UNIT IV

Fundamentals of Care

Pyramid to Success

On the NCLEX-RN®, safety and infection control concepts, including standard precautions and transmission-based precautions, related to client care are a priority focus. Medication or intravenous (IV) calculation questions are also a focus on the NCLEX-RN examination. Fill-in-the-blank questions may require that you calculate a medication dose or an IV flow rate. Use the on-screen calculator for these medication and IV problems and then recheck the calculation before selecting an option or typing the answer.

The Pyramid to Success also focuses on the procedures for performing a health and physical assessment of the adult client and collecting both subjective and objective data. Perioperative nursing care and monitoring for postoperative complications is a priority. Client safety related to positioning and ambulation, and care to the client with a tube such as a gastrointestinal tube or chest tube are important concepts addressed on the NCLEX. Because many surgical procedures are performed through ambulatory care units (1-day-stay units), Pyramid Points also focus on preparing the client for discharge, teaching related to the prescribed treatments and medications, follow-up care, and the mobilization of home care support services.

Client Needs: Learning Objectives

Safe and Effective Care Environment

Acting as an advocate regarding the client's wishes
Collaborating with interprofessional health care members
Ensuring environmental, personal, and home safety
Ensuring that the client's rights, including informed consent, are upheld
Establishing priorities of assessments and interventions
Following advance directives regarding the client's documented requests
Following guidelines regarding the use of safety devices
Handling hazardous and infectious materials safely
Informing the client of the surgical process and ensuring that informed consent for a surgical procedure and other procedures has been obtained
Knowing the emergency response plan and actions to take for exposure to biological and chemical warfare agents
Maintaining confidentiality
Maintaining continuity of care and initiating referrals to home care and other support services
Maintaining precautions to prevent errors, accidents, and injury
Positioning the client appropriately and safely
Preparing and administering medications, using the rights of medication administration
Preventing a surgical infection
Protecting the medicated client from injury
Upholding the client's rights
Using equipment safely
Using ergonomic principles and body mechanics when moving a client
Using standard and transmission-based precautions and surgical asepsis procedures

Health Promotion and Maintenance

Assisting clients and families to identify environmental hazards in the home
Performing home safety assessments
Performing the techniques associated with the health and physical assessment of the client
Providing health and wellness teaching to prevent complications
Discussing high-risk behaviors and lifestyle choices
Respecting lifestyle choices and health care beliefs and preferences
Teaching clients and families about accident prevention
Teaching clients and families about measures to be implemented in an emergency or disaster

Teaching clients and families about preventing the spread of infection and preventing diseases
Teaching the client about prescribed medication(s) or IV therapy

Psychosocial Integrity

Assessing and managing the client with sensory and perception alterations
Discussing expected body image changes and situational role changes
Facilitating client and family coping
Identifying support systems
Identifying the cultural, religious, and spiritual factors influencing health
Keeping the family informed of client progress
Providing emotional support to significant others

Physiological Integrity

Administering medications and IV therapy safely
Assessing for expected and unexpected effects of pharmacological therapy
Assessing the mobility and immobility level of the client
Assisting the client with activities of daily living
Calculating medication doses and IV flow rates
Documenting the client's response to basic life support (BLS) measures
Handling medical emergencies
Identifying client allergies and sensitivities
Identifying the adverse effects of and contraindications to medication or IV therapy
Implementing priority nursing actions in an emergency or disaster
Initiating nursing interventions when surgical complications arise
Managing and providing care to clients with infectious diseases
Monitoring for alterations in body systems
Monitoring for surgical complications
Monitoring for wound infection
Preparing for diagnostic tests to confirm accurate placement of a tube
Preventing the complications of immobility
Promoting an environment that will allow the client to express concerns
Providing comfort and assistance to the client
Providing nutrition and oral intake
Providing interventions compatible with the client's age; cultural, religious, spiritual and health care beliefs; education level; and language
Providing personal hygiene as needed
Recognizing changes in the client's condition that indicate a potential complication and intervening appropriately
Using assistive devices to prevent injury
Using special equipment

CHAPTER 15

Health and Physical Assessment of the Adult Client

PRIORITY CONCEPTS Clinical Judgment; Health Promotion

CRITICAL THINKING What Should You Do?

The nurse is performing a cardiovascular assessment and notes the presence of a blowing, swishing sound over the carotid artery. What should the nurse do?
Answer located on p. 188.

I. Environment/Setting

A. Establish a relationship and explain the procedure to the client.
B. Ensure privacy and make the client feel comfortable (comfortable room temperature, sufficient lighting, remove distractions such as noise or objects, and avoid interruptions).
C. Sit down for the interview (avoid barriers such as a desk), maintain an appropriate social distance, and maintain eye level.
D. Use therapeutic communication techniques and open-ended questions to obtain information about the client's symptoms and concerns; allow time for the client to ask questions.
E. Consider religious and cultural characteristics such as language (the need for an interpreter), values and beliefs, health practices, eye contact, and touch.
F. Keep note-taking to a minimum so the client is the focus of attention.
G. Types of health and physical assessments (Box 15-1)

II. Health History

A. General state of health: Body features and physical characteristics, body movements, body posture, level of consciousness, nutritional status, speech
B. Chief complaint and history of present illness (document direct client quotes) that leads the client to seek care
C. Family history: The health status of direct blood relatives as well as the client's spouse
D. Social history
   1. Data about the client's lifestyle, with a focus on factors that may affect health
   2. Information about alcohol, drug, and tobacco use; sexual practices; tattoos; body piercing; travel history; and work setting to identify occupational hazards
E. Domestic violence screening
   1. Done to determine whether the client is experiencing any form of domestic violence
   2. Conducted during a 1-to-1 interview with the client while obtaining the health history

III. Mental Status Exam

A. The mental status can be assessed while obtaining subjective data from the client during the health history interview.
B. Appearance
   1. Note appearance, including posture, body movements, dress, and hygiene and grooming.
   2. An inappropriate appearance and poor hygiene may be indicative of depression, manic disorder, dementia, organic brain disease, or another disorder.
C. Behavior
   1. Level of consciousness: Assess alertness and awareness and the client's ability to interact appropriately with the environment.
   2. Facial expression and body language: Check for appropriate eye contact and determine whether facial expression and body language are appropriate to the situation; this assessment also provides information regarding the client's mood and affect.
   3. Speech: Assess speech pattern for articulation and appropriateness of conversation.
D. Cognitive level of functioning (Box 15-2)

BOX 15-1 Types of Health and Physical Assessments

Complete Assessment: Includes a complete health history and physical examination and forms a baseline database.
Focused Assessment: Focuses on a limited or short-term problem, such as the client's complaint.
Episodic/Follow-up Assessment: Focuses on evaluating a client's progress.
Emergency Assessment: Involves the rapid collection of data, often during the provision of life-saving measures.

BOX 15-2 The Mental Status Examination: Cognitive Level of Functioning

Orientation: Assess client's orientation to person, place, and time.
Attention Span: Assess client's ability to concentrate.
Recent Memory: Assessed by asking the client to recall a recent occurrence (e.g., the means of transportation used to get to the health care agency for the physical assessment).
Remote Memory: Assessed by asking the client about a verifiable past event (e.g., a vacation).
New Learning: Used to assess the client's ability to recall unrelated words identified by the nurse; the nurse selects 4 words and asks the client to recall the words 5, 10, and 30 minutes later.
Judgment: Determine whether the client's actions or decisions regarding discussions during the interview are realistic.
Thought Processes and Perceptions: The way the client thinks and what the client says should be logical, coherent, and relevant; the client should be consistently aware of reality.

IV. Physical Exam

A. Overview
   1. Gather equipment needed for the examination.
   2. Use the senses of sight, smell, touch, and hearing to collect data.
   3. Assessment includes inspection, palpation, percussion, and auscultation; these skills are performed one at a time, in this order (except the abdominal assessment).

B. Assessment techniques
   1. Inspection
      a. The first assessment technique, which uses vision and smell senses while observing the client
      b. Requires good lighting, adequate body exposure, and possibly the use of certain instruments such as an otoscope or ophthalmoscope
   2. Palpation
      a. Uses the sense of touch; warm the hands before touching the client.
      b. Identify tender areas and palpate them last.
      c. Start with light palpation to detect surface characteristics, and then perform deeper palpation.
      d. Light palpation is done with 1 hand by pressing the skin gently with the tips of 2 or 3 fingers held close together; deep palpation is done by placing 1 hand on top of the other and pressing down with the fingertips of both hands.
      e. Assess texture, temperature, and moisture of the skin, as well as organ location and size and symmetry if appropriate.
      f. Assess for swelling, vibration or pulsation, rigidity or spasticity, and crepitation.
      g. Assess for the presence of lumps or masses, as well as the presence of tenderness or pain.
   3. Percussion
      a. Involves tapping the client's skin to assess underlying structures and to determine the presence of vibrations and sounds and, if present, their intensity, duration, pitch, quality, and location
      b. Provides information related to the presence of air, fluid, or solid masses as well as organ size, shape, and position
      c. Descriptions of findings include resonance, hyperresonance, tympany, dullness, or flatness
   4. Auscultation: Involves listening to sounds produced by the body for presence and quality, such as heart, lung, or bowel sounds

C. Vital signs
   1. Includes temperature, radial pulse (apical pulse may be measured during the cardiovascular assessment), respirations, blood pressure, pulse oximetry, and presence of pain (refer to Chapter 10 for information on vital signs, pulse oximetry, and pain)
   2. Height, weight, and nutritional status are also assessed.

V. Body Systems Assessment

A. Integumentary system: Involves inspection and palpation of skin, hair, and nails.
   1. Subjective data: Self-care behaviors, history of skin disease, medications being taken, environmental or occupational hazards and exposure to toxic substances, changes in skin color or pigmentation, change in a mole or a sore that does not heal
   2. Objective data: Color, temperature (hypothermia or hyperthermia); excessive dryness or moisture; skin turgor; texture (smoothness, firmness); excessive bruising, itching, rash; hair loss (alopecia) or nail abnormalities such as pitting; lesions (may be inspected with a magnifier and light or with the use of a Wood's light [ultraviolet light

used in a darkened room]); scars or birthmarks; edema; capillary filling time (Boxes 15-3 and 15-4; Table 15-1)

3. Dark-skinned client
   a. Cyanosis: Check lips and tongue for a gray color; nail beds, palms, and soles for a blue color; and conjunctivae for pallor.
   b. Jaundice: Check oral mucous membranes for a yellow color; check the sclera nearest to the iris for a yellow color.
   c. Bleeding: Look for skin swelling and darkening and compare the affected side with the unaffected side.
   d. Inflammation: Check for warmth or a shiny or taut and pitting skin area, and compare with the unaffected side.
4. Refer to Chapter 46 for diagnostic tests related to the integumentary system

To test skin turgor, pinch a large fold of skin and assess the ability of the skin to return to its place when released. Poor turgor occurs in severe dehydration or extreme weight loss.

5. Client teaching
   a. Provide information about factors that can be harmful to the skin, such as sun exposure.
   b. Encourage performing self-examination of the skin monthly.

B. Head, neck, and lymph nodes: Involves inspection and palpation of the head, neck, and lymph nodes
   1. Ask the client about headaches; episodes of dizziness (lightheadedness) or vertigo (spinning sensation); history of head injury; loss of consciousness; seizures; episodes of neck pain; limitations of range of motion; numbness or tingling in the shoulders, arms, or hands; lumps or swelling in the neck; difficulty swallowing; medications being taken; and history of surgery in the head and neck region.
   2. Head
      a. Inspect and palpate: Size, shape, masses or tenderness, and symmetry of the skull
      b. Palpate temporal arteries, located above the cheekbone between the eye and the top of the ear.
      c. Temporomandibular joint: Ask the client to open his or her mouth; note any crepitation, tenderness, or limited range of motion.
      d. Face: Inspect facial structures for shape, symmetry, involuntary movements, or swelling, such as periorbital edema (swelling around the eyes).
   3. Neck
      a. Inspect for symmetry of accessory neck muscles.
      b. Assess range of motion.
      c. Test cranial nerve XI (spinal accessory nerve) to assess muscle strength: Ask the client to push against resistance applied to the side of the chin (tests sternocleidomastoid muscle); also ask the client to shrug the shoulders against resistance (tests trapezius muscle).
      d. Palpate the trachea: It should be midline, without any deviations.
      e. Thyroid gland: Inspect the neck as the client takes a sip of water and swallows (thyroid tissue moves up with a swallow); palpate using an anterior-posterior approach

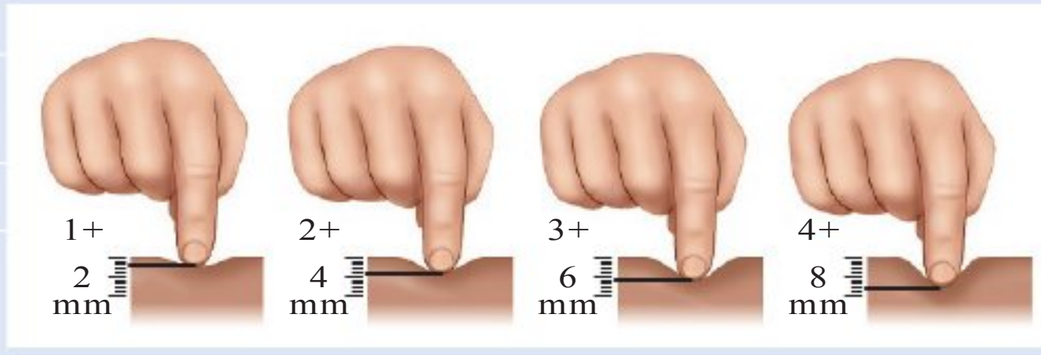
BOX 15-3 Characteristics of Skin Color

Cyanosis: Mottled bluish coloration
Erythema: Redness
Pallor: Pale, whitish coloration
Jaundice: Yellow coloration

BOX 15-4 Assessing Capillary Filling Time

1. Depress the nail bed to produce blanching.
2. Release and observe for the return of color.
3. Color will return within 3 seconds if arterial capillary perfusion is normal.

TABLE 15-1 Pitting Edema Scale

Scale	Description	"Measurement"*	
1+	A barely perceptible pit	2 mm ($^{3}=_{32}$ in)	
2+	A deeper pit, rebounds in a few seconds	4 mm ($^{6}/_{32}$ in)	
3+	A deep pit, rebounds in 10-20 sec	6 mm ($^{1}=_{4}$ in)	
4+	A deeper pit, rebounds in > 30 sec	8 mm ($^{5}=_{16}$ in)	

*"Measurement" is in quotation marks because depth of edema is rarely actually measured but is included as a frame of reference.
Data from Wilson AF, Giddens JF: Health assessment for nursing practice, ed 5, St. Louis, 2013, Mosby. Description column data from Kirton C: Assessing edema, Nursing 96 26(7):54, 1996.

(usually the normal adult thyroid cannot be palpated); if it is enlarged, auscultate for a bruit.

4. Lymph nodes
   a. Palpate using a gentle pressure and a circular motion of the finger pads.
   b. Begin with the preauricular lymph nodes (in front of the ear); move to the posterior auricular lymph nodes and then downward toward the supraclavicular lymph nodes.
   c. Palpate with both hands, comparing the 2 sides for symmetry.
   d. If nodes are palpated, note their size, shape, location, mobility, consistency, and tenderness.
5. Client teaching: Instruct the client to notify the health care provider (HCP) if persistent headache, dizziness, or neck pain occurs; if swelling or lumps are noted in the head and neck region; or if a neck or head injury occurs.

! Neck movements are never performed if the client has sustained a neck injury or if a neck injury is suspected.

C. Eyes: Includes inspection, palpation, vision-testing procedures, and the use of an ophthalmoscope

1. Subjective data: Difficulty with vision (e.g., decreased acuity, double vision, blurring, blind spots); pain, redness, swelling, watery or other discharge from the eye; use of glasses or contact lenses; medications being taken; history of eye problems
2. Objective data
   a. Inspect the external eye structures, including eyebrows, for symmetry; eyelashes for even distribution; eyelids for ptosis (drooping); eyeballs for exophthalmos (protrusion) or enophthalmos (recession into the orbit; sunken eye).
   b. Inspect the conjunctiva (should be clear), sclera (should be white), and lacrimal apparatus (check for excessive tearing, redness, tenderness, or swelling); cornea and lens (should be smooth and clear); iris (should be flat, with a round regular shape and even coloration); eyelids; and pupils
3. Snellen eye chart
   a. The Snellen eye chart is a simple tool used to measure distance vision.
   b. Position the client in a well-lit spot 20 feet (6 meters) from the chart, with the chart at eye level, and ask the client to read the smallest line that he or she can discern.
   c. Instruct the client to leave on glasses or leave in contact lenses; if the glasses are for reading only, they are removed because they blur distance vision.
   d. Test 1 eye at a time.
   e. Record the result using the fraction at the end of the last line successfully read on the chart.
   f. Normal visual acuity is 20/20 (distance in feet at which the client is standing from the chart/distance in feet at which a normal eye could have read that particular line).
4. Near vision
   a. Use a hand-held vision screener (held about 14 inches [35.5 centimeters] from the eye) that contains various sizes of print or ask the client to read from a magazine.
   b. Test each eye separately with the client's glasses on or contact lenses in.
   c. Normal result is 14/14 (distance in inches at which the subject holds the card from the eye/distance in inches at which a normal eye could have read that particular line).
5. Confrontation test
   a. A crude but rapid test used to measure peripheral vision and compare the client's peripheral vision with the nurse's (assuming that the nurse's peripheral vision is normal)
   b. The client covers 1 eye and looks straight ahead; the nurse, positioned 2 feet away (60 centimeters), covers his or her eye opposite the client's covered eye.
   c. The nurse advances a finger or other small object from the periphery from several directions; the client should see the object at the same time the nurse does.
6. Corneal light reflex
   a. Used to assess for parallel alignment of the axes of the eyes
   b. Client is asked to gaze straight ahead as the nurse holds a light about 12 inches (30 centimeters) from the client.
   c. The nurse looks for reflection of the light on the corneas in exactly the same spot in each eye.
7. Cover test
   a. Used to check for slight degrees of deviated alignment
   b. Each eye is tested separately.
   c. The nurse asks the client to gaze straight ahead and cover 1 eye.
   d. The nurse examines the uncovered eye, expecting to note a steady, fixed gaze.
8. Extraocular muscle function (6 cardinal positions of gaze) (Fig. 15-1)
   a. The 6 muscles that attach the eyeball to its orbit and serve to direct the eye to points of interest are tested.
   b. Client holds head still and is asked to move his or her eyes and follow a small object.
   c. The examiner notes any parallel movements of the eye or nystagmus, an involuntary, rhythmic, rapid twitching of the eyeballs.

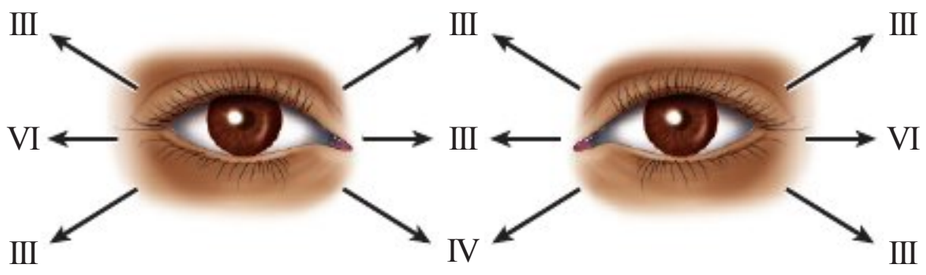


FIGURE 15-1 Checking extraocular muscles in the 6 cardinal positions. This indicates the functioning of cranial nerves III, IV, and VI.

9. Color vision
   a. Tests for color vision involve picking numbers or letters out of a complex and colorful picture.
   b. The Ishihara chart is used for testing and consists of numbers composed of colored dots located within a circle of colored dots.
   c. The client is asked to read the numbers on the chart.
   d. Each eye is tested separately.
   e. Reading the numbers correctly indicates normal color vision.
   f. The test is sensitive for the diagnosis of red-green blindness but cannot detect discrimination of blue.

The first slide on the Ishihara chart is one that everyone can discriminate; failure to identify numbers on this slide suggests a problem with performing the test, not a problem with color vision.

10. Pupils (Box 15-5)
    a. The pupils are round and of equal size.
    b. Increasing light causes pupillary constriction.
    c. Decreasing light causes pupillary dilation.
    d. Constriction of both pupils is a normal response to direct light.
11. Sclera and cornea
    a. Normal sclera color is white.
    b. A yellow color to the sclera may indicate jaundice or systemic problems.
    c. In a dark-skinned person, the sclera may normally appear yellow; pigmented dots may be present.
    d. The cornea is transparent, smooth, shiny, and bright.
    e. Cloudy areas or specks on the cornea may be the result of an accident or eye injury.
12. Ophthalmoscopy
    a. The ophthalmoscope is an instrument used to examine the external structures and the interior of the eye.
    b. The room is darkened so that the pupil will dilate.
    c. The instrument is held with the right hand when examining the right eye and with the left hand when examining the left eye.
    d. The client is asked to look straight ahead at an object on the wall.
    e. The examiner should approach the client's eye from about 12 to 15 inches (30.5 to 38 centimeters) away and 15 degrees lateral to the client's line of vision.
    f. As the instrument is directed at the pupil, a red glare (red reflex) is seen in the pupil.
    g. The red reflex is the reflection of light on the vascular retina.
    h. Absence of the red reflex may indicate opacity of the lens.
    i. The retina, optic disc, optic vessels, fundus, and macula can be examined.
13. Refer to Chapter 60 for diagnostic tests related to the eye.
14. Client teaching
    a. Instruct the client to notify the HCP if alterations in vision occur or any redness, swelling, or drainage from the eye is noted.
    b. Inform the client of the importance of regular eye examinations.

D. Ears: Includes inspection, palpation, hearing tests, vestibular assessment, and the use of an otoscope
   1. Subjective data: Difficulty hearing, earaches, drainage from the ears, dizziness, ringing in the ears, exposure to environmental noise, use of a hearing aid, medications being taken, history of ear problems or infections
   2. Objective data
      a. Inspect and palpate the external ear, noting size, shape, symmetry, skin color, and the presence of pain.

BOX 15-5 Assessing and Documenting Pupillary Responses

Pupillary Light Reflex

1. Darken the room (to dilate the client's pupils) and ask the client to look forward.
2. Test each eye.
3. Advance a light in from the side to note constriction of the same-side pupil (direct light reflex) and simultaneous constriction of the other pupil (consensual light reflex).

Accommodation

1. Ask the client to focus on a distant object (dilates the pupil).
2. Ask the client to shift gaze to a near object held about 3 inches (7.5 centimeters) from the nose.
3. Normal response includes pupillary constriction and convergence of the axes of the eyes.

Documenting Normal Findings: PERRLA

P ¼ pupils
E ¼ equal
R ¼ round
RL ¼ reactive to light
A ¼ reactive to accommodation

b. Inspect the external auditory meatus for size, swelling, redness, discharge, and foreign bodies; some cerumen (earwax) may be present.

3. Auditory assessment
   a. Sound is transmitted by air conduction and bone conduction.
   b. Air conduction takes 2 or 3 times longer than bone conduction.
   c. Hearing loss is categorized as conductive, sensorineural, or mixed conductive and sensorineural.
   d. Conductive hearing loss is caused by any physical obstruction to the transmission of sound waves.
   e. Sensorineural hearing loss is caused by a defect in the cochlea, eighth cranial nerve, or the brain itself.
   f. A mixed hearing loss is a combination of a conductive and sensorineural hearing loss; it results from problems in both the inner ear and the outer ear or middle ear.
4. Voice (Whisper) test
   a. Used to determine whether hearing loss has occurred
   b. One ear is tested at a time (the ear not being tested is occluded by the client).
   c. The nurse stands 1 to 2 feet (30 to 60 centimeters) from the client, covers his or her mouth so that the client cannot read the lips, exhales fully, and softly whispers 2-syllable words in the direction of the unoccluded ear; the client points a finger up during the test when the nurse's voice is heard (a ticking watch may also be used to test hearing acuity).
   d. Failure to hear the sounds could indicate possible fluid collection and/or consolidation, requiring further assessment.
5. Watch test
   a. A ticking watch is used to test for high-frequency sounds.
   b. The examiner holds a ticking watch about 5 inches (12.5 centimeters) from each ear and asks the client if the ticking is heard.
6. Tuning fork tests
   a. Used to measure hearing on the basis of air conduction or bone conduction; includes the Weber and Rinne tests
   b. To activate the tuning fork, the nurse holds the base and lightly taps the tines against the other hand, setting the fork in vibration.
7. Weber test
   a. Determines whether the client has a conductive or sensorineural hearing loss
   b. Stem of the vibrating tuning fork is placed in the midline of the client's skull and the client is asked if the tone sounds the same in both ears or better in 1 ear.
   c. The client hears the tone by bone conduction and the sound should be heard equally in both ears.
   d. In conductive loss, the sound travels toward the impaired ear.
   e. In sensorineural loss, the sound travels toward the good ear.
8. Rinne test
   a. Stem of the vibrating tuning fork is placed on the client's mastoid process.
   b. When the client no longer hears the sound, the tuning fork is quickly inverted and placed near the ear canal; the client should still hear a sound.
   c. Normally the sound is heard twice as long by way of air conduction (AC) (near the ear canal) than by way of bone conduction (BC) (at the mastoid process); AC > BC.
   d. In sensorineural hearing loss, air conduction is heard longer than bone conduction, but it is not heard to be twice as long.
   e. In conductive hearing loss, the bone conduction sound is longer than or equal to the air conduction sound.
9. Vestibular assessment (Box 15-6)
10. Otoscopic exam

! Before performing an otoscopic exam and inserting the speculum, check the auditory canal for foreign bodies. Instruct the client not to move the head during the examination to avoid damage to the canal and tympanic membrane.

   a. The client's head is tilted slightly away and the otoscope is held upside down as if it were a large pen; this permits the examiner's hand to lay against the client's head for support.
   b. In an adult, pull the pinna up and back to straighten the external canal.
   c. Visualize the external canal while slowly inserting the speculum.
   d. The normal external canal is pink and intact, without lesions and with varying amounts of cerumen and fine little hairs.
   e. Assess the tympanic membrane for intactness; the normal tympanic membrane is intact, without perforations, and should be free from lesions.
   f. The tympanic membrane is transparent, opaque, pearly gray, and slightly concave.
   g. A fluid line or the presence of air bubbles is not normally visible.
   h. If the tympanic membrane is bulging or retracting, the edges of the light reflex will be fuzzy (diffuse) and may spread over the tympanic membrane.

BOX 15-6 Vestibular Assessment

Test for Falling

1. The examiner asks the client to stand with the feet together, arms hanging loosely at the sides, and eyes closed.
2. The client normally remains erect, with only slight swaying.
3. A significant sway is a positive Romberg sign.

Test for Past Pointing

1. The client sits in front of the examiner.
2. The client closes the eyes and extends the arms in front, pointing both index fingers at the examiner.
3. The examiner holds and touches his or her own extended index fingers under the client's extended index fingers to give the client a point of reference.
4. The client is instructed to raise both arms and then lower them, attempting to return to the examiner's extended index fingers.
5. The normal test response is that the client can easily return to the point of reference.
6. The client with a vestibular function problem lacks a normal sense of position and cannot return the extended fingers to the point of reference; instead, the fingers deviate to the right or left of the reference point.

Gaze Nystagmus Evaluation

1. The client's eyes are examined as the client looks straight ahead, 30 degrees to each side, upward and downward.
2. Any spontaneous nystagmus—an involuntary, rhythmic, rapid twitching of the eyeballs—represents a problem with the vestibular system.

Dix-Hallpike Maneuver

1. The client starts in a sitting position; the examiner lowers the client to the exam table and rather quickly turns the client's head to the 45-degree position.
2. If after about 30 seconds there is no nystagmus, the client is returned to a sitting position and the test is repeated on the other side.

⚠ The otoscope is never introduced blindly into the external canal because of the risk of perforating the tympanic membrane.

11. Refer to Chapter 60 for diagnostic tests related to the ear.
12. Client teaching
    a. Instruct the client to notify the HCP if an alteration in hearing or ear pain or ringing in the ears occurs, or if redness, swelling, or drainage from the ear is noted.
    b. Instruct the client in the proper method of cleaning the ear canal.
    c. The client should cleanse the ear canal with the corner of a moistened washcloth and should never insert sharp objects or cotton-tipped applicators into the ear canal.

