand will now be nonsterile. This hand must remain in place throughout the procedure.
24. With your sterile dominant hand, use the forceps to pick up a cotton ball. Cleanse the periurethral mucosa with the saturated cotton ball. Discard the cotton ball after use into the plastic bag, not crossing the sterile field. Repeat for a total of three times using a new cotton ball each time. Discard the forceps in the plastic bag without touching the sterile gloved hand to the bag.
25. Pick up the catheter with your sterile dominant hand. Instruct the patient to take a deep breath and exhale or "bear down" as if to void, as you steadily insert the catheter maintaining sterility of the catheter until urine is noted.
26. Once urine is noted, continue inserting the catheter 1"-2". Do not force the catheter.
27. With your dominant hand, inflate the retention balloon with the water-filled syringe to the level indicated on the balloon port of the catheter. With the plunger still pressed, remove the syringe and set it aside. Pull back on the catheter until resistance is met, confirming the balloon is in place.



If the patient experiences pain during balloon inflation, deflate the balloon and insert the catheter farther into the bladder. If pain continues with the balloon inflation, remove the catheter and notify the patient's provider.

28. Remove the sterile draping and supplies from the bed area and place them on the bedside table. Remove the bath blanket and reposition the patient.
29. Remove your gloves and perform hand hygiene.
30. Apply new gloves. Secure the catheter with securement device, allowing room as to not pull on the catheter.
31. Place the drainage bag below the level of the bladder, attaching it to the bed frame.
32. Perform peri-care as needed; assist the patient to a comfortable position.
33. Dispose of waste and used supplies.
34. Remove gloves and perform hand hygiene.
35. Assist the patient to a comfortable position, ask if they have any questions, and thank them for their time.
36. Ensure safety measures when leaving the room:
    - CALL LIGHT: Within reach
    - BED: Low and locked (in lowest position and brakes on)
    - SIDE RAILS: Secured
    - TABLE: Within reach
    - ROOM: Risk-free for falls (scan room and clear any obstacles)
37. Perform hand hygiene.
38. Document the procedure and related assessment findings. Report any concerns according to agency policy.

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11.12: Checklist for Obtaining a Urine Specimen from a Foley Catheter

Use the checklist below to review the steps for completion of “Obtaining a Urine Specimen from a Foley Catheter.”

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

1. Gather supplies: peri-care supplies, nonsterile gloves, 30 – 60 mL Luer-lock syringe for sterile specimen, alcohol wipes/scrub hubs, two preprinted patient labels, clear biohazard bag for lab sample, urinary graduated cylinder, and 10-mL syringe.
2. Perform safety steps:
   - Perform hand hygiene.
   - Check the room for transmission-based precautions.
   - Introduce yourself, your role, the purpose of your visit, and an estimate of the time it will take.
   - Confirm patient ID using two patient identifiers (e.g., name and date of birth).
   - Explain the process to the patient.
   - 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. Verify the order and assemble the supplies on a protective drape on the table: gloves, Luer-lock syringe, alcohol swabs, sterile container, two preprinted patient labels, and clear lab specimen biohazard bag for transport to lab.
4. Perform hand hygiene and put on nonsterile gloves.
5. Check for urine in the tubing and position the tubing on the bed.
6. If additional urine is needed, clamp the tubing below the port for 10-15 minutes or until urine appears.
7. Clean the sample port of the catheter with an alcohol swab.
8. Attach the Luer-lock syringe to the sample port of the catheter and withdraw 10-30 mL of urine; remove the syringe and unclamp the tubing.
9. Open the lid of the sterile container, inverting the lid on the drape and maintaining sterility. Transfer the urine to the sterile container, preventing touching the syringe to the container; place the syringe on the drape; close the lid tightly; clean the outside of the container with germicidal wipes.
10. Remove gloves and perform hand hygiene.
11. Add information to the preprinted label: date, time collected, and your initials. Apply gloves. Place the label on the specimen container and put the container inside the biohazard bag. Remove gloves and wash your hands. Place the second label outside of the bag. Transport to the lab immediately.
12. Assist the patient to a comfortable position, ask if they have any questions, and thank them for their time.
13. Ensure safety measures when leaving the room:
    - CALL LIGHT: Within reach
    - BED: Low and locked (in lowest position and brakes on)
    - SIDE RAILS: Secured
    - TABLE: Within reach
    - ROOM: Risk-free for falls (scan room and clear any obstacles)
14. Perform hand hygiene.
15. Document the procedure and related assessment findings. Report any concerns according to agency policy.

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11.13: Checklist for Foley Removal

Use the checklist below to review the steps for completion of “Foley Removal.”

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

1. Verify order.
2. Gather supplies: urinary graduated cylinder, gloves, 10-mL syringe, peri-care supplies, chux/waterproof pad, and wastebasket.
3. Perform safety steps:
   - Perform hand hygiene.
   - Check the room for transmission-based precautions.
   - Introduce yourself, your role, the purpose of your visit, and an estimate of the time it will take.
   - Confirm patient ID using two patient identifiers (e.g., name and date of birth).
   - Explain the process to the patient.
   - 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.
4. Place peri-care supplies, chux, and syringe on the overbed table. Place the wastebasket near the bed and place the urinary graduate on the floor near the Foley bag:
   - Empty urine from the tubing into the catheter bag. Empty the catheter bag into the urinary graduate.
   - Note amount of urine for I & O.
   - Empty graduate in the bathroom.
5. Remove gloves. Perform hand hygiene and then apply clean nonsterile gloves.
6. Uncover the patient so that only the genital area and catheter are exposed.
7. Place a protective pad under the patient.
8. Remove any securement device holding the catheter to the upper thigh.
9. Attach the 10-mL syringe into the balloon port and remove all the fluid from the balloon; while holding the plunger, detach the syringe.
10. Ask the patient to take a deep breath and exhale, as you remove the catheter on expiration. Stop if resistance is met.
11. Inspect the catheter to determine if it was removed intact; place it in the wastebasket or facility-approved receptacle.
12. Cleanse the perineal area or allow the patient to cleanse the area.
13. Remove the catheter materials and waste and place them in the wastebasket.
14. Remove gloves and perform hand hygiene.
15. Assist the patient to a comfortable position, ask if they have any questions, and thank them for their time.
16. Ensure safety measures when leaving the room:
    - CALL LIGHT: Within reach
    - BED: Low and locked (in lowest position and brakes on)
    - SIDE RAILS: Secured
    - TABLE: Within reach
    - ROOM: Risk-free for falls (scan room and clear any obstacles)
17. Perform hand hygiene.
18. Document the procedure and related assessment findings. Report any concerns according to agency policy.

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11.14: Checklist for Straight Catheterization – Female/Male

Please follow the checklist below to review the steps for completion of “Straight Catheterization for Female/Male.”

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

1. Gather supplies: peri-care supplies, nonsterile gloves, straight catheter kit, extra pair of sterile gloves, and preprinted patient label.
2. Perform safety steps:
   - Perform hand hygiene.
   - Check the room for transmission-based precautions.
   - Introduce yourself, your role, the purpose of your visit, and an estimate of the time it will take.
   - Confirm patient ID using two patient identifiers (e.g., name and date of birth).
   - Explain the process to the patient.
   - 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. Assess for latex/iodine allergies, joint limitations for positioning, and history of previous difficulties with catheterization:
   - Female: Ask about previous gynecological surgeries.
   - Male: Ask about previous diagnosis of enlarged prostate.
4. Place the hand sanitizer and other supplies for use during/after procedure off the table near the bed.
5. Place the catheter kit and peri-care supplies on the over-the-bed table.
6. Secure the wastebasket and linen cart/bag near the bed for disposal.
7. Ensure adequate lighting. Enlist assistance for positioning if needed.
8. Raise the opposite side rail. Set the bed to a comfortable height.
9. Position the patient supine and uncover the patient, exposing the patient’s groin, legs, and feet for positioning and sterile field (male = supine, legs extended; female = dorsal recumbent; may need assistance to position patient and help support legs).
10. Wash your hands, apply clean gloves, and clean the perineal area.
11. Remove your gloves and perform hand hygiene.
12. Open the package. Take out the sterile package and place it on the table. Place the plastic package wrapping at end of the bed or on the side of the bed near you.
13. Open the kit extending the outer wrapping to create a sterile field; position the sterile field on the table to create space for opening gloves at the end of the table.
14. Place the sterile pad/sheet under the patient without contaminating the center of the drape by only holding onto the edges of the drape.
15. Perform hand hygiene and apply sterile gloves.
16. Place the fenestrated drape over the patient’s perineal area, keeping your gloves sterile by folding the corners of the sterile drape over the sterile gloves before approaching the patient.
17. Remove the sterile specimen container and remove the lid, if attached. Set the container on the sterile drape and invert the lid to maintain sterility. Position the container on the sterile drape to be within reach during the procedure.
18. Place the plastic tray with cotton balls and forceps on the sterile drape. Simulate opening the iodine solution and simulate pouring on the cotton balls; set the iodine package on the drape. Iodine cannot be used on mannequins.
19. Locate the catheter in the bottom of the tray; leave it in the tray. Open the water-soluble sterile lubricant and empty it into the bottom of the tray.
20. Put the plastic tray with saturated cotton balls horizontally on top of the tray to fit above the catheter and lubricant, which are located in the bottom of the tray.

21. Make sure that the sterile specimen container is within reach of your dominant hand. Then carefully move the tray as a unit with supplies inside to the sterile drape between patient's legs.
22. Tell the patient that you are now going to start the cleaning process and that there will be a cold sensation:
    - Once the nondominant/nonsterile hand touches the patient, the position is held throughout the procedure until the catheter is inserted.
23. Inspect for the urinary meatus:
    - Female: Gently spread the labia minora with your thumb and index finger of your nondominant hand and visualize the urinary meatus.
    - Male: Gently grasp the penis with the nondominant hand and retract the foreskin if present.
24. Cleanse the urinary meatus:
    - Female: Holding the labia apart with your nondominant/nonsterile hand, use your dominant/sterile hand to hold the forceps and pick up a cotton ball soaked in antimicrobial solution and cleanse the urethra with one downward stroke each time, once on each side and then once down the center. Discard each cotton ball after use without crossing the sterile field. With the dominant sterile gloved hand, pick up the lubricated catheter about 4 inches from the end for stability. Hold the catheter loosely in your hand. Place the distal end in the receptacle.
    - Male: With your sterile dominant hand, use the forceps to pick up a cotton ball. Cleanse the glans penis with the antimicrobial cleanser using a circular motion from the center of the meatus outward to the base of the glans. Discard each cotton ball after use without crossing the sterile field. Continue to hold the penis perpendicular to the body or labia apart with your nondominant hand. With the dominant sterile gloved hand, pick up the lubricated catheter about 4 inches from the end for stability.
25. Steadily insert the catheter, maintaining sterility into the meatus until a return of urine occurs.
26. Continue inserting another 1-2 inches and hold the catheter in place.
27. When urine begins to drain out of the catheter, pinch the catheter with your thumb and index finger of your nondominant/nonsterile hand while continuing to hold the labia apart or penis perpendicular to the body.
28. With your dominant/sterile hand, obtain the sterile specimen container from the table and put it under the catheter.
29. Release clamping/pinching of the catheter, allowing urine to drain into the sterile specimen container.
30. When the container is almost full, use your dominant hand to remove the container from under the stream of urine and set it on the table, maintaining sterility.
31. Allow urine to continue to flow into the receptacle provided until the flow of urine stops.
32. Tell the patient that the catheter will be removed. Instruct the patient to take a deep breath and exhale, and then remove the catheter and place it on the sterile drape on the bed.
33. Carefully remove the urine container full of urine from the bed and place it on the kit wrapper on the table. Do not put the urine container directly on the table.
34. Put the cap on the sterile specimen container, maintaining sterility.
35. Remove the catheter and other supplies from the patient's bed; provide peri-care. For males, replace foreskin if it was retracted for the procedure.
36. Remove your gloves; wash hands and apply new gloves.
37. Assist the patient to a comfortable position.
38. Write the date, time collected, and your initials on the two preprinted patient labels.
39. With an antibacterial wipe, clean the outer surface of the specimen container.
40. Apply one patient label to the specimen container and one patient label to the outside of the clear biohazard bag for transport to the lab.
41. Place the specimen container in the biohazard bag.
42. Measure and dispose of the urine in the bathroom.
43. Remove your gloves and perform hand hygiene.
44. Assist the patient to a comfortable position, ask if they have any questions, and thank them for their time.
45. Ensure safety measures when leaving the room:
    - CALL LIGHT: Within reach

- BED: Low and locked (in lowest position and brakes on)
- SIDE RAILS: Secured
- TABLE: Within reach
- ROOM: Risk-free for falls (scan room and clear any obstacles)

46. Send the specimen to the lab for processing.
47. Document the procedure and related assessment findings. Report any concerns according to agency policy.