E. Nose, mouth, and throat: Includes inspection and palpation

1. Subjective data
    a. Nose: Ask about discharge or nosebleed (epistaxis), facial or sinus pain, history of frequent colds, altered sense of smell, allergies, medications being taken, history of nose trauma or surgery.
    b. Mouth and throat: Ask about the presence of sores or lesions; bleeding from the gums or elsewhere; altered sense of taste; toothaches; use of dentures or other appliances; tooth and mouth care hygiene habits; at-risk behaviors (e.g., smoking, alcohol consumption); and history of infection, trauma, or surgery.
2. Objective data
    a. External nose should be midline and in proportion to other facial features.
    b. Patency of the nostrils can be tested by pushing each nasal cavity closed and asking the client to sniff inward through the other nostril.
    c. Anasal speculum and penlight or a short, wide-tipped speculum attached to an otoscope head is used to inspect for redness, swelling, discharge, bleeding, or foreign bodies; the nasal septum is assessed for deviation.
    d. The nurse presses the frontal sinuses (located below the eyebrows) and over the maxillary sinuses (located below the cheekbones); the client should feel firm pressure but no pain.
    e. The external and inner surfaces of the lips are assessed for color, moisture, cracking, or lesions.
    f. The teeth are inspected for condition and number (should be white, spaced evenly, straight, and clean, free of debris and decay).
    g. The alignment of the upper and lower jaw is assessed by having the client bite down.
    h. The gums are inspected for swelling, bleeding, discoloration, and retraction of gingival margins (gums normally appear pink).
    i. The tongue is inspected for color, surface characteristics, moisture, white patches, nodules, and ulcerations (dorsal surface is normally rough; ventral surface is smooth and glistening, with visible veins).
    j. The nurse retracts the cheek with a tongue depressor to check the buccal mucosa for color and the presence of nodules or lesions; normal mucosa is glistening, pink, soft, moist, and smooth.
    k. Using a penlight and tongue depressor, the nurse inspects the hard and soft palates for color, shape, texture, and defects; the hard palate (roof of the mouth), which is located anteriorly, should be white and dome-shaped, and the soft palate, which extends posteriorly, should be light pink and smooth.

l. The uvula is inspected for midline location; the nurse asks the client to say "ahhh" and watches for the soft palate and uvula to rise in the midline (this tests 1 function of cranial nerve X, the vagus nerve).
m. Using a penlight and tongue depressor, the nurse inspects the throat for color, presence of tonsils, and the presence of exudate or lesions; 1 technique to test cranial nerve XII (the hypoglossal nerve) is asking the client to stick out the tongue (should protrude in the midline).
n. To test the gag reflex, touch the posterior pharynx with the end of a tongue blade; the client should gag momentarily (this tests the function of cranial nerve IX, the glossopharyngeal nerve).

3. Client teaching
   a. Emphasize the importance of hygiene and tooth care, as well as regular dental examinations and the use of fluoridated water or fluoride supplements.
   b. Encourage the client to avoid at-risk behaviors (e.g., smoking, alcohol consumption).
   c. Stress the importance of reporting pain or abnormal occurrence (e.g., nodules, lesions, signs of infection).

F. Lungs
1. Subjective data: Cough; expectoration of sputum; shortness of breath or dyspnea; chest pain on breathing; smoking history; environmental exposure to pollution or chemicals; medications being taken; history of respiratory disease or infection; last tuberculosis test, chest radiograph, pneumonia, and any influenza immunizations. Record the smoking history in pack-years (the number of packs per day times the number of years smoked). For example, a client who has smoked one-half pack a day for 20 years has a 10–pack-year smoking history.
2. Objective data: Includes inspection, palpation, percussion, and auscultation
3. Inspection of the anterior and posterior chest: Note skin color and condition and the rate and quality of respirations, look for lumps or lesions, note the shape and configuration of the chest wall, and note the position the client takes to breathe.
4. Palpation: Palpate the entire chest wall, noting skin temperature and moisture and looking for areas of tenderness and lumps, lesions, or masses; assess chest excursion and tactile or vocal fremitus (Box 15-7).
5. Percussion
   a. Starting at the apices, percuss across the top of the shoulders, moving to the interspaces, making a side-to-side comparison all the way down the lung area (Fig. 15-2).
   b. Determine the predominant note; resonance is noted in healthy lung tissue.
   c. Hyperresonance is noted when excessive air is present and a dull note indicates lung density.
6. Auscultation
   a. Using the flat diaphragm endpiece of the stethoscope, hold it firmly against the chest wall, and listen to at least 1 full respiration in each location (anterior, posterior, and lateral).
   b. Posterior: Start at the apices and move side to side for comparison (see Fig. 15-2).
   c. Anterior: Auscultate the lung fields from the apices in the supraclavicular area down to the 6th rib; avoid percussion and auscultation over female breast tissue (displace this tissue) because a dull sound will be produced (see Fig. 15-2).
   d. Compare findings on each side.
7. Normal breath sounds: Three types of breath sounds are considered normal in certain parts of the thorax, including vesicular, bronchovesicular, and bronchial; breath sounds should be clear to auscultation (Fig. 15-3).
8. Abnormal breath sounds: Also known as adventitious sounds (Table 15-2)
9. Voice sounds (Box 15-8)
   a. Performed when a pathological lung condition is suspected

BOX 15-7 Palpation of the Chest

Chest Excursion

Posterior: The nurse places the thumbs along the spinal processes at the 10th rib, with the palms in light contact with the posterolateral surfaces.
The nurse's thumbs should be about 2 inches (5 centimeters) apart, pointing toward the spine, with the fingers pointing laterally.
Anterior: The nurse places the hands on the anterolateral wall with the thumbs along the costal margins, pointing toward the xiphoid process.
The nurse instructs the client to take a deep breath after exhaling.
The nurse should note movement of the thumbs and chest excursion should be symmetrical, separating the thumbs approximately 2 inches (5 centimeters).

Tactile or Vocal Fremitus

The nurse places the ball or lower palm of the hand over the chest, starting at the lung apices and palpating from side to side.
The nurse asks the client to repeat the words "ninety-nine."
Symmetrical palpable vibration should be felt by the nurse.

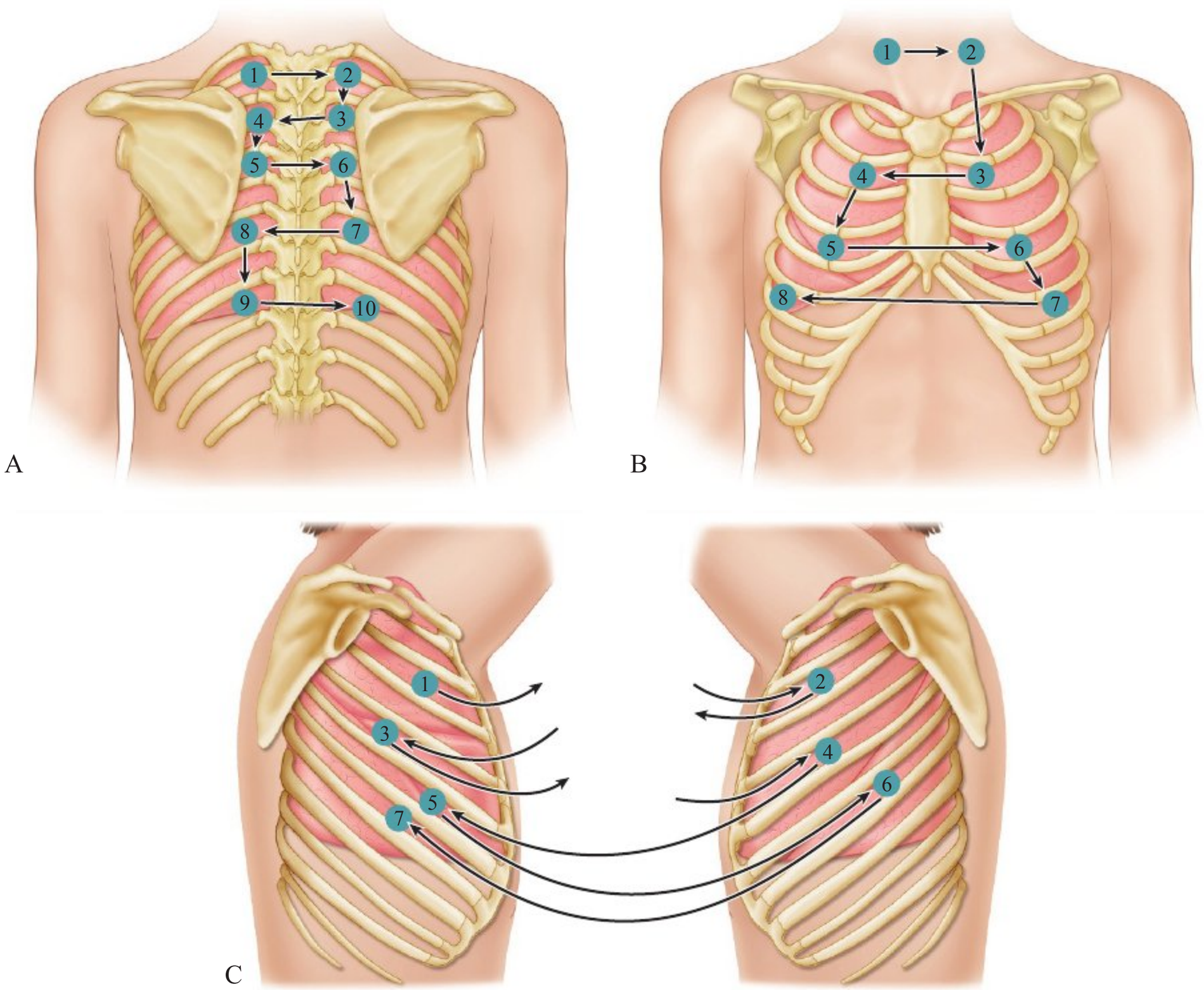


FIGURE 15-2 Landmarks for chest auscultation and percussion. A, Posterior view. B, Anterior view. C, Lateral views.

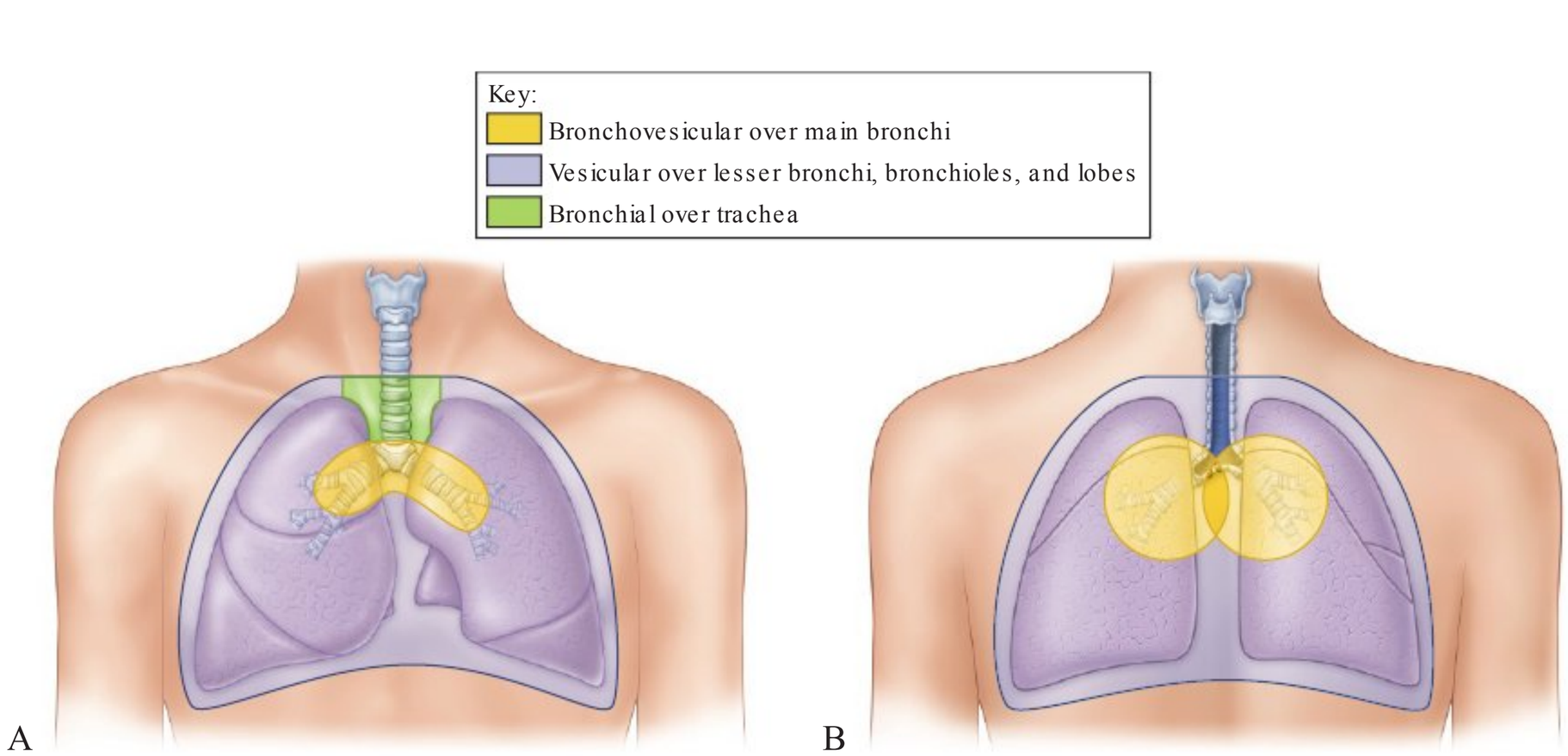


FIGURE 15-3 Auscultatory sounds. A, Anterior thorax. B, Posterior thorax.

TABLE 15-2 Characteristics of Adventitious Sounds

Adventitious Sound	Characteristics	Clinical Examples
Crackles (previously called rales)		
Fine crackles	High-pitched crackling and popping noises (discontinuous sounds) heard during the end of inspiration. Not cleared by cough	May be heard in pneumonia, heart failure, asthma, and restrictive pulmonary diseases
Medium crackles	Medium-pitched, moist sound heard about halfway through inspiration. Not cleared by cough	Same as above, but condition is worse
Coarse crackles	Low-pitched, bubbling or gurgling sounds that start early in inspiration and extend into the first part of expiration	Same as above, but condition is worse or may be heard in terminally ill clients with diminished gag reflex. Also heard in pulmonary edema and pulmonary fibrosis
Wheeze (also called sibilant wheeze)	High-pitched, musical sound similar to a squeak. Heard more commonly during expiration, but may also be heard during inspiration. Occurs in small airways	Heard in narrowed airway diseases such as asthma
Rhonchi (also called sonorous wheeze)	Low-pitched, coarse, loud, low snoring or moaning tone. Actually sounds like snoring. Heard primarily during expiration, but may also be heard during inspiration. Coughing may clear	Heard in disorders causing obstruction of the trachea or bronchus, such as chronic bronchitis
Pleural friction rub	A superficial, low-pitched, coarse rubbing or grating sound. Sounds like 2 surfaces rubbing together. Heard throughout inspiration and expiration. Loudest over the lower anterolateral surface. Not cleared by cough	Heard in individuals with pleurisy (inflammation of the pleural surfaces)

Data from Wilson AF, Giddens JF: Health assessment for nursing practice, ed 5, St. Louis, 2013, Mosby.

BOX 15-8 Voice Sounds

Bronchophony

1. Ask the client to repeat the words "ninety-nine."
2. Normal voice transmission is soft, muffled, and indistinct.

Egophony

1. Ask the client to repeat a long "ee-ee-ee" sound.
2. Normally the nurse would hear the "ee-ee-ee" sound.

Whispered Pectoriloquy

1. Ask the client to whisper the word "ninety-nine."
2. Normal voice transmission is faint, muffled, and almost inaudible.

b. Auscultate over the chest wall; the client is asked to vocalize words or a phrase while the nurse listens to the chest.
c. Normal voice transmission is soft and muffled; the nurse can hear the sound but is unable to distinguish exactly what is being said.

When auscultating breath sounds, instruct the client to breathe through the mouth and monitor the client for dizziness.

10. Refer to Chapter 54 for diagnostic tests related to the respiratory system.
11. Client teaching
    a. Encourage the client to avoid exposure to environmental hazards, including smoking (discuss smoking cessation programs as appropriate).
    b. Client should undergo periodic examinations as prescribed (e.g., chest x-ray study, tuberculosis skin testing; refer to Chapter 54).
    c. Encourage the client to obtain pneumonia and influenza immunizations.
    d. HCP should be notified if client experiences persistent cough, shortness of breath, or other respiratory symptoms.

G. Heart and peripheral vascular system
    1. Subjective data: Chest pain, dyspnea, cough, fatigue, edema, nocturia, leg pain or cramps (claudication), changes in skin color, obesity, medications being taken, cardiovascular risk factors, family history of cardiac or vascular problems, personal history of cardiac or vascular problems
    2. Objective data: May include inspection, palpation, percussion, and auscultation
    3. Inspection: Inspect the anterior chest for pulsations (apical impulse) created as the left ventricle rotates against the chest wall during systole; not always visible.
    4. Palpation
        a. Palpate the apical impulse at the fourth or fifth interspace, or medial to the midclavicular line (not palpable in obese clients or clients with thick chest walls).
        b. Palpate the apex, left sternal border, and base for pulsations; normally none are present.

5. Percussion: May be performed to outline the heart's borders and to check for cardiac enlargement (denoted by resonance over the lung and dull notes over the heart).
6. Auscultation
   a. Areas of the heart (Fig. 15-4)
   b. Auscultate heart rate and rhythm; check for a pulse deficit (auscultate the apical heartbeat while palpating an artery) if an irregularity is noted.
   c. Assess S1 ("lub") and S2 ("dub") sounds, and listen for extra heart sounds, as well as the presence of murmurs (blowing or swooshing noise that can be faint or loud with a high, medium, or low pitch).
7. Peripheral vascular system
   a. Assess adequacy of blood flow to the extremities by palpating arterial pulses for equality and symmetry and checking the condition of the skin and nails.
   b. Check for pretibial edema and measure calf circumference (see Table 15-1).
   c. Measure blood pressure.
   d. Palpate superficial inguinal nodes (using firm but gentle pressure), beginning in the inguinal area and moving down toward the inner thigh.
   e. An ultrasonic stethoscope may be needed to amplify the sounds of a pulse wave if the pulse cannot be palpated.
   f. Carotid artery: Located in the groove between the trachea and sternocleidomastoid muscle, medial to and alongside the muscle
   g. Palpate 1 carotid artery at a time to avoid compromising blood flow to the brain.
   h. Auscultate each carotid artery for the presence of a bruit (a blowing, swishing, or buzzing, humming sound), which indicates blood flow turbulence; normally a bruit is not present.
   i. Palpate the arteries in the extremities (Box 15-9).
8. Refer to Chapter 56 for diagnostic tests related to the cardiovascular system.
9. Client teaching
   a. Advise client to modify lifestyle for risk factors associated with heart and vascular disease.
   b. Encourage the client to seek regular physical examinations.
   c. Client should seek medical assistance for signs of heart or vascular disease.

H. Breasts
1. Subjective data: Pain or tenderness, lumps or thickening, swollen axillary lymph nodes, nipple discharge, rash or swelling, medications being taken, personal or family history of breast disease, trauma or injury to the breasts, previous surgery on the breasts, breast self-examination (BSE) compliance, mammograms as prescribed
2. Objective data: Inspection and palpation
3. Inspection
   a. Performed with the client's arms raised above the head, the hands pressed against the hips, and the arms extended straight ahead while the client sits and leans forward
   b. Assess size and symmetry (1 breast is often larger than the other); masses, flattening,

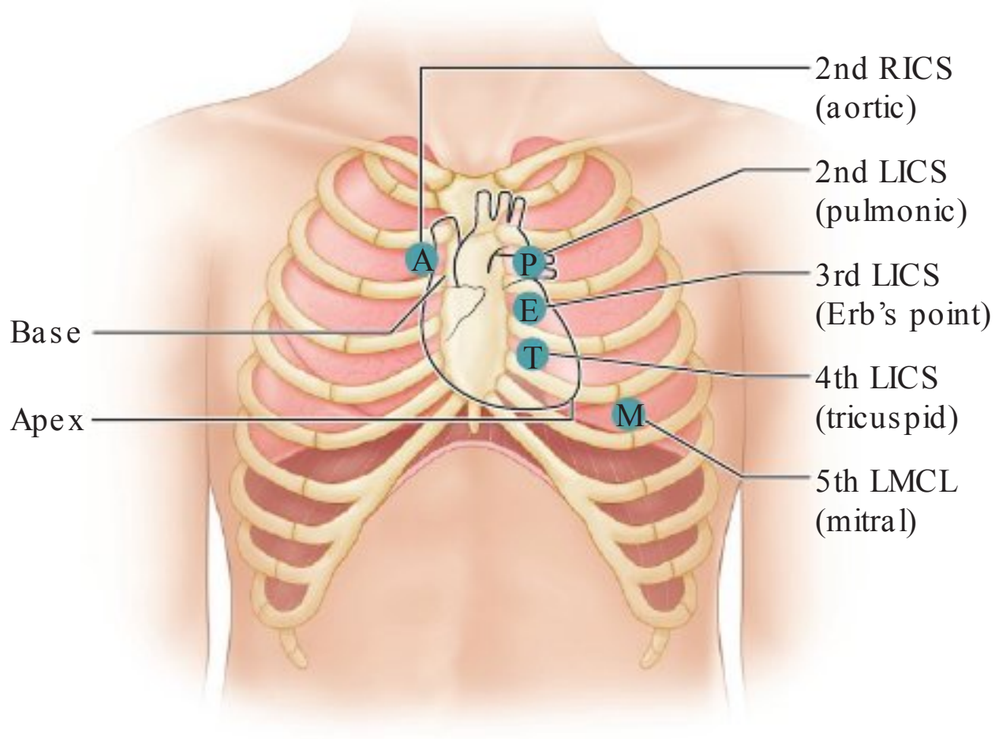


FIGURE 15-4 Auscultation areas of the heart. LICS, Left intercostal space; LMCL, left midclavicular line; RICS, right intercostal space.

BOX 15-9 Arterial Pulse Points and Grading the Force of Pulses

Arteries in the Arms and Hands

Radial Pulse: Located at the radial side of the forearm at the wrist

Ulnar Pulse: Located on the opposite side of the location of the radial pulse at the wrist

Brachial Pulse: Located above the elbow at the antecubital fossa, between the biceps and triceps muscles

Arteries in the Legs

Femoral Pulse: Located below the inguinal ligament, midway between the symphysis pubis and the anterosuperior iliac spine

Popliteal Pulse: Located behind the knee

Dorsalis Pedis Pulse: Located at the top of the foot, in line with the groove between the extensor tendons of the great and first toes

Posterior Tibial Pulse: Located on the inside of the ankle, behind and below the medial malleolus (ankle bone)

Grading the Force

4+¼ Strong and bounding
3+¼ Full pulse, increased
2+¼ Normal, easily palpable
1+¼ Weak, barely palpable

retraction, or dimpling; color and venous pattern; size, color, shape, and discharge in the nipple and areola; and the direction in which nipples point.

4. Palpation
   a. Client lies supine, with the arm on the side being examined behind the head and a small pillow under the shoulder.
   b. The nurse uses the pads of the first 3 fingers to compress the breast tissue gently against the chest wall, noting tissue consistency.
   c. Palpation is performed systematically, ensuring that the entire breast and tail are palpated.
   d. The nurse notes the consistency of the breast tissue, which normally feels dense, firm, and elastic.
   e. The nurse gently palpates the nipple and areola and compresses the nipple, noting any discharge.
5. Axillary lymph nodes
   a. The nurse faces the client and stands on the side being examined, supporting the client's arm in a slightly flexed position, and abducts the arm away from the chest wall.
   b. The nurse places the free hand against the client's chest wall and high in the axillary hollow, then, with the fingertips, gently presses down, rolling soft tissue over the surface of the ribs and muscles.
   c. Lymph nodes are normally not palpable.
6. Client teaching
   a. Encourage and teach the client to perform BSE (refer to Chapter 48 for information on performing BSE).
   b. Client should report lumps or masses to the HCP immediately.
   c. Regular physical examinations and mammograms should be obtained as prescribed.

I. Abdomen
1. Subjective data: Changes in appetite or weight, difficulty swallowing, dietary intake, intolerance to certain foods, nausea or vomiting, pain, bowel habits, medications currently being taken, history of abdominal problems or abdominal surgery
2. Objective data
   a. Ask the client to empty the bladder.
   b. Be sure to warm the hands and the endpiece of the stethoscope.
   c. Examine painful areas last.

When performing an abdominal assessment, the specific order for assessment techniques is inspection, auscultation, percussion, and palpation.

3. Inspection
   a. Contour: Look down at the abdomen and then across the abdomen from the rib margin to the pubic bone; describe as flat, rounded, concave, or protuberant.
   b. Symmetry: Note any bulging or masses.
   c. Umbilicus: Should be midline and inverted
   d. Skin surface: Should be smooth and even
   e. Pulsations from the aorta may be noted in the epigastric area, and peristaltic waves may be noted across the abdomen.
4. Auscultation
   a. Performed before percussion and palpation, which can increase peristalsis.
   b. Hold the stethoscope lightly against the skin and listen for bowel sounds in all 4 quadrants; begin in the right lower quadrant (bowel sounds are normally heard here).
   c. Note the character and frequency of normal bowel sounds: high-pitched gurgling sounds occurring irregularly from 5 to 30 times a minute.
   d. Identify as normal, hypoactive, or hyperactive (borborygmus).
   e. Absent sounds: Auscultate for 5 minutes before determining that sounds are absent.
   f. Auscultate over the aorta, renal arteries, iliac arteries, and femoral arteries for vascular sounds or bruits.
5. Percussion
   a. All 4 quadrants are percussed lightly.
   b. Borders of the liver and spleen are percussed.
   c. Tympany should predominate over the abdomen, with dullness over the liver and spleen.
   d. Percussion over the kidney at the 12th rib (costovertebral angle) should produce no pain.
6. Palpation
   a. Begin with light palpation of all 4 quadrants, using the fingers to depress the skin about 1 cm; next perform deep palpation, depressing 5 to 8 cm.
   b. Palpate the liver and spleen (spleen may not be palpable).
   c. Palpate the aortic pulsation in the upper abdomen slightly to the left of midline; normally it pulsates in a forward direction (pulsation expands laterally if an aneurysm is present).
7. Refer to Chapter 52 for diagnostic tests related to the gastrointestinal system.
8. Client teaching
   a. Encourage the client to consume a balanced diet; obesity needs to be prevented.
   b. Substances that can cause gastric irritation should be avoided.
   c. The regular use of laxatives is discouraged.
   d. Lifestyle behaviors that can cause gastric irritation (e.g., spicy foods) should be modified.
   e. Regular physical examinations are important.

f. The client should report gastrointestinal problems to the HCP.

J. Musculoskeletal system
   1. Subjective data: Joint pain or stiffness; redness, swelling, or warm joints; limited motion of joints; muscle pain, cramps, or weakness; bone pain; limitations in activities of daily living; exercise patterns; exposure to occupational hazards (e.g., heavy lifting, prolonged standing or sitting); medications being taken; history of joint, muscle, or bone injuries; history of surgery of the joints, muscles, or bones
   2. Objective data: Inspection and palpation
   3. Inspection: Inspect gait and posture, and for cervical, thoracic, and lumbar curves (Box 15-10).
   4. Palpation: Palpate all bones, joints, and surrounding muscles.
   5. Range of motion
      a. Perform active and passive range-of-motion exercises of each major joint.
      b. Check for pain, limited mobility, spastic movement, joint instability, stiffness, and contractures.
      c. Normally joints are nontender, without swelling, and move freely.
   6. Muscle tone and strength
      a. Assess during measurement of range of motion.
      b. Ask client to flex the muscle to be examined and then to resist while applying opposing force against the flexion.
      c. Assess for increased tone (hypertonicity) or little tone (hypotonicity).
   7. Grading muscle strength (Table 15-3)
   8. Refer to Chapter 64 for diagnostic tests related to the musculoskeletal system.
   9. Client teaching
      a. The client should consume a balanced diet, including foods containing calcium and vitamin D.
      b. Activities that cause muscle strain or stress to the joints should be avoided.
      c. Encourage the client to maintain a normal weight.
      d. Participation in a regular exercise program is beneficial.
      e. The client should contact the HCP if joint or muscle pain or problems occur or if limitations in range of motion or muscle strength develop.

BOX 15-10 Common Postural Abnormalities

Lordosis (Swayback): Increased lumbar curvature
Kyphosis (Hunchback): Exaggeration of the posterior curvature of the thoracic spine
Scoliosis: Lateral spinal curvature

TABLE 15-3 Criteria for Grading and Recording Muscle Strength

Functional Level	Lovett Scale	Grade	Percentage of Normal
No evidence of contractility	Zero (0)	0	0
Evidence of slight contractility	Trace (T)	1	10
Complete range of motion with gravity eliminated	Poor (P)	2	25
Complete range of motion with gravity	Fair (F)	3	50
Complete range of motion against gravity with some resistance	Good (G)	4	75
Complete range of motion against gravity with full resistance	Normal (N)	5	100

Data from Wilson AF, Giddens JF: Health assessment for nursing practice, ed 5, St. Louis, 2013, Mosby.