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11.15: Checklist for Ostomy Appliance Change

Use the checklist below to review the steps for completion of an “Ostomy Appliance Change.”

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

1. Gather supplies: washcloth and warm water, stoma products/appliances per order/patient preference (wafer, bag, clip), sizing measures, scissors, pen, nonsterile gloves, skin prep or other skin products per patient preference, and wastebasket.
2. Perform safety steps:
    - Perform hand hygiene.
    - Check the room for transmission-based precautions.
    - Introduce yourself, your role, the purpose of your visit, and an estimate of the time it will take.
    - Confirm patient ID using two patient identifiers (e.g., name and date of birth).
    - Explain the process to the patient.
    - 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. Set the bed to a comfortable height; raise the opposite side rail.
4. Ask the patient about preferences, usual practices, care, and maintenance at home.
5. Apply nonsterile gloves.
6. Position the patient according to patient status:
    - Assist the patient to the bathroom and have him/her sit on the toilet to be near the sink for ease of process.
    - If in bed, uncover the patient, exposing only the abdomen. Apply drape/chux under the patient or ostomy pouch. Place the wastebasket near the bed.
7. Empty the pouch depending on the type of the appliance and the location type of procedure:
    - Remove the pouch and empty it into the toilet.
    - Set pouch aside in the basin or receptacle if at bedside.
    - Assess ostomy bag contents, and remove current ostomy appliance (keep clamp if present).
8. Remove adhesive residue from the skin with adhesive remover wipes.
9. Cleanse the stoma and surrounding skin with gauze and room temperature tap water; pat dry the skin.
10. Assess the condition of the stoma and peristomal skin.
11. Place the gauze pad over the stoma while you are preparing the new wafer and pouch.
12. Trace the pattern onto the paper backing of the wafer and cut the wafer. No more than 1/8 inch of skin around the stoma should be exposed for correct fit.
13. Apply skin prep and wait until tacky (optional).
14. Remove the gauze pad from the orifice of the stoma.
15. Remove the paper backing from the wafer and place it on the skin with the stoma centered in the cutout opening of the wafer; press gently on the wafer to remove air/seal to the skin.
16. Apply pouch to wafer with clamp on pouch and opening in downward position.
17. Attach and close the pouch clamp.
18. Dispose of old supplies and wrappings.
19. Remove your gloves and perform hand hygiene.
20. Assist the patient to a comfortable position, ask if they have any questions, and thank them for their time.
21. Ensure safety measures when leaving the room:
    - CALL LIGHT: Within reach
    - BED: Low and locked (in lowest position and brakes on)

- SIDE RAILS: Secured
- TABLE: Within reach
- ROOM: Risk-free for falls (scan room and clear any obstacles)

22. Document the procedure and related assessment findings. Report any concerns according to agency policy.

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11.16: Learning Activities

Learning Activities

(Answers to “Learning Activities” can be found in the “Answer Key” at the end of the book. Answers to interactive activity elements will be provided within the element as immediate feedback.)

1. Your patient complains of pain while you are inflating the balloon during a urinary catheter insertion. **Describe your next steps.**

2. Your patient is admitted with a fractured head of the right femur and is scheduled for surgery in the next six hours. You have a prescription to insert a Foley catheter. After you assess the patient’s ability for the recommended position to insert the catheter, you note that the patient is unable to move the right leg and should not move the leg. **Describe how you will proceed with the procedure.**

3. A patient with a new colostomy 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?**

4. The nurse is caring for a female patient who is experiencing inadequate bladder emptying. The nurse obtains an order to determine post-void residual. **Which catheter type would the nurse use to evaluate post-void residual?**

a. Coude catheter
b. Indwelling catheter
c. Straight catheter
d. Foley catheter

5. The nurse is caring for a patient who had a colostomy placed two days earlier. The nurse notes that the stoma is moist and beefy red. **Which 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.

6. The nurse is providing patient education on the care of an ostomy. **Which of the following statements by the patient would indicate that further education is necessary?**

a. “I should plan to replace the pouch system every 8-10 days.”
b. “Wafer should be cut 1/16 to 1/8 an inch 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 knowledge using this flashcard activity:

Use this drag and drop activity to check your knowledge about catheters:

Take a quiz on managing catheters:

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11.17: XXI Glossary

Bladder scan: A bedside test using a noninvasive tool used to measure the volume of urine in the bladder.

CAUTI: Catheter-associated urinary tract infection.

Colostomy: The colon is attached to a stoma to bypass the rectum and the anus.

Coude catheter: A catheter specifically designed to maneuver around obstructions or blockages in the urethra such as with enlarged prostate glands in males. Coude originates from the French word that means “bend.”

Ileostomy: The lower end of the small intestine (ileum) is attached to a stoma to bypass the colon, rectum, and anus.

Indwelling catheter: A device often referred to as a “Foley catheter” that is inserted into the neck of the bladder and remains in place for continual collection of urine into a collection bag.

Intermittent catheterization: The insertion and removal of a straight catheter for relief of urinary retention.

Ostomy: The surgical procedure that creates the opening from the stoma outside the body to an organ such as the small intestine, colon, rectum, or bladder. A stoma can be permanent, such as when an organ is removed, or temporary, such as when an organ requires time to heal.

Prostate hypertrophy: A common medical condition of the enlargement of the prostate gland in males as they age, causing uncomfortable urinary symptoms such as urgency and frequency.

Stoma: An opening on the abdomen that is connected to the gastrointestinal or urinary systems to allow waste (urine or feces) to be collected in a pouch.

Straight catheter: A catheter used for intermittent urinary catheterization; it does not have a balloon at the insertion end.

Urinary catheterization: The insertion of a catheter tube into the urethral opening and placing it in the neck of the urinary bladder to drain urine.

Urinary Tract Infection (UTI): An infection in the urinary system causing symptoms such as burning on urination (dysuria), frequent urination, malodorous urine, fever, and change in level of consciousness.

Urostomy: The ureters (tubes that carry urine from the kidney to the bladder) are attached to a stoma to bypass the bladder.

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CHAPTER OVERVIEW

12: Tracheostomy Care and Suctioning

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12.1: Tracheostomy Care and Suctioning Introduction

Learning Objectives

- Safely perform nasal, oral, pharyngeal, and tracheostomy suctioning
- Provide tracheostomy care
- Explain procedure to patient
- Adapt procedure to reflect variations across the life span
- Document actions and observations
- Recognize and report significant deviations from norms

This chapter will discuss tracheostomy care and various types of suctioning (e.g., oral, nasal, pharyngeal, and tracheostomy) performed by nurses. The purpose of respiratory suctioning is to maintain a patent airway and improve oxygenation by removing mucous secretions and foreign material (e.g., vomit or gastric secretions). During oral suctioning, a rigid plastic suction catheter is typically used in a patient's mouth to remove oral secretions. Nasal and pharyngeal suctioning is performed with a sterile, soft, flexible catheter to remove accumulated saliva, pulmonary secretions, blood, vomitus, or other foreign material from nasopharyngeal areas that cannot be removed by the patient's spontaneous cough or other less invasive procedures.[1]

Tracheostomy suctioning uses a sterile catheter that is inserted through a tracheostomy tube into a patient's trachea. A tracheostomy tube is a tube that is inserted through a surgical opening in the neck to the trachea to create an artificial airway. Tracheostomies require routine care to prevent infection and obstruction, as well as frequent suctioning to maintain a patent airway.[2] Tracheostomy care and suctioning are performed collaboratively by nurses and respiratory therapists.

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1. American Association for Respiratory Care. (2004). AARC clinical practice guideline: Nasotracheal suctioning - 2004 revision & update. *Respiratory Care*, *49*(9), 1080-1084. https://www.aarc.org/wp-content/uploads/2014/08/09.04.1080.pdf↵
2. This work is a derivative of Clinical Procedures for Safer Patient Care by British Columbia Institute of Technology and is licensed under CC BY 4.0. ↵

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12.2: Basic Concepts Related to Suctioning

Respiratory System Anatomy

It is important for the nurse to have an understanding of the underlying structures of the respiratory system before performing suctioning to ensure that care is given to protect sensitive tissues and that airways are appropriately assessed during the suctioning procedure. See Figure **12.2.1**[1] for an illustration of the anatomy of the respiratory system.

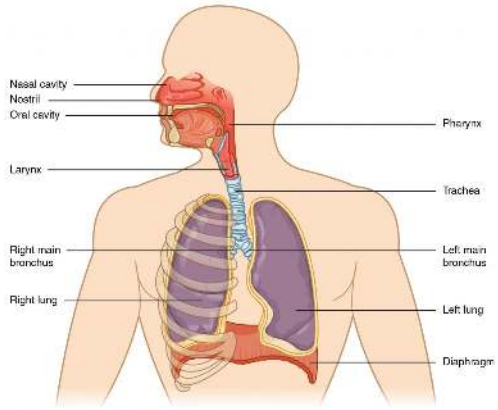


Figure **12.2.1**: Anatomy of the Respiratory System

Maintaining a patent airway is a top priority and one of the "ABCs" of patient care (i.e., Airway, Breathing, and Circulation). Suctioning is often required in acute-care settings for patients who cannot maintain their own airway due to a variety of medical conditions such as respiratory failure, stroke, unconsciousness, or postoperative care. The suctioning procedure is useful for removing mucus that may obstruct the airway and compromise the patient's breathing ability.

To read more details about the respiratory system, see the "Respiratory Assessment" chapter.

Respiratory Failure and Respiratory Arrest

Respiratory failure and respiratory arrest often require emergency suctioning. Respiratory failure is a life-threatening condition that is caused when the respiratory system cannot get enough oxygen from the lungs into the blood to oxygenate the tissues, or there are high levels of carbon dioxide in the blood that the body cannot effectively eliminate via the lungs. Acute respiratory failure can happen quickly without much warning. It is often caused by a disease or injury that affects breathing, such as pneumonia, opioid overdose, stroke, or a lung or spinal cord injury. Acute respiratory failure requires emergency treatment. Untreated respiratory failure can lead to respiratory arrest.

Signs and symptoms of respiratory failure include shortness of breath (dyspnea), rapid breathing (tachypnea), rapid heart rate (tachycardia), unusual sweating (diaphoresis), decreasing pulse oximetry readings below 90%, and air hunger (a feeling as if you can't breathe in enough air). In severe cases, signs and symptoms may include cyanosis (a bluish color of the skin, lips, and fingernails), confusion, and sleepiness.

The main goal of treating respiratory failure is to ensure that sufficient oxygen reaches the lungs and is transported to the other organs while carbon dioxide is cleared from the body.[2] Treatment measures may include suctioning to clear the airway while also providing supplemental oxygen using various oxygenation devices. Severe respiratory distress may require intubation and mechanical ventilation, or the emergency placement of a tracheostomy may be performed if the airway is obstructed. For additional details about oxygenation and various oxygenation devices, go to the "Oxygen Therapy" chapter.

Tracheostomy

A **tracheostomy** is a surgically-created opening called a stoma that goes from the front of the patient's neck into the trachea. A tracheostomy tube is placed through the stoma and directly into the trachea to maintain an open (patent) airway. See Figure **12.2.2** [3]for an illustration of a patient with a tracheostomy tube in place.