K. Neurological system
   1. Subjective data: Headaches, dizziness or vertigo, tremors, weakness, incoordination, numbness or tingling in any area of the body, difficulty speaking or swallowing, medications being taken, history of seizures, history of head injury or surgery, exposure to environmental or occupational hazards (e.g., chemicals, alcohol, drugs)
   2. Objective data: Assessment of cranial nerves, level of consciousness, pupils, motor function, cerebellar function, coordination, sensory function, and reflexes
   3. Note mental and emotional status, behavior and appearance, language ability, and intellectual functioning, including memory, knowledge, abstract thinking, association, and judgment.
   4. Vital signs: Check temperature, pulse, respirations, and blood pressure; monitor for blood pressure or pulse changes, which may indicate increased intracranial pressure (see Chapter 62 for abnormal respiratory patterns).
   5. Cranial nerves (Table 15-4)
   6. Level of consciousness
      a. Assess the client's behavior to determine level of consciousness (e.g., alertness, confusion, delirium, unconsciousness, stupor, coma); assessment becomes increasingly invasive as the client is less responsive.
      b. Speak to client.
      c. Assess appropriateness of behavior and conversation.
      d. Lightly touch the client (as culturally appropriate).

TABLE 15-4 Assessment of the Cranial Nerves

Cranial Nerve	Test
Cranial Nerve I: Olfactory ■ Sensory ■ Controls the sense of smell	■ Have the client close the eyes and occlude 1 nostril with a finger ■ Ask the client to identify nonirritating and familiar odors (e.g., coffee, tea, cloves, soap, chewing gum, peppermint) ■ Repeat the test on the other nostril
Cranial Nerve II: Optic ■ Sensory ■ Controls vision	■ Assess visual acuity with a Snellen chart and perform an ophthalmoscopic exam ■ Check peripheral vision by confrontation ■ Check color vision
Cranial Nerves III, IV, and VI Cranial Nerve III: Oculomotor ■ Motor ■ Controls pupillary constriction, upper-eyelid elevation, and most eye movement Cranial Nerve IV: Trochlear ■ Motor ■ Controls downward and inward eye movement Cranial Nerve VI: Abducens ■ Motor ■ Controls lateral eye movement	■ The motor functions of cranial nerves III, IV, and VI overlap; therefore, they should be tested together ■ Inspect the eyelids for ptosis (drooping); then assess ocular movements and note any eye deviation ■ Test accommodation and direct and consensual light reflexes
Cranial Nerve V: Trigeminal ■ Sensory and motor ■ Controls sensation in the cornea, nasal and oral mucosa, and facial skin, as well as mastication	■ To test motor function, ask the client to clench the teeth and assess the muscles of mastication; then try to open the client's jaws after asking the client to keep them tightly closed ■ The corneal reflex may be tested by the health care provider; this is done by lightly touching the client's cornea with a cotton wisp (this test may be omitted if the client is alert and blinking normally) ■ Check sensory function by asking the client to close the eyes; lightly touch forehead, cheeks, and chin, noting whether the touch is felt equally on the 2 sides
Cranial Nerve VII: Facial ■ Sensory and motor ■ Controls movement of the face and taste sensation	■ Test taste perception on the anterior two thirds of the tongue; the client should be able to taste salty and sweet tastes ■ Have the client smile, frown, and show the teeth ■ Ask the client to puff out the cheeks ■ Attempt to close the client's eyes against resistance
Cranial Nerve VIII: Acoustic or Vestibulocochlear ■ Sensory ■ Controls hearing and vestibular function	■ Assessing the client's ability to hear tests the cochlear portion ■ Assessing the client's sense of equilibrium tests the vestibular portion ■ Check the client's hearing, using acuity tests ■ Observe the client's balance and watch for swaying when he or she is walking or standing ■ Assessment of sensorineural hearing loss may be done with the Weber or Rinne test
Cranial Nerves IX and X Cranial Nerve IX: Glossopharyngeal ■ Sensory and motor ■ Controls swallowing ability, sensation in the pharyngeal soft palate and tonsillar mucosa, taste perception on the posterior third of the tongue, and salivation Cranial Nerve X: Vagus ■ Sensory and motor ■ Controls swallowing and phonation, sensation in the exterior ear's posterior wall, and sensation behind the ear ■ Controls sensation in the thoracic and abdominal viscera	■ Usually cranial nerves IX and X are tested together ■ Test taste perception on the posterior one third of the tongue or pharynx; the client should be able to taste bitter and sour tastes ■ Inspect the soft palate and watch for symmetrical elevation when the client says "aaah" ■ Touch the posterior pharyngeal wall with a tongue depressor to elicit the gag reflex

Continued

TABLE 15-4 Assessment of the Cranial Nerves—cont'd

Cranial Nerve	Test
Cranial Nerve XI: Spinal Accessory ■ Motor ■ Controls strength of neck and shoulder muscles	■ The nurse palpates and inspects the sternocleidomastoid muscle as the client pushes the chin against the nurse's hand ■ The nurse palpates and inspects the trapezius muscle as the client shrugs the shoulders against the nurse's resistance
Cranial Nerve XII: Hypoglossal ■ Motor ■ Controls tongue movements involved in swallowing and speech	■ Observe the tongue for asymmetry, atrophy, deviation to 1 side, and fasciculations (uncontrollable twitching); ask the client to stick out the tongue (tongue should be midline) ■ Ask the client to push the tongue against a tongue depressor, and then have the client move the tongue rapidly in and out and from side to side

7. Pupils
   a. Assess size, equality, and reaction to light (brisk, slow, or fixed) and note any unusual eye movements (check direct light and consensual light reflex); refer to Chapter 62 for abnormal pupillary findings
   b. This component of the neurological examination may be performed during assessment of the eye.
8. Motor function
   a. Assess muscle tone, including strength and equality.
   b. Assess for voluntary and involuntary movements and purposeful and nonpurposeful movements.
   c. This component of the neurological examination may be performed during assessment of the musculoskeletal system.
9. Cerebellar function
   a. Monitor gait as the client walks in a straight line, heel to toe (tandem walking).
   b. Romberg test: Client is asked to stand with the feet together and the arms at the sides and to close the eyes and hold the position; normally the client can maintain posture and balance.
   c. If appropriate, ask the client to perform a shallow knee bend or to hop in place on 1 leg and then the other.
10. Coordination
   a. Assess by asking the client to perform rapid alternating movements of the hands (e.g., turning the hands over and patting the knees continuously).
   b. The nurse asks the client to touch the nurse's finger, then his or her own nose; the client keeps the eyes open and the nurse moves the finger to different spots to ensure that the client's movements are smooth and accurate.
   c. Heel-to-shin test: Assist the client into a supine position, then ask the client to place the heel on the opposite knee and run it down the shin; normally the client moves the heel down the shin in a straight line.
11. Sensory function
   a. Pain: Assess by applying an object with a sharp point and one with a dull point to the client's body in random order; ask the client to identify the sharp and dull feelings.
   b. Light touch: Brush a piece of cotton over the client's skin at various locations in a random order and ask the client to say when the touch is felt.
   c. Vibration: Use a tuning fork to test the client's ability to feel vibrations over bony prominences; ask the client to announce when the vibration starts and stops.
   d. Position sense (kinesthesia): Move the client's finger or toe up or down and ask the client which way it has been moved; this tests the client's ability to perceive passive movement.
   e. Stereognosis: Tests the client's ability to recognize objects placed in his or her hand
   f. Graphesthesia: Tests the client's ability to identify a number traced on the client's hand
   g. Two-point discrimination: Tests the client's ability to discriminate 2 simultaneous pinpricks on the skin
12. Deep tendon reflexes
   a. Includes testing the following reflexes: biceps, triceps, brachioradialis, patella, Achilles
   b. Limb should be relaxed.
   c. The tendon is tapped quickly with a reflex hammer, which should cause contraction of muscle.
   d. Scoring deep tendon reflex activity (Box 15-11)
13. Plantar reflex
   a. A cutaneous (superficial) reflex is tested with a pointed but not sharp object.
   b. The sole of the client's foot is stroked from the heel, up the lateral side, and then across the ball of the foot to the medial side.
   c. The normal response is plantar flexion of all toes.

BOX 15-11 Scoring Deep Tendon Reflex Activity

0 ¼ No response
1+ ¼ Sluggish or diminished
2+ ¼ Active or expected response
3+ ¼ Slightly hyperactive, more brisk than normal; not necessarily pathological
4+ ¼ Brisk, hyperactive with intermittent clonus associated with disease

Data from Wilson AF, Giddens JF: Health assessment for nursing practice, ed 5, St. Louis, 2013, Mosby.

! Dorsiflexion of the great toe and fanning of the other toes (Babinski's sign) is abnormal in anyone older than 2 years and indicates the presence of central nervous system disease indicating an upper motor neuron lesion.

14. Testing for meningeal irritation
    a. A positive Brudzinski's sign or Kernig's sign indicates meningeal irritation.
    b. Brudzinski's sign is tested with the client in the supine position. The nurse flexes the client's head (gently moves the head to the chest) and there should be no reports of pain or resistance to the neck flexion; a positive Brudzinski's sign is observed if the client passively flexes the hip and knee in response to neck flexion and reports pain in the vertebral column.
    c. Kernig's sign is positive when the client flexes the legs at the hip and knee and complains of pain along the vertebral column when the leg is extended.
15. Refer to Chapter 62 for additional neurological assessments and diagnostic tests.
16. Client teaching
    a. Client should avoid exposure to environmental hazards (e.g., insecticides, lead).
    b. High-risk behaviors that can result in head and spinal cord injuries should be avoided.
    c. Protective devices (e.g., a helmet, body pads) should be worn when participating in high-risk behaviors.
    d. Seat belts should always be worn.

L. Female genitalia and reproductive tract
1. Subjective data: Urinary difficulties or symptoms such as frequency, urgency, or burning; vaginal discharge; pain; menstrual and obstetrical histories; onset of menopause; medications being taken; sexual activity and the use of contraceptives; history of sexually transmitted infections
2. Objective data
    a. Use a calm and relaxing approach; the examination is embarrassing for many women and may be a difficult experience for an adolescent.
    b. Consider the client's cultural background and her beliefs regarding examination of the genitalia.
    c. A complete examination will include the external genitalia and a vaginal examination.
    d. The nurse's role is to prepare the client for the examination and to assist the HCP, nurse practitioner, or nurse midwife.
    e. The client is asked to empty her bladder before the examination.
    f. The client is placed in the lithotomy position, and a drape is placed across the client.
3. External genitalia
    a. Quantity and distribution of hair
    b. Characteristics of labia majora and minora (make note of any inflammation, edema, lesions, or lacerations)
    c. Urethral orifice is observed for color and position.
    d. Vaginal orifice (introitus) is inspected for inflammation, edema, discoloration, discharge, and lesions.
    e. The examiner may check Skene's and Bartholin's glands for tenderness or discharge (if discharge is present, color, odor, and consistency are noted and a culture of the discharge is obtained).
    f. The client is assessed for the presence of a cystocele (in which a portion of the vaginal wall and bladder prolapse, or fall, into the orifice anteriorly) or a rectocele (bulging of the posterior wall of the vagina caused by prolapse of the rectum).
4. Speculum examination of the internal genitalia
    a. Performed by the HCP, nurse practitioner, or nurse midwife
    b. Permits visualization of the cervix and vagina
    c. Papanicolaou (Pap) smear (test): A painless screening test for cervical cancer is done; the specimen is obtained during the speculum examination, and the nurse helps to prepare the specimen for laboratory analysis.
5. Client teaching
    a. Stress the importance of personal hygiene.
    b. Explain the purpose and recommended frequency of Pap tests.
    c. Explain the signs of sexually transmitted infections.
    d. Educate the client on measures to prevent a sexually transmitted infection.
    e. Inform the client with a sexually transmitted infection that she must inform her sexual partner(s) of the need for an examination.

M. Male genitalia
1. Subjective data: Urinary difficulty (e.g., frequency, urgency, hesitancy or straining, dysuria, nocturia); pain, lesions, or discharge on or from

the penis; pain or lesions in the scrotum; medications being taken; sexual activity and the use of contraceptives; history of sexually transmitted infections

2. Objective data
   a. Includes assessment (inspection and palpation) of the external genitalia and inguinal ring and canal
   b. Client may stand or lie down for this examination.
   c. Genitalia are manipulated gently to avoid causing erection or discomfort.
   d. Sexual maturity is assessed by noting the size and shape of the penis and testes, the color and texture of the scrotal skin, and the character and distribution of pubic hair.
   e. The penis is checked for the presence of lesions or discharge; a culture is obtained if a discharge is present.
   f. The scrotum is inspected for size, shape, and symmetry (normally the left testicle hangs lower than the right) and is palpated for the presence of lumps.
   g. Inguinal ring and canal; inspection (asking the client to bear down) and palpation are performed to assess for the presence of a hernia.
3. Client teaching
   a. Stress the importance of personal hygiene.
   b. Teach the client how to perform testicular self-examination (TSE); a day of the month is selected and the exam is performed on the same day each month after a shower or bath when the hands are warm and soapy and the scrotum is warm. (Refer to Chapter 48 for information on performing TSE.)
   c. Explain the signs of sexually transmitted infections.
   d. Educate the client on measures to prevent sexually transmitted infections.
   e. Inform the client with a sexually transmitted infection that he must inform his sexual partner(s) of the need for an examination.

N. Rectum and anus
1. Subjective data: Usual bowel pattern; any change in bowel habits; rectal pain, bleeding from the rectum, or black or tarry stools; dietary habits; problems with urination; previous screening for colorectal cancer; medications being taken; history of rectal or colon problems; family history of rectal or colon problems
2. Objective data
   a. Examination can detect colorectal cancer in its early stages; in men, the rectal examination can also detect prostate tumors.
   b. Women may be examined in the lithotomy position after examination of the genitalia.
   c. A man is best examined by having the client bend forward with his hips flexed and upper body resting over the examination table.
   d. A nonambulatory client may be examined in the left lateral (Sims') position.
   e. The external anus is inspected for lumps or lesions, rashes, inflammation or excoriation, scars, or hemorrhoids.
   f. Digital examination will most likely be performed by the HCP or nurse practitioner.
   g. Digital examination is performed to assess sphincter tone; to check for tenderness, irregularities, polyps, masses, or nodules in the rectal wall; and to assess the prostate gland.
   h. The prostate gland is normally firm, without bogginess, tenderness, or nodules (hardness or nodules may indicate the presence of a cancerous lesion).
3. Client teaching
   a. Diet should include high-fiber and low-fat foods and plenty of liquids.
   b. The client should obtain regular digital examinations.
   c. The client should be able to identify the symptoms of colorectal cancer or prostatic cancer (men).
   d. The client should follow the American Cancer Society's guidelines for screening for colorectal cancer.

VI. Documenting Health and Physical Assessment Findings

A. Documentation of findings may be either written or recorded electronically (depending on agency protocol).
B. Whether written or electronic, the documentation is a legal document and a permanent record of the client's health status.
C. Principles of documentation need to be followed and data need to be recorded accurately, concisely, completely, legibly, and objectively without bias or opinions; always follow agency protocol for documentation.
D. Documentation findings serve as a source of client information for other health care providers; procedures for maintaining confidentiality are always followed.
E. Record findings about the client's health history and physical examination as soon as possible after completion of the health assessment.
F. Refer to Chapter 6 for additional information about documentation guidelines.

CRITICAL THINKING What Should You Do?

Answer: The carotid arteries are located in the groove between the trachea and sternocleidomastoid muscle, medial to and alongside the muscle. On assessment, the nurse should palpate 1 carotid artery at a time to avoid compromising blood flow to the brain. On auscultation, the nurse listens for the presence of a bruit (a blowing, swishing sound), which indicates blood flow turbulence. Normally a bruit is not present, so this finding necessitates the need for follow-up. Both carotid arteries should be auscultated. The nurse should notify the health care provider if a bruit is detected. The nurse should also document the findings.

Reference: Ignatavicius, Workman (2016), p. 639.

PRACTICE QUESTIONS

132. A Spanish-speaking client arrives at the triage desk in the emergency department and states to the nurse, "No speak English, need interpreter." Which is the best action for the nurse to take?
    1. Have one of the client's family members interpret.
    2. Have the Spanish-speaking triage receptionist interpret.
    3. Page an interpreter from the hospital's interpreter services.
    4. Obtain a Spanish-English dictionary and attempt to triage the client.

133. The nurse is performing a neurological assessment on a client and elicits a positive Romberg's sign. The nurse makes this determination based on which observation?
    1. An involuntary rhythmic, rapid, twitching of the eyeballs
    2. A dorsiflexion of the ankle and great toe with fanning of the other toes
    3. A significant sway when the client stands erect with feet together, arms at the side, and the eyes closed
    4. A lack of normal sense of position when the client is unable to return extended fingers to a point of reference

134. The nurse notes documentation that a client is exhibiting Cheyne-Stokes respirations. On assessment of the client, the nurse should expect to note which finding?
    1. Rhythmic respirations with periods of apnea
    2. Regular rapid and deep, sustained respirations
    3. Totally irregular respiration in rhythm and depth
    4. Irregular respirations with pauses at the end of inspiration and expiration

135. A client diagnosed with conductive hearing loss asks the nurse to explain the cause of the hearing problem. The nurse plans to explain to the client that this condition is caused by which problem?
    1. A defect in the cochlea
    2. A defect in cranial nerve VIII
    3. A physical obstruction to the transmission of sound waves
    4. A defect in the sensory fibers that lead to the cerebral cortex

136. While performing a cardiac assessment on a client with an incompetent heart valve, the nurse auscultates a murmur. The nurse documents the finding and describes the sound as which?
    1. Lub-dub sounds
    2. Scratchy, leathery heart noise
    3. A blowing or swooshing noise
    4. Abrupt, high-pitched snapping noise

137. The nurse is testing the extraocular movements in a client to assess for muscle weakness in the eyes. The nurse should implement which assessment technique to assess for muscle weakness in the eye?
    1. Test the corneal reflexes.
    2. Test the 6 cardinal positions of gaze.
    3. Test visual acuity, using a Snellen eye chart.
    4. Test sensory function by asking the client to close the eyes and then lightly touching the forehead, cheeks, and chin.

138. The nurse is instructing a client how to perform a testicular self-examination (TSE). The nurse should explain that which is the best time to perform this exam?
    1. After a shower or bath
    2. While standing to void
    3. After having a bowel movement
    4. While lying in bed before arising

139. The nurse is assessing a client for meningeal irritation and elicits a positive Brudzinski's sign. Which finding did the nurse observe?
    1. The client rigidly extends the arms with pronated forearms and plantar flexion of the feet.
    2. The client flexes a leg at the hip and knee and reports pain in the vertebral column when the leg is extended.
    3. The client passively flexes the hip and knee in response to neck flexion and reports pain in the vertebral column.
    4. The client's upper arms are flexed and held tightly to the sides of the body and the legs are extended and internally rotated.

140. A client with a diagnosis of asthma is admitted to the hospital with respiratory distress. Which type of adventitious lung sounds should the nurse expect to hear when performing a respiratory assessment on this client?
1. Stridor
2. Crackles
3. Wheezes
4. Diminished

141. The clinic nurse prepares to perform a focused assessment on a client who is complaining of symptoms of a cold, a cough, and lung congestion. Which should the nurse include for this type of assessment? Select all that apply.
- ❑ 1. Auscultating lung sounds
- ❑ 2. Obtaining the client's temperature
- ❑ 3. Assessing the strength of peripheral pulses
- ❑ 4. Obtaining information about the client's respirations
- ❑ 5. Performing a musculoskeletal and neurological examination
- ❑ 6. Asking the client about a family history of any illness or disease

ANSWERS

132. 3
Rationale: The best action is to have a professional hospital-based interpreter translate for the client. English-speaking family members may not appropriately understand what is asked of them and may paraphrase what the client is actually saying. Also, client confidentiality as well as accurate information may be compromised when a family member or a non–health care provider acts as interpreter.
Test-Taking Strategy: Note the strategic word, best. Initially focus on what the client needs. In this case the client needs and asks for an interpreter. Next keep in mind the issue of confidentiality and making sure that information is obtained in the most efficient and accurate way. This will assist in eliminating options 1, 2, and 4.
Review: Actions to take to address language barriers
Level of Cognitive Ability: Applying
Client Needs: Psychosocial Integrity
Integrated Process: Communication and Documentation
Content Area: Developmental Stages—Health Assessment/Physical Exam
Priority Concepts: Communication; Culture
Reference: Jarvis (2016), pp. 45-46.

133. 3
Rationale: In Romberg's test, the client is asked to stand with the feet together and the arms at the sides, and to close the eyes and hold the position; normally the client can maintain posture and balance. A positive Romberg's sign is a vestibular neurological sign that is found when a client exhibits a loss of balance when closing the eyes. This may occur with cerebellar ataxia, loss of proprioception, and loss of vestibular function. A lack of normal sense of position coupled with an inability to return extended fingers to a point of reference is a finding that indicates a problem with coordination. A positive gaze nystagmus evaluation results in an involuntary rhythmic, rapid twitching of the eyeballs. A positive Babinski's test results in dorsiflexion of the ankle and great toe with fanning of the other toes; if this occurs in anyone older than 2 years it indicates the presence of central nervous system disease.
Test-Taking Strategy: Note the subject, Romberg's sign. You can easily answer this question if you can recall that the client's balance is tested in this test.
Review: Romberg's test
Level of Cognitive Ability: Analyzing
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Assessment
Content Area: Developmental Stages—Health Assessment/Physical Exam
Priority Concepts: Clinical Judgment; Mobility
References: Ignatavicius, Workman (2016), p. 842; Jarvis (2016), p. 650.

134. 1
Rationale: Cheyne-Stokes respirations are rhythmic respirations with periods of apnea and can indicate a metabolic dysfunction in the cerebral hemisphere or basal ganglia. Neurogenic hyperventilation is a regular, rapid and deep, sustained respiration that can indicate a dysfunction in the low midbrain and middle pons. Ataxic respirations are totally irregular in rhythm and depth and indicate a dysfunction in the medulla. Apneustic respirations are irregular respirations with pauses at the end of inspiration and expiration and can indicate a dysfunction in the middle or caudal pons.
Test-Taking Strategy: Focus on the subject, the characteristics of Cheyne-Stokes respirations. Recalling that periods of apnea occur with this type of respiration will help direct you to the correct answer.
Review: Cheyne-Stokes respirations
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Assessment
Content Area: Developmental Stages—Health Assessment/Physical Exam
Priority Concepts: Clinical Judgment; Gas Exchange
Reference: Jarvis (2016), p. 444.

135. 3
Rationale: A conductive hearing loss occurs as a result of a physical obstruction to the transmission of sound waves. A sensorineural hearing loss occurs as a result of a pathological process in the inner ear, a defect in cranial nerve VIII, or a defect of the sensory fibers that lead to the cerebral cortex.
Test-Taking Strategy: Focus on the subject, a conductive hearing loss. Noting the relationship of the word conductive in the question and transmission in the correct option will direct you to this option.
Review: Conductive hearing loss and sensorineural hearing loss

Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Teaching and Learning
Content Area: Developmental Stages—Health Assessment/Physical Exam
Priority Concepts: Client Education; Sensory Perception
Reference: Ignatavicius, Workman (2016), p. 1009.

136. 3
Rationale: A heart murmur is an abnormal heart sound and is described as a faint or loud blowing, swooshing sound with a high, medium, or low pitch. Lub-dub sounds are normal and represent the S1 (first) heart sound and S2 (second) heart sound, respectively. A pericardial friction rub is described as a scratchy, leathery heart sound. A click is described as an abrupt, high-pitched snapping sound.
Test-Taking Strategy: Focus on the subject, characteristics of a murmur. Eliminate option 1 because it describes normal heart sounds. Next recall that a murmur occurs as a result of the manner in which the blood is flowing through the cardiac chambers and valves. This will direct you to the correct option.
Review: Heart murmur
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Communication and Documentation
Content Area: Developmental Stages—Health Assessment/Physical Exam
Priority Concepts: Clinical Judgment; Perfusion
References: Ignatavicius, Workman (2016), p. 640; Jarvis (2016), pp. 464, 506.

137. 2
Rationale: Testing the 6 cardinal positions of gaze is done to assess for muscle weakness in the eyes. The client is asked to hold the head steady, and then to follow movement of an object through the positions of gaze. The client should follow the object in a parallel manner with the 2 eyes. A Snellen eye chart assesses visual acuity and cranial nerve II (optic). Testing sensory function by having the client close his or her eyes and then lightly touching areas of the face and testing the corneal reflexes assess cranial nerve V (trigeminal).
Test-Taking Strategy: Focus on the subject, assessing for muscle weakness in the eyes. Note the relationship between the words extraocular movements in the question and positions of gaze in the correct option.
Review: Physical assessment techniques for muscle weakness in the eyes
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Assessment
Content Area: Developmental Stages—Health Assessment/Physical Exam
Priority Concepts: Clinical Judgment; Sensory Perception
References: Ignatavicius, Workman (2016), pp. 972-973; Jarvis (2016), p. 313.

138. 1
Rationale: The nurse needs to teach the client how to perform a TSE. The nurse should instruct the client to perform the exam on the same day each month. The nurse should also instruct the client that the best time to perform a TSE is after a shower or bath when the hands are warm and soapy and the scrotum is warm. Palpation is easier and the client will be better able to identify any abnormalities. The client would stand to perform the exam, but it would be difficult to perform the exam while voiding. Having a bowel movement is unrelated to performing a TSE.
Test-Taking Strategy: Note the strategic word, best. Think about the purpose of this test and visualize this assessment technique to answer correctly.
Review: Testicular self-examination
Level of Cognitive Ability: Applying
Client Needs: Health Promotion and Maintenance
Integrated Process: Teaching and Learning
Content Area: Developmental Stages—Health Assessment/Physical Exam
Priority Concepts: Client Education; Sexuality
References: Ignatavicius, Workman (2016), p. 1513; Jarvis (2016), pp. 704-705.

139. 3
Rationale: Brudzinski's sign is tested with the client in the supine position. The nurse flexes the client's head (gently moves the head to the chest) and there should be no reports of pain or resistance to the neck flexion. A positive Brudzinski's sign is observed if the client passively flexes the hip and knee in response to neck flexion and reports pain in the vertebral column. Kernig's sign also tests for meningeal irritation and is positive when the client flexes the legs at the hip and knee and complains of pain along the vertebral column when the leg is extended. Decorticate posturing is abnormal flexion and is noted when the client's upper arms are flexed and held tightly to the sides of the body and the legs are extended and internally rotated. Decerebrate posturing is abnormal extension and occurs when the arms are fully extended, forearms pronated, wrists and fingers flexed, jaws clenched, neck extended, and feet plantar-flexed.
Test-Taking Strategy: Focus on the subject, a positive Brudzinski's sign. Recalling that a positive sign is elicited if the client reports pain will assist in eliminating options 1 and 4. Next it is necessary to know that a positive Brudzinski's sign is observed if the client passively flexes the hip and knee in response to neck flexion and reports pain in the vertebral column.
Review: Brudzinski's sign
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Assessment
Content Area: Developmental Stages—Health Assessment/Physical Exam
Priority Concepts: Clinical Judgment; Intracranial Regulation
Reference: Jarvis (2016), p. 688.

140. 3
Rationale: Asthma is a respiratory disorder characterized by recurring episodes of dyspnea, constriction of the bronchi, and wheezing. Wheezes are described as high-pitched musical sounds heard when air passes through an obstructed or narrowed lumen of a respiratory passageway. Stridor is a harsh sound noted with an upper airway obstruction and often signals a life-threatening emergency. Crackles are produced by air passing over retained airway secretions or fluid, or the sudden opening of collapsed

airways. Diminished lung sounds are heard over lung tissue where poor oxygen exchange is occurring.
Test-Taking Strategy: Note the subject, assessment of abnormal lung sounds. Note the client's diagnosis and think about the pathophysiology that occurs in this disorder. Recalling that bronchial constriction occurs will assist in directing you to the correct option. Also, thinking about the definition of each adventitious lung sound identified in the options will direct you to the correct option.
Review: Adventitious lung sounds
Level of Cognitive Ability: Analyzing
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Assessment
Content Area: Developmental Stages—Health Assessment/Physical Exam
Priority Concepts: Clinical Judgment; Gas Exchange
References: Ignatavicius, Workman (2016), pp. 506-507; Jarvis (2016), p. 447.