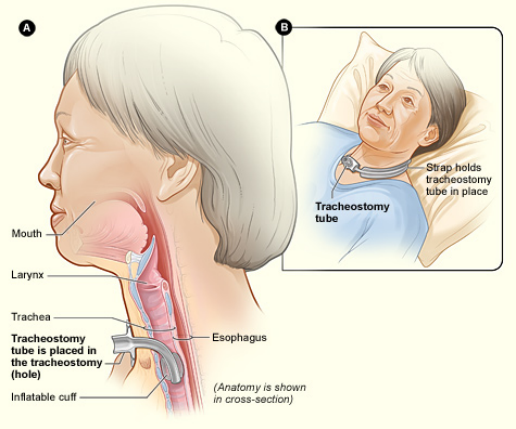


Figure **12.2.2**: Patient with Tracheostomy Tube

Placement of a tracheostomy tube may be performed emergently or as a planned procedure due to the following:

- A large object blocking the airway
- Respiratory failure or arrest
- Severe neck or mouth injuries
- A swollen or blocked airway due to inhalation of harmful material such as smoke, steam, or other toxic gases
- Cancer of the throat or neck, which can affect breathing by pressing on the airway
- Paralysis of the muscles that affect swallowing
- Surgery around the larynx that prevents normal breathing and swallowing
- Long-term oxygen therapy via a mechanical ventilator[4]

See Figure **12.2.3**[5] for an image of the parts of a tracheostomy tube. The outside end of the outer cannula has a flange that is placed against the patient's neck. The **flange** is secured around the patient's neck with tie straps, and a split 4″ x 4″ tracheostomy dressing is placed under the flange to absorb secretions. A cuff is typically present on the distal end of the outer cannula to make a tight seal in the airway. (See the top image in Figure **12.2.3**.) The cuff is inflated and deflated with a syringe attached to the pilot balloon. Most tracheostomy tubes have a hollow **inner cannula** inside the **outer cannula** that is either disposable or removed for cleaning as part of the tracheostomy care procedure. (See the middle image of Figure **12.2.3**.) A solid obturator is used during the initial tracheostomy insertion procedure to help guide the outer cannula through the tracheostomy and into the airway. (See the bottom image of Figure **12.2.3**.) It is removed after insertion and the inner cannula is slid into place.



Figure **12.2.3**: Parts of a Tracheostomy Tube

When a tracheostomy is placed, the provider determines if a fenestrated or unfenestrated outer cannula is needed based on the patient's condition. A **fenestrated** tube is used for patients who can speak with their tracheostomy tube in place. Under the guidance of a speech pathologist and respiratory therapist, the inner cannula is eventually removed from a fenestrated tube and the cuff deflated so the patient is able to speak. Otherwise, a patient with a tracheostomy tube is unable to speak because there is no

airflow over the vocal cords, and alternative communication measures, such as a whiteboard, pen and paper, or computer device with note-taking ability, must be put into place by the nurse. Suctioning should never be performed through a fenestrated tube without first inserting a nonfenestrated inner cannula, or severe tracheal damage can occur. See Figure **12.2.4**[6] for images of a fenestrated and nonfenestrated outer cannula.

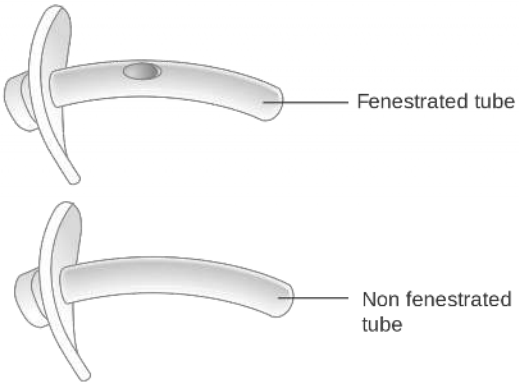


Figure **12.2.4**: Fenestrated and Nonfenestrated Outer Cannula

Caring for a patient with a tracheostomy tube includes providing routine tracheostomy care and suctioning. Tracheostomy care is a procedure performed routinely to keep the flange, tracheostomy dressing, ties or straps, and surrounding area clean to reduce the introduction of bacteria into the trachea and lungs. The inner cannula becomes occluded with secretions and must be cleaned or replaced frequently according to agency policy to maintain an open airway. Suctioning through the tracheostomy tube is also performed to remove mucus and to maintain a patent airway.

When caring for a patient with a tracheostomy tube in the acute care setting, it is important to ensure that proper safety equipment is present at the patient's bedside. Patients with a tracheostomy should have the obturator used for initial tracheostomy placement present and readily available. Many health facilities recommend that obturators be taped to the wall at the head of the bed in case of the need for emergency tracheostomy tube reinsertion. Additionally, there should be spare tracheostomy tubes (same size and one size smaller), lubricant, syringe for cuff inflation, and tracheostomy ties (or means to resecure the tracheostomy tube) if reinsertion is required. A bag valve mask should always be kept at the bedside.

1. "2301 Major Respiratory Organs.jpg" by OpenStax is licensed under CC BY 3.0↵
2. National Heart, Lung, and Blood Institute. (n.d.). *Respiratory failure*. https://www.nhlbi.nih.gov/health-topics/respiratory-failure↵
3. "Tracheostomy NIH.jpg" by National Heart Lung and Blood Institute is in the Public Domain↵
4. A.D.A.M. Medical Encyclopedia [Internet]. Atlanta (GA): A.D.A.M., Inc.; c1997-2020. Nail abnormalities; [updated 2020, June 2] https://medlineplus.gov/ency/article/002955.htm↵
5. "Tracheostomy tube.jpg" by Kaluse D Peter, Wiehl, Germany is licensed under CC BY 2.0 DE↵
6. "Diagram showing a fenestrated and a non fenestrated tracheostomy tube CRUK 066.svg" by Cancer Research UK is licensed under CC BY-SA 4.0. ↵

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12.3: Assessments Related to Airway Suctioning

Subjective Assessment

If appropriate, perform a focused interview collecting a brief history of respiratory conditions and assess for feelings of shortness of breath (dyspnea), sputum production, and coughing.

Objective Assessment

Prior to suctioning, a baseline assessment for indications of respiratory distress and the need for suctioning should be obtained and documented, including, but not limited to, the following:

- Secretions from the mouth and/or tracheal stoma
- Auscultation of lung sounds
- Heart rate
- Respiratory rate
- Cardiac rhythm
- Oxygen saturation
- Skin color and perfusion
- Effectiveness of cough[1]

Prepare the patient by explaining the procedure and providing adequate sedation and pain relief as needed. Place the patient in semi-Fowler's position if conscious or in a lateral position facing you if they are unconscious. While suctioning the patient, if signs of worsening respiratory distress occur, stop the procedure and request emergency assistance. The following should be monitored during and following the procedure:

- Lung sounds
- Skin color
- Breathing pattern and rate
- Oxygenation (pulse oximeter)
- Pulse rate
- Dysrhythmias if electrocardiogram is available
- Color, consistency, and volume of secretions
- Presence of bleeding or evidence of physical trauma
- Subjective response including pain
- Cough
- Laryngospasm (spasm of the vocal cords that can result in airway obstruction)[2]

After completing suctioning, the outcomes from the procedure should be evaluated and documented, including the following:

- Improvement of lung sounds
- Removal of secretions
- Improvement of pulse oximetry
- Decreased work of breathing
- Stabilized respiratory rate
- Decreased dyspnea

Be aware that the patient's lung sounds may not clear completely after suctioning, but the removal of secretions should improve the patency of the patient's airway.

Potential complications resulting from this procedure include nasal irritation/bleeding, gagging/vomiting, discomfort and pain, and uncontrolled coughing. Potential adverse reactions include mucosal hemorrhage, laceration of nasal turbinate, perforation of the pharynx, hypoxia/hypoxemia, cardiac dysrhythmias/arrest, bradycardia, elevated blood pressure, hypotension, respiratory arrest, laryngospasm, bronchoconstriction, bronchospasm, hospital-acquired infection, atelectasis, increased intracranial pressure, and pneumothorax.

1. American Association for Respiratory Care. (2004). AARC clinical practice guideline: Nasotracheal suctioning - 2004 revision & update. *Respiratory Care*, *49*(9), 1080-1084. https://www.aarc.org/wp-content/uploads/2014/08/09.04.1080.pdf↵
2. American Association for Respiratory Care. (2004). AARC clinical practice guideline: Nasotracheal suctioning - 2004 revision & update. *Respiratory Care*, *49*(9), 1080-1084. https://www.aarc.org/wp-content/uploads/2014/08/09.04.1080.pdf↵

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12.4: Oropharyngeal and Nasopharyngeal Suctioning Checklist and Sample Documentation

Suctioning via the **oropharyngeal** (mouth) and nasopharyngeal (nasal) routes is performed to remove accumulated saliva, pulmonary secretions, blood, vomitus, and other foreign material from these areas that cannot be removed by the patient's spontaneous cough or other less invasive procedures. Nasal and pharyngeal suctioning are performed in a wide variety of settings, including critical care units, emergency departments, inpatient acute care, skilled nursing facility care, home care, and outpatient/ambulatory care. Suctioning is indicated when the patient is unable to clear secretions and/or when there is audible or visible evidence of secretions in the large/central airways that persist in spite of the patient's best cough effort. Need for suctioning is evidenced by one or more of the following:

- Visible secretions in the airway
- Chest auscultation of coarse, gurgling breath sounds, rhonchi, or diminished breath sounds
- Reported feeling of secretions in the chest
- Suspected aspiration of gastric or upper airway secretions
- Clinically apparent increased work of breathing
- Restlessness
- Unrelieved coughing[1]

In emergent situations, a provider order is not necessary for suctioning to maintain a patient's airway. However, routine suctioning does require a provider order.

For oropharyngeal suctioning, a device called a **Yankauer suction tip** is typically used for suctioning mouth secretions. A Yankauer device is rigid and has several holes for suctioning secretions that are commonly thick and difficult for the patient to clear. See Figure **12.4.1**[2] for an image of a Yankauer device. In many agencies, Yankauer suctioning can be delegated to trained assistive personnel if the patient is stable, but the nurse is responsible for assessing and documenting the patient's respiratory status.



Figure **12.4.1**: Yankauer Suction Tip

Yankauer suction devices are made of rigid firm plastic. The nurse or assistive personnel who performs suctioning with these devices should use care to protect the patient's soft mucous membranes and prevent unnecessary trauma.

Nasopharyngeal suctioning removes secretions from the nasal cavity, pharynx, and throat by inserting a flexible, soft suction catheter through the nares. This type of suctioning is performed when oral suctioning with a Yankauer is ineffective. See Figure **12.4.2**[3] for an image of a sterile suction catheter.



Figure **12.4.2**: Sterile Suction Catheter

Extension tubing is used to attach the Yankauer or suction catheter device to a suction canister that is attached to wall suction or a portable suction source. The amount of suction is set to an appropriate pressure according to the patient's age. See Figure **12.4.3**[4] for an image of extension tubing attached to a suction canister that is connected to a wall suctioning source.



Figure **12.4.3**: Tubing Attaching Suction Canister to Wall Suction Source

Follow agency policy regarding setting suction pressure. Pressure should not exceed 150 mm Hg because higher pressures have been shown to cause trauma, hypoxemia, and atelectasis. The following ranges are appropriate pressure according to the patient's age:

- Neonates: 60-80 mm Hg
- Infants: 80-100 mm Hg
- Children: 100-120 mm Hg
- Adults: 100-150 mm Hg



Suction only when clinically indicated and for up to 15 seconds at a time to decrease the risk of respiratory complications. Hyperoxygenation and hyperventilation should be performed prior to the nasal and tracheal procedures to avoid the most common hazards of suctioning (hypoxemia, arrhythmias, and atelectasis). For nasal suctioning, increase the amount of O2 the patient is receiving for a few minutes prior to the procedure and instruct the patient to take several deep breaths. For tracheal suctioning, do the same. If the patient is on a ventilator, you can either hyperoxygenate and ventilate with the Ambu bag or provide a few extra machine assisted breaths prior to the procedure. Allow the patient to recover and hyperventilate and hyperoxygenate between each passing of the suction catheter. The patient should recover for 30-60 seconds between passes.[5]



When performing nasal suctioning, have the patient lean their head backwards to open the airway. This helps guide the catheter toward the trachea rather than the esophagus.

Checklist for Oropharyngeal or Nasopharyngeal Suctioning

Use the checklist below to review the steps for completion of “Oropharyngeal or Nasopharyngeal Suctioning.”