❖ 141. 1, 2, 4
Rationale: A focused assessment focuses on a limited or short-term problem, such as the client's complaint. Because the client is complaining of symptoms of a cold, a cough, and lung congestion, the nurse would focus on the respiratory system and the presence of an infection. A complete assessment includes a complete health history and physical examination and forms a baseline database. Assessing the strength of peripheral pulses relates to a vascular assessment, which is not related to this client's complaints. A musculoskeletal and neurological examination also is not related to this client's complaints. However, strength of peripheral pulses and a musculoskeletal and neurological examination would be included in a complete assessment. Likewise, asking the client about a family history of any illness or disease would be included in a complete assessment.
Test-Taking Strategy: Focus on the subject and note the words focused assessment. Noting that the client's symptoms relate to the respiratory system and the presence of an infection will direct you to the correct options.
Review: Focused assessments
Level of Cognitive Ability: Analyzing
Client Needs: Health Promotion and Maintenance
Integrated Process: Nursing Process—Assessment
Content Area: Developmental Stages—Health Assessment/Physical Exam
Priority Concepts: Clinical Judgment; Gas Exchange
References: Jarvis (2016), p. 7; Lewis et al. (2014), pp. 44-45.

CHAPTER 16

Provision of a Safe Environment

PRIORITY CONCEPTS Infection, Safety

CRITICAL THINKING What Should You Do?

The nurse is working in a long-term care facility that has a "no restraint policy." An assigned client is disoriented and unsteady and continually attempts to climb out of bed. What should the nurse do with regard to instituting safety precautions for this client?

Answer located on p. 199.

I. Environmental Safety

A. Fire safety (see Priority Nursing Actions)

PRIORITY NURSING ACTIONS

Event of a Fire

1. Rescue clients who are in immediate danger.
2. Activate the fire alarm.
3. Confine the fire.
4. Extinguish the fire.
   a. Obtain the fire extinguisher.
   b. Pull the pin on the fire extinguisher.
   c. Aim at the base of the fire.
   d. Squeeze the extinguisher handle.
   e. Sweep the extinguisher from side to side to coat the area of the fire evenly.

Remember the mnemonic RACE to prioritize in the event of a fire. R is rescue clients in immediate danger, A is alarm (sound the alarm), C is confine the fire by closing all doors, and E is extinguish. To properly use the fire extinguisher, remember the mnemonic PASS to prioritize in the use of a fire extinguisher. P is pull the pin, A is aim at the base of the fire, S is squeeze the handle, and S is sweep from side to side to coat the area evenly.

Reference

Perry, Potter, Ostendorf (2014), pp. 313-314.

1. Keep open spaces free of clutter.
2. Clearly mark fire exits.
3. Know the locations of all fire alarms, exits, and extinguishers (Table 16-1; also see Priority Nursing Actions).
4. Know the telephone number for reporting fires.
5. Know the fire drill and evacuation plan of the agency.
6. Never use the elevator in the event of a fire.
7. Turn off oxygen and appliances in the vicinity of the fire.
8. In the event of a fire, if a client is on life support, maintain respiratory status manually with an Ambu bag (resuscitation bag) until the client is moved away from the threat of the fire and can be placed back on life support.
9. In the event of a fire, ambulatory clients can be directed to walk by themselves to a safe area and, in some cases, may be able to assist in moving clients in wheelchairs.
10. Bedridden clients generally are moved from the scene of a fire by stretcher, their bed, or wheelchair.
11. If a client must be carried from the area of a fire, appropriate transfer techniques need to be used.
12. If fire department personnel are at the scene of the fire, they will help to evacuate clients.

Remember the mnemonic RACE (Rescue clients, Activate the fire alarm, Confine the fire, Extinguish the fire) to set priorities in the event of a fire and the mnemonic PASS (Pull the pin, Aim at the base of the fire, Squeeze the handle, Sweep from side to side) to use a fire extinguisher.

B. Electrical safety
   1. Electrical equipment must be maintained in good working order and should be grounded; otherwise, it presents a physical hazard.
   2. Use a 3-pronged electrical cord.

TABLE 16-1 Types of Fire Extinguishers

Type	Class of Fire
A	Wood, cloth, upholstery, paper, rubbish, plastic
B	Flammable liquids or gases, grease, tar, oil-based paint
C	Electrical equipment

3. In a 3-pronged electrical cord, the third, longer prong of the cord is the ground; the other 2 prongs carry the power to the piece of electrical equipment.
4. Check electrical cords and outlets for exposed, frayed, or damaged wires.
5. Avoid overloading any circuit.
6. Read warning labels on all equipment; never operate unfamiliar equipment.
7. Use safety extension cords only when absolutely necessary, and tape them to the floor with electrical tape.
8. Never run electrical wiring under carpets.
9. Never pull a plug by using the cord; always grasp the plug itself.
10. Never use electrical appliances near sinks, bathtubs, or other water sources.
11. Always disconnect a plug from the outlet before cleaning equipment or appliances.
12. If a client receives an electrical shock, turn off the electricity before touching the client.

Any electrical equipment that the client brings into the health care facility must be inspected for safety before use.

C. Radiation safety
1. Know the protocols and guidelines of the health care agency.
2. Label potentially radioactive material.
3. To reduce exposure to radiation, do the following.
   a. Limit the time spent near the source.
   b. Make the distance from the source as great as possible.
   c. Use a shielding device such as a lead apron.
4. Monitor radiation exposure with a film (dosimeter) badge.
5. Place the client who has a radiation implant in a private room.
6. Never touch dislodged radiation implants.
7. Keep all linens in the client's room until the implant is removed.

D. Disposal of infectious wastes
1. Handle all infectious materials as a hazard.
2. Dispose of waste in designated areas only, using proper containers for disposal.
3. Ensure that infectious material is labeled properly.
4. Dispose of all sharps immediately after use in closed, puncture-resistant disposal containers that are leak-proof and labeled or color-coded.

Needles (sharps) should not be recapped, bent, or broken because of the risk of accidental injury (needle stick).

E. Physiological changes in the older client that increase the risk of accidents (Box 16-1)
F. Risk for falls assessment
1. Should be client-centered and include the use of a fall risk scale per agency procedures
2. Include the client's own perceptions of their risk factors for falls and their method to adapt to these factors. Areas of concern may include gait stability, muscle strength and coordination, balance, and vision.
3. Assess for any previous accidents.
4. Assess with the client any concerns about their immediate environment, including stairs, use of throw rugs, grab bars, or a raised toilet seat.
5. Review the medications that the client is taking that could have a side or adverse effect or side/adverse effects that could place the client at risk for a fall.
6. Determine any scheduled procedures that pose risks to the client.

G. Measures to prevent falls (Box 16-2)
H. Measures to promote safety in ambulation for the client

BOX 16-1 Physiological Changes in Older Clients That Increase the Risk of Accidents

Musculoskeletal Changes
Strength and function of muscles decrease.
Joints become less mobile and bones become brittle.
Postural changes and limited range of motion occur.

Nervous System Changes
Voluntary and autonomic reflexes become slower.
Decreased ability to respond to multiple stimuli occurs.
Decreased sensitivity to touch occurs.

Sensory Changes
Decreased vision and lens accommodation and cataracts develop.
Delayed transmission of hot and cold impulses occurs.
Impaired hearing develops, with high-frequency tones less perceptible.

Genitourinary Changes
Increased nocturia and occurrences of incontinence may occur.

Adapted from Potter A, Perry P, Stockert P, Hall A: Fundamentals of nursing, ed 8, St. Louis, 2013, Mosby; and Touhy T, Jett K: Ebersole and Hess' toward healthy aging, ed 8, St. Louis, 2012, Mosby.

BOX 16-2 Measures to Prevent Falls

- Assess the client's risk for falling.
- Assign the client at risk for falling to a room near the nurses' station.
- Alert all personnel to the client's risk for falling.
- Assess the client frequently.
- Orient the client to physical surroundings.
- Instruct the client to seek assistance when getting up.
- Explain the use of the nurse call system.
- Use safety devices such as floor pads, and bed or chair alarms that alert health care personnel of the person getting out of bed or a chair.
- Keep the bed in the low position with side rails adjusted to a safe position (follow agency policy).
- Lock all beds, wheelchairs, and stretchers.
- Keep clients' personal items within their reach.
- Eliminate clutter and obstacles in the client's room.
- Provide adequate lighting.
- Reduce bathroom hazards.
- Maintain the client's toileting schedule throughout the day.

BOX 16-3 Steps to Prevent Injury to the Health Care Worker When Moving a Client

- Use available safety equipment.
- Keep the weight to be lifted as close to the body as possible.
- Bend at the knees.
- Tighten abdominal muscles and tuck the pelvis.
- Maintain the trunk erect and knees bent so that multiple muscle groups work together in a coordinated manner.

Adapted from Potter A, Perry P, Stockert P, Hall A: Fundamentals of nursing, ed 8, St. Louis, 2013, Mosby.

1. Gait belt may be used to keep the center of gravity midline.
   a. Place the belt on the client prior to ambulation.
   b. Encircle the client's waist with the belt.
   c. Hold on to the side or back of the belt so that the client does not lean to 1 side.
   d. Return the client to bed or a nearby chair if the client develops dizziness or becomes unsteady.

I. Steps to prevent injury to the health care worker (Box 16-3)

J. Restraints (safety devices)

1. Restraints (safety devices) are protective devices used to limit the physical activity of a client or to immobilize a client or an extremity.
   a. The agency policy should be checked when applying side rails.
   b. The use of side rails is not considered a restraint when they are used to prevent a sedated client from falling out of bed.
   c. The client must be able to exit the bed easily in case of an emergency when using side rails. Only the top 2 side rails should be used.
   d. The bed must be kept the in the lowest position when using side rails.
2. Physical restraints restrict client movement through the application of a device.
3. Chemical restraints are medications given to inhibit a specific behavior or movement.
4. Interventions
   a. Use alternative devices, such as pressure-sensitive beds or chair pads with alarms or other types of bed or chair alarms, whenever possible.
   b. If restraints are necessary, the health care provider's (HCP's) prescriptions should state the type of restraint, identify specific client behaviors for which restraints are to be used, and identify a limited time frame for use.
   c. The HCP's prescriptions for restraints should be renewed within a specific time frame according to agency policy.
   d. Restraints are not to be prescribed PRN (as needed).
   e. The reason for the safety device should be given to the client and the family, and their permission should be sought.
   f. Restraints should not interfere with any treatments or affect the client's health problem.
   g. Use a half-bow or safety knot (quick release tie) or a restraint with a quick release buckle to secure the device to the bed frame or chair, not to the side rails.
   h. Ensure that there is enough slack on the straps to allow some movement of the body part.
   i. Assess skin integrity and neurovascular and circulatory status every 30 minutes and remove the safety device at least every 2 hours to permit muscle exercise and to promote circulation (follow agency policies).
   j. Continually assess and document the need for safety devices (Box 16-4).
   k. Offer fluids if clinically indicated every 2 hours.
   l. Offer bedpan or toileting every 2 hours.

An HCP's prescription for use of a safety device (restraint) is needed. Alternative measures for safety devices should always be used first.

5. Alternatives to safety devices
   a. Orient the client and family to the surroundings.
   b. Explain all procedures and treatments to the client and family.
   c. Encourage family and friends to stay with the client, and use sitters for clients who need supervision.

BOX 16-4 Documentation Points with Use of a Safety Device (Restraint)

- Reason for safety device
- Method of use for safety device
- Date and time of application of safety device
- Duration of use of safety device and client's response
- Release from safety device with periodic exercise and circulatory, neurovascular, and skin assessment
- Assessment of continued need for safety device
- Evaluation of client's response

d. Assign confused and disoriented clients to rooms near the nurses' station.
e. Provide appropriate visual and auditory stimuli, such as a night light, clocks, calendars, television, and a radio, to the client.
f. Place familiar items, such as family pictures, near the client's bedside.
g. Maintain toileting routines.
h. Eliminate bothersome treatments, such as nasogastric tube feedings, as soon as possible.
i. Evaluate all medications that the client is receiving.
j. Use relaxation techniques with the client.
k. Institute exercise and ambulation schedules as the client's condition allows.
l. Collaborate with the HCP to evaluate oxygenation status, vital signs, electrolyte/laboratory values, and other pertinent assessment findings that may provide information about the cause of the client's confusion.

K. Poisons
1. A poison is any substance that impairs health or destroys life when ingested, inhaled, or otherwise absorbed by the body.
2. Specific antidotes or treatments are available only for some types of poisons.
3. The capacity of body tissue to recover from a poison determines the reversibility of the effect.
4. Poison can impair the respiratory, circulatory, central nervous, hepatic, gastrointestinal, and renal systems of the body.
5. The toddler, the preschooler, and the young school-age child must be protected from accidental poisoning.
6. In older adults, diminished eyesight and impaired memory may result in accidental ingestion of poisonous substances or an overdose of prescribed medications.
7. A Poison Control Center phone number should be visible on the telephone in homes with small children; in all cases of suspected poisoning, the number should be called immediately.
8. Interventions
a. Remove any obvious materials from the mouth, eyes, or body area immediately.
b. Identify the type and amount of substance ingested.
c. Call the Poison Control Center before attempting an intervention.
d. If the victim vomits or vomiting is induced, save the vomitus if requested to do so, and deliver it to the Poison Control Center.
e. If instructed by the Poison Control Center to take the person to the emergency department, call an ambulance.
f. Never induce vomiting following ingestion of lye, household cleaners, grease, or petroleum products.
g. Never induce vomiting in an unconscious victim.

! The Poison Control Center should be called first before attempting an intervention.

II. Health Care–Associated (Nosocomial) Infections

A. Health care–associated (nosocomial) infections also are referred to as hospital-acquired infections.
B. These infections are acquired in a hospital or other health care facility and were not present or incubating at the time of a client's admission.
C. Clostridium difficile is spread mainly by hand-to-hand contact in a health care setting. Clients taking multiple antibiotics for a prolonged period are most at risk.
D. Common drug-resistant infections: Vancomycin-resistant enterococci, methicillin-resistant Staphylococcus aureus, multidrug-resistant tuberculosis, carbapenem-resistant Enterobacteriaceae (CRE)
E. Illness and some medications such as immunosuppressants impair the normal defense mechanisms.
F. The hospital environment provides exposure to a variety of virulent organisms that the client has not been exposed to in the past; therefore, the client has not developed resistance to these organisms.
G. Infections can be transmitted by health care personnel who fail to practice proper hand-washing procedures or fail to change gloves between client contacts.
H. At many health care agencies, dispensers containing an alcohol-based solution for hand sanitization are mounted at the entrance to each client's room; it is important to note that alcohol-based sanitizers are not effective against some infectious agents such as Clostridium difficile spores.

III. Standard Precautions

A. Description
1. Nurses must practice standard precautions with all clients in any setting, regardless of the diagnosis or presumed infectiveness.
2. Standard precautions include hand washing and the use of gloves, masks, eye protection, and gowns, when appropriate, for client contact.

3. These precautions apply to blood, all body fluids (whether or not they contain blood), secretions and excretions, nonintact skin, and mucous membranes.

B. Interventions
1. Wash hands between client contacts; after contact with blood, body fluids, secretions or excretions, nonintact skin, or mucous membranes; after contact with equipment or contaminated articles; and immediately after removing gloves.
2. Wear gloves when touching blood, body fluids, secretions, excretions, nonintact skin, mucous membranes, or contaminated items; remove gloves and wash hands between client care contacts.
3. For routine decontamination of hands, use alcohol-based hand rubs when hands are not visibly soiled. For more information on hand hygiene from the Centers for Disease Control and Prevention (CDC), see www.cdc.gov/handhygiene/
4. Wear masks and eye protection, or face shields, if client care activities may generate splashes or sprays of blood or body fluid.
5. Wear gowns if soiling of clothing is likely from blood or body fluid; wash hands after removing a gown.
6. Steps for donning and removing personal protective equipment (PPE) (Table 16-2)
7. Clean and reprocess client care equipment properly and discard single-use items.
8. Place contaminated linens in leak-proof bags and limit handling to prevent skin and mucous membrane exposure.
9. Use needleless devices or special needle safety devices whenever possible to reduce the risk of needle sticks and sharps injuries to health care workers.
10. Discard all sharp instruments and needles in a puncture-resistant container; dispose of needles uncapped or engage the safety mechanism on the needle if available.
11. Clean spills of blood or body fluids with a solution of bleach and water (diluted 1:10) or agency-approved disinfectant.

Handle all blood and body fluids from all clients as if they were contaminated.

IV. Transmission-Based Precautions

A. Transmission-based precautions include airborne, droplet, and contact precautions.

B. Airborne precautions
1. Diseases
   a. Measles
   b. Chickenpox (varicella)
   c. Disseminated varicella zoster
   d. Pulmonary or laryngeal tuberculosis

TABLE 16-2 Steps for Donning and Removing Personal Protective Equipment (PPE)

Donning of PPE	Removal of PPE*
Gown Fully cover front of body from neck to knees and upper arms to end of wrist Fasten in the back at neck and waist, wrap around the back	**Gloves** Grasp outside of glove with opposite hand with glove still on and peel off Hold on to removed glove in gloved hand Slide fingers of ungloved hand under clean side of remaining glove at wrist and peel off
Mask or Respirator Secure ties or elastic band at neck and middle of head Fit snug to face and below chin Fit to nose bridge Respirator fit should be checked per agency policy	**Goggles/Face Shield** Remove by touching clean band or inner part
Goggles/Face Shield Adjust to fit according to agency policy	**Gown** Unfasten at neck, then at waist Remove using a peeling motion, pulling gown from each shoulder toward the hands Allow gown to fall forward, and roll into a bundle to discard
Gloves Select appropriate size and extend to cover wrists of gown	**Mask or Respirator** Grasp bottom ties then top ties to remove

*Note: All equipment is considered contaminated on the outside.

2. Barrier protection
   a. Single room is maintained under negative pressure; door remains closed except upon entering and exiting.
   b. Negative airflow pressure is used in the room, with a minimum of 6 to 12 air exchanges per hour via high-efficiency particulate air (HEPA) filtration mask or according to agency protocol.
   c. Ultraviolet germicide irradiation or HEPA filter is used in the room.
   d. Health care workers wear a respiratory mask (N95 or higher level). A surgical mask is placed on the client when the client needs to leave the room; the client leaves the room only if necessary.

C. Droplet precautions
1. Diseases
   a. Adenovirus
   b. Diphtheria (pharyngeal)
   c. Epiglottitis
   d. Influenza (flu)
   e. Meningitis
   f. Mumps
   g. Mycoplasmal pneumonia or meningococcal pneumonia

h. Parvovirus B19
i. Pertussis
j. Pneumonia
k. Rubella
l. Scarlet fever
m. Sepsis
n. Streptococcal pharyngitis

2. Barrier protection
   a. Private room or cohort client (a client whose body cultures contain the same organism)
   b. Wear a surgical mask when within 3 feet of a client.
   c. Place a mask on the client when the client needs to leave the room.

D. Contact precautions
1. Diseases
   a. Colonization or infection with a multidrug-resistant organism
   b. Enteric infections, such as Clostridium difficile
   c. Respiratory infections, such as respiratory syncytial virus
   d. Influenza: Infection can occur by touching something with flu viruses on it and then touching the mouth or nose.
   e. Wound infections
   f. Skin infections, such as cutaneous diphtheria, herpes simplex, impetigo, pediculosis, scabies, staphylococci, and varicella zoster
   g. Eye infections, such as conjunctivitis
   h. Indirect contact transmission may occur when contaminated object or instrument, or hands, are encountered.
2. Barrier protection
   a. Private room or cohort client
   b. Use gloves and a gown whenever entering the client's room.

V. Emergency Response Plan and Disasters

A. Know the emergency response plan of the agency.
B. Internal disasters are those that occur within the health care facility.
C. External disasters occur in the community, and victims are brought to the health care facility for care.
D. When the health care facility is notified of a disaster, the nurse should follow the guidelines specified in the emergency response plan of the facility.
E. See Chapter 7 for additional information on disaster planning.

! In the event of a disaster, the emergency response plan is activated immediately.

VI. Biological Warfare Agents

A. A warfare agent is a biological or chemical substance that can cause mass destruction or fatality.
B. Anthrax (Fig. 16-1)

FIGURE 16-1 Anthrax. (From Swartz, 2010.)

1. The disease is caused by Bacillus anthracis and can be contracted through the digestive system, abrasions in the skin, or inhalation through the lungs.
2. Anthrax is transmitted by direct contact with bacteria and spores; spores are dormant encapsulated bacteria that become active when they enter a living host (no person-to-person spread) (Box 16-5).
3. The infection is carried to the lymph nodes and then spreads to the rest of the body by way of the blood and lymph; high levels of toxins lead to shock and death.
4. In the lungs, anthrax can cause buildup of fluid, tissue decay, and death (fatal if untreated).
5. A blood test is available to detect anthrax (detects and amplifies Bacillus anthracis DNA if present in the blood sample).
6. Anthrax is usually treated with antibiotics such as ciprofloxacin, doxycycline, or penicillin.
7. The vaccine for anthrax has limited availability.

BOX 16-5 Anthrax: Transmission and Symptoms

Skin

Spores enter the skin through cuts and abrasions and are contracted by handling contaminated animal skin products.
Infection starts with an itchy bump like a mosquito bite that progresses to a small liquid-filled sac.
The sac becomes a painless ulcer with an area of black, dead tissue in the middle.
Toxins destroy surrounding tissue.

Gastrointestinal

Infection occurs following the ingestion of contaminated undercooked meat.
Symptoms begin with nausea, loss of appetite, and vomiting.
The disease progresses to severe abdominal pain, vomiting of blood, and severe diarrhea.

Inhalation

Infection is caused by the inhalation of bacterial spores, which multiply in the alveoli.
The disease begins with the same symptoms as the flu, including fever, muscle aches, and fatigue.
Symptoms suddenly become more severe with the development of breathing problems and shock.
Toxins cause hemorrhage and destruction of lung tissue.

FIGURE 16-2 Smallpox. (Courtesy Centers for Disease Control and Prevention [CDC]: Evaluating patients for smallpox. Atlanta, 2002, CDC.)

C. Smallpox (Fig. 16-2)
   1. Smallpox is transmitted in air droplets and by handling contaminated materials and is highly contagious.
   2. Symptoms begin 7 to 17 days after exposure and include fever, back pain, vomiting, malaise, and headache.
   3. Papules develop 2 days after symptoms develop and progress to pustular vesicles that are abundant on the face and extremities initially.
   4. A vaccine is available to those at risk for exposure to smallpox.

D. Botulism
   1. Botulism is a serious paralytic illness caused by a nerve toxin produced by the bacterium Clostridium botulinum (death can occur within 24 hours).
   2. Its spores are found in the soil and can spread through the air or food (improperly canned food) or via a contaminated wound.
   3. Botulism cannot be spread from person to person.
   4. Symptoms include abdominal cramps, diarrhea, nausea and vomiting, double vision, blurred vision, drooping eyelids, difficulty swallowing or speaking, dry mouth, and muscle weakness.
   5. Neurological symptoms begin 12 to 36 hours after ingestion of food-borne botulism and 24 to 72 hours after inhalation and can progress to paralysis of the arms, legs, trunk, or respiratory muscles (mechanical ventilation is necessary).
   6. If diagnosed early, food-borne and wound botulism can be treated with an antitoxin that blocks the action of toxin circulating in the blood.
   7. Other treatments include induction of vomiting, enemas, and penicillin.
   8. No vaccine is available.

E. Plague
   1. Plague is caused by Yersinia pestis, a bacteria found in rodents and fleas.
   2. Plague is contracted by being bitten by a rodent or flea that is carrying the plague bacterium, by the ingestion of contaminated meat, or by handling an animal infected with the bacteria.
   3. Transmission is by direct person-to-person spread.
   4. Forms include bubonic (most common), pneumonic, and septicemic (most deadly).
   5. Symptoms usually begin within 1 to 3 days and include fever, chest pain, lymph node swelling, and a productive cough (hemoptysis).
   6. The disease rapidly progresses to dyspnea, stridor, and cyanosis; death occurs from respiratory failure, shock, and bleeding.
   7. Antibiotics are effective only if administered immediately; the usual medications of choice include streptomycin or gentamicin.
   8. A vaccine is available.

F. Tularemia
   1. Tularemia (also called deer fly fever or rabbit fever) is an infectious disease of animals caused by the bacillus Francisella tularensis.
   2. The disease is transmitted by ticks, deer flies, or contact with an infected animal.
   3. Symptoms include fever, headache, and an ulcerated skin lesion with localized lymph node enlargement, eye infections, gastrointestinal ulcerations, or pneumonia.
   4. Treatment is with antibiotics.
   5. Recovery produces lifelong immunity (a vaccine is available).

G. Hemorrhagic fever
   1. Hemorrhagic fever is caused by several viruses, including Marburg, Lassa, Junin, and Ebola.
   2. The virus is carried by rodents and mosquitoes.
   3. The disease can be transmitted directly by person-to-person spread via body fluids.
   4. Symptoms include fever, headache, malaise, conjunctivitis, nausea, vomiting, hypotension, hemorrhage of tissues and organs, and organ failure.
   5. No known specific treatment is available; treatment is symptomatic.

H. Ebola Virus Disease (EVD)
   1. Previously known as Ebola hemorrhagic fever
   2. Caused by infection with a virus of the family Filoviridae, genus Ebolavirus
   3. First discovered in 1976 in the Democratic Republic of the Congo. Outbreaks have appeared in Africa.
   4. The natural reservoir host of Ebolavirus remains unknown. It is believed that the virus is animal-borne and that bats are the most likely reservoir.
   5. Spread of the virus is through contact with objects (such as clothes, bedding, needles, syringes/sharps, or medical equipment) that have been contaminated with the virus.
   6. Symptoms similar to hemorrhagic fever may appear from 2 to 21 days after exposure.
   7. Assessment: Ask the client if he or she traveled to an area with EVD such as Guinea, Liberia, or Sierra Leone within the last 21 days or if he or she has had contact with someone with EVD and had any of the following symptoms:

a. Fever at home or a current temperature of 38 °C (100.4 °F) or greater
b. Severe headache
c. Muscle pain
d. Weakness
e. Fatigue
f. Diarrhea
g. Vomiting
h. Abdominal pain
i. Unexplained bleeding or bruising

8. Interventions
   a. If the assessment indicates possible infection with EVD, the client needs to be isolated in a private room with a private bathroom or a covered bedside commode with the door closed.
   b. Health care workers need to wear the proper PPE and follow updated procedures designated by the Centers for Disease Control and Prevention for donning (putting on) and doffing (removing) PPE. Refer to the following Web site for updated information: http://www.cdc.gov/vhf/ebola/healthcare-us/ppe/guidance.html
   c. The number of health care workers entering the room should be limited and a log of everyone who enters and leaves the room should be kept.
   d. Only necessary tests and procedures should be performed, and aerosol-generating procedures should be avoided.
   e. Refer to the CDC guidelines for cleaning, disinfecting, and managing waste (www.cdc.gov/vhf/ebola/healthcare-us/cleaning/hospitals.html).
   f. The agency's infection control program should be notified, and state and local public health authorities should be notified. A list of the state and local health department numbers is available at www.cdc.gov/vhf/ebola/outbreaks/state-local-health-department-contacts.html

Anthrax is transmitted by direct contact with bacteria and spores and can be contracted through the digestive system, abrasions in the skin, or inhalation through the lungs.

VII. Chemical Warfare Agents

A. Sarin
   1. Sarin is a highly toxic nerve gas that can cause death within minutes of exposure.
   2. It enters the body through the eyes and skin and acts by paralyzing the respiratory muscles.

B. Phosgene is a colorless gas normally used in chemical manufacturing that if inhaled at high concentrations for a long enough period will lead to severe respiratory distress, pulmonary edema, and death.

C. Mustard gas is yellow to brown and has a garliclike odor that irritates the eyes and causes skin burns and blisters.

D. Ionizing radiation
   1. Acute radiation exposure develops after a substantial exposure to radiation.
   2. Exposure can occur from external radiation or internal absorption.
   3. Symptoms depend on the amount of exposure to the radiation and range from nausea and vomiting, diarrhea, fever, electrolyte imbalances, and neurological and cardiovascular impairment to leukopenia, purpura, hemorrhage, and death.

VIII. Nurse's Role in Exposure to Warfare Agents

A. Be aware that, initially, a bioterrorism attack may resemble a naturally occurring outbreak of an infectious disease.

B. Nurses and other health care workers must be prepared to assess and determine what type of event occurred, the number of clients who may be affected, and how and when clients will be expected to arrive at the health care agency.

C. It is essential to determine any changes in the microorganism that may increase its virulence or make it resistant to conventional antibiotics or vaccines.

D. See Chapter 7 for additional information on disasters and emergency response planning.

CRITICAL THINKING What Should You Do?