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

1. Gather supplies: Yankauer or suction catheter, suction machine or wall suction device, suction canister, connecting tubing, pulse oximeter, stethoscope, PPE (e.g., mask, goggles or face shield, nonsterile gloves), sterile gloves for suctioning with sterile suction catheter, towel or disposable paper drape, nonsterile basin or disposable cup, and normal saline or tap water.
2. Perform safety steps:
    - Perform hand hygiene.
    - Check the room for transmission-based precautions.
    - Introduce yourself, your role, the purpose of your visit, and an estimate of the time it will take.
    - Confirm patient ID using two patient identifiers (e.g., name and date of birth).
    - Explain the process to the patient.
    - 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. Adjust the bed to a comfortable working height and lower the side rail closest to you.
4. Position the patient:
    - If conscious, place the patient in a semi-Fowler’s position.
    - If unconscious, place the patient in the lateral position, facing you.
5. Move the bedside table close to your work area and raise it to waist height.
6. Place a towel or waterproof pad across the patient’s chest.
7. Adjust the suction to the appropriate pressure:
    - Adults and adolescents: no more than 150 mm Hg
    - Children: no more than 120 mmHg
    - Infants: no more than 100 mm Hg
    - Neonates: no more than 80 mm Hg

For a portable unit:

- Adults: 10 to 15 cm Hg
- Adolescents: 8 to 15 cm Hg
- Children: 8 to 10 cm Hg
- Infants: 8 to 10 cm Hg
- Neonates: 6 to 8 cm Hg

8. Put on a clean glove and occlude the end of the connection tubing to check suction pressure.
9. Place the connecting tubing in a convenient location (e.g., at the head of the bed).
10. Open the sterile suction package using aseptic technique. (NOTE: The open wrapper or container becomes a sterile field to hold other supplies.) Carefully remove the sterile container, touching only the outside surface. Set it up on the work surface and fill with sterile saline using sterile technique.
11. Place a small amount of water-soluble lubricant on the sterile field, taking care to avoid touching the sterile field with the lubricant package.
12. Increase the patient's supplemental oxygen level or apply supplemental oxygen per facility policy or primary care provider order.
13. Don additional PPE. Put on a face shield or goggles and mask.
14. Don sterile gloves. The dominant hand will manipulate the catheter and must remain sterile.
15. The nondominant hand is considered clean rather than sterile and will control the suction valve on the catheter.
    - In the home setting and other community-based settings, maintenance of sterility is not necessary.
16. With the dominant gloved hand, pick up the sterile suction catheter. Pick up the connecting tubing with the nondominant hand and connect the tubing and suction catheter.
17. Moisten the catheter by dipping it into the container of sterile saline. Occlude the suction valve on the catheter to check for suction.
18. Encourage the patient to take several deep breaths.
19. Apply lubricant to the first 2 to 3 inches of the catheter, using the lubricant that was placed on the sterile field.
20. Remove the oxygen delivery device, if appropriate. Do not apply suction as the catheter is inserted. Hold the catheter between your thumb and forefinger.
21. Insert the catheter. For nasopharyngeal suctioning, gently insert the catheter through the naris and along the floor of the nostril toward the trachea. Roll the catheter between your fingers to help advance it. Advance the catheter approximately 5 to 6 inches to reach the pharynx. For oropharyngeal suctioning, insert the catheter through the mouth, along the side of the mouth toward the trachea. Advance the catheter 3 to 4 inches to reach the pharynx.
22. Apply suction by intermittently occluding the suction valve on the catheter with the thumb of your nondominant hand and continuously rotate the catheter as it is being withdrawn.[6]
    - Suction only on withdrawal and do not suction for more than 10 to 15 seconds at a time to minimize tissue trauma.
23. Replace the oxygen delivery device using your nondominant hand, if appropriate, and have the patient take several deep breaths.
24. Flush the catheter with saline. Assess the effectiveness of suctioning by listening to lung sounds and repeat, as needed, and according to the patient's tolerance. Wrap the suction catheter around your dominant hand between attempts:
    - Repeat the procedure up to three times until gurgling or bubbling sounds stop and respirations are quiet. Allow 30 seconds to 1 minute between passes to allow reoxygenation and reventilation.[7]
25. When suctioning is completed, remove gloves from the dominant hand over the coiled catheter, pulling them off inside out.
26. Remove the glove from the nondominant hand and dispose of gloves, catheter, and the container with solution in the appropriate receptacle.
27. Assist the patient to a comfortable position. Raise the bed rail and place the bed in the lowest position.
28. Turn off the suction. Remove the supplemental oxygen placed for suctioning, if appropriate.
29. Remove face shield or goggles and mask; perform hand hygiene.
30. Perform oral hygiene on the patient after suctioning.
31. Reassess the patient's respiratory status, including respiratory rate, effort, oxygen saturation, and lung sounds.

32. Assist the patient to a comfortable position, ask if they have any questions, and thank them for their time.
33. Ensure safety measures when leaving the room:
    - CALL LIGHT: Within reach
    - BED: Low and locked (in lowest position and brakes on)
    - SIDE RAILS: Secured
    - TABLE: Within reach
    - ROOM: Risk-free for falls (scan room and clear any obstacles)
34. Perform hand hygiene.
35. Document the procedure and related assessment findings. Report any concerns according to agency policy.

Sample Documentation

Sample Documentation of Expected Findings

Patient complaining of not being able to cough up secretions. Order was obtained to suction via the nasopharyngeal route. Procedure explained to the patient. Vital signs obtained prior to procedure were heart rate 88 in regular rhythm, respiratory rate 28/minute, and O2 sat 88% on room air. Coarse rhonchi present over anterior upper airway. No cyanosis present. Patient tolerated procedure without difficulties. A small amount of clear, white, thick sputum was obtained. Post-procedure vital signs were heart rate 78 in regular rhythm, respiratory rate 18/minute, and O2 sat 94% on room air. Lung sounds clear and no cyanosis present.

Sample Documentation of Unexpected Findings

Patient complaining of not being able to cough up secretions. Order was obtained to suction via the nasopharyngeal route. Procedure explained to the patient. Vital signs obtained prior to procedure were heart rate 88 in regular rhythm, respiratory rate 28/minute, and O2 sat 88% on room air. Coarse rhonchi present over anterior upper airway. No cyanosis present. After first pass of suctioning, patient began coughing uncontrollably. Procedure was stopped and emergency assistance was requested from the respiratory therapist. Post-procedure vital signs were heart rate 78 in regular rhythm, respiratory rate 18/minute, and O2 sat 94% on room air. Coarse rhonchi continued to be present over anterior upper airway but no cyanosis present. Dr. Smith notified and a STAT order was received for a chest X-ray and to call with results.

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1. American Association for Respiratory Care. (2004). AARC clinical practice guideline: Nasotracheal suctioning - 2004 revision & update. *Respiratory Care*, *49*(9), 1080-1084. https://www.aarc.org/wp-content/uploads/2014/08/09.04.1080.pdf↵
2. "Yankauer Suction Tip.jpg" by Thomasrive is licensed under CC BY-SA 3.0↵
3. "DSC_0210-150x150.jpg" by British Columbia Institute of Technology is licensed under CC BY 4.0. Access for free at https://opentextbc.ca/clinicalskills/chapter/5-7-oral-suctioning/ ↵
4. "DSC_0206-e1437445438554.jpg" by British Columbia Institute of Technology is licensed under CC BY 4.0. Access for free at https://opentextbc.ca/clinicalskills/chapter/5-7-oral-suctioning/↵
5. American Association for Respiratory Care. (2010). AARC clinical practice guideline: Endotracheal suctioning of mechanically ventilated patients with artificial airways 2010. *Respiratory Care*, *55*(6), 758-764. www.rcjournal.com/cpgs/pdf/06.10.0758.pdf↵
6. Oronasopharyngeal suctioning. (2020). Lippincott procedures. http://procedures.lww.com↵
7. Oronasopharyngeal suctioning. (2020). Lippincott procedures. http://procedures.lww.com↵

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12.5: Checklist for Tracheostomy Suctioning and Sample Documentation

Tracheostomy suctioning may be performed with open or closed technique. Open suctioning requires disconnection of the patient from the oxygen source, whereas closed suctioning uses an inline suctioning catheter that does not require disconnection. This checklist will explain the open suctioning technique.

Indications for tracheostomy suctioning include the following:

- The need to maintain the patency and integrity of the artificial airway
- Deterioration of oxygen saturation and/or arterial blood gas values
- Visible secretions in the airway
- The patient's inability to generate an effective spontaneous cough
- Acute respiratory distress
- Suspected aspiration of gastric or upper-airway secretions
- The need to obtain a sputum specimen[1]

Similar assessments and monitoring apply when performing tracheostomy suctioning compared with other types of suctioning with the addition of assessing the stoma. The stoma should be free from redness and drainage. Hyperoxygenation using a bag mask valve attached to an oxygen source may be required before and during the open suctioning procedure based on the patient's oxygenation status. See Figure **12.5.1**[2] for an image of an example of sterile tracheostomy suctioning kit.



Figure **12.5.1**: Example of a Sterile Tracheostomy Kit

- To ensure patient safety, a replacement tracheostomy tube, an obturator, a bag valve mask (Ambu bag), and suction catheter kit must always be available in the room.
- Communication should be facilitated with the patient using writing when possible.
- Follow agency policy regarding hyperoxygenation and hyperventilation prior to and during suctioning.
- Do not suction for more than 15 seconds per pass.[3]
- During the procedure, it is important to continually monitor the patient's pulse oximetry to determine if the oxygen saturation is maintaining at an adequate level.
- Perform oral care after suctioning according to agency policy.

Checklist for Tracheostomy Suctioning[4]

Use the checklist below to review the steps for "Tracheostomy Suctioning."

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

1. Gather supplies: sterile gloves, trach suction kit, mask with face shield, gown, goggles, pulse oximetry, and bag valve device. It is helpful to request assistance from a second nurse if preoxygenating the patient before suction passes.
2. Perform safety steps.
    - Perform hand hygiene.
    - Check the room for transmission-based precautions.
    - Introduce yourself, your role, the purpose of your visit, and an estimate of the time it will take.
    - 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. Verify that there are a backup tracheostomy and bag valve device available at the bedside.
4. Assess lung sounds, heart rate and rhythm, and pulse oximetry.
5. Raise the head of the bed to waist level. Place the patient in a semi-Fowler's position and apply the pulse oximeter for monitoring during the procedure.
6. Turn on the suction. Set the suction gauge to appropriate setting based on age of the patient.
7. Perform hand hygiene. Don appropriate PPE (gown and mask).
8. Open the suction catheter package faced away from you to maintain sterility.
9. Don the sterile gloves from the kit.
10. Remove the sterile fluid and check the expiration date.
11. Open the sterile container used for flushing the catheter and place it back into the kit. Pour the sterile fluid into the sterile container using sterile technique.
12. Remove the suction catheter from the packaging. Ensure the catheter size is not greater than half of the inner diameter of the tracheostomy tube.
13. Keep the catheter sterile by holding it with your dominant hand and attaching it to the suction tubing with your nondominant hand. Note that your nondominant hand is no longer sterile.
14. Test the suction and lubricate the sterile catheter by using your sterile hand to dip the end into the sterile saline while occluding the thumb control.
15. Ask an assistant to preoxygenate the patient with 100% oxygen for 30 to 60 seconds using a handheld bag valve mask (Ambu bag) per agency protocol. Alternatively, ask the patient to take two or three deep breaths if able.
16. Insert the catheter into the patient's tracheostomy tube using your sterile hand without applying suctioning:
    - For shallow suctioning, insert the catheter the length of the tracheostomy tube before beginning any suctioning.
    - For deep suctioning, insert the catheter until resistance is met (at the carina) and withdraw 1 centimeter before beginning suctioning.
    - Do not force the catheter.
    - Keep the dominant (sterile) hand at least one inch from the end of the trach tube.
    - To apply suction, place your nondominant thumb over the control valve
17. Withdraw the catheter while continually rotating it between your fingers to suction all sides of the tracheostomy tube. Do not suction longer than 15 seconds to prevent hypoxia. Follow agency policy regarding the use of intermittent or continuous suctioning. Do not contaminate the catheter as you remove it from the trach tube.
18. Suction sterile saline each time the suction catheter is removed to flush the catheter and suction tubing of secretions.
19. Assess the patient response to suctioning; hyperoxygenation may be required. If dysrhythmia or bradycardia occur, stop the procedure.

20. Allow the patient to rest. After the patient's pulse oximetry returns to baseline, a second suctioning pass can be initiated if clinically indicated. Encourage the patient to cough and deep breath to remove secretions between suctioning passes.
21. Do not insert the suction catheter more than two times. If the patient's respiratory status does not improve or it worsens, call for emergency assistance.
22. Reattach the preexisting oxygen delivery device to the patient with your noncontaminated hand.
23. Evaluate the effectiveness of the procedure and the patient's respiratory status. Assess patency of the airway and pulse oximetry.
24. Remove the catheter from the tubing and then remove gloves while holding the catheter inside the glove. Perform hand hygiene.
25. Turn off the suction.
26. Perform proper hand hygiene and don clean gloves.
27. Reassess lung sounds, heart rate and rhythm, and pulse oximetry for improvement .
28. Perform patient oral care.
29. Remove gloves and perform proper hand hygiene.
30. Assist the patient to a comfortable position, ask if they have any questions, and thank them for their time.
31. Ensure safety measures when leaving the room:
    - CALL LIGHT: Within reach
    - BED: Low and locked (in lowest position and brakes on)
    - SIDERAILS: Secured
    - TABLE: Within reach
    - ROOM: Risk-free for falls (scan room and clear any obstacles)
32. Perform hand hygiene.
33. Document the procedure and related assessment findings. Report any concerns according to agency policy.

Sample Documentation

Sample Documentation of Expected Findings

Mucus present at entrance to tracheostomy tube. Hyperoxygenation provided for 30 seconds before and after suctioning using a bag valve mask with FiO2 100%. Patient's pulse oximetry remained 92-96% during suctioning. Moderate amount of thick, white mucus without odor was suctioned. Post procedure: HR 78, RR 18, O2 sat 96%, and lung sounds clear throughout all lobes. Patient tolerated the procedure without discomfort.

Sample Documentation of Unexpected Findings

Mucus present at entrance to tracheostomy tube. Hyperoxygenation provided for 30 seconds before and after suctioning using a bag valve mask with FiO2 100%. During the first suctioning pass, the ECG demonstrated bradycardia with HR dropping into the 50s. Suctioning was stopped. Trach tube was reattached to the mechanical ventilator and emergency assistance was requested from the respiratory therapist. Moderate amount of thick, white mucus without odor was suctioned. Post procedure, HR 78, RR 18, O2 sat 96% and lung sounds clear throughout all lobes.

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1. American Association for Respiratory Care. (2010). AARC clinical practice guideline: Endotracheal suctioning of mechanically ventilated patients with artificial airways 2010. *Respiratory Care*, *55*(6), 758-764. www.rcjournal.com/cpgs/pdf/06.10.0758.pdf↵
2. "Example of a Sterile Tracheostomy Kit" by Julie Teeter at Gateway Technical College is licensed under CC BY 4.0↵
3. American Association for Respiratory Care. (2010). AARC clinical practice guideline: Endotracheal suctioning of mechanically ventilated patients with artificial airways 2010. *Respiratory Care*, *55*(6), 758-764. www.rcjournal.com/cpgs/pdf/06.10.0758.pdf↵
4. Tracheostomy suctioning. (2020). Lippincott procedures. http://procedures.lww.com↵

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https://med.libretexts.org/@go/page/77059

12.6: Checklist for Tracheostomy Care and Sample Documentation

Tracheostomy care is provided on a routine basis to keep the tracheostomy tube's flange, inner cannula, and surrounding area clean to reduce the amount of bacteria entering the artificial airway and lungs. See Figure **12.6.1**[1] for an image of a sterile tracheostomy care kit.



Figure **12.6.1**: Sterile Tracheostomy Care Kit

Replacing and Cleaning an Inner Cannula

The primary purpose of the inner cannula is to prevent tracheostomy tube obstruction. Many sources of obstruction can be prevented if the inner cannula is regularly cleaned and replaced. Some inner cannulas are designed to be disposable, while others are reusable for a number of days. Follow agency policy for inner cannula replacement or cleaning, but as a rule of thumb, inner cannula cleaning should be performed every 12-24 hours at a minimum. Cleaning may be needed more frequently depending on the type of equipment, the amount and thickness of secretions, and the patient's ability to cough up the secretions.

Changing the inner cannula may encourage the patient to cough and bring mucus out of the tracheostomy. For this reason, the inner cannula should be replaced prior to changing the tracheostomy dressing to prevent secretions from soiling the new dressing. If the inner cannula is disposable, no cleaning is required.[2]

Checklist for Tracheostomy Care With a Reusable Inner Cannula

Use the checklist below to review the steps for completion of "Tracheostomy Care."

Stoma site should be assessed and a clean dressing applied at least once per shift. Wet or soiled dressings should be changed immediately.[3] Follow agency policy regarding clearing the inner cannula; it should be inspected at least twice daily and cleaned as needed.

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

1. Gather supplies: bedside table, towel, sterile gloves, pulse oximeter, PPE (i.e., mask, goggles, or face shield), tracheostomy suctioning equipment, bag valve mask (should be located in the room), and a sterile tracheostomy care kit (or sterile cotton-tipped applicators, sterile manufactured **tracheostomy split sponge dressing,** sterile basin, normal saline, and a disposable inner cannula or a small, sterile brush to clean the reusable inner cannula).
2. Perform safety steps:
    - Perform hand hygiene.

- Check the room for transmission-based precautions.
- Introduce yourself, your role, the purpose of your visit, and an estimate of the time it will take.
- 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. Raise the bed to waist level and place the patient in a semi-Fowler's position.
4. Verify that there is a backup tracheostomy kit available.
5. Don appropriate PPE.
6. Perform tracheal suctioning if indicated.
7. Remove and discard the trach dressing. Inspect drainage on the dressing for color and amount and note any odor.
8. Inspect stoma site for redness, drainage, and signs and symptoms of infection.
9. Remove the gloves and perform proper hand hygiene.
10. Open the sterile package and loosen the bottle cap of sterile saline.
11. Don one sterile glove on the dominant hand.
12. Open the sterile drape and place it on the patient's chest.
13. Set up the equipment on the sterile field.
14. Remove the cap and pour saline in both basins with ungloved hand (4″-6" above basin).
15. Don the second sterile glove.
16. Prepare and arrange supplies. Place pipe cleaners, trach ties, trach dressing, and forceps on the field. Moisten cotton applicators and place them in the third (empty) basin. Moisten two 4″ x 4″ pads in saline, wring out, open, and separately place each one in the third basin. Leave one 4″ x 4″ dry.
17. With nondominant "contaminated" hand, remove the trach collar (if applicable) and remove (unlock and twist) the inner cannula. If the patient requires continuous supplemental oxygen, place the oxygenation device near the outer cannula or ask a staff member to assist in maintaining the oxygen supply to the patient.
18. Place the inner cannula in the saline basin.
19. Pick up the inner cannula with your nondominant hand, holding it only by the end usually exposed to air.
20. With your dominant hand, use a brush to clean the inner cannula. Place the brush back into the saline basin.
21. After cleaning, place the inner cannula in the second saline basin with your nondominant hand and agitate for approximately 10 seconds to rinse off debris. Repeat cleansing with brush as needed.
22. Dry the inner cannula with the pipe cleaners and place the inner cannula back into the outer cannula. Lock it into place and pull gently to ensure it is locked appropriately. Reattach the preexisting oxygenation device.
23. Clean the stoma with cotton applicators using one on the superior aspect and one on the inferior aspect.
24. With your dominant, noncontaminated hand, moisten sterile gauze with sterile saline and wring out excess. Assess the stoma for infection and skin breakdown caused by flange pressure. Clean the stoma with the moistened gauze starting at the 12 o'clock position of the stoma and wipe toward the 3 o'clock position. Begin again with a new gauze square at 12 o'clock and clean toward 9 o'clock. To clean the lower half of the site, start at the 3 o'clock position and clean toward 6 o'clock; then wipe from 9 o'clock to 6 o'clock, using a clean moistened gauze square for each wipe. Continue this pattern on the surrounding skin and tube flange. Avoid using a hydrogen peroxide mixture because it can impair healing.[4]
25. Use sterile gauze to dry the area.
26. Apply the sterile tracheostomy split sponge dressing by only touching the outer edges.
27. Replace trach ties as needed. (The literature overwhelmingly recommends a two-person technique when changing the securing device to prevent tube dislodgement. In the two-person technique, one person holds the trach tube in place while the other changes the securing device). Thread the clean tie through the opening on one side of the trach tube. Bring the tie around the back of the neck, keeping one end longer than the other. Secure the tie on the opposite side of the trach. Make sure that only one finger can be inserted under the tie.
28. Remove the old tracheostomy ties.

29. Remove gloves and perform proper hand hygiene.
30. Provide oral care. Oral care keeps the mouth and teeth not only clean, but also has been shown to prevent hospital-acquired pneumonia.
31. Lower the bed to lowest the position. If the patient is on a mechanical ventilator, the head of the bed should be maintained at 30-45 degrees to prevent ventilator-associated pneumonia.
32. Assist the patient to a comfortable position, ask if they have any questions, and thank them for their time.
33. Ensure safety measures when leaving the room:
    - CALL LIGHT: Within reach
    - BED: Low and locked (in lowest position and brakes on)
    - SIDE RAILS: Secured
    - TABLE: Within reach
    - ROOM: Risk-free for falls (scan room and clear any obstacles)
34. Perform hand hygiene.
35. Document the procedure and related assessment findings. Report any concerns according to agency policy.

Sample Documentation

Sample Documentation of Expected Findings

Tracheostomy care provided with sterile technique. Stoma site free of redness or drainage. Inner cannula cleaned and stoma dressing changed. Patient tolerated the procedure without difficulties.

Sample Documentation of Unexpected Findings

Tracheostomy care provided with sterile technique. Stoma site is erythematous, warm, and tender to palpation. Inner cannula cleaned and stoma dressing changed. Patient tolerated the procedure without difficulties. Dr. Smith notified of change in condition of stoma at 1315 and stated would assess the patient this afternoon.

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1. "Sterile Tracheostomy Care Kit" by Julie Teeter at Gateway Technical College is licensed under CC BY 4.0↵
2. This work is a derivative of Clinical Procedures for Safer Patient Care by British Columbia Institute of Technology and is licensed under CC BY 4.0. ↵
3. Nance-Floyd, B. (2011). Tracheostomy care: An evidence-based guide. *American Nurse*. https://www.myamericannurse.com/tracheostomy-care-an-evidence-based-guide-to-suctioning-and-dressing-changes/↵
4. Nance-Floyd, B. (2011). Tracheostomy care: An evidence-based guide. *American Nurse*. https://www.myamericannurse.com/tracheostomy-care-an-evidence-based-guide-to-suctioning-and-dressing-changes/↵

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12.7: Supplementary Videos

Note

View these videos from Santa Fe College for more information on tracheostomy care and suctioning:

Trach Care Suction Video [1]

Trach Care – Washing the Inner Canula [2]

1. SF Educational Media Studio. (2017, August 11). SF Nursing Trach Care 1 Suction. [Video]. YouTube. All rights reserved. https://youtu.be/TNokX_WKCpY↵
2. SF Educational Media Studio. (2018, March 1). SF Nursing Trach Care Part 2 Change Wash Inner Cannula. [Video]. YouTube. All rights reserved. https://youtu.be/EWAA_saUDSo↵

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12.8: Learning Activities

Learning Activities

(Answers to “Learning Activities” can be found in the “Answer Key” at the end of the book. Answers to interactive activity elements will be provided within the element as immediate feedback.)

1. You are caring for a patient with a tracheostomy. **What supplies should you ensure are in the patient’s room when you first assess the patient?**

2. Your patient with a tracheostomy puts on their call light. As you enter the room, the patient is coughing violently and turning red. **Prioritize the action steps that you will take.**

a. Assess lung sounds
b. Suction patient
c. Provide oxygen via the trach collar if warranted
d. Check pulse oximetry

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12.9: XXII Glossary

Fenestrated cannula: Type of tracheostomy tube that contains holes so the patient can speak if the cuff is deflated and the inner cannula is removed.

Flange: The end of the tracheostomy tube that is placed securely against the patient's neck.

Inner cannula: The cannula inside the outer cannula that is removed during tracheostomy care by the nurse. Inner cannulas can be disposable or reusable with appropriate cleaning.