Answer: Many facilities implement a "no restraint policy," which requires health care workers to implement other safety strategies for clients who pose a risk for falls. These strategies include orienting the client and family to the surroundings; explaining all procedures and treatments to the client and family; encouraging family and friends to stay with the client as appropriate and using sitters for clients who need supervision; assigning confused and disoriented clients to rooms near the nurses' station; providing appropriate visual and auditory stimuli to the client, such as a night light, clocks, calendars, television, and a radio; maintaining toileting routines; eliminating bothersome treatments, such as tube feedings, as soon as possible; evaluating all medications that the client is receiving; using relaxation techniques with the client; and instituting exercise and ambulation schedules as the client's condition allows. Some agencies are instituting certain policies, such as hourly rounding, to ensure client safety. With hourly rounding, nurses and unlicensed assistive personnel are required to check the client to address the 5 Ps—problem, pain, positioning, potty, and possessions—every hour. This helps to eliminate the need to call for assistance and ensures that the client's basic needs are being met in a timely manner.

Reference: Perry, Potter, Ostendorf (2014), pp. 304, 307.

PRACTICE QUESTIONS

142. The nurse is preparing to initiate an intravenous (IV) line containing a high dose of potassium chloride and plans to use an IV infusion pump. The nurse brings the pump to the bedside, prepares to plug the pump cord into the wall, and notes that no receptacle is available in the wall socket. The nurse should take which action?
1. Initiate the IV line without the use of a pump.
2. Contact the electrical maintenance department for assistance.
3. Plug in the pump cord in the available plug above the room sink.
4. Use an extension cord from the nurses' lounge for the pump plug.

143. The nurse obtains a prescription from a health care provider to restrain a client and instructs an unlicensed assistive personnel (UAP) to apply the safety device to the client. Which observation of unsafe application of the safety device would indicate that further instruction is required by the UAP?
1. Placing a safety knot in the safety device straps
2. Safely securing the safety device straps to the side rails
3. Applying safety device straps that do not tighten when force is applied against them
4. Securing so that 2 fingers can slide easily between the safety device and the client's skin

144. The community health nurse is providing a teaching session about anthrax to members of the community and asks the participants about the methods of transmission. Which answers by the participants would indicate that teaching was effective? Select all that apply.
- ❑ 1. Bites from ticks or deer flies
- ❑ 2. Inhalation of bacterial spores
- ❑ 3. Through a cut or abrasion in the skin
- ❑ 4. Direct contact with an infected individual
- ❑ 5. Sexual contact with an infected individual
- ❑ 6. Ingestion of contaminated undercooked meat

145. The nurse is giving a report to an unlicensed assistive personnel (UAP) who will be caring for a client who has hand restraints (safety devices). The nurse instructs the UAP to check the skin integrity of the restrained hands how frequently?
1. Every 2 hours
2. Every 3 hours
3. Every 4 hours
4. Every 30 minutes

146. The nurse is reviewing a plan of care for a client with an internal radiation implant. Which intervention, if noted in the plan, indicates the need for revision of the plan?
1. Wearing gloves when emptying the client's bedpan
2. Keeping all linens in the room until the implant is removed
3. Wearing a lead apron when providing direct care to the client
4. Placing the client in a semiprivate room at the end of the hallway

147. Contact precautions are initiated for a client with a health care–associated (nosocomial) infection caused by methicillin-resistant Staphylococcus aureus. The nurse prepares to provide colostomy care and should obtain which protective items to perform this procedure?
1. Gloves and gown
2. Gloves and goggles
3. Gloves, gown, and shoe protectors
4. Gloves, gown, goggles, and a mask or face shield

148. The nurse enters a client's room and finds that the wastebasket is on fire. The nurse immediately assists the client out of the room. What is the next nursing action?
1. Call for help.
2. Extinguish the fire.
3. Activate the fire alarm.
4. Confine the fire by closing the room door.

149. A mother calls a neighbor who is a nurse and tells the nurse that her 3-year-old child has just ingested liquid furniture polish. The nurse would direct the mother to take which immediate action?
1. Induce vomiting.
2. Call an ambulance.
3. Call the Poison Control Center.
4. Bring the child to the emergency department.

150. The emergency department (ED) nurse receives a telephone call and is informed that a tornado has hit a local residential area and that numerous casualties have occurred. The victims will be brought to the ED. The nurse should take which initial action?
1. Prepare the triage rooms.
2. Activate the emergency response plan.
3. Obtain additional supplies from the central supply department.
4. Obtain additional nursing staff to assist in treating the casualties.

151. The nurse is caring for a client with meningitis and implements which transmission-based precautions for this client?
1. Private room or cohort client
2. Personal respiratory protection device
3. Private room with negative airflow pressure
4. Mask worn by staff when the client needs to leave the room

152. The nurse working in the emergency department (ED) is assessing a client who recently returned from Liberia and presented complaining of a fever at home, fatigue, muscle pain, and abdominal pain. Which action should the nurse take next?
1. Check the client's temperature.
2. Contact the health care provider.
3. Isolate the client in a private room.
4. Check a complete set of vital signs.

ANSWERS

142. 2
Rationale: Electrical equipment must be maintained in good working order and should be grounded; otherwise, it presents a physical hazard. An IV line that contains a dose of potassium chloride should be administered by an infusion pump. The nurse needs to use hospital resources for assistance. A regular extension cord should not be used because it poses a risk for fire. Use of electrical appliances near a sink also presents a hazard.
Test-Taking Strategy: Note the subject, electrical safety. Recalling safety issues will direct you to the correct option. Contacting the maintenance department is the only correct option since the other options are not considered safe practice when implementing electrical actions. In addition, since potassium chloride is in the IV solution, a pump must be used.
Review: Electrical safety
Level of Cognitive Ability: Applying
Client Needs: Safe and Effective Care Environment
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Safety
Priority Concepts: Clinical Judgment; Safety
Reference: Perry, Potter, Ostendorf (2014), p. 314.

143. 2
Rationale: The safety device straps are secured to the bed frame and never to the side rails to avoid accidental injury in the event that the side rails are released. A half-bow or safety knot or device with a quick release buckle should be used to apply a safety device because it does not tighten when force is applied against it and it allows quick and easy removal of the safety device in case of an emergency. The safety device should be secure, and 1 or 2 fingers should slide easily between the safety device and the client's skin.
Test-Taking Strategy: Focus on the subject, the unsafe intervention. Also note the strategic words, further instruction is required. These words indicate a negative event query and the need to select the incorrect option. Read each option carefully. The words securing the safety device straps to the side rails in option 2 should direct your attention to this as an incorrect and unsafe action.
Review: Safety device application
Level of Cognitive Ability: Evaluating
Client Needs: Safe and Effective Care Environment
Integrated Process: Teaching and Learning
Content Area: Fundamentals of Care—Safety
Priority Concepts: Health Care Quality; Safety
Reference: Perry, Potter, Ostendorf (2014), p. 310.

144. 2, 3, 6
Rationale: Anthrax is caused by Bacillus anthracis and can be contracted through the digestive system or abrasions in the skin, or inhaled through the lungs. It cannot be spread from person to person, and it is not contracted via bites from ticks or deer flies.
Test-Taking Strategy: Focus on the subject, routes of transmission of anthrax. Knowledge regarding the methods of contracting anthrax is needed to answer this question. Remember that it is not spread by person-to-person contact or contracted via tick or deer fly bites.
Review: Anthrax
Level of Cognitive Ability: Evaluating
Client Needs: Safe and Effective Care Environment
Integrated Process: Teaching and Learning
Content Area: Fundamentals of Care—Infection Control
Priority Concepts: Client Teaching; Infection
Reference: Ignatavicius, Workman (2016), p. 411.

145. 4
Rationale: The nurse should instruct the UAP to check safety devices and skin integrity every 30 minutes. The neurovascular and circulatory status of the extremity should also be checked every 30 minutes. In addition, the safety device should be removed at least every 2 hours to permit muscle exercise and to promote circulation. Agency guidelines regarding the use of safety devices should always be followed.
Test-Taking Strategy: Focus on the subject, checking skin integrity of a client with safety devices. In this situation, selecting the option that identifies the most frequent time frame is best.
Review: Safety device guidelines
Level of Cognitive Ability: Applying
Client Needs: Safe and Effective Care Environment
Integrated Process: Teaching and Learning
Content Area: Leadership/Management—Delegating
Priority Concepts: Health Care Quality; Safety
Reference: Perry, Potter, Ostendorf (2014), p. 311.

146. 4
Rationale: A private room with a private bath is essential if a client has an internal radiation implant. This is necessary to prevent accidental exposure of other clients to radiation. The remaining options identify accurate interventions for a client with an internal radiation implant and protect the nurse from exposure.
Test-Taking Strategy: Note the strategic words, indicates the need for revision. These words indicate a negative event query

and the need to select the incorrect nursing intervention. Remember that the client with an internal radiation implant needs to be placed in a private room.
Review: Radiation safety principles
Level of Cognitive Ability: Applying
Client Needs: Safe and Effective Care Environment
Integrated Process: Nursing Process—Planning
Content Area: Fundamentals of Care—Safety
Priority Concepts: Health Care Quality; Safety
Reference: Ignatavicius, Workman (2016), p. 376.

147. 4
Rationale: Splashes of body secretions can occur when providing colostomy care. Goggles and a mask or face shield are worn to protect the face and mucous membranes of the eyes during interventions that may produce splashes of blood, body fluids, secretions, or excretions. In addition, contact precautions require the use of gloves, and a gown should be worn if direct client contact is anticipated. Shoe protectors are not necessary.
Test-Taking Strategy: Focus on the subject, protective items needed to perform colostomy care. Also, note the words contact precautions. Visualize care for this client to determine the necessary items required for self-protection. This will direct you to the correct option.
Review: Transmission-based precautions
Level of Cognitive Ability: Applying
Client Needs: Safe and Effective Care Environment
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Infection Control
Priority Concepts: Clinical Judgment; Safety
Reference: Ignatavicius, Workman (2016), pp. 403-404, 453.

148. 3
Rationale: The order of priority in the event of a fire is to rescue the clients who are in immediate danger. The next step is to activate the fire alarm. The fire then is confined by closing all doors and, finally, the fire is extinguished.
Test-Taking Strategy: Note the strategic word, next. Remember the mnemonic RACE to prioritize in the event of a fire. R is rescue clients in immediate danger, A is alarm (sound the alarm), C is confine the fire by closing all doors, and E is extinguish or evacuate.
Review: Fire safety
Level of Cognitive Ability: Applying
Client Needs: Safe and Effective Care Environment
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Safety
Priority Concepts: Clinical Judgment; Safety
Reference: Perry, Potter, Ostendorf (2014), pp. 313-314.

149. 3
Rationale: If a poisoning occurs, the Poison Control Center should be contacted immediately. Vomiting should not be induced if the victim is unconscious or if the substance ingested is a strong corrosive or petroleum product. Bringing the child to the emergency department or calling an ambulance would not be the initial action because this would delay treatment. The Poison Control Center may advise the mother to bring the child to the emergency department; if this is the case, the mother should call an ambulance.
Test-Taking Strategy: Note the strategic word, immediate. Calling the Poison Control Center is the first action since it will direct the mother on the next step to take based on the type of poisoning. The other options are unsafe or could cause a delay in treatment.
Review: Poison control measures
Level of Cognitive Ability: Applying
Client Needs: Safe and Effective Care Environment
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Safety
Priority Concepts: Clinical Judgment; Safety
Reference: Hockenberry, Wilson (2015), pp. 545, 548.

150. 2
Rationale: In an external disaster (a disaster that occurs outside of the institution or agency), many victims may be brought to the ED for treatment. The initial nursing action must be to activate the emergency response plan. Once the emergency response plan is activated, the actions in the other options will occur.
Test-Taking Strategy: Note the strategic word, initial, and determine the priority action. Note that the correct option is the umbrella option. The emergency response plan includes all of the other options.
Review: Disaster preparedness
Level of Cognitive Ability: Applying
Client Needs: Safe and Effective Care Environment
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Safety
Priority Concepts: Clinical Judgment; Safety
Reference: Ignatavicius, Workman (2016), pp. 140-143.

151. 1
Rationale: Meningitis is transmitted by droplet infection. Precautions for this disease include a private room or cohort client and use of a standard precaution mask. Private negative airflow pressure rooms and personal respiratory protection devices are required for clients with airborne disease such as tuberculosis. When appropriate, a mask must be worn by the client and not the staff when the client leaves the room.
Test-Taking Strategy: Focus on the subject, the correct precaution needs for a client with meningitis. Recalling that meningitis is transmitted by droplets will direct you to the correct option.
Review: Transmission-based precautions
Level of Cognitive Ability: Applying
Client Needs: Safe and Effective Care Environment
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Infection Control
Priority Concepts: Infection; Safety
Reference: Ignatavicius, Workman (2016), pp. 403-404.

152. 3
Rationale: The nurse should suspect the potential for Ebola virus disease (EVD) because of the client's recent travel to Liberia. The nurse needs to consider the symptoms that the client is reporting, and clients who meet the exposure criteria should be

isolated in a private room before other treatment measures are taken. Exposure criteria include a fever reported at home or in the ED of 38.0 °C (100.4 °F) or headache, fatigue, weakness, muscle pain, vomiting, diarrhea, abdominal pain, or signs of bleeding. This client is reporting a fever and is showing other signs of EVD, and therefore should be isolated. After isolating the client, it would be acceptable to then collect further data and notify the health care provider and other state and local authorities of the client's signs and symptoms.

Test-Taking Strategy: Note the strategic word, next. This indicates that some or all of the other options may be partially or totally correct, but the nurse needs to prioritize. Eliminate options 1 and 4 first because they are comparable or alike. Next note that the client recently traveled to Liberia. Recall that isolation to prevent transmission of an infection is the immediate priority in the care of a client with suspected EVD. Review: Care of the client with Ebola virus disease.

Level of Cognitive Ability: Analyzing
Client Needs: Safe and Effective Care Environment
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Safety
Priority Concepts: Clinical Judgment; Safety
Reference: Lewis et al. (2014), p. 228.
www.cdc.gov/vhf/ebola/healthcare-us/emergency-services/emergency-departments.html

CHAPTER 17

Calculation of Medication and Intravenous Prescriptions

PRIORITY CONCEPTS Clinical Judgment, Safety

CRITICAL THINKING What Should You Do?

The nurse is preparing to administer 30 milliliters (mL) of a liquid medication to an assigned client. What should the nurse do when preparing this medication?
Answer located on p. 209.

I. Medication Administration (Box 17-1)

II. Medication Measurement Systems

A. Metric system (Box 17-2)
   1. The basic units of metric measures are the meter, liter, and gram.
   2. Meter measures length; liter measures volume; gram measures mass.

B. Apothecary and household systems
   1. The apothecary and household systems are the oldest of the medication measurement systems.
   2. Apothecary measures such as grain, dram, minim, and ounce are not commonly used in the clinical setting.
   3. Commonly used household measures include drop, teaspoon, tablespoon, ounce, pint, and cup.

The NCLEX® will not present questions that require you to convert from the apothecary system of measurement to the metric system; however, this system is still important to know because, although it is not common, you may encounter it in the clinical setting.

C. Additional common medication measures
   1. Milliequivalent
      a. Milliequivalent is abbreviated mEq.
      b. The milliequivalent is an expression of the number of grams of a medication contained in 1 mL of a solution.
      c. For example, the measure of serum potassium is given in milliequivalents.
   2. Unit
      a. Unit measures a medication in terms of its action, not its physical weight.
      b. For example, penicillin, heparin sodium, and insulin are measured in units.

III. Conversions

A. Conversion between metric units (Box 17-3)
   1. The metric system is a decimal system; therefore, conversions between the units in this system can be done by dividing or multiplying by 1000 or by moving the decimal point 3 places to the right or 3 places to the left.
   2. In the metric system, to convert larger to smaller, multiply by 1000 or move the decimal point 3 places to the right.
   3. In the metric system, to convert smaller to larger, divide by 1000 or move the decimal point 3 places to the left.

B. Conversion between household and metric systems
   1. Household and metric measures are equivalent and not equal measures.
   2. Conversion to equivalent measures between systems is necessary when a medication prescription is written in one system but the medication label is stated in another.
   3. Medications are not always prescribed and prepared in the same system of measurement; therefore, conversion of units from one system to another is necessary. However, the metric system is the most commonly used system in the clinical setting.
   4. Calculating equivalents between 2 systems may be done by using the method of ratio and proportion (Boxes 17-4 and 17-5).

Conversion is the first step in the calculation of dosages.

BOX 17-1 Medication Administration

Assess the medication prescription.
Compare the client's medication prescription with all medications that the client was previously taking (medication reconciliation).
Ask the client about a history of allergies.
Assess the client's current condition and the purpose for the medication or intravenous (IV) solution.
Determine the client's understanding of the purpose of the prescribed medication or need for IV solution.
Teach the client about the medication and about self-administration at home.
Identify and address concerns (social, cultural, religious) that the client may have about taking the medication.
Assess the need for conversion when preparing a dose of medication for administration to the client.
Assess the 6 rights of medication administration: right medication, right dose, right client, right route, right time, and right documentation.
Assess the vital signs, check significant laboratory results, and identify any potential interactions (food or medication interactions) before administering medication, when appropriate.
Document the administration of the prescribed therapy and the client's response to the therapy.

BOX 17-2 Metric System

Abbreviations	Equivalents
meter: m	1 mcg ¼ 0.000001 g
liter: L	1 mg ¼ 1000 mcg or 0.001 g
milliliter: mL	1 g ¼ 1000 mg
kilogram: kg	1 kg ¼ 1000 g
gram: g	1 kg ¼ 2.2 lb
milligram: mg	1 mL ¼ 0.001 L
microgram: mcg	

BOX 17-3 Conversion Between Metric Units

Problem 1

Convert 2 g to milligrams.

Solution

Change a larger unit to a smaller unit:

2 g ¼ 2000 mg (moving decimal point 3 places to the right)

Problem 2

Convert 250 mL to liters.

Solution

Change a smaller unit to a larger unit:

250 mL ¼ 0.25 L (moving decimal point 3 places to the left)

BOX 17-4 Ratio and Proportion

Ratio: The relationship between 2 numbers, separated by a colon; for example, 1:2 (1 to 2).
Proportion: The relationship between 2 ratios, separated by a double colon (::) or an equal sign (¼).

Formula:

Hðon handÞ: VðvehicleÞ:: ð¼ÞðdesiredÞ doseÞ: XðunknownÞ

To solve a ratio and proportion problem: The middle numbers (means) are multiplied and the end numbers (extremes) are multiplied.

Sample Problem

H ¼ 1
V ¼ 2
Desired dose ¼ 3
X ¼ unknown
Set up the formula: 1 : 2 :: 3 : X
Solve: Multiply means and extremes:
1X ¼ 6
X ¼ 6

BOX 17-5 Calculating Equivalents Between Two Systems

Calculating equivalents between 2 systems may be done by using the method of ratio and proportion.

Problem

The health care provider prescribes nitroglycerin $\frac{1}{150}$ grain (gr).
The medication label reads 0.4 milligrams (mg) per tablet. The nurse prepares to administer how many tablets to the client?
If you knew that $\frac{1}{150}$ gr was equal to 0.4 mg, you would know that you need to administer 1 tablet. Otherwise, use the ratio and proportion formula.

Ratio and Proportion Formula

Hðon handÞ: VðvehicleÞ:: ð¼ÞðdesiredÞ doseÞ: XðunknownÞ

$$1\text{gr} : 60\text{ mg} :: \frac{1}{150}\text{ gr} : X\text{mg}$$

$$60\ \hat{A}\ \frac{1}{150} ¼ X$$

X ¼ 0:4 mgðl tabletÞ

IV. Medication Labels

A. A medication label always contains the generic name and may contain the trade name of the medication.

The NCLEX now only tests you on generic names of medications. Trade names will not be available for most medications, so be sure to learn medications by their generic names for the examination. However, you will likely still encounter the trade names in the clinical setting.

B. Always check expiration dates on medication labels.

BOX 17-6 Medication Prescriptions

Name of client
Date and time when prescription is written
Name of medication to be given
Dosage of medication
Medication route
Time and frequency of administration
Signature of person writing the prescription

V. Medication Prescriptions (Box 17-6)

A. In a medication prescription, the name of the medication is written first, followed by the dosage, route, and frequency (depending on the frequency of the prescription, times of administration are usually established by the health care agency and written in an agency policy).

B. Medication prescriptions need to be written using accepted abbreviations, acronyms, and symbols approved by The Joint Commission; also follow agency guidelines.

If the nurse has any questions about or sees inconsistencies in the written prescription, the nurse must contact the person who wrote the prescription immediately and must verify the prescription.

VI. Oral Medications

A. Scored tablets contain an indented mark to be used for possible breakage into partial doses; when necessary, scored tablets (those marked for division) can be divided into halves or quarters according to agency policy.

B. Enteric-coated tablets and sustained-released capsules delay absorption until the medication reaches the small intestine; these medications should not be crushed.

C. Capsules contain a powdered or oily medication in a gelatin cover.

D. Orally administered liquids are supplied in solution form and contain a specific amount of medication in a given amount of solution, as stated on the label.

E. The medicine cup
   1. The medicine cup has a capacity of 30 mL or 1 ounce (oz) and is used for orally administered liquids.
   2. The medicine cup is calibrated to measure teaspoons, tablespoons, and ounces.
   3. To pour accurately, place the medication cup on a level surface at eye level and then pour the liquid while reading the measuring markings.

F. Volumes of less than 5 mL are measured using a syringe with the needle removed.

A calibrated syringe is used for giving medicine to children.

VII. Parenteral Medications

A. Parenteral always means an injection route and parenteral medications are administered by intravenous (IV), intramuscular, subcutaneous, or intradermal injection (see Fig. 17-1 for angles of injection).

B. Parenteral medications are packaged in single-use ampules, in single- and multiple-use rubber-stoppered vials, and in premeasured syringes and cartridges.

C. The nurse should not administer more than 3 mL per intramuscular injection site (2 mL for the deltoid) or 1 mL per subcutaneous injection site; larger volumes are difficult for an injection site to absorb and, if prescribed, need to be verified. Variations for pediatric clients are discussed in the pediatric sections of this text.

D. The standard 3-mL syringe is used to measure most injectable medications and is calibrated in tenths (0.1) of a milliliter.

E. The syringe is filled by drawing in solution until the top ring on the plunger (i.e., the ring closest to the needle), not the middle section or the bottom ring of the plunger, is aligned with the desired calibration (Fig. 17-2).

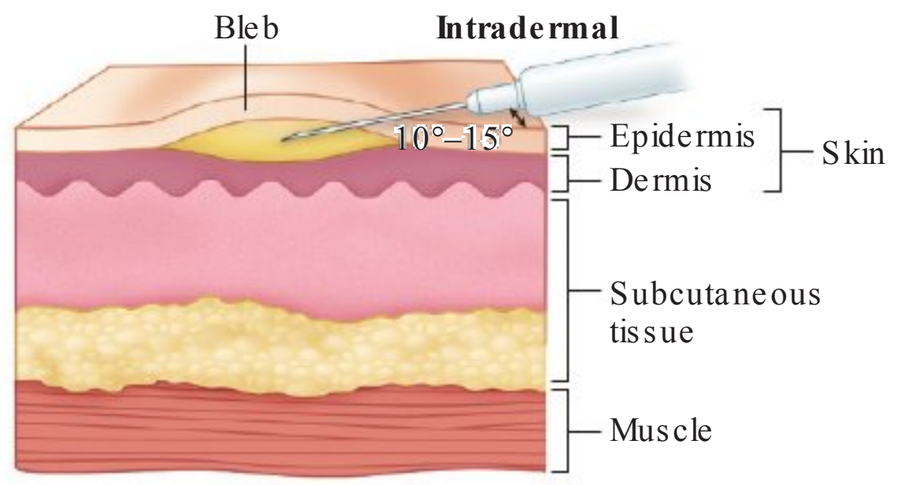


FIGURE 17-1 Angles of injection.

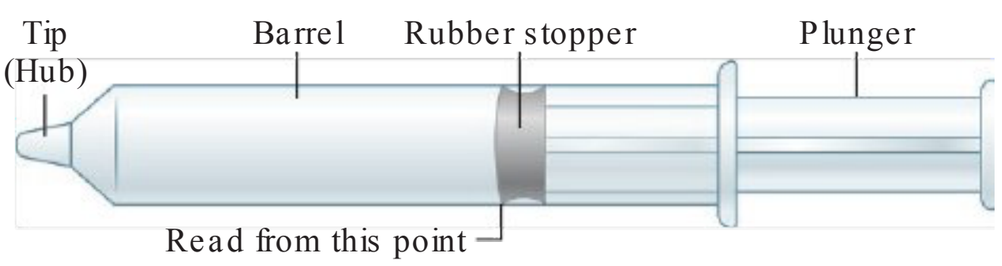


FIGURE 17-2 Parts of a syringe.

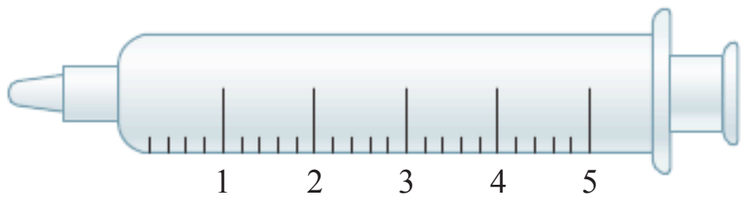


FIGURE 17-3 Five-milliliter syringe.

⚠ Always question and verify excessively large or small volumes of medication.

F. Prefilled medication cartridge
   1. The medication cartridge slips into the cartridge holder, which provides a plunger for injection of the medication.
   2. The cartridge is designed to provide sufficient capacity to allow for the addition of a second medication when combined dosages are prescribed.
   3. The prefilled medication cartridge is to be used once and discarded; if the nurse is to give less than the full single dose provided, the nurse needs to discard the extra amount before giving the client the injection, in accordance with agency policies and procedures.

G. In general, standard medication doses for adults are to be rounded to the nearest tenth (0.1 mL) of a milliliter and measured on the milliliter scale; for example, 1.28 mL is rounded to 1.3 mL (follow agency policy for rounding medication doses).

H. When volumes larger than 3 mL are required, the nurse may use a 5-mL syringe; these syringes are calibrated in fifths (0.2 mL) (Fig. 17-3).

I. Other syringe sizes may be available (10, 20, and 50 mL) and may be used for medication administration requiring dilution.

J. Tuberculin syringe (Fig. 17-4)
   1. The tuberculin syringe holds 1 mL and is used to measure small or critical amounts of medication, such as allergen extract, vaccine, or a child's medication.
   2. The syringe is calibrated in hundredths (0.01) of a milliliter, with each one tenth (0.1) marked on the metric scale.

K. Insulin syringe (Fig. 17-5)
   1. The standard 100-unit insulin syringe is calibrated for 100 units of insulin (100 units ¼ 1 mL); low-dose insulin syringes ($\frac{1}{2}$ - and $\frac{3}{10}$-mL sizes) may also be used when administering smaller insulin doses.
   2. Insulin should not be measured in any other type of syringe.

⚠ If the insulin prescription states to administer regular and NPH insulin, combine both types of insulin in the same syringe. Use the mnemonic RN: Draw Regular insulin into the insulin syringe first, and then draw the NPH insulin.

L. Safety needles contain shielding devices that are attached to the needle and slipped over the needle to reduce the incidence of needle-stick injuries.

VIII. Injectable Medications in Powder Form

A. Some medications become unstable when stored in solution form and are therefore packaged in powder form.

B. Powders must be dissolved with a sterile diluent before use; usually, sterile water or normal saline is used. The dissolving procedure is called reconstitution (Box 17-7).

IX. Calculating the Correct Dosage (see Box 17-8 for the standard formula)

A. When calculating dosages of oral medications, check the calculation and question the prescription if the calculation calls for more than 3 tablets.

BOX 17-7 Reconstitution

In reconstituting a medication, locate the instructions on the label or in the vial package insert, and read and follow the directions carefully.

Instructions will state the volume of diluent to be used and the resulting volume of the reconstituted medication.

Often, the powdered medication adds volume to the solution in addition to the amount of diluent added.

The total volume of the prepared solution will exceed the volume of the diluent added.

When reconstituting a multiple-dose vial, label the medication vial with the date and time of preparation, your initials, and the date of expiration.

Indicating the strength per volume on the medication label also is important.

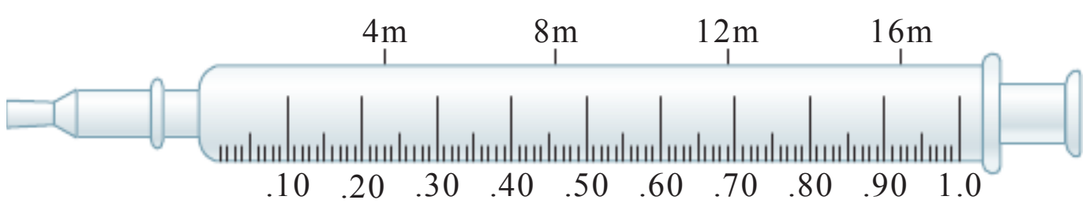


FIGURE 17-4 Tuberculin syringe.

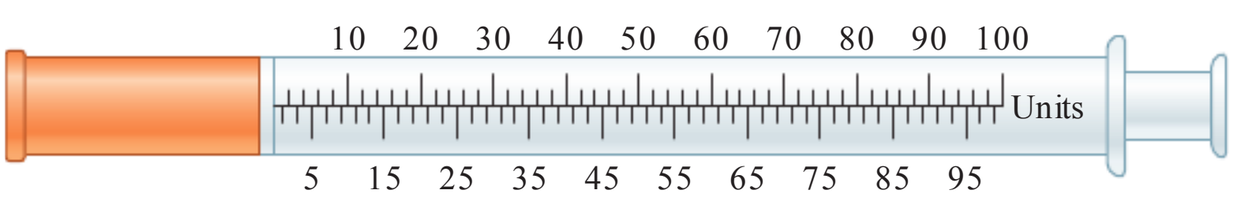


FIGURE 17-5 A 100-unit insulin syringe.

BOX 17-8 Standard Formula for Calculating a Medication Dosage

$$\frac{D}{A} \times Q = X$$

D (desired) is the dosage that the health care provider prescribed.
A (available) is the dosage strength as stated on the medication label.
Q (quantity) is the volume or form in which the dosage strength is available, such as tablets, capsules, or milliliters.

BOX 17-9 Formulas for Intravenous Calculations

Flow Rates

$$\frac{\text{Total volume} \times \text{Drop factor}}{\text{Time in minutes}} = \text{Drops per minute}$$

Infusion Time

$$\frac{\text{Total volume to infuse}}{\text{Milliliters per hour being infused}} = \text{Infusion time}$$

Number of Milliliters per Hour

$$\frac{\text{Total volume in milliliters}}{\text{Number of hours}} = \text{Number of milliliters per hour}$$

B. When calculating dosages of parenteral medications, check the calculation and question the prescription if the amount to be given is too large a dose.
C. Be sure that all measures are in the same system, and that all units are in the same size, converting when necessary; carefully consider what the reasonable amount of the medication that should be administered is.
D. Round standard injection doses to tenths and measure in a 3-mL syringe (follow agency policy).
E. Round small, critical amounts or children's doses to hundredths and measure in a 1-mL tuberculin syringe (follow agency policy).
F. In addition to using the standard formula (see Box 17-8), calculations can be done using dimensional analysis, a method that uses conversion factors to move from one unit of measurement to another; the required elements of the equation include the desired answer units, conversion formula that includes the desired answer units and the units that need to be converted, and the original factors to convert including quantity and units.

Regardless of the source or cause of a medication error, if the nurse gives an incorrect dose, the nurse is legally responsible for the action.

X. Percentage and Ratio Solutions

A. Percentage solutions
   1. Express the number of grams (g) of the medication per 100 mL of solution.
   2. For example, calcium gluconate 10% is 10 g of pure medication per 100 mL of solution.
B. Ratio solutions
   1. Express the number of grams of the medication per total milliliters of solution.
   2. For example, epinephrine 1:1000 is 1 g of pure medication per 1000 mL of solution.

XI. Intravenous Flow Rates (Box 17-9)

A. Monitor IV flow rate frequently even if the IV solution is being administered through an electronic infusion device (follow agency policy regarding frequency).
B. If an IV is running behind schedule, collaborate with the health care provider to determine the client's ability to tolerate an increased flow rate, particularly for older clients and those with cardiac, pulmonary, renal, or neurological conditions.

The nurse should never increase the rate of (i.e., speed up) an IV infusion to catch up if the infusion is running behind schedule.

C. Whenever a prescribed IV rate is increased, the nurse should assess the client for increased heart rate, increased respirations, and increased lung congestion, which could indicate fluid overload.
D. Intravenously administered fluids are prescribed most frequently based on milliliters per hour to be administered.
E. The volume per hour prescribed is administered by setting the flow rate, which is counted in drops per minute.
F. Most flow rate calculations involve changing milliliters per hour to drops per minute.
G. Intravenous tubing
   1. IV tubing sets are calibrated in drops per milliliter; this calibration is needed for calculating flow rates.
   2. A standard or macrodrip set is used for routine adult IV administrations; depending on the manufacturer and type of tubing, the set will require 10, 15, or 20 drops (gtt) to equal 1 mL.
   3. A minidrip or microdrip set is used when more exact measurements are needed, such as in intensive care units and pediatric units.
   4. In a minidrip or microdrip set, 60 gtt is usually equal to 1 mL.
   5. The calibration, in drops per milliliter, is written on the IV tubing package.

XII. Calculation of Infusions Prescribed by Unit Dosage per Hour

A. The most common medications that will be prescribed by unit dosage per hour and run by continuous infusion are heparin sodium and regular insulin.

BOX 17-10 Infusions Prescribed by Unit Dosage per Hour

Calculation of these problems can be done using a 2-step process.

1. Determine the amount of medication per 1 mL.
2. Determine the infusion rate or milliliters per hour.

Problem 1

Prescription: Continuous heparin sodium by IV at 1000 units per hour
Available: IV bag of 500 mL D_5W with 20,000 units of heparin sodium

How many milliliters per hour are required to administer the correct dose?

Solution

Step 1: Calculate the amount of medication (units) per milliliter (mL).

$$\frac{\text{Known amount of medication in solution}}{\text{Total volume of diluent}} \rightarrow \text{Amount of medication per milliliter}$$

$$\frac{20{,}000 \text{ units}}{500 \text{ mL}} \rightarrow 40 \text{ units} = 1 \text{ mL}$$

Step 2: Calculate milliliters per hour.

$$\frac{\text{Dose per hour desired}}{\text{Concentration per milliliter}} \rightarrow \text{Infusion rate, or mL/hour}$$

$$\frac{1000 \text{ units}}{40 \text{ units}} \rightarrow 25 \text{ mL/hour}$$

Problem 2

Prescription: Continuous regular insulin by IV at 10 units per hour
Available: IV bag of 100 mL NS with 50 units regular insulin

How many milliliters per hour are required to administer the correct dose?

Solution

Step 1: Calculate the amount of medication (units) per milliliter.

$$\frac{\text{Known amount of medication in solution}}{\text{Total volume of diluent}} \rightarrow \text{Amount of medication per milliliter}$$

$$\frac{50 \text{ units}}{100 \text{ mL}} \rightarrow 0.5 \text{ units} = 1 \text{ mL}$$

Step 2: Calculate milliliters per hour.

$$\frac{\text{Dose per hour desired}}{\text{Concentration per milliliter}} \rightarrow \text{Infusion rate, or mL/hour}$$

$$\frac{10 \text{ units}}{0.5 \text{ units/mL}} \rightarrow 20 \text{ mL/hour}$$

B. Calculation of these infusions can be done using a 2-step process (Box 17-10).
   1. Determine the amount of medication per 1 mL.
   2. Determine the infusion rate or milliliters per hour.

CRITICAL THINKING What Should You Do?

Answer: When preparing to administer a liquid medication, the nurse should use a medicine cup, pouring the liquid into it after placing it on a flat surface at eye level with the thumbnail at the medicine cup line indicating the desired amount. Liquids should not be mixed with tablets or with other liquids in the same container. The nurse should be sure not to return poured medication to its container and should properly discard poured medication if not used. The nurse should pour liquids from the side opposite the bottle's label to avoid spilling medicine on the label. Medications that irritate the gastric mucosa, such as potassium products, should be diluted or taken with meals. Ice chips should be offered before administering unpleasant-tasting medications in order to numb the client's taste buds.

Reference: Perry, Potter, Ostendorf (2014), pp. 486, 496-498.

PRACTICE QUESTIONS

153. A health care provider's prescription reads 1000 mL of normal saline (NS) to infuse over 12 hours. The drop factor is 15 drops (gtt)/1 mL. The nurse prepares to set the flow rate at how many drops per minute? Fill in the blank. Record your answer to the nearest whole number.
Answer: _____ drops per minute

154. A health care provider's prescription reads to administer an intravenous (IV) dose of 400,000 units of penicillin G benzathine. The label on the 10-mL ampule sent from the pharmacy reads penicillin G benzathine, 300,000 units/mL. The nurse prepares how much medication to administer the correct dose? Fill in the blank. Record your answer using 1 decimal place.
Answer: _____ mL

155. A health care provider's prescription reads potassium chloride 30 mEq to be added to 1000 mL normal saline (NS) and to be administered over a 10-hour period. The label on the medication bottle reads 40 mEq/20 mL. The nurse prepares

how many milliliters of potassium chloride to administer the correct dose of medication? Fill in the blank.
Answer: _____ mL

156. A health care provider's prescription reads clindamycin phosphate 0.3 g in 50 mL normal saline (NS) to be administered intravenously over 30 minutes. The medication label reads clindamycin phosphate 900 mg in 6 mL. The nurse prepares how many milliliters of the medication to administer the correct dose? Fill in the blank.
Answer: _____ mL

157. A health care provider's prescription reads phenytoin 0.2 g orally twice daily. The medication label states that each capsule is 100 mg. The nurse prepares how many capsule(s) to administer 1 dose? Fill in the blank.
Answer: _____ capsule(s)

158. A health care provider prescribes 1000 mL of normal saline 0.9% to infuse over 8 hours. The drop factor is 15 drops (gtt)/1 mL. The nurse sets the flow rate at how many drops per minute? Fill in the blank. Record your answer to the nearest whole number.
Answer: _____ drops per minute

159. A health care provider prescribes heparin sodium, 1300 units/hour by continuous intravenous (IV) infusion. The pharmacy prepares the medication and delivers an IV bag labeled heparin sodium 20,000 units/250 mL D_5W. An infusion pump must be used to administer the medication. The nurse sets the infusion pump at how many milliliters per hour to deliver 1300 units/hour? Fill in the blank. Record your answer to the nearest whole number.
Answer: _____ mL per hour

160. A health care provider prescribes 3000 mL of D_5W to be administered over a 24-hour period. The nurse determines that how many milliliters per hour will be administered to the client? Fill in the blank.
Answer: _____ mL per hour

161. Gentamicin sulfate, 80 mg in 100 mL normal saline (NS), is to be administered over 30 minutes. The drop factor is 10 drops (gtt)/1 mL. The nurse sets the flow rate at how many drops per minute? Fill in the blank. Record your answer to the nearest whole number.
Answer: _____ drops per minute

162. A health care provider's prescription reads levothyroxine, 150 mcg orally daily. The medication label reads levothyroxine, 0.1 mg/tablet. The nurse administers how many tablet(s) to the client? Fill in the blank.
Answer: _____ tablet(s)

163. Cefuroxime sodium, 1 g in 50 mL normal saline (NS), is to be administered over 30 minutes. The drop factor is 15 drops (gtt)/1 mL. The nurse sets the flow rate at how many drops per minute? Fill in the blank.
Answer: _____ drops per minute

164. A health care provider prescribes 1000 mL D_5W to infuse at a rate of 125 mL/hour. The nurse determines that it will take how many hours for 1 L to infuse? Fill in the blank.
Answer: _____ hour(s)

165. A health care provider prescribes 1 unit of packed red blood cells to infuse over 4 hours. The unit of blood contains 250 mL. The drop factor is 10 drops (gtt)/1 mL. The nurse prepares to set the flow rate at how many drops per minute? Fill in the blank. Record your answer to the nearest whole number.
Answer: _____ drops per minute

166. A health care provider's prescription reads morphine sulfate, 8 mg stat. The medication ampule reads morphine sulfate, 10 mg/mL. The nurse prepares how many milliliters to administer the correct dose? Fill in the blank.
Answer: _____ mL

167. A health care provider prescribes regular insulin, 8 units/hour by continuous intravenous (IV) infusion. The pharmacy prepares the medication and then delivers an IV bag labeled 100 units of regular insulin in 100 mL normal saline (NS). An infusion pump must be used to administer the medication. The nurse sets the infusion pump at how many milliliters per hour to deliver 8 units/hour? Fill in the blank.
Answer: _____ mL/hour

ANSWERS: ALTERNATE ITEM FORMAT (FILL-IN-THE-BLANK)

❖ 153. 21

Rationale: Use the intravenous (IV) flow rate formula.
Formula:

$$\frac{\text{Total Volume} \times \text{Drop factor}}{\text{Time in minutes}} = \text{Drops per minute}$$

$$\frac{1000\ \text{mL} \times 15\ \text{gtt}}{720\ \text{minutes}} = \frac{15{,}000}{720} = 20{:}8, \text{ or } 21\ \text{gtt/min}$$

Test-Taking Strategy: Focus on the subject, IV flow rates. Use the formula for calculating IV flow rates when answering the question. Once you have performed the calculation, verify your answer using a calculator and make sure that the answer makes sense. Remember to round the answer to the nearest whole number.
Review: Intravenous infusion calculations
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Medications/IV Calculations
Priority Concepts: Clinical Judgment; Safety
Reference: Perry, Potter, Ostendorf (2014), pp. 710-711.

❖ 154. 1.3

Rationale: Use the medication dose formula.
Formula:

$$\frac{\text{Desired} \times \text{mL}}{\text{Available}} = \text{Milliliters per dose}$$

$$\frac{400{,}000\ \text{units} \times 1\ \text{mL}}{300{,}000\ \text{units}} = \text{Milliliters per dose}$$

$$\frac{400{,}000}{300{,}000} = 1{:}33 = 1{:}3\ \text{mL}$$

Test-Taking Strategy: Focus on the subject, a dosage calculation. Follow the formula for the calculation of the correct medication dose. Once you have performed the calculation, verify your answer using a calculator and make sure that the answer makes sense. Remember to record your answer using 1 decimal place.
Review: Medication calculations
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Medications/IV Calculations
Priority Concepts: Clinical Judgment; Safety
Reference: Perry, Potter, Ostendorf (2014), pp. 486-487.

❖ 155. 15

Rationale: In most facilities, potassium chloride is premixed in the intravenous solution and the nurse will need to verify the correct dose before administration. In some cases the nurse will need to add the potassium chloride and will use the medication calculation formula to determine the mL to be added.
Formula:

$$\frac{\text{Desired} \times \text{mL}}{\text{Available}} = \text{Milliliters per dose}$$

$$\frac{30\ \text{mEq} \times 20\ \text{mL}}{40\ \text{mEq}} = 15\ \text{mL}$$

Test-Taking Strategy: Focus on the subject, a dosage calculation. Follow the formula for the calculation of the correct medication dose. Once you have performed the calculation, verify your answer using a calculator and make sure that the answer makes sense.
Review: Medication calculations
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Fundamental of Care—Medications/IV Calculations
Priority Concepts: Clinical Judgment; Safety
Reference: Perry, Potter, Ostendorf (2014), pp. 486-487.

❖ 156. 2

Rationale: You must convert 0.3 g to milligrams. In the metric system, to convert larger to smaller, multiply by 1000 or move the decimal 3 places to the right. Therefore, 0.3 g = 300 mg. Following conversion from grams to milligrams, use the formula to calculate the correct dose.
Formula:

$$\frac{\text{Desired} \times \text{mL}}{\text{Available}} = \text{Milliliters per dose}$$

$$\frac{300\ \text{mg} \times 6\ \text{mL}}{900\ \text{mg}} = \frac{1800}{900} = 2\ \text{mL}$$

Test-Taking Strategy: Focus on the subject, a dosage calculation. In this medication calculation problem, first you must convert grams to milligrams. Once you have performed the calculation, verify your answer using a calculator and make sure that the answer makes sense.
Review: Medication calculations
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Medications/IV Calculations
Priority Concepts: Clinical Judgment; Safety
Reference: Perry, Potter, Ostendorf (2014), pp. 486-487.

❖ 157. 2

Rationale: You must convert 0.2 g to milligrams. In the metric system, to convert larger to smaller, multiply by 1000 or move the decimal point 3 places to the right. Therefore, 0.2 g equals 200 mg. After conversion from grams to milligrams, use the formula to calculate the correct dose.
Formula:

$$\frac{\text{Desired} \times \text{Capsule (s)}}{\text{Available}} = \text{Capsule(s) per dose}$$

$$\frac{200\ \text{mg} \times 1\ \text{Capsule}}{100\ \text{mg}} = 2\ \text{Capsules}$$

Test-Taking Strategy: Focus on the subject, a dosage calculation. In this medication calculation problem, first you must convert grams to milligrams. Once you have done the conversion and reread the medication calculation problem, you will know that 2 capsules is the correct answer. Recheck

your work using a calculator and make sure that the answer makes sense.
Review: Medication calculations
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Medications/IV Calculations
Priority Concepts: Clinical Judgment; Safety
Reference: Perry, Potter, Ostendorf (2014), pp. 486-487.

❖ 158. 31
Rationale: Use the intravenous (IV) flow rate formula.
Formula:

$$\frac{\text{Total volume Â Drop factor}}{\text{Time in Minutes}} \text{ ¼ Drop per minute}$$

$$\frac{1000\text{ mL Â 15 gtt}}{480\text{ minutes}} \text{ ¼ } \frac{15{,}000}{480} \text{ ¼ 31:2, or 31 gtt=min}$$

Test-Taking Strategy: Focus on the subject, an IV flow rate. Use the formula for calculating IV flow rates when answering the question. Once you have performed the calculation, verify your answer using a calculator and make sure that the answer makes sense. Remember to round the answer to the nearest whole number.
Review: Intravenous infusion calculations
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Medications/IV Calculations
Priority Concepts: Clinical Judgment; Safety
Reference: Perry, Potter, Ostendorf (2014), pp. 710-711.

❖ 159. 16
Rationale: Calculation of this problem can be done using a 2-step process. First, you need to determine the amount of heparin sodium in 1 mL. The next step is to determine the infusion rate, or milliliters per hour.
Step 1:

$$\frac{\text{Known amount of medication in solution}}{\text{Total volume of diluent}} \text{ ¼ Amount of medication per millimeter}$$

$$\frac{20{,}000\text{ units}}{250\text{ mL}} \text{ ¼ 80 units=mL}$$

Step 2:

$$\frac{\text{Dose per hour desired}}{\text{Concentration per millileter}} \text{ ¼ Infusion rate, or mL=hr}$$

$$\frac{1300\text{ units}}{80\text{ units=mL}} \text{ ¼ 16:25, or 16 mL=hr}$$

Test-Taking Strategy: Focus on the subject, an IV flow rate. Read the question carefully, noting that 2 steps can be used to solve this medication problem. Follow the formula, verify your answer using a calculator, and make sure that the answer makes sense. Remember to round the answer to the nearest whole number.
Review: Intravenous infusion calculations
Level of Cognitive Ability: Analyzing
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Medications/IV Calculations
Priority Concepts: Clinical Judgment; Safety
Reference: Perry, Potter, Ostendorf (2014), pp. 710-711.

❖ 160. 125
Rationale: Use the intravenous (IV) formula to determine milliliters per hour.
Formula:

$$\frac{\text{Total volume in milliliters}}{\text{Number of hours}} \text{ ¼ Milliliters per hour}$$

$$\frac{3000\text{ mL}}{24\text{ hours}} \text{ ¼ 125 mL=hr}$$

Test-Taking Strategy: Focus on the subject, an IV infusion calculation. Read the question carefully, noting that the question is asking about milliliters per hour to be administered to the client. Use the formula for calculating milliliters per hour. Once you have performed the calculation, verify your answer using a calculator and make sure that the answer makes sense.
Review: Intravenous infusion calculations
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Medications/IV Calculations
Priority Concepts: Clinical Judgment; Safety
Reference: Perry, Potter, Ostendorf (2014), pp. 710-711.

❖ 161. 33
Rationale: Use the intravenous (IV) flow rate formula.
Formula:

$$\frac{\text{Total volume Â Drop factor}}{\text{Time in minutes}} \text{ ¼ Drops per minute}$$

$$\frac{100\text{ mL Â 10 gtt}}{30\text{ minutes}} \text{ ¼ } \frac{1000}{30} \text{ ¼ 33:3, or 33 gtt=min}$$

Test-Taking Strategy: Focus on the subject, an IV infusion calculation. Use the formula for calculating IV flow rates when answering the question. Once you have performed the calculation, verify your answer using a calculator and make sure that the answer makes sense. Remember to round the answer to the nearest whole number.
Review: Intravenous infusion calculations
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Medications/IV Calculations
Priority Concepts: Clinical Judgment; Safety
Reference: Perry, Potter, Ostendorf (2014), pp. 710-711.

❖ 162. 1.5
Rationale: You must convert 150 mcg to milligrams. In the metric system, to convert smaller to larger, divide by 1000 or

move the decimal 3 places to the left. Therefore, 150 mcg equals 0.15 mg. Next, use the formula to calculate the correct dose.
Formula:

$$\frac{\text{Desired}}{\text{Available}} \times \text{Tablet} = \text{Tablets per dose}$$

$$\frac{0{:}15\ \text{mg}}{0{:}1\ \text{mg}} \times 1\ \text{tablet} = 1{:}5\ \text{tablets}$$

Test-Taking Strategy: Focus on the subject, a dosage calculation. In this medication calculation problem, first you must convert micrograms to milligrams. Next, follow the formula for the calculation of the correct dose, verify your answer using a calculator, and make sure that the answer makes sense.
Review: Medication calculations
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Medications/IV Calculations
Priority Concepts: Clinical Judgment; Safety
Reference: Perry, Potter, Ostendorf (2014), pp. 486-487.

❖ 163. 25
Rationale: Use the intravenous (IV) flow rate formula.
Formula:

$$\frac{\text{Total volume} \times \text{Drop factor}}{\text{Time in minutes}} = \text{Drops per minute}$$

$$\frac{50\ \text{mL} \times 15\ \text{gtt}}{30\ \text{minutes}} = \frac{750}{30} = 25\ \text{gtt/min}$$

Test-Taking Strategy: Focus on the subject, an IV infusion calculation. Use the formula for calculating IV flow rates when answering the question. Once you have performed the calculation, verify your answer using a calculator and make sure that the answer makes sense.
Review: Intravenous infusion calculations
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Medications/IV Calculations
Priority Concepts: Clinical Judgment; Safety
Reference: Perry, Potter, Ostendorf (2014), pp. 710-711.

❖ 164. 8
Rationale: You must determine that 1 L equals 1000 mL. Next, use the formula for determining infusion time in hours. Verify your answer using a calculator and make sure that the answer makes sense.
Review: Intravenous infusion calculations
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Medications/IV Calculations
Priority Concepts: Clinical Judgment; Safety
Reference: Perry, Potter, Ostendorf (2014), pp. 710-711.
Formula:

$$\frac{\text{Total volume to infuse}}{\text{Milliliters per hour being infused}} = \text{Infusion time}$$

$$\frac{1000\ \text{mL}}{125\ \text{mL}} = 8\ \text{hours}$$

Test-Taking Strategy: Focus on the subject, an intravenous infusion calculation. Read the question carefully, noting that the question is asking about infusion time in hours. First, convert 1 L to milliliters. Next, use the formula for determining infusion time in hours. Verify your answer using a calculator and make sure that the answer makes sense.
Review: Intravenous infusion calculations
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Medications/IV Calculations
Priority Concepts: Clinical Judgment; Safety
Reference: Perry, Potter, Ostendorf (2014), pp. 710-711.

❖ 165. 10
Rationale: Use the intravenous (IV) flow rate formula.
Formula:

$$\frac{\text{Total volume} \times \text{Drop factor}}{\text{Time in minute}} = \text{Drops per minute}$$

$$\frac{250\ \text{mL} \times 10\ \text{gtt}}{240\ \text{minutes}} = \frac{2500}{240} = 10{:}4, \text{ or } 10\ \text{gtt/min}$$

Test-Taking Strategy: Focus on the subject, an IV infusion calculation. Use the formula for calculating IV flow rates when answering the question. Once you have performed the calculation, verify your answer using a calculator and make sure that the answer makes sense. Remember to round the answer to the nearest whole number.
Review: Intravenous infusion calculations
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Medications/IV Calculations
Priority Concepts: Clinical Judgment; Safety
Reference: Perry, Potter, Ostendorf (2014), pp. 710-711.

❖ 166. 0.8
Rationale: Use the formula to calculate the correct dose.
Formula:

$$\frac{\text{Desired} \times \text{mL}}{\text{Available}} = \text{Milliliters per hour}$$

$$\frac{8\ \text{mg} \times 1\ \text{mL}}{10\ \text{mg}} = 0{:}8\ \text{mL}$$

Test-Taking Strategy: Focus on the subject, a dosage calculation. Follow the formula for the calculation of the correct dose. Once you have performed the calculation, verify your answer using a calculator and make sure that the answer makes sense.
Review: Medication calculations
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Medications/IV Calculations
Priority Concepts: Clinical Judgment; Safety
Reference: Perry, Potter, Ostendorf (2014), pp. 486-487.

❖ 167. 8
Rationale: Calculation of this problem can be done using a 2-step process. First, you need to determine the amount of

regular insulin in 1 mL. The next step is to determine the infusion rate, or milliliters per hour.

Formula:

Step 1:

$$\frac{\text{Known amount of medication in solution}}{\text{Total volume of diluent}} = \text{Amount of medication per milliliter}$$

$$\frac{100 \text{ units}}{100 \text{ mL}} = 1 \text{ unit=mL}$$

Step 2:

$$\frac{\text{Dose per hour desired}}{\text{Concentration per milliliter}} = \text{Infusion rate, or milliliters per hour}$$

$$\frac{8 \text{ units}}{1 \text{ unit=mL}} = 8 \text{ mL=hour}$$

Test-Taking Strategy: Focus on the subject, an IV flow rate. Read the question carefully, noting that 2 steps can be used to solve this medication problem. Once you have performed the calculation, verify your answer using a calculator and make sure that the answer makes sense. These steps can be used for similar medication problems related to the administration of heparin sodium or regular insulin by IV infusion.

Review: Medication calculations

Level of Cognitive Ability: Analyzing

Client Need: Physiological Integrity

Integrated Process: Nursing Process—Implementation

Content Area: Fundamentals of Care—Medications/IV Calculations

Priority Concepts: Clinical Judgment; Safety

References: Perry, Potter, Ostendorf (2014), pp. 486-487.

CHAPTER 18

Perioperative Nursing Care

PRIORITY CONCEPT Infection; Safety

CRITICAL THINKING What Should You Do?

The nurse is assisting the surgeon in obtaining informed consent from a client for a scheduled surgical procedure. The client signs the consent and after the surgeon leaves the nursing unit the client informs the nurse that he is unclear about certain aspects of the surgical procedure. What should the nurse do?

Answer located on p. 225.

I. Preoperative Care

A client may return home shortly after having a surgical procedure because many surgical procedures are done through ambulatory care or 1-day stay surgical units. Perioperative care procedures apply even when the client returns home on the same day of the surgical procedure.

A. Obtaining informed consent

1. The surgeon is responsible for explaining the surgical procedure to the client and answering the client's questions. Often, the nurse is responsible for obtaining the client's signature on the consent form for surgery, which indicates the client's agreement to the procedure based on the surgeon's explanation.
2. The nurse may witness the client's signing of the consent form, but the nurse must be sure that the client has understood the surgeon's explanation of the surgery.
3. The nurse needs to document the witnessing of the signing of the consent form after the client acknowledges understanding the procedure.
4. Minors (clients younger than 18 years) may need a parent or legal guardian to sign the consent form.
5. Older clients may need a legal guardian to sign the consent form.
6. Psychiatric clients have a right to refuse treatment until a court has legally determined that they are unable to make decisions for themselves.
7. No sedation should be administered to the client before the client signs the consent form.
8. Obtaining telephone consent from a legal guardian or power of attorney for health care is an acceptable practice if clients are unable to give consent themselves. The nurse must engage another nurse as a witness to the consent given over the telephone.

B. Nutrition

1. Review the surgeon's prescriptions regarding the NPO (nothing by mouth) status before surgery.
2. Withhold solid foods and liquids as prescribed to avoid aspiration, usually for 6 to 8 hours before general anesthesia and for approximately 3 hours before surgery with local anesthesia (as prescribed).
3. Insert an intravenous (IV) line and administer IV fluids, if prescribed; per agency policy, the IV catheter size should be large enough to administer blood products if they are required.

C. Elimination

1. If the client is to have intestinal or abdominal surgery, per surgeon's preference an enema, laxative, or both may be prescribed for the day or night before surgery.
2. The client should void immediately before surgery.
3. Insert an indwelling urinary catheter, if prescribed; urinary catheter collection bags should be emptied immediately before surgery, and the nurse should document the amount and characteristics of the urine.

D. Surgical site

1. Clean the surgical site with a mild antiseptic or antibacterial soap on the night before surgery, as prescribed.
2. Shave the operative site, as prescribed; shaving may be done in the operative area.