Oropharyngeal suctioning: Suction of secretions through the mouth, often using a Yankauer device.

Outer cannula: The outer cannula placed by the provider through the tracheostomy hole and continuously remains in place.

Suction canister: A container for collecting suctioned secretions that is attached to a suction source.

Suction catheter: A soft, flexible, sterile catheter used for nasopharyngeal and tracheostomy suctioning.

Tracheostomy: A surgically created opening that goes from the front of the neck into the trachea.

Tracheostomy dressing: A manufactured dressing used with tracheostomies that does not shed fibers, which could potentially be inhaled by the patient.

Yankauer suction tip: Rigid device used to suction secretions from the mouth.

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CHAPTER OVERVIEW

13: IV Therapy Management

13.1: IV Therapy Management Introduction
13.2: IV Therapy Basics
13.3: Intravenous Therapy Assessment
13.4: Sample Documentation
13.5: Checklist for Primary IV Solution Administration
13.6: Checklist for Secondary IV Solution Administration
13.7: Sample Documentation
13.8: Checklist for Discontinuing an IV
13.9: Supplementary Videos Related to IV Therapy
13.10: Learning Activities
13.11: XXIII Glossary

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13.1: IV Therapy Management Introduction

Learning Objectives

- Inspect established IV site for deviations from normal
- Prepare and safely administer primary and secondary IV fluids and medication
- Calculate and ensure designated flow rate
- Change IV tubing
- Change IV site dressing
- Discontinue short-term peripheral IV
- Modify the procedure to reflect variations across the life span
- Document actions and observation
- Report significant deviations from norms

The purpose of intravenous (IV) therapy is to replace fluid and electrolytes, provide medications, and replenish blood volume.

The nurse's responsibilities in managing IV therapy include the following:

- assessing an IV site
- priming and hanging a primary IV bag
- preparing and hanging a secondary IV bag
- calculating IV rates
- monitoring the effectiveness of IV therapy
- discontinuing a peripheral IV

IV medications and fluids enter the patient's bloodstream directly through the vein. They act rapidly within the body to restore fluid volume and deliver medications. Once a medication enters the vein, there is no way to terminate this action. Therefore, it is important to properly prepare the IV medication or fluid, correctly calculate the dosage, and administer it safely to the patient. Additionally, IV fluid administration is considered a medical intervention and requires a medication order prior to the initiation of fluid therapy.

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13.2: IV Therapy Basics

Primary IV Fluid Infusion

Primary IV fluid infusions are prescribed by health care providers to restore or maintain hydration and electrolyte status within the body. When administering IV fluids to a patient, the nurse must continually monitor the patient's fluid and electrolyte status to evaluate the effectiveness of the infusion and to avoid potential complications of fluid overload and electrolyte imbalance.

The most commonly used primary IV fluid bag contains 1,000 mL. There are also 500 mL, 250 mL, 100 mL, and 50 mL bags. The size of the primary fluid bag is based on infusion need, patient condition, and age. Most adult patients receive continuous IV fluids with 1,000 mL bags due to the higher drip (gtt) rate. Many other fluid volume bags are used for intermittent infusions or short-term therapy.

For example, for renal dialysis patients, IV bags smaller than 1,000 mL are used because large amounts of continuous fluids are contraindicated due to their renal impairment. Many institutions will hang smaller volume normal saline continuous infusion bags just to serve as an additional reminder that these patients should not receive large amounts of primary fluids. Another example of patients requiring smaller IV bags are pediatric patients who, due to their smaller anatomical size, do not require large primary fluid infusion volumes.

Primary fluids are typically administered using an IV pump. An IV pump is the safest method of administration to ensure specific amounts of fluid are administered. However, there may be situations when IV pumps are not available and nurses administer primary fluids by gravity using drip tubing. Read more about calculating infusion rates in the "Math Calculation" chapter.

Primary fluids are run at consistent infusion rates for a prescribed period of time. For example, a continuous fluid infusion may be ordered at a rate of 125 mL/hour for 24 hours. Continuous fluids may also be ordered to run until the provider gives a follow-up order to discontinue or decrease the fluid rate.

IV primary fluid bags consist of various types of fluid such as 0.9% normal saline, 0.45% (½) normal saline, lactated ringers solution, and dextrose (5%) preparations. They may also contain replacement electrolytes like potassium chloride. The provider will order primary fluids based on the patient's fluid and electrolyte statuses.

There are three types of intravenous fluid concentrations: isotonic, hypertonic, and hypotonic fluids.

- Isotonic fluids are typically administered for fluid and electrolyte replacement. Isotonic fluids have a similar concentration to the solutes contained in blood, so they do not cause the osmotic movement of fluid into or out of the patient's individual cells. An example of isotonic fluid is 0.9% normal saline.
- Hypertonic fluids have a higher concentration of solutes than blood. They are typically used in critical care situations to treat hyponatremia and avoid pulmonary edema by relying on osmosis to help remove excess fluid. An example of a hypertonic fluid is dextrose 5% in 0.9% normal saline (D5NS).
- Hypotonic fluids have a lower concentration of solutes than blood. The goal of hypotonic fluid administration is to move fluids into a patient's cells due to osmosis. Hypotonic solutions are commonly used when a patient has severe intracellular dehydration such as during diabetic ketoacidosis. An example of hypotonic fluid is 0.45% normal saline (1/2NS). See Figure **13.2.1**[1] for an example of the effects of the administration of hypertonic, isotonic, and hypotonic IV fluids on a patient's red blood cells.

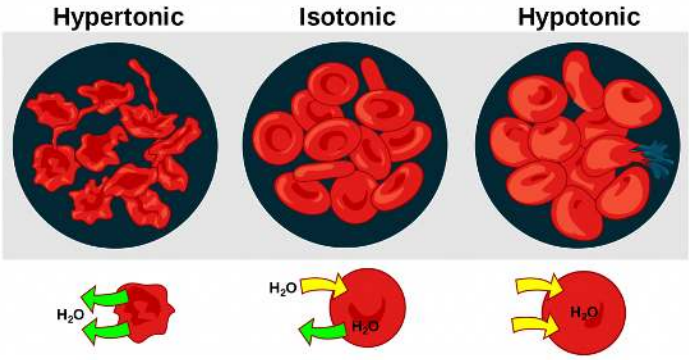


Figure **13.2.1**: Osmotic Effects of Hypertonic, Isotonic, and Hypotonic IV Fluids on Red Blood Cells

Because a patient's fluid and electrolyte statuses are constantly changing when receiving IV fluids, it is important for the nurse to monitor for signs of fluid or electrolyte imbalances and appropriately notify the health care provider of any concerns. For example, primary fluids may be started at a higher rate of infusion when a patient is receiving nothing by mouth (NPO), but should be tapered as they resume normal diet and fluid intake. It is important for the nurse to continually monitor a patient's skin turgor, urinary output, lung sounds, and oxygen requirements and to assess for any new edema to offer important insight into their fluid volume status. A nurse must also evaluate the effects of replacement fluids and discuss their ongoing need with the prescribing provider.

Note

Read more about types of intravenous fluids in the "Fluids and Electrolytes" chapter in Open RN *Nursing Fundamentals*.

Secondary Fluid Infusion

Secondary IV fluid administration is usually an intermittent infusion that infuses at regular intervals (e.g., every 8 hours). This form of IV therapy usually contains medications that are supplied in a smaller infusion bag and mixed with a diluent fluid like saline (e.g., IV antibiotics). Many common preparations come in 25 to 100 mL bags.

Secondary IV therapy is often referred to as "IV piggyback" (IVPB) medication because it is attached to the primary bag of intravenous fluids. In this case, the primary line maintains venous access between drug doses.

It is important to remember that not all IV solutions are compatible with all IV medications. It is vital for the nurse to triple check that the secondary medications/fluids are compatible with primary fluids. If medication and fluids are not compatible, a precipitate may form when the fluids mix within the line, posing a significant health danger for the patient.

IV Administration Equipment

Intravenous (IV) fluids and medications are administered through flexible plastic tubing called an IV administration set. The IV administration set connects the bag of solution to the patient's IV access site. There are two major types of IV administration sets: primary tubing and secondary tubing. Additionally, IV fluids can be administered by gravity or by infusion pump, and each method requires its own administration set.

Primary and Secondary Administration Sets

Primary IV Administration Sets

Primary IV administration sets are used to infuse continuous or intermittent fluids or medications. Primary IV tubing can be a macro-drip or micro-drip solution set. A macro-drip infusion set delivers 10, 15, or 20 drops per milliliter, whereas a micro-drip infusion set delivers 60 drops per milliliter. The drop factor is located on the packaging of the IV tubing and is important to verify when calculating medication administration rates. Macro-drip sets are used for routine primary infusions for adults. Micro-drip IV tubing is used in pediatric or neonatal care where small amounts of fluids are administered over a long period of time.

Primary IV administration sets consist of the following parts:

Sterile spike: This part of the tubing must be kept sterile as you spike the IV fluid bag.

Drip chamber: The drip chamber allows air to rise out from a fluid so that it is not passed onto the patient. It is also used to calculate the rate at which fluid is administered by gravity (drops per minute). It should be kept ¼ to ½ full of solution.

Backcheck valve: A backcheck valve prevents fluid or medication from travelling up into the primary IV bag.

Access ports: Access ports are used to infuse secondary medications and to administer IV push medications. These may also be referred to as "Y ports."

Roller clamp: A roller clamp is used to regulate the speed, or stop, an infusion by gravity.

Secondary IV Administration Sets

Secondary IV administration sets are used to intermittently administer a secondary medication, such as an antibiotic, while the primary IV is also running. Secondary IV tubing is shorter in length than primary tubing and is connected to a primary line via an access port or an IV pump. The secondary infusion is hung above the primary infusion and connected at an access port.

Secondary fluids should always be "piggybacked" into primary infusion lines to ensure that the correct amount of medication is infused. By piggybacking a medication, the solution from the primary fluid line is used to prime the secondary tubing. However, if a secondary infusion is run as a primary fluid, there is a risk of losing some of the secondary medication when priming the line, which results in less medication being administered. Loss of medication is considered a medication error because the patient received less active medication than prescribed.

See Figure **13.2.2**[2] for an illustration of the set up of a primary and secondary tubing for administration of fluids and a secondary medication by gravity. See Figure **13.2.3**[3] for an example of an IV infusion pump.

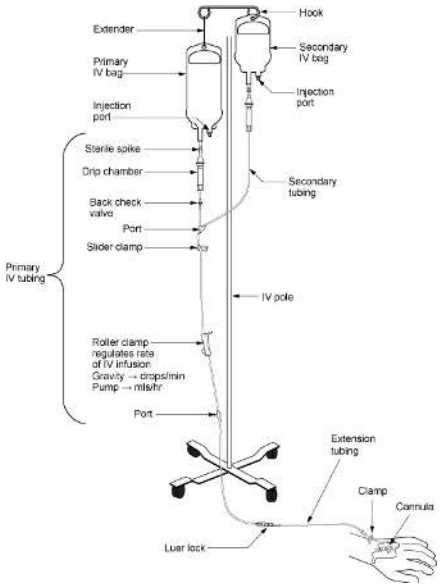


Figure **13.2.2**: Primary and Secondary Tubing Administration Set



Figure 13.2.3: Example of an IV Infusion Pump

IV Administration

When initiating or changing an IV bag of fluids or medications, it is important to remember these items:

- IV fluids are a medication. Verify physician orders and check that the patient does not have an allergy to this 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 that the bag itself 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 and 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 medications.
- If administration set tubing is present, trace the tubing from the patient to its point of origin to make sure that you're accessing the correct port.
- Assess the IV site. Inspect for redness, swelling, or tenderness that can 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.

Complications of IV Therapy

While monitoring a patient receiving IV fluids, it is important to assess for potential complications such as infiltration, extravasation, phlebitis, or infection. If these conditions occur, promptly notify the provider for treatment; the IV catheter will need to be removed and replaced at an alternative site, and additional medication may be prescribed.