Hair on the head or face (including the eyebrows) should be shaved only if prescribed.

E. Preoperative client teaching
   1. Inform the client about what to expect postoperatively.
   2. Inform the client to notify the nurse if the client experiences any pain postoperatively and that pain medication will be prescribed and given as the client requests. The client should be informed that some degree of pain should be expected and is normal.
   3. Inform the client that requesting an opioid after surgery will not make the client a drug addict.
   4. Demonstrate the use of a patient-controlled analgesia (PCA) pump if prescribed.
   5. Instruct the client how to use noninvasive pain-relief techniques such as relaxation, distraction techniques, and guided imagery before the pain occurs and as soon as the pain is noticed.
   6. The nurse should instruct the client not to smoke (for at least 24 hours before surgery); discuss smoking cessation treatments and programs.
   7. Instruct the client in deep-breathing and coughing techniques, use of incentive spirometry, and the importance of performing the techniques postoperatively to prevent the development of pneumonia and atelectasis (Box 18-1).
   8. Instruct the client in leg and foot exercises to prevent venous stasis of blood and to facilitate venous blood return (Fig. 18-1; see Box 18-1).
   9. Instruct the client in how to splint an incision, turn, and reposition (Fig. 18-2; see Box 18-1).
   10. Inform the client of any invasive devices that may be needed after surgery, such as a nasogastric tube, drain, urinary catheter, epidural catheter, or IV or subclavian lines.
   11. Instruct the client not to pull on any of the invasive devices; they will be removed as soon as possible.

F. Psychosocial preparation
   1. Be alert to the client's level of anxiety.
   2. Answer any questions or concerns that the client may have regarding surgery.
   3. Allow time for privacy for the client to prepare psychologically for surgery.
   4. Provide support and assistance as needed.
   5. Take cultural aspects into consideration when providing care (Box 18-2).

G. Preoperative checklist
   1. Ensure that the client is wearing an identification bracelet.
   2. Assess for allergies, including an allergy to latex (see Chapter 66 for information on latex allergy).
   3. Review the preoperative checklist to be sure that each item is addressed before the client is transported to surgery.
   4. Follow agency policies regarding preoperative procedures, including informed consents, preoperative checklists, prescribed laboratory or radiological tests, and any other preoperative procedure.
   5. Ensure that informed consent forms have been signed for the operative procedure, any blood transfusions, disposal of a limb, or surgical sterilization procedures.
   6. Ensure that a history and physical examination have been completed and documented in the client's record (Box 18-3).
   7. Ensure that consultation requests have been completed and documented in the client's record.

BOX 18-1 Client Teaching

Deep-Breathing and Coughing Exercises

Instruct the client that a sitting position gives the best lung expansion for coughing and deep-breathing exercises.
Instruct the client to breathe deeply 3 times, inhaling through the nostrils and exhaling slowly through pursed lips.
Instruct the client that the third breath should be held for 3 seconds; then the client should cough deeply 3 times.
The client should perform this exercise every 1 to 2 hours.

Incentive Spirometry

Instruct the client to assume a sitting or upright position.
Instruct the client to place the mouth tightly around the mouthpiece.
Instruct the client to inhale slowly to raise and maintain the flow rate indicator, usually between the 600 and 900 marks on the device.
Instruct the client to hold the breath for 5 seconds and then to exhale through pursed lips.
Instruct the client to repeat this process 10 times every hour.

Leg and Foot Exercises

Gastrocnemius (calf) pumping: Instruct the client to move both ankles by pointing the toes up and then down.
Quadriceps (thigh) setting: Instruct the client to press the back of the knees against the bed and then to relax the knees; this contracts and relaxes the thigh and calf muscles to prevent thrombus formation.
Foot circles: Instruct the client to rotate each foot in a circle.
Hip and knee movements: Instruct the client to flex the knee and thigh and to straighten the leg, holding the position for 5 seconds before lowering (not performed if the client is having abdominal surgery or if the client has a back problem).

Splinting the Incision

If the surgical incision is abdominal or thoracic, instruct the client to place a pillow, or 1 hand with the other hand on top, over the incisional area.
During deep breathing and coughing, the client presses gently against the incisional area to splint or support it.

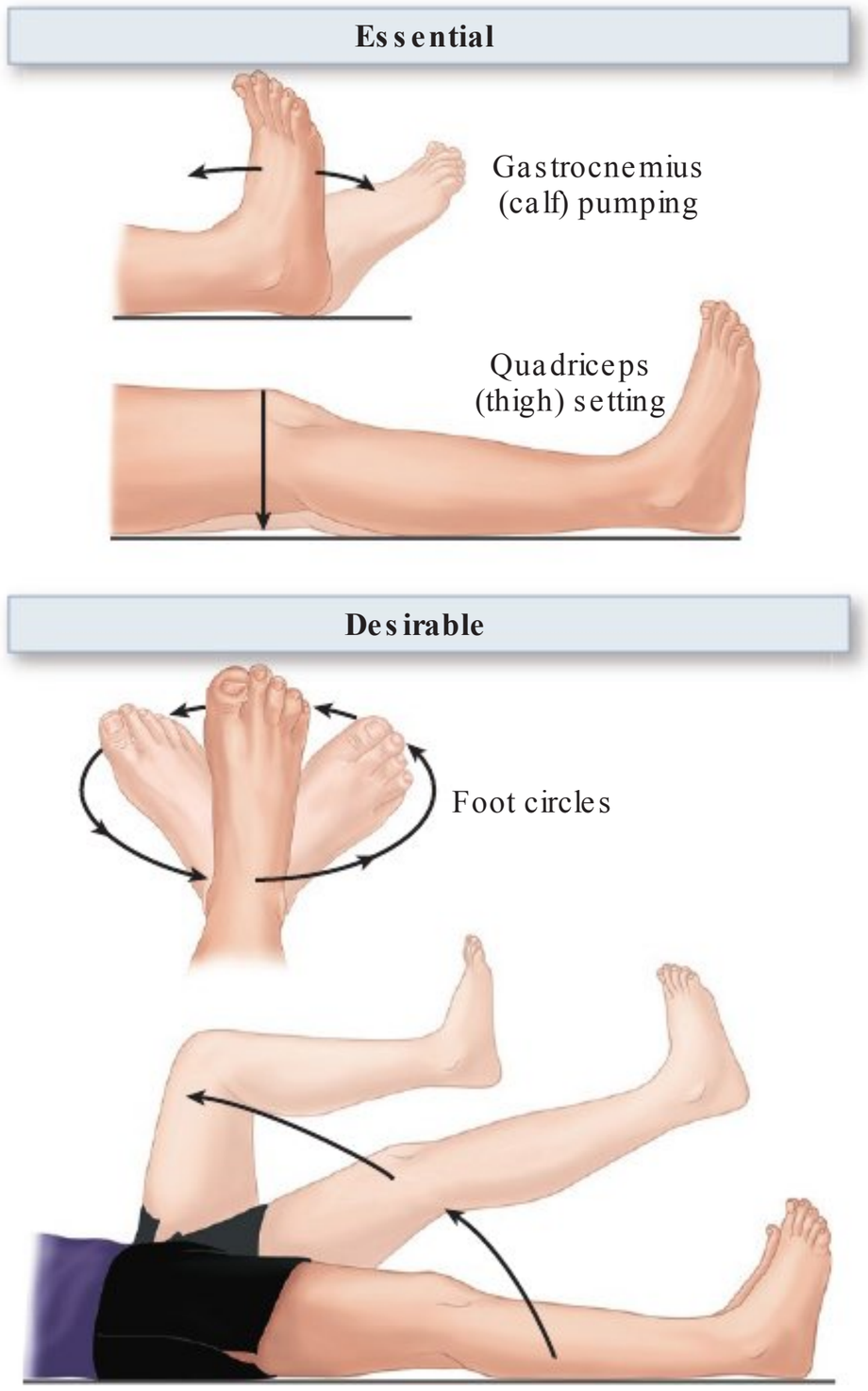


FIGURE 18-1 Postoperative leg exercises.

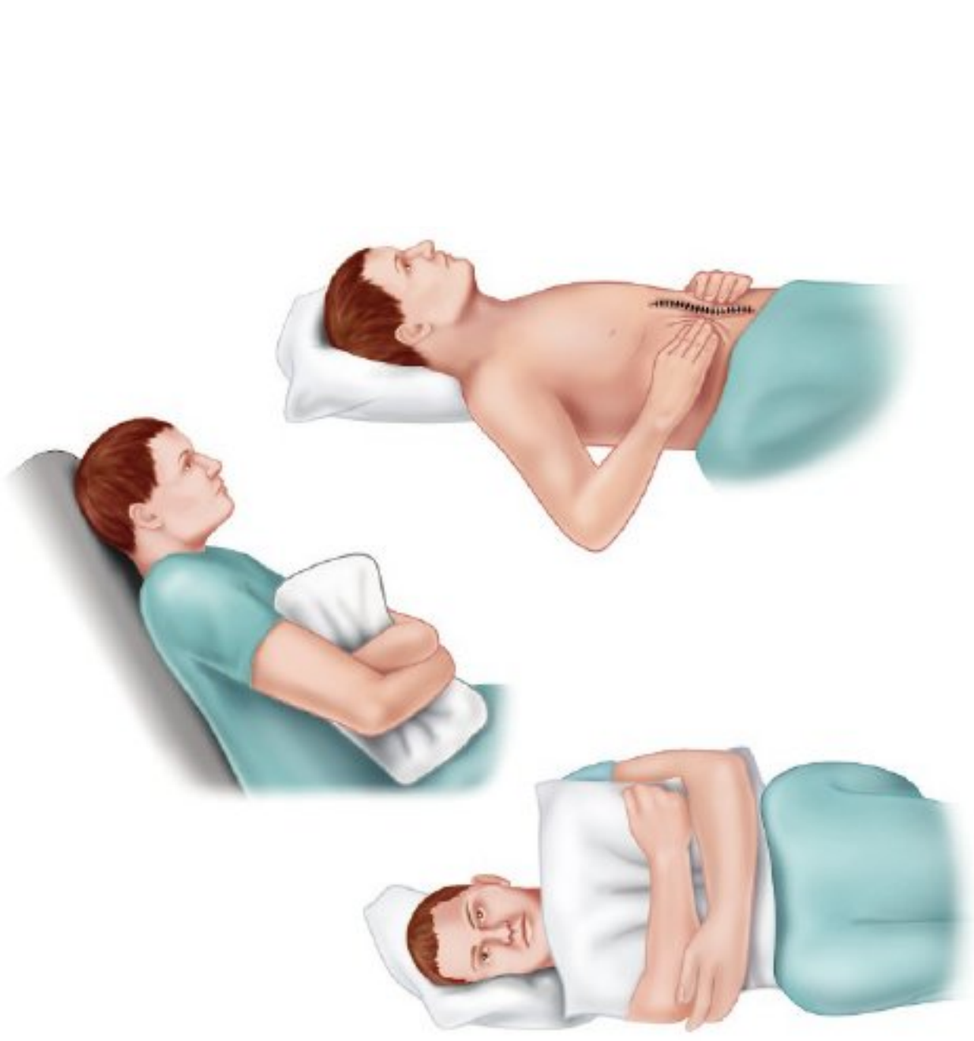


FIGURE 18-2 Techniques for splinting a wound when coughing.

BOX 18-2 Cultural Aspects of Perioperative Nursing Care

Cultural assessment includes questions related to:

- Primary language spoken
- Feelings related to surgery and pain
- Pain management
- Expectations
- Support systems
- Feelings toward self
- Cultural practices and beliefs

Allow a family member to be present if appropriate.

Secure the help of a professional interpreter to communicate with non–English-speaking clients.

Use pictures or phrase cards to communicate and assess the non–English-speaking client's perception of pain or other feelings.

Provide preoperative and postoperative educational materials in the appropriate language.

Adapted from Potter P, Perry A, Stockert P, Hall A: Fundamentals of nursing, ed 8, St. Louis, 2013, Mosby.

BOX 18-3 Medical Conditions That Increase Risk During Surgery

- Bleeding disorders such as thrombocytopenia or hemophilia
- Diabetes mellitus
- Chronic pain
- Heart disease, such as a recent myocardial infarction, dysrhythmia, heart failure, or peripheral vascular disease
- Obstructive sleep apnea
- Upper respiratory infection
- Liver disease
- Fever
- Chronic respiratory disease, such as emphysema, bronchitis, or asthma
- Immunological disorders, such as leukemia, infection with human immunodeficiency virus, acquired immunodeficiency syndrome, bone marrow depression, or use of chemotherapy or immunosuppressive agents
- Abuse of street drugs

Adapted from Potter P, Perry A, Stockert P, Hall A: Fundamentals of nursing, ed 8, St. Louis, 2013, Mosby.

8. Ensure that prescribed laboratory results are documented in the client's record.
9. Ensure that electrocardiogram and chest radiography reports are documented in the client's record.
10. Ensure that a blood type, screen, and crossmatch are performed and documented in the client's record within the established time frame per agency policy.
11. Remove jewelry, makeup, dentures, hairpins, nail polish (depending on agency procedures), glasses, and prostheses.

12. Document that valuables have been given to the client's family members or locked in the hospital safe.
13. Document the last time that the client ate or drank.
14. Document that the client voided before surgery.
15. Document that the prescribed preoperative medications were given (Box 18-4).
16. Monitor and document the client's vital signs.

H. Preoperative medications
1. Prepare to administer preoperative medications as prescribed before surgery.
2. Instruct the client about the desired effects of the preoperative medication.

After administering the preoperative medications, keep the client in bed with the side rails up (per agency policy). Place the call bell next to the client; instruct the client not to get out of bed and to call for assistance if needed.

I. Arrival in the operating room
1. Guidelines to prevent wrong site and wrong procedure surgery
   a. The surgeon meets with the client in the preoperative area and uses indelible ink to mark the operative site.
   b. In the operating room, the nurse and surgeon ensure and reconfirm that the operative site has been appropriately marked.
   c. Just before starting the surgical procedure, a time-out is conducted with all members of the operative team present to identify the correct client and appropriate surgical site again.
2. When the client arrives in the operating room, the operating room nurse will verify the identification bracelet with the client's verbal response and will review the client's chart.
3. The client's record will be checked for completeness and reviewed for informed consent forms, history and physical examination, and allergic reaction information.
4. The surgeon's prescriptions will be verified and implemented.
5. The IV line may be initiated at this time (or in the preoperative area), if prescribed.
6. The anesthesia team will administer the prescribed anesthesia.

Verification of the client and the surgical operative site is critical.

BOX 18-4 Substances That Can Affect the Client in Surgery

Antibiotics
Antibiotics potentiate the action of anesthetic agents.

Anticholinergics
Medications with anticholinergic effects increase the potential for confusion, tachycardia, and intestinal hypotonicity and hypomotility.

Anticoagulants, antiplatelets, and thrombolytics
These medications alter normal clotting factors and increase the risk of hemorrhaging.

Acetylsalicylic acid (Aspirin), clopidogrel, and nonsteroidal anti-inflammatory drugs are commonly used medications that can alter platelet aggregation.

These medications should be discontinued at least 48 hours before surgery or as specified by the surgeon; clopidogrel usually has to be discontinued 5 days before surgery.

Anticonvulsants
Long-term use of certain anticonvulsants can alter the metabolism of anesthetic agents.

Antidepressants
Antidepressants may lower the blood pressure during anesthesia.

Antidysrhythmics
Antidysrhythmic medications reduce cardiac contractility and impair cardiac conduction during anesthesia.

Antihypertensives
Antihypertensive medications can interact with anesthetic agents and cause bradycardia, hypotension, and impaired circulation.

Corticosteroids
Corticosteroids cause adrenal atrophy and reduce the ability of the body to withstand stress.

Before and during surgery, dosages may be increased temporarily.

Diuretics
Diuretics potentiate electrolyte imbalances after surgery.

Herbal Substances
Herbal substances can interact with anesthesia and cause a variety of adverse effects. These substances may need to be stopped at a specific time before surgery. During the preoperative period, the client needs to be asked if he or she is taking an herbal substance.

Insulin
The need for insulin after surgery in a diabetic may be reduced because the client's nutritional intake is decreased, or the need for insulin may be increased because of the stress response and intravenous administration of glucose solutions.

Adapted from Potter P, Perry A, Stockert P, Hall A: Fundamentals of nursing, ed 8, St. Louis, 2013, Mosby.

II. Postoperative Care

A. Description
   1. Postoperative care is the management of a client after surgery and includes care given during the immediate postoperative period as well as during the days following surgery.
   2. The goal of postoperative care is to prevent complications, to promote healing of the surgical incision, and to return the client to a healthy state.

B. Respiratory system

⚠ Assess breath sounds; stridor, wheezing, or a crowing sound can indicate partial obstruction, bronchospasm, or laryngospasm, while crackles or rhonchi may indicate pulmonary edema.

   1. Monitor vital signs.
   2. Monitor airway patency and ensure adequate ventilation (prolonged mechanical ventilation during anesthesia may affect postoperative lung function).
   3. Remember that extubated clients who are lethargic may not be able to maintain an airway.
   4. Monitor for secretions; if the client is unable to clear the airway by coughing, suction the secretions from the client's airway.
   5. Observe chest movement for symmetry and the use of accessory muscles.
   6. Monitor oxygen administration if prescribed.
   7. Monitor pulse oximetry and end title carbon dioxide (CO_2) as prescribed.
   8. Encourage deep-breathing and coughing exercises as soon as possible after surgery.
   9. Note the rate, depth, and quality of respirations; the respiratory rate should be greater than 10 and less than 30 breaths/minute.
   10. Monitor for signs of respiratory distress, atelectasis, or other respiratory complications.

C. Cardiovascular system
   1. Monitor circulatory status, such as skin color, peripheral pulses, and capillary refill, and for the absence of edema, numbness, and tingling.
   2. Monitor for bleeding.
   3. Assess the pulse for rate and rhythm (a bounding pulse may indicate hypertension, fluid overload, or client anxiety).
   4. Monitor for signs of hypertension and hypotension.
   5. Monitor for cardiac dysrhythmias.
   6. Monitor for signs of thrombophlebitis, particularly in clients who were in the lithotomy position during surgery.
   7. Encourage the use of antiembolism stockings or sequential compression devices (Fig. 18-3), if prescribed, to promote venous return, strengthen muscle tone, and prevent pooling of blood in the extremities.

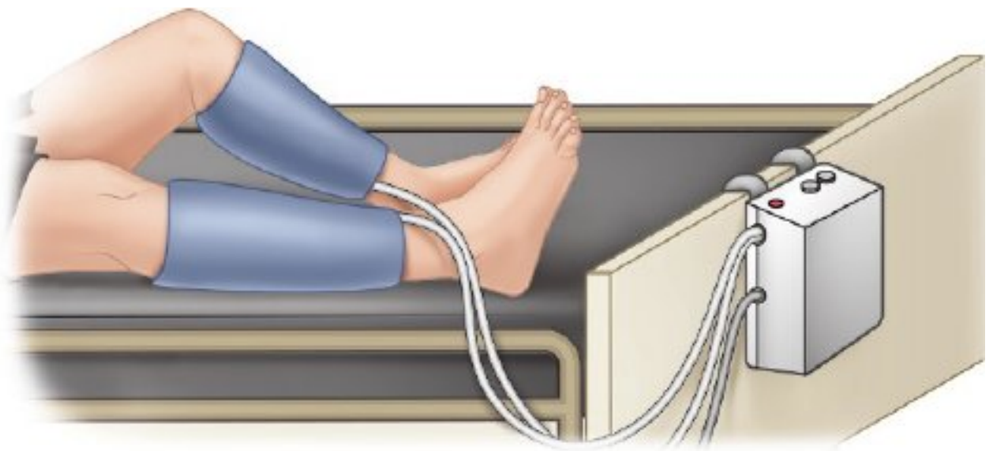


FIGURE 18-3 Sequential compression device.

D. Musculoskeletal system
   1. Assess the client for movement of the extremities.
   2. Review the surgeon's prescriptions regarding client positioning or restrictions.
   3. Encourage ambulation if prescribed; before ambulation, instruct the client to sit at the edge of the bed with his or her feet supported to assume balance.
   4. Unless contraindicated, place the client in a low Fowler's position after surgery to increase the size of the thorax for lung expansion.
   5. Avoid positioning the postoperative client in a supine position until pharyngeal reflexes have returned; if the client is comatose or semicomatose, position on the side (in addition, an oral airway may be needed).
   6. If the client is unable to get out of bed, turn the client every 1 to 2 hours.

E. Neurological system
   1. Assess level of consciousness.
   2. Make frequent periodic attempts to awaken the client until the client awakens.
   3. Orient the client to the environment.
   4. Speak in a soft tone; filter out extraneous noises in the environment.
   5. Maintain the client's body temperature and prevent heat loss by providing the client with warm blankets and raising the room temperature as necessary.

F. Temperature control
   1. Monitor temperature.
   2. Monitor for signs of hypothermia that may result from anesthesia, a cool operating room, or exposure of the skin and internal organs during surgery.
   3. Apply warm blankets, continue oxygen, and administer medication as prescribed if the client experiences postoperative shivering.

G. Integumentary system
   1. Assess the surgical site, drains, and wound dressings (serous drainage may occur from an incision, but notify the surgeon if excessive bleeding occurs from the site).
   2. Assess the skin for redness, abrasions, or breakdown that may have resulted from surgical positioning.

3. Monitor body temperature and wound for signs of infection.
4. Maintain a dry, intact dressing.
5. Change dressings as prescribed, noting the amount of bleeding or drainage, odor, and intactness of sutures or staples; commonly used dressings include 4Â4 inch gauze, nonadherent pads, abdominal pads, gauze rolls, and split gauze that are commonly referred to as drain sponges.
6. Wound drains should be patent; prepare to assist with the removal of drains (as prescribed by the surgeon) when the drainage amount becomes insignificant.
7. An abdominal binder may be prescribed for obese and debilitated individuals to prevent dehiscence of the incision.

H. Fluid and electrolyte balance
1. Monitor IV fluid administration as prescribed.
2. Record intake and output.
3. Monitor for signs of fluid or electrolyte imbalances.

I. Gastrointestinal system
1. Monitor intake and output and for nausea and vomiting.
2. Maintain patency of the nasogastric tube if present and monitor placement and drainage per agency procedure.
3. Monitor for abdominal distention.
4. Monitor for passage of flatus and return of bowel sounds.
5. Administer frequent oral care, at least every 2 hours.
6. Maintain the NPO status until the gag reflex and peristalsis return.
7. When oral fluids are permitted, start with ice chips and water.
8. Ensure that the client advances to clear liquids and then to a regular diet, as prescribed and as the client can tolerate.

! To prevent aspiration, turn the client to a side-lying position if vomiting occurs; have suctioning equipment available and ready to use.

J. Renal system
1. Assess the bladder for distention.
2. Monitor urine output (urinary output should be at least 30 mL/hour).
3. If the client does not have a urinary catheter, the client is expected to void within 6 to 8 hours postoperatively depending on the type of anesthesia administered; ensure that the amount is at least 200 mL.

K. Pain management
1. Assess the type of anesthetic used and preoperative medication that the client received, and note whether the client received any pain medications in the postanesthesia period.
2. Assess for pain and inquire about the type and location of pain; ask the client to rate the degree of pain on a scale of 1 to 10, with 10 being the most severe.
3. If the client is unable to rate the pain using a numerical pain scale, use a descriptor scale that lists words that describe different levels of pain intensity, such as no pain, mild pain, moderate pain, and severe pain, or other available pain rating scales.
4. Monitor for objective data related to pain, such as facial expressions, body gestures, increased pulse rate, increased blood pressure, and increased respirations.
5. Inquire about the effectiveness of the last pain medication.
6. Administer pain medication as prescribed.
7. Ensure that the client with a PCA pump understands how to use it.
8. If an opioid has been prescribed, after administration assess the client every 30 minutes for respiratory rate and pain relief.
9. Use noninvasive measures to relieve postoperative pain, including provision of distraction, relaxation techniques, guided imagery, comfort measures, positioning, backrubs, and a quiet and restful environment.
10. Document effectiveness of the pain medication and noninvasive pain-relief measures.

! Consider cultural practices and beliefs when planning pain management.

III. Pneumonia and Atelectasis

A. Description (Box 18-5 and Fig. 18-4)
1. Pneumonia: An inflammation of the alveoli caused by an infectious process that may develop 3 to 5 days postoperatively as a result of infection, aspiration, or immobility
2. Atelectasis: A collapsed or airless state of the lung that may be the result of airway obstruction

BOX 18-5 Postoperative Complications

- Pneumonia and atelectasis
- Hypoxemia
- Pulmonary embolism
- Hemorrhage
- Shock
- Thrombophlebitis
- Urinary retention
- Constipation
- Paralytic ileus
- Wound infection
- Wound dehiscence
- Wound evisceration

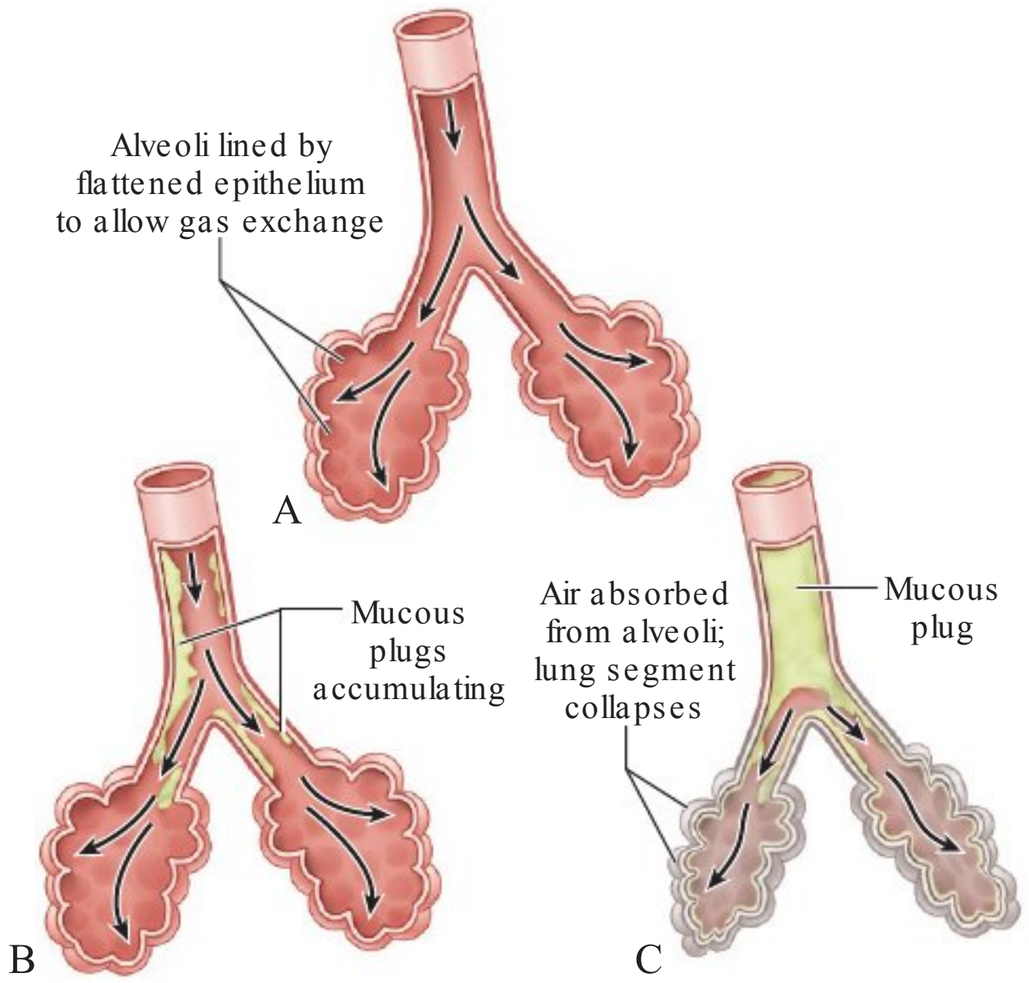


FIGURE 18-4 Postoperative atelectasis. A, Normal bronchiole and alveoli. B, Mucous plug in bronchiole. C, Collapse of alveoli caused by atelectasis following absorption of air.

caused by accumulated secretions or failure of the client to deep-breathe or ambulate after surgery; a postoperative complication that usually occurs 1 to 2 days after surgery

B. Assessment
   1. Dyspnea and increased respiratory rate
   2. Crackles over involved lung area
   3. Elevated temperature
   4. Productive cough and chest pain
C. Interventions
   1. Assess lung sounds.
   2. Reposition the client every 1 to 2 hours.
   3. Encourage the client to deep-breathe, cough, and use the incentive spirometer as prescribed.
   4. Provide chest physiotherapy and postural drainage, as prescribed.
   5. Encourage fluid intake and early ambulation.
   6. Use suction to clear secretions if the client is unable to cough.