Infiltration occurs when the tip of the catheter slips out of the vein. The catheter passes through the wall of the vein, or the blood vessel wall allows part of the fluid to infuse into the surrounding tissue, resulting in the leakage of IV fluids into the surrounding tissue. Infiltration may cause pain, swelling, and skin that is cool to the touch. If you are concerned an IV is infiltrated, follow your facility policy and, as a general guideline, discontinue the site and relocate the IV. If the infiltration is severe, you may consider the

application of a compress in addition to elevating the affected limb. Check your institution's policy regarding which type of compress (warm or cold) should be applied.[4],[5] Additionally, clinical pharmacists can also be helpful resources for determining the appropriate type of infiltration treatment.

Extravasation refers to infiltration of damaging intravenous medications, such as chemotherapy, into the extravascular tissue around the site of infusion. Extravasation causes tissue injury, and depending on the medication, site, and length of exposure, it can cause tissue death, which is also referred to as necrosis. If detected early, extravasation may be treated with medications that help avoid the complication of necrosis.

Phlebitis is inflammation of a vein. Phlebitis of superficial veins can occur due to trauma to the vein during insertion of the IV catheter. It can cause redness and tenderness along the vein and can lead to infection if not treated appropriately. Treatment may include warm compresses and nonsteroidal anti-inflammatory medications.

Infection can occur whenever the skin barrier is broken by the insertion of an IV catheter. Signs of infection include redness, warmth, tenderness, and possible fever. Vascular catheter–associated infection is considered a hospital-acquired condition because it can be prevented using best practices. Be sure to follow evidence-based infection prevention practices, such as performing hand hygiene, performing a vigorous mechanical scrub of needleless connectors, limiting catheter access, and following sterile no-touch technique during intravenous infusion to reduce the risk of vascular catheter–associated infection.

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1. "Osmotic pressure on blood cells diagram.svg" by LadyofHatsis in the Public Domain↵
2. "intravenous_equipment_labels-2.png" by British Columbia Institute of Technology is licensed under CC BY 4.0. Access for free at https://opentextbc.ca/clinicalskills/chapter/8-2-types-of-iv-therapy/↵
3. "DSC_0738-e1443533768679-678x1024.jpg" by British Columbia Institute of Technology is licensed under CC BY 4.0. Access for free at https://opentextbc.ca/clinicalskills/chapter/8-2-types-of-iv-therapy/↵
4. Drugs.com [Internet]. *IV Infiltration*. © 2000-2020 [updated 3 February, 2020; cited 7 August, 2020]. https://www.drugs.com/cg/iv-infiltration-aftercare-instructions.html↵
5. AMN Healthcare Education Services. (2015). *Know the difference: Infiltration versus extravasation*. https://www.rn.com/nursing-news/know-the-difference-infiltration-vs-extravasation/↵

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13.3: Intravenous Therapy Assessment

To prepare for intravenous therapy administration, the nurse should collect important subjective and objective assessment information from the patient.

Subjective Assessment

When performing the subjective assessment, the nurse should begin by focusing on data collection that may signify a potential complication if a patient receives IV infusion therapy. The nurse should begin by identifying if the patient has medication allergies or a latex allergy. The patient's history should also be considered with special attention given to those with known congestive heart failure (CHF) or chronic kidney disease (CKD) because they are more susceptible to developing fluid overload. Additionally, the patient should be asked if they have any pain or discomfort in their IV access site now or during the infusion of medications or fluids.

Life Span Considerations

Children

Safety measures for a child with an IV infusion include assessing the IV site every hour for patency. Infused volumes and signs of fluid overload should be carefully assessed and documented frequently per agency policy. The IV may be wrapped in gauze or an arm board may be used to deter the child from tampering with the IV site or tubing. Additionally, the tubing should be well-secured, and the dressing should remain free from moisture so the IV site is not compromised. Be aware that mobile children will require guidance to ensure that the tubing is not obstructed if they sit or lie on the tubing accidentally.

Older Adults

Older adults with an IV infusion should be frequently monitored for the development of fluid volume overload. Signs of fluid volume overload include elevated blood pressure and respiratory rate, decreased oxygen saturation, peripheral edema, fine crackles in the posterior lower lobes of the lungs, or signs of worsening heart failure. Additionally, older adults have delicate venous walls that may not withstand rapid infusion rates. It is important to monitor the IV site patency carefully when infusing large amounts of fluids at faster rates and appropriately modify the infusion rate.



Every time you interact with the patient, assess the IV site for signs of complications and educate the patient to inform you if there is tenderness or swelling at the IV site.

Objective Assessment

The patient's IV site should be checked for patency before initiating IV therapy and throughout the course of treatment. The IV site should be free of redness, swelling, coolness, or warmth to the touch. The IV infusion should flow freely. The nurse should also be aware of different types of intravenous access that may be used for an infusion. For example, a peripherally inserted central catheter (PICC) looks similar to intravenous access, but requires different assessment and monitoring as a central line. Please review Table **13.3.1** to consider the expected and unexpected assessment findings that may occur with IV therapy.

Table **13.3.1**: Expected Versus Unexpected Findings With IV Therapy

Assessment	Expected Findings	Unexpected Findings (document and notify provider if a new finding*)
Inspection	IV site free of redness, swelling, tenderness, coolness, or warmth to touch	IV site with redness, swelling, tenderness, coolness, or warmth to the touch
Patency	IV fluid flows freely	IV fluid does not flow; patient reports pain during flush
***CRITICAL CONDITIONS to report immediately**		Notify the HCP if there is redness, warmth, or blisters at the site

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13.4: Sample Documentation

Sample Documentation of Expected Findings

Initiated IV infusion of normal saline at 125 mL/hr using existing 22 gauge IV catheter located in the right hand. The IV site is free from pain, coolness, redness, or swelling.

Sample Documentation of Unexpected Findings

Attempted to initiate IV infusion in right hand using existing 22 gauge IV catheter. The IV site was free from pain, redness, or signs of infiltration. It infused freely with the normal saline flush. IV fluids were connected to run the normal saline infusion at 200 mL/hr. The infusion was started, but immediate leaking around the infusion site was noted. Swelling was noted superior to the infusion site and the fluids were immediately stopped.

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13.5: Checklist for Primary IV Solution Administration

Use the checklist below to review the steps for completion of "Primary IV Solution Administration." Review the steps to safely administer all types of medication in the "Checklist for Oral Medication Administration" in the "Administration of Enteral Medications" chapter.

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

1. Gather supplies: IV fluid, primary tubing, tubing change label, and alcohol pads/scrub hubs.
2. Verify the provider order with the medication administration record (eMAR/MAR).
3. Perform the first check of the six rights of medication administration while withdrawing the IV fluids from the medication dispensing unit. Check expiration date and verify patient allergies.
4. Remove the IV solution from the packaging and gently apply pressure to the bag while inspecting for tears or leaks.
5. Check the color and clarity of the solution.
6. Perform the second check of the six rights of medication administration.
7. Enter the patient room and greet the patient.
8. Perform safety steps:
    - Perform hand hygiene.
    - Check the room for transmission-based precautions.
    - Introduce yourself, your role, the purpose of your visit, and an estimate of the time it will take.
    - 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.
9. Perform the third medication check of the six rights of medication administration at the patient's bedside.
10. Remove the primary IV tubing from the packaging. If administering IV fluid by gravity, note the drip factor on the package and calculate drops/min. Perform the necessary calculations for the infusion rate.
11. Move the roller clamp so that it is halfway up the tubing and clamp it.
12. Remove the cover from the tubing port on the bag of IV fluid.
13. Remove the cap from the insertion spike on the tubing. While maintaining sterility, insert the spike into the tubing port of the bag of IV fluid.
14. Squeeze the drip chamber two or three times to fill the chamber halfway.
15. Loosen the cap from the end of the IV tubing and open the clamp to prime the tubing over the sink:
    - If using multiple port tubing, invert the ports to prime them and to prevent air accumulation in line.
    - If the solution is an antibiotic, take care to not waste solution while priming the tubing to ensure the patient receives the correct dosage.
16. Once primed, clamp the IV tubing and check the entire length of the tubing for air bubbles. Tap the tubing gently to remove any air.
17. Replace or tighten the cap on the end of the tubing.
18. Label the primary IV fluid bag with the date and time. Place the tubing label on the tubing near the drip chamber.
19. Assess the patient's venipuncture site for signs and symptoms of vein irritation or infiltration. Do not proceed with administering fluids at this site if there are any concerns.
20. Vigorously cleanse the catheter cap on the patient's IV port with an alcohol pad/scrub hub (or the agency required cleansing agent) for at least five seconds and allow it to dry.

21. Assess IV site patency according to agency policy. Purge a prefilled normal saline syringe of air. Attach the syringe onto the the saline lock cap. Undo the clamp on the extension tubing. Inject 3 to 5 mL of normal saline using a turbulent stop-start technique. If resistance is felt, do not force the flush and do not proceed with IV solution administration; follow up according to agency policy.
22. Remove the syringe from the IV cap and then clamp the extension tubing.
23. Vigorously cleanse the catheter cap on the patient's IV port with an alcohol pad/scrub hub (or the agency required cleansing agent) for at least five seconds and allow it to dry.
24. Remove the protective cap from the end of the primary tubing and attach it to the IV port while maintaining sterility.
25. Move the slide clamp on the saline lock to open the tubing.
26. Set the infusion rate based on the provider order:
    - For infusion pump: Set volume to be infused and rate (mL/hr) to be administered.
    - For gravity: Calculate drop per minute.
27. Assess the patient's IV site for signs and symptoms of vein irritation or infiltration after infusion begins.
28. Secure the tubing to the patient's arm.
29. Assist the patient to a comfortable position, ask if they have any questions, and thank them for their time.
30. Ensure safety measures when leaving the room:
    - CALL LIGHT: Within reach
    - BED: Low and locked (in lowest position and brakes on)
    - SIDE RAILS: Secured
    - TABLE: Within reach
    - ROOM: Risk-free for falls (scan room and clear any obstacles)
31. Perform hand hygiene.
32. Document the procedure and related assessment findings. Report any concerns according to agency policy. Include IV fluids on patient's input/output documentation.

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13.6: Checklist for Secondary IV Solution Administration

Use the checklist below to review the steps for completion of “Secondary IV Solution Administration.” This checklist is used when fluids are already being administered via the primary IV tubing and a second IV solution is administered.

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

1. Gather supplies: secondary IV fluid/medication, secondary IV tubing, alcohol wipe/scrub hubs, and tubing labels.
2. Verify the provider order with the medication administration record (eMAR/MAR).
3. Perform the first check of the six rights of medication administration while withdrawing the IV solution and tubing from the medication dispensing unit. Check expiration dates on the fluid and the tubing and verify allergies.
4. Verify compatibility of the secondary IV solution with the other IV fluids the patient is concurrently receiving.
5. Remove the IV solution from the packaging and gently apply pressure to the bag while inspecting for tears or leaks. Check the color and clarity of the solution.
6. Perform the second check of the six rights of medication administration.
7. Enter the patient room and greet the patient.
8. Perform safety steps:
    - Perform hand hygiene.
    - Check the room for transmission-based precautions.
    - Introduce yourself, your role, the purpose of your visit, and an estimate of the time it will take.
    - Confirm patient ID using two patient identifiers (e.g., name and date of birth).
    - Explain the process to the patient.
    - 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.
9. Perform the third check of the six rights of medication administration at the patient’s bedside.
10. If the patient is receiving the medication for the first time, teach the patient and family (if appropriate) about the potential adverse reactions and other concerns related to the medication.
11. Remove the secondary IV tubing from the packaging.
12. Place the roller clamp to the “off” position.
13. Remove the protective sheath from the IV spike and the cover from the tubing port of the IV solution.
14. Insert the spike into the IV bag while maintaining sterility.
15. Compress and release the drip chamber, filling halfway.
16. Prime the secondary IV tubing. Back priming is considered best practice and is performed using an infusion pump with primary fluids attached:
    - Vigorously cleanse the catheter tip on the patient’s IV port with an alcohol pad/scrub hub (or the agency required cleansing agent) for at least five seconds and allow it to dry.
    - Connect the secondary tubing to the port closest to the drip chamber. Lower the secondary bag below the primary bag, and allow the fluid from the primary bag to fill secondary tubing. Fill the secondary tubing until it reaches the drip chamber, and then raise the secondary bag above the primary line.
17. Hang the secondary IV solution on the IV pole with the primary bag lower than the secondary bag.
18. Label the secondary tubing near the drip chamber.
19. Set the infusion rate:
    - For infusion pump: Set the volume to be infused and the rate (mL/hr) to be administered based on the provider order.
    - For gravity: Set the roller clamp to achieve the appropriate number of drops per minute based on the provider order.



Take time to watch the IV fluid or medication to drip into the drip chamber to ensure the medication or fluid is flowing to the patient.

20. Assess the patient's IV site for signs and symptoms of vein irritation or infiltration after infusion begins. Do not proceed with administering secondary fluids if there are any concerns about the site.
21. Assist the patient to a comfortable position, ask if they have any questions, and thank them for their time.
22. Ensure safety measures when leaving the room:
    - CALL LIGHT: Within reach
    - BED: Low and locked (in lowest position and brakes on)
    - SIDE RAILS: Secured
    - TABLE: Within reach
    - ROOM: Risk-free for falls (scan room and clear any obstacles)
23. Perform hand hygiene.
24. Document the procedure and assessment findings. Report any concerns according to agency policy.

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13.7: Sample Documentation

Sample Documentation of Expected Findings

IV catheter on the right hand was discontinued. IV catheter tip was intact. Site is free from redness, warmth, tenderness, or swelling. Gauze applied with pressure for one minute with no bleeding noted. Dressing applied to the site.

Sample Documentation of Unexpected Findings

IV catheter on the right hand was discontinued. IV catheter tip was intact. Site free from redness, warmth, tenderness, or swelling. Gauze applied with pressure for one minute but bleeding was noted to continue around the gauze dressing. Ongoing pressure was held for five minutes until hemostasis was achieved.

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13.8: Checklist for Discontinuing an IV

Use the checklist below to review the steps for completion of “Discontinuing an IV.”

Steps

Disclaimer: Always review and follow agency policy regarding this specific skill.

1. Gather supplies: gauze, tape, or a Band-Aid.
2. Perform safety steps:
   - Perform hand hygiene.
   - Check the room for transmission-based precautions.
   - Introduce yourself, your role, the purpose of your visit, and an estimate of the time it will take.
   - Confirm patient ID using two patient identifiers (e.g., name and date of birth).
   - Explain the process to the patient.
   - 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 gauze and tape.
4. Place the IV clamp to the “off” position (clamped).
5. Loosen the edges of the transparent dressing and tape in the direction of the IV site.
6. Place a gauze pad over the IV site and gently pull the IV out parallel to the skin in a slow and steady motion.
7. Hold pressure on the IV site for 2-3 minutes. If the patient is on anticoagulant medication, you may need to hold for 5-10 minutes.
8. Inspect the catheter to ensure it is intact and dispose of it in an appropriate container.
9. Remove the gauze pad once bleeding has stopped and assess for any signs of infection at the site, such as redness, swelling, warmth, tenderness, or purulent drainage.
10. Tape the gauze or apply a Band-Aid over the IV site.
11. Assist the patient to a comfortable position, ask if they have any questions, and thank them for their time.
12. Ensure safety measures when leaving the room:
    - CALL LIGHT: Within reach
    - BED: Low and locked (in lowest position and brakes on)
    - SIDE RAILS: Secured
    - TABLE: Within reach
    - ROOM: Risk-free for falls (scan room and clear any obstacles)
13. Perform hand hygiene.
14. Document the procedure and related assessment findings. Report any concerns according to agency policy.

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13.9: Supplementary Videos Related to IV Therapy

Video Review for Priming IV Tubing and Spiking an IV Bag:[1]



1. RegisteredNurseRN. (2017, March 10). *How to prime IV tubing line | How to spike a IV bag for nursing*. [Video]. YouTube. All rights reserved. Video used with permission. https://youtu.be/4ntqS_R1r70↵

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13.10: Learning Activities

Learning Activities

(Answers to “Learning Activities” can be found in the “Answer Key” at the end of the book. Answers to interactive activity elements will be provided within the element as immediate feedback.)

The patient’s IV site is cool to the touch and swollen. The patient states “it hurts a little.” **List in order the steps the nurse should take.**

a. Discontinue the IV
b. Stop the IV infusion
c. Elevate the affected site
d. Document the findings

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13.11: XXIII Glossary

Extravasation: The infiltration of damaging intravenous medications, such as chemotherapy, into the extravascular tissue around the site of infusion, causing tissue injury and possible necrosis.

Fluid volume overload (hypervolemia): A condition when there is too much fluid in the blood. Patients may present with shortness of breath, edema to the extremities, and weight gain.

Infiltration: Infiltration occurs when the tip of the IV catheter slips out of the vein, the catheter passes through the wall of the vein, or the blood vessel wall allows part of the fluid to infuse into the surrounding tissue, resulting in the leakage of IV fluids into the surrounding tissue.

Necrosis: Tissue death.

Phlebitis: Inflammation of a vein.

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CHAPTER OVERVIEW

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14.2: Chapter 15 (Administration of Enteral Medications)
14.3: Chapter 16 (Administration of Medications via Other Routes)
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14.5: Chapter 18 (Administration of Parenteral Medications)
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14.8: Chapter 20 (Wound Care)
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14.1: Chapter 11 (Oxygen Therapy)

Answer Key to Chapter 11 Learning Activities

1.

Priority	Actions
First	Assess pulse oximetry
Second	Assess lung sounds
Third	Apply oxygen as ordered
Four	Reassess pulse oximetry
Fifth	Institute actions to improve oxygenation
Sixth	Teach oxygen safety

(Rationale: Priority of actions includes the gathering of assessment information to reflect the patient's respiratory condition. Once you have collected information, intervention can be initiated with application of oxygen if needed and subsequent reassessment of the pulse oximetry reading. Additional actions to improve client oxygenation and lung capacity can then be implemented with coughing, deep breathing, and use of incentive spirometry. Finally, once the patient experiences improvement in oxygenation and breathing status, reinforcement of oxygen education and safety measures would be appropriate).

Answers to interactive elements are given within the interactive element.

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14.2: Chapter 15 (Administration of Enteral Medications)

Answer Key to Chapter 15 Learning Activities

1. Dimensional Analysis:

$$\frac{750\ mg}{x\ mL} \times \frac{1\ g}{1000\ mg} \times \frac{8\ mL}{2\ g} = \frac{6000}{2000} = 3\ mL \tag{14.2.1}$$

Ratio Proportion:

$$\frac{750\ mg}{X\ mL} = \frac{2000\ mg}{8\ mL} \tag{14.2.2}$$

$$750\ mg \times 8\ mL = 2000\ mg \times X\ mL \tag{14.2.3}$$

$$\frac{6000\ mg}{mL} = 2000\ mg \times X\ mL \tag{14.2.4}$$

$$\frac{6000\ \cancel{mg}\ mL}{2000\ \cancel{mg}} = X\ mL \tag{14.2.5}$$

$$3\ mL = X\ mL \tag{14.2.6}$$

2. If an incorrect medication is given, the nurse should promptly take the following actions:
   - Assess the patient given the wrong medication. Assess for adverse effects related to the error.
   - Notify the nurse manager/primary care provider regarding the medication error.
   - Discuss the course of action to be taken.
   - Implement action and continue to monitor the patient for signs of complication or change in condition.
   - Report the incident via institution policy.

Answers to interactive elements are given within the interactive element.

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14.3: Chapter 16 (Administration of Medications via Other Routes)

Answer Key to Chapter 16 Learning Activities

1. Patients suffering from nausea or experiencing difficulty swallowing may not tolerate medications administered via the enteral route. For a patient experiencing pain, appropriate alternate methods of medication administration may be transdermal medication administration. Transdermal medications are beneficial in that they provide a consistent level of drug into the bloodstream during distribution.
2. B – when placing a patch, the nurse should press firmly to the skin to ensure adequate adherence, C – gloves are required for patch application and removal, E – date and location of patch application should be promptly documented in the medication administration record (MAR).

Answers to interactive elements are given within the interactive element.

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14.4: Chapter 17 (Enteral Tube Management)

Answer Key to Chapter 17 Learning Activities

1. D – slow or stop the infusion based on the patient's response.

Answers to interactive elements are given within the interactive element.

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14.5: Chapter 18 (Administration of Parenteral Medications)

Answer Key to Chapter 18 Learning Activities

1. The optimal size needle would be 23G 5/8 inch with injection into the deltoid muscle. With the limited amount of fat tissue, a ⅝-inch needle will be sufficient for entering the muscular tissue. Additionally, a 23G diameter needle is adequate for aqueous and water-based medications.
2. The optimal size needle would be 21G 1 1/2inch with injection into the buttock. With the excess amount of adipose tissue, the nurse should ensure that the length of the needle would be appropriate to reach the intramuscular route.
3. A – Injects 5 units of air into the regular insulin vial first and withdraws 5 units of regular insulin

Answers to interactive elements are given within the interactive element.

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14.6: Chapter 19 (Specimen Collection)

Answer Key to Chapter 19 Learning Activities

1. When experiencing difficulty in collecting a capillary blood sample, one should consider the location of the lancet puncture. It is best to avoid calloused areas. Additionally, the hand can be placed in a dependent position for a short period of time to facilitate blood collection into the fingertips. The use of a warm pack or heat application can also facilitate vasodilation and increase blood flow.

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14.7: Chapter 1 (General Survey)

Answer Key to Chapter 1 Learning Activities

1. D – Patient is experiencing increased difficulty breathing. (*Rationale:The severity of an airway concern and the life threatening nature of the condition neccessitates immediate notification of the provider).*

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14.8: Chapter 20 (Wound Care)

Answer Key to Chapter 20 Learning Activities

1. a) Mr. Jones has a history of diabetes, is overweight, takes a corticosteroid, and has had a recent life stressor. These factors may all be contributory to the lack of wound healing.

   b) Other factors that would be important to assess with Mr. Jones would be his current diet and level of dietary protein, smoking, and alcohol consumption.

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14.9: Chapter 21 (Facilitation of Elimination)

Answer Key to Chapter 21 Learning Activities

1. Deflate the balloon, ensure flow of urine, advance the catheter, and attempt reinflation.
2. Utilize assistant to help with positioning and holding. Manipulation of the left leg should only occur, and additional personnel may be needed to assist in holding, providing light source, and retracting skin as needed.
3. The patient should be encouraged to verbalize feelings related to the colostomy. Body image issues can be a significant concern with new stoma creation. The nurse should ensure that the patient is allowed to voice their feelings, while also reinforcing the measures required to provide care. Education regarding colostomy management can aid in empowerment and facilitate the beginning of normalization. Additionally, it can be helpful to provide guidance on measures for dress to accommodate the colostomy.
4. C – Straight catheter
5. C – Document the assessment findings of the stoma.
6. A – “I should plan to replace the pouch system every 8-10 days.”

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14.10: Chapter 22 (Tracheostomy Care and Suctioning)

Answer Key to Chapter 22 Learning Activities

1. The items that you should have available include the replacement trach, Ambu bag, and suctioning kit.
2. D – Check pulse oximetry, B – Suction patient, C – Provide oxygen via the trach collar if warranted, A – Assess lung sounds

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14.11: Chapter 23 (IV Therapy Management)

Answer Key to Chapter 23 Critical Thinking Activities

1. Correct Order: 2 – Stop the IV infusion, 1 – Discontinue the IV, 3 – Elevate the affected side, 4 – Document the findings

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14.12: Chapter 3 (Blood Pressure)

Answer Key to Chapter 3 Learning Activities

1. To safely obtain an individual's blood pressure, it is important to note the size of the patient to select the appropriate blood pressure cuff size. Additionally, it is important to note if the patient has an limb restrictions such as an injury, mastectomy, lymph node removal, fistula placement, etc. Blood pressures should not be taken in any limb with a potential restriction.

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14.13: Chapter 4 (Aseptic Technique)

Answer Key to Chapter 4 Learning Activities

1. The five moments of hand hygeine occur: 1) before touching a patient, 2) before a procedure, 3) after a procedure/body fluid exposure risk, 4) after touching a patient, 5) after touching a patient's surroundings.

When entering a patient's room to perform the skill of intermittent catheterization, hand hygeine should be performed:

- Upon entry into the room
- After touching the patient's surroundings and preparing for the procedure
- Before touching the patient
- After the procedure/ body fluid exposure risk
- After touching the patient's surroundings
- Upon exiting the room

2. B – Patient on *Clostridium Difficile* (C-Diff) contact precautions, D – Hands are visibly soiled

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