IV. Hypoxemia

A. Description: An inadequate concentration of oxygen in arterial blood; in the postoperative client, hypoxemia can be due to shallow breathing from the effects of anesthesia or medications.
B. Assessment
   1. Restlessness
   2. Dyspnea
   3. Diaphoresis
   4. Tachycardia
   5. Hypertension
   6. Cyanosis
   7. Low pulse oximetry readings
C. Interventions
   1. Monitor for signs of hypoxemia.
   2. Notify the surgeon.
   3. Monitor lung sounds and pulse oximetry.
   4. Administer oxygen as prescribed.
   5. Encourage deep breathing and coughing and use of the incentive spirometer.
   6. Turn and reposition the client frequently; encourage ambulation.

V. Pulmonary Embolism

A. Description: An embolus blocking the pulmonary artery and disrupting blood flow to 1 or more lobes of the lung
B. Assessment
   1. Sudden dyspnea
   2. Sudden sharp chest or upper abdominal pain
   3. Cyanosis
   4. Tachycardia
   5. A drop in blood pressure
C. Interventions
   1. Notify the surgeon immediately because pulmonary embolism may be life-threatening and requires emergency action.
   2. Monitor vital signs.
   3. Administer oxygen and medications as prescribed.

VI. Hemorrhage

A. Description: The loss of a large amount of blood externally or internally in a short time period
B. Assessment
   1. Restlessness
   2. Weak and rapid pulse
   3. Hypotension
   4. Tachypnea
   5. Cool, clammy skin
   6. Reduced urine output
C. Interventions
   1. Provide pressure to the site of bleeding.
   2. Notify the surgeon.
   3. Administer oxygen, as prescribed.
   4. Administer IV fluids and blood, as prescribed.
   5. Prepare the client for a surgical procedure, if necessary.

VII. Shock

A. Description: Loss of circulatory fluid volume, which usually is caused by hemorrhage
B. Assessment: Similar to assessment findings in hemorrhage
C. Interventions
   1. If shock develops, elevate the legs.
   2. Notify the surgeon.
   3. Determine and treat the cause of shock.
   4. Administer oxygen, as prescribed.
   5. Monitor level of consciousness.

6. Monitor vital signs for increased pulse or decreased blood pressure.
7. Monitor intake and output.
8. Assess color, temperature, turgor, and moisture of the skin and mucous membranes.
9. Administer IV fluids, blood, and colloid solutions, as prescribed.

! If the client had spinal anesthesia, do not elevate the legs any higher than placing them on the pillow; otherwise, the diaphragm muscles needed for effective breathing could be impaired.

VIII. Thrombophlebitis

A. Description
1. Thrombophlebitis is an inflammation of a vein, often accompanied by clot formation.
2. Veins in the legs are affected most commonly.

B. Assessment
1. Vein inflammation
2. Aching or cramping pain
3. Vein feels hard and cordlike and is tender to touch.
4. Elevated temperature

C. Interventions
1. Monitor legs for swelling, inflammation, pain, tenderness, venous distention, and cyanosis; notify the surgeon if any of these signs are present.
2. Elevate the extremity 30 degrees without allowing any pressure on the popliteal area.
3. Encourage the use of antiembolism stockings as prescribed; remove stockings twice a day to wash and inspect the legs.
4. Use a sequential compression device as prescribed (see Fig. 18-3).
5. Perform passive range-of-motion exercises every 2 hours if the client is confined to bed rest.
6. Encourage early ambulation, as prescribed.
7. Do not allow the client to dangle the legs.
8. Instruct the client not to sit in 1 position for an extended period of time.
9. Administer anticoagulants such as heparin sodium or enoxaparin, as prescribed.

IX. Urinary Retention

A. Description
1. Urinary retention is an involuntary accumulation of urine in the bladder as a result of loss of muscle tone.
2. It is caused by the effects of anesthetics or opioid analgesics and appears 6 to 8 hours after surgery.

B. Assessment
1. Inability to void
2. Restlessness and diaphoresis
3. Lower abdominal pain
4. Distended bladder
5. Hypertension
6. On percussion, bladder sounds like a drum.

C. Interventions
1. Monitor for voiding.
2. Assess for a distended bladder by palpation and bladder scanning if indicated.
3. Encourage ambulation when prescribed.
4. Encourage fluid intake unless contraindicated.
5. Assist the client to void by helping the client to stand.
6. Provide privacy.
7. Pour warm water over the perineum or allow the client to hear running water to promote voiding.
8. Contact the surgeon and catheterize the client as prescribed after all noninvasive techniques have been attempted.

X. Constipation

A. Description
1. Constipation is an abnormal infrequent passage of stool.
2. When the client resumes a solid diet postoperatively, failure to pass stool within 48 hours may indicate constipation.

B. Assessment
1. Absence of bowel movements
2. Abdominal distention
3. Anorexia, headache, and nausea

C. Interventions
1. Assess bowel sounds.
2. Encourage fluid intake up to 3000 mL/day unless contraindicated.
3. Encourage early ambulation.
4. Encourage consumption of fiber foods unless contraindicated.
5. Provide privacy and adequate time for bowel elimination.
6. Administer stool softeners and laxatives, as prescribed.

XI. Paralytic Ileus

A. Description
1. Paralytic ileus is failure of appropriate forward movement of bowel contents.
2. The condition may occur as a result of anesthetic medications or of manipulation of the bowel during the surgical procedure.

B. Assessment
1. Vomiting postoperatively
2. Abdominal distention
3. Absence of bowel sounds, bowel movement, or flatus

C. Interventions
1. Monitor intake and output.
2. Maintain NPO status until bowel sounds return.
3. Maintain patency of a nasogastric tube if in place; assess patency and drainage per agency procedure.
4. Encourage ambulation.

5. Administer IV fluids or parenteral nutrition, as prescribed.
6. Administer medications as prescribed to increase gastrointestinal motility and secretions.
7. If ileus occurs, it is treated first nonsurgically with bowel decompression by insertion of a nasogastric tube attached to intermittent or constant suction.

⚠ Vomiting postoperatively, abdominal distention, and absence of bowel sounds may be signs of paralytic ileus.

XII. Wound Infection

A. Description
   1. Wound infection may be caused by poor aseptic technique or a contaminated wound before surgical exploration; existing client conditions such as diabetes mellitus or immunocompromise may place the client at risk.
   2. Infection usually occurs 3 to 6 days after surgery.
   3. Purulent material may exit from the drains or separated wound edges.

B. Assessment
   1. Fever and chills
   2. Warm, tender, painful, and inflamed incision site
   3. Edematous skin at the incision and tight skin sutures
   4. Elevated white blood cell count

C. Interventions
   1. Monitor temperature.
   2. Monitor incision site for approximation of suture line, edema, or bleeding, and signs of infection (REEDA: redness, erythema, ecchymosis, drainage, approximation of the wound edges); notify the surgeon if signs of wound infection are present.
   3. Maintain patency of drains, and assess drainage amount, color, and consistency.
   4. Maintain asepsis, change the dressing, and perform wound irrigation, if prescribed (Box 18-6).
   5. Administer antibiotics, as prescribed.

BOX 18-6 Procedure for Sterile Dressing Change and Wound Irrigation*

Verify the prescription for the procedure in the medical record.
Anticipate supplies that will be needed and gather supplies, including personal protective equipment (PPE) and additional equipment needed for protection (i.e., gown, face shield, clean gloves), a sterile dressing change kit if available, and any anticipated additional supplies such as gauze pads, drain sponges, cotton tipped applicators, tape, an abdominal pad, a measuring tool, syringe for irrigation, irrigation basin, extra pair of sterile gloves, and underpad.
Introduce self to client, identify the client with 2 accepted identifiers and compare against medical record, provide privacy, and explain the procedure.
Assess the client's pain level using an appropriate pain scale and medicate as necessary.
Assess the client for allergies, particularly to tape or latex.
Perform hand hygiene and don PPE.
Position the client appropriately, apply clean gloves, and place the underpad underneath the client.
Remove the soiled dressing, assess and characterize drainage noted on the dressing, and discard the removed dressing in the biohazard waste; note: if a moist-to-dry dressing adheres to the wound, gently free the dressing and warn the client of the discomfort; if a dry dressing adheres to the wound that is not to be debrided, moisten the dressing with normal saline and remove.
Assess the wound and periwound for size (length, width, depth; measure using measuring tool), appearance, color, drainage, edema, approximation, granulation tissue, presence and condition of drains, and odor; and palpate edges for tenderness or pain.
Cover the wound with sterile gauze by opening a sterile gauze pack and lightly placing the gauze on the wound without touching the dressing material; remove gloves and perform hand hygiene.
Set up the sterile field: prepare sterile equipment using sterile technique on an overbed table. If irrigation is prescribed, pour any prescribed irrigation solution into a sterile basin and draw solution into the irrigating syringe. Gently irrigate the wound with the prescribed solution from the least contaminated area to the most contaminated area. Use an approved irrigation basin to collect solution from the irrigating procedure.
Cleanse the wound with sterile gauze from the least contaminated area to the most contaminated area, using single-stroke motions. Discard the gauze from each stroke and use a new one for the next stroke. If drains are present, use cotton tipped applicators to hold drains up and clean around drain sites using circular strokes, starting near the drain and moving outward from the insertion site using cotton tipped applicators or sterile gauze. Dry sites in the same manner using sterile gauze.
Apply any prescribed wound antiseptic with a cotton-tipped applicator or sterile gauze, using the same technique as when cleansing the wound.
Dress the wound with the prescribed dressings using sterile technique and secure in place.
Date/time/initial the dressing and discard supplies as indicated per agency procedures, and remove gloves.
Assist the client to a comfortable position and ensure safety; assess pain level.
Document the procedure, any related assessments, client response, and any additional procedural responses.

Adapted from Perry A, Potter P, Ostendorf W: Clinical nursing skills and techniques, ed 8, St. Louis, 2014, Mosby.
*Note: Adapt procedure if irrigation is not prescribed or if the client does not have drains or tubes in place. Always follow agency procedures for dressing changes and wound irrigations.

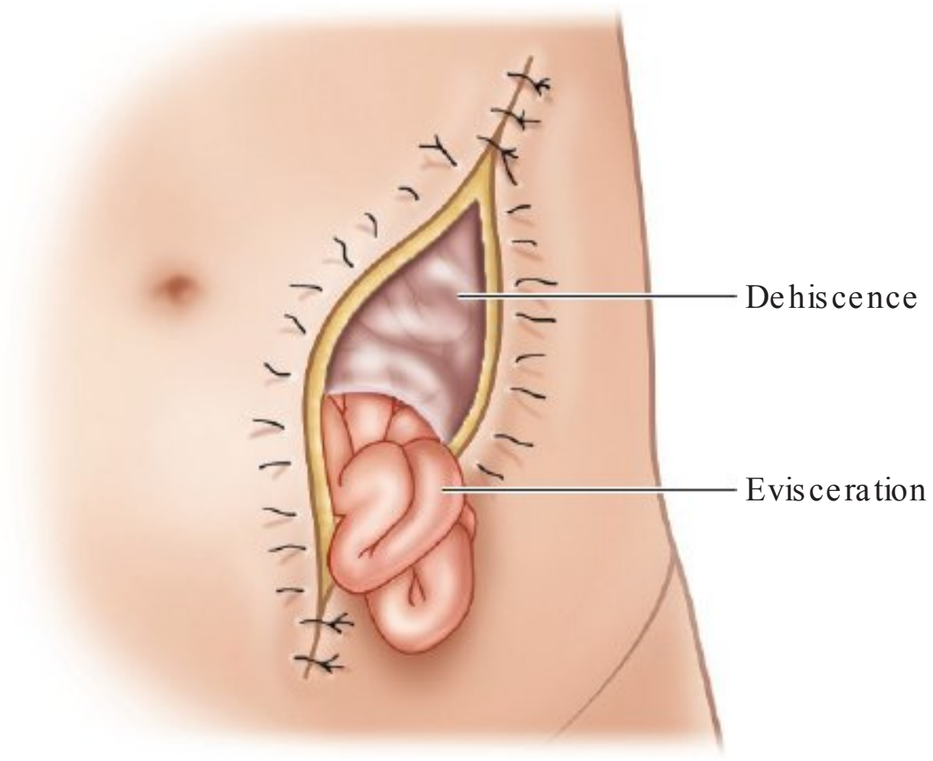


FIGURE 18-5 Complications of wound healing.

XIII. Wound Dehiscence and Evisceration (Fig. 18-5)

A. Description
   1. Wound dehiscence is separation of the wound edges at the suture line; it usually occurs 6 to 8 days after surgery.
   2. Wound evisceration is protrusion of the internal organs through an incision; it usually occurs 6 to 8 days after surgery.
   3. Evisceration is most common among obese clients, clients who have had abdominal surgery, or those who have poor wound-healing ability.
   4. Wound evisceration is an emergency.

B. Assessment: Dehiscence
   1. Increased drainage
   2. Opened wound edges
   3. Appearance of underlying tissues through the wound

C. Assessment: Evisceration
   1. Discharge of serosanguineous fluid from a previously dry wound
   2. The appearance of loops of bowel or other abdominal contents through the wound
   3. Client reports feeling a popping sensation after coughing or turning.

D. Interventions (see Priority Nursing Actions)

XIV. Ambulatory Care or 1-Day Stay Surgical Units

A. General criteria for client discharge
   1. Is alert and oriented.
   2. Has voided.
   3. Has no respiratory distress.
   4. Is able to ambulate, swallow, and cough.
   5. Has minimal pain.
   6. Is not vomiting.
   7. Has minimal, if any, bleeding from the incision site.
   8. Has a responsible adult available to drive the client home.
   9. The surgeon has signed a release form.

B. Discharge teaching (Box 18-7)
   1. Discharge teaching should be performed before the date of the scheduled procedure.
   2. Provide written instructions to the client and family regarding the specifics of care.
   3. Instruct the client and family about postoperative complications that can occur.
   4. Provide appropriate resources for home care support.
   5. Instruct the client not to drive, make important decisions, or sign any legal documents for 24 hours after receiving general anesthesia.
   6. Instruct the client to call the surgeon, ambulatory center, or emergency department if postoperative problems occur.
   7. Instruct the client to keep follow-up appointments with the surgeon.

PRIORITY NURSING ACTIONS

Evisceration in a Wound

1. Call for help; ask that the surgeon be notified and that needed supplies be brought to the client's room.
2. Stay with the client.
3. While waiting for supplies to arrive, place the client in a low Fowler's position with the knees bent.
4. Cover the wound with a sterile normal saline dressing and keep the dressing moist.
5. Take vital signs and monitor the client closely for signs of shock.
6. Prepare the client for surgery as necessary.
7. Document the occurrence, actions taken, and the client's response.

Wound evisceration is protrusion of the internal organs through an incision; it usually occurs 6 to 8 days after surgery. Evisceration is most common among obese clients, clients who have had abdominal surgery, or those who have poor wound-healing ability. Wound evisceration is an emergency. The nurse immediately calls for help and asks that the surgeon be notified and that needed supplies (vital sign measurement devices, sterile normal saline, and dressings) be brought to the client's room. The nurse stays with the client and while waiting for supplies to arrive, places the client in a low Fowler's position with the knees bent to prevent abdominal tension on the abdominal suture line. The nurse covers the wound with a sterile normal saline dressing as soon as supplies are available and keeps the dressing moist. Vital signs are monitored closely, and the client is monitored for signs of shock. The client is prepared for surgery if necessary. The nurse also documents the occurrence, actions taken, and client's response.

Reference

Perry, Potter, Ostendorf (2014), pp. 925–926.

BOX 18-7 Postoperative Discharge Teaching

Assess the client's readiness to learn, educational level, and desire to change or modify lifestyle.
Assess the need for resources needed for home care.
Demonstrate care of the incision and how to change the dressing.
Instruct the client to cover the incision with plastic if showering is allowed.
Ensure that the client is provided with a 48-hour supply of dressings for home use.
Instruct the client on the importance of returning to the surgeon's office for follow-up.
Instruct the client that sutures usually are removed in the surgeon's office 7 to 10 days after surgery.
Inform the client that staples are removed 7 to 14 days after surgery and that the skin may become slightly reddened when staples are ready to be removed.
Sterile adhesive strips (e.g., Steri-Strips®) may be applied to provide extra support after the sutures are removed.
Instruct the client on the use of medications, their purpose, dosages, administration, and side effects or adverse effects.
Instruct the client on diet and to drink 6 to 8 glasses of liquid a day.
Instruct the client about activity levels and to resume normal activities gradually.
Instruct the client to avoid lifting for 6 weeks if a major surgical procedure was performed.
Instruct the client with an abdominal incision not to lift anything weighing 10 pounds or more and not to engage in any activities that involve pushing or pulling.
The client usually can return to work in 6 to 8 weeks depending on the procedure and as prescribed by the surgeon.
Instruct the client about the signs and symptoms of complications and when to call the surgeon.

CRITICAL THINKING What Should You Do?

Answer: Nursing responsibilities with regard to informed consent for a surgical procedure include witnessing the client's signing of the consent form, but the nurse must be sure that the client has understood the surgeon's explanation of the surgery. The nurse needs to document the witnessing of the signing of the consent form after the client acknowledges understanding the procedure. If the client informs the nurse that the explanation was not fully understood, the nurse must notify the surgeon and the surgeon will need to clarify anything that was not understood by the client.

Reference: Lewis et al. (2014), pp. 325–326.

PRACTICE QUESTIONS

168. The nurse has just reassessed the condition of a postoperative client who was admitted 1 hour ago to the surgical unit. The nurse plans to monitor which parameter most carefully during the next hour?
1. Urinary output of 20 mL/hour
2. Temperature of 37.6 °C (99.6 °F)
3. Blood pressure of 100/70 mm Hg
4. Serous drainage on the surgical dressing

169. The nurse is teaching a client about coughing and deep-breathing techniques to prevent postoperative complications. Which statement is most appropriate for the nurse to make to the client at this time as it relates to these techniques?
1. "Use of an incentive spirometer will help prevent pneumonia."
2. "Close monitoring of your oxygen saturation will detect hypoxemia."
3. "Administration of intravenous fluids will prevent or treat fluid imbalance."
4. "Early ambulation and administration of blood thinners will prevent pulmonary embolism."

170. The nurse is creating a plan of care for a client scheduled for surgery. The nurse should include which activity in the nursing care plan for the client on the day of surgery?
1. Avoid oral hygiene and rinsing with mouthwash.
2. Verify that the client has not eaten for the last 24 hours.
3. Have the client void immediately before going into surgery.
4. Report immediately any slight increase in blood pressure or pulse.

171. A client with a gastric ulcer is scheduled for surgery. The client cannot sign the operative consent form because of sedation from opioid analgesics that have been administered. The nurse should take which most appropriate action in the care of this client?
1. Obtain a court order for the surgery.
2. Have the charge nurse sign the informed consent immediately.
3. Send the client to surgery without the consent form being signed.
4. Obtain a telephone consent from a family member, following agency policy.

172. A preoperative client expresses anxiety to the nurse about upcoming surgery. Which response by the nurse is most likely to stimulate further discussion between the client and the nurse?
1. "If it's any help, everyone is nervous before surgery."
2. "I will be happy to explain the entire surgical procedure to you."
3. "Can you share with me what you've been told about your surgery?"
4. "Let me tell you about the care you'll receive after surgery and the amount of pain you can anticipate."

173. The nurse is conducting preoperative teaching with a client about the use of an incentive spirometer. The nurse should include which piece of information in discussions with the client?
1. Inhale as rapidly as possible.
2. Keep a loose seal between the lips and the mouthpiece.
3. After maximum inspiration, hold the breath for 15 seconds and exhale.
4. The best results are achieved when sitting up or with the head of the bed elevated 45 to 90 degrees.

174. The nurse has conducted preoperative teaching for a client scheduled for surgery in 1 week. The client has a history of arthritis and has been taking acetylsalicylic acid. The nurse determines that the client needs additional teaching if the client makes which statement?
1. "Aspirin can cause bleeding after surgery."
2. "Aspirin can cause my ability to clot blood to be abnormal."
3. "I need to continue to take the aspirin until the day of surgery."
4. "I need to check with my health care provider about the need to stop the aspirin before the scheduled surgery."

175. The nurse assesses a client's surgical incision for signs of infection. Which finding by the nurse would be interpreted as a normal finding at the surgical site?
1. Red, hard skin
2. Serous drainage
3. Purulent drainage
4. Warm, tender skin

176. The nurse is monitoring the status of a postoperative client in the immediate postoperative period. The nurse would become most concerned with which sign that could indicate an evolving complication?
1. Increasing restlessness
2. A pulse of 86 beats/minute
3. Blood pressure of 110/70 mm Hg
4. Hypoactive bowel sounds in all 4 quadrants

177. A client who has had abdominal surgery complains of feeling as though "something gave way" in the incisional site. The nurse removes the dressing and notes the presence of a loop of bowel protruding through the incision. Which interventions should the nurse take? Select all that apply.
- ❑ 1. Contact the surgeon.
- ❑ 2. Instruct the client to remain quiet.
- ❑ 3. Prepare the client for wound closure.
- ❑ 4. Document the findings and actions taken.
- ❑ 5. Place a sterile saline dressing and ice packs over the wound.
- ❑ 6. Place the client in a supine position without a pillow under the head.

178. A client who has undergone preadmission testing has had blood drawn for serum laboratory studies, including a complete blood count, coagulation studies, and electrolytes and creatinine levels. Which laboratory result should be reported to the surgeon's office by the nurse, knowing that it could cause surgery to be postponed?
1. Hemoglobin, 8.0 g/dL (80 mmol/L)
2. Sodium, 145 mEq/L (145 mmol/L)
3. Serum creatinine, 0.8 mg/dL (70.6 μmol/L)
4. Platelets, 210,000 cells/mm^3 (210 Â 10^3/μL/ 210 Â 10^9/L)

179. The nurse receives a telephone call from the postanesthesia care unit stating that a client is being transferred to the surgical unit. The nurse plans to take which action first on arrival of the client?
1. Assess the patency of the airway.
2. Check tubes or drains for patency.
3. Check the dressing to assess for bleeding.
4. Assess the vital signs to compare with preoperative measurements.

180. The nurse is reviewing a surgeon's prescription sheet for a preoperative client that states that the client must be nothing by mouth (NPO) after midnight. The nurse should call the surgeon to clarify that which medication should be given to the client and not withheld?
1. Prednisone
2. Ferrous sulfate
3. Cyclobenzaprine
4. Conjugated estrogen

ANSWERS

168. 1
Rationale: Urine output should be maintained at a minimum of 30 mL/hour for an adult. An output of less than 30 mL for 2 consecutive hours should be reported to the health care provider. A temperature higher than 37.7 °C (100 °F) or lower than 36.1 °C (97 °F) and a falling systolic blood pressure, lower than 90 mm Hg, are usually considered reportable immediately. The client's preoperative or baseline blood pressure is used to make informed postoperative comparisons. Moderate or light serous drainage from the surgical site is considered normal.
Test-Taking Strategy: Note the strategic word, most. Focus on the subject, expected postoperative assessment findings. To

answer this question correctly, you must know the normal ranges for temperature, blood pressure, urinary output, and wound drainage. Note that the urinary output is the only observation that is not within the normal range.
Review: Postoperative assessment
Level of Cognitive Ability: Analyzing
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Planning
Content Area: Fundamentals of Care—Perioperative Care
Priority Concepts: Clinical Judgment; Perfusion
Reference: Ignatavicius, Workman (2016), p. 262.

169. 1
Rationale: Postoperative respiratory problems are atelectasis, pneumonia, and pulmonary emboli. Pneumonia is the inflammation of lung tissue that causes productive cough, dyspnea, and lung crackles and can be caused by retained pulmonary secretions. Use of an incentive spirometer helps to prevent pneumonia and atelectasis. Hypoxemia is an inadequate concentration of oxygen in arterial blood. While close monitoring of the oxygen saturation will help to detect hypoxemia, monitoring is not directly related to coughing and deep-breathing techniques. Fluid imbalance can be a deficit or excess related to fluid loss or overload, and surgical clients are often given intravenous fluids to prevent a deficit; however, this is not related to coughing and deep breathing. Pulmonary embolus occurs as a result of a blockage of the pulmonary artery that disrupts blood flow to 1 or more lobes of the lung; this is usually due to clot formation. Early ambulation and administration of blood thinners helps to prevent this complication; however, it is not related to coughing and deep-breathing techniques.
Test-Taking Strategy: Note the strategic words, most appropriate. Focus on the subject, client instructions related to coughing and deep-breathing techniques. Also, focus on the data in the question and note the relationship between the words coughing and deep-breathing in the question and pneumonia in the correct option.
Review: Postoperative complications
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Teaching and Learning
Content Area: Fundamentals of Care—Perioperative Care
Priority Concepts: Client Education; Gas Exchange
Reference: Perry, Potter, Ostendorf (2014), pp. 597-599, 893.

170. 3
Rationale: The nurse would assist the client to void immediately before surgery so that the bladder will be empty. Oral hygiene is allowed, but the client should not swallow any water. The client usually has a restriction of food and fluids for 6 to 8 hours (or longer as prescribed) before surgery instead of 24 hours. A slight increase in blood pressure and pulse is common during the preoperative period and is usually the result of anxiety.
Test-Taking Strategy: Focus on the subject, preoperative care measures. Think about the measures that may be helpful and promote comfort. Oral hygiene should be administered since it may make the client feel more comfortable. A client should be nothing by mouth (NPO) for 6 to 8 hours before surgery rather than 24 hours. A slight increase in blood pressure or pulse is insignificant in this situation.
Review: Preoperative care
Level of Cognitive Ability: Creating
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Planning
Content Area: Fundamentals of Care—Perioperative Care
Priority Concepts: Clinical Judgment; Palliation
Reference: Ignatavicius, Workman (2016), p. 234.

171. 4
Rationale: Every effort should be made to obtain permission from a responsible family member to perform surgery if the client is unable to sign the consent form. A telephone consent must be witnessed by 2 persons who hear the family member's oral consent. The 2 witnesses then sign the consent with the name of the family member, noting that an oral consent was obtained. Consent is not informed if it is obtained from a client who is confused, unconscious, mentally incompetent, or under the influence of sedatives. In an emergency, a client may be unable to sign and family members may not be available. In this situation, a health care provider is permitted legally to perform surgery without consent, but the data in the question do not indicate an emergency. Options 1, 2, and 3 are not appropriate in this situation. Also, agency policies regarding informed consent should always be followed.
Test-Taking Strategy: Note the strategic words, most appropriate. Focus on the data in the question. Eliminate options 1 and 3 first. Option 1 will delay necessary surgery and option 3 is inappropriate. Option 2 is not an acceptable and legal role of a charge nurse. Select option 4 since it is the only legally acceptable option: to obtain a telephone permission from a family member if it is witnessed by 2 persons.
Review: The procedures for obtaining informed consent
Level of Cognitive Ability: Applying
Client Needs: Safe and Effective Care Environment
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Perioperative Care
Priority Concepts: Ethics; Health Care Law
Reference: Lewis et al. (2014), pp. 325-326, 784.

172. 3
Rationale: Explanations should begin with the information that the client knows. By providing the client with individualized explanations of care and procedures, the nurse can assist the client in handling anxiety and fear for a smooth preoperative experience. Clients who are calm and emotionally prepared for surgery withstand anesthesia better and experience fewer postoperative complications. Option 1 does not focus on the client's anxiety. Explaining the entire surgical procedure may increase the client's anxiety. Option 4 avoids the client's anxiety and is focused on postoperative care.
Test-Taking Strategy: Note that the client expresses anxiety. Use knowledge of therapeutic communication techniques. Note that the question contains strategic words, most likely, and also note the words stimulate further discussion. Also use the steps of the nursing process. The correct option addresses assessment and is the only therapeutic response.
Review: Therapeutic communication techniques
Level of Cognitive Ability: Applying

Client Needs: Psychosocial Integrity
Integrated Process: Communication and Documentation
Content Area: Fundamentals of Care—Perioperative Care
Priority Concepts: Anxiety; Communication
References: Lewis et al. (2014), p. 319; Perry, Potter, Ostendorf (2014), p. 31.

173. 4
Rationale: For optimal lung expansion with the incentive spirometer, the client should assume the semi-Fowler's or high Fowler's position. The mouthpiece should be covered completely and tightly while the client inhales slowly, with a constant flow through the unit. The breath should be held for 5 seconds before exhaling slowly.
Test-Taking Strategy: Focus on the subject, correct use of an incentive spirometer, and visualize the procedure. Note the words rapidly, loose, and 15 seconds in the incorrect options. Options 1, 2, and 3 are incorrect steps regarding incentive spirometer use.
Review: Incentive spirometry
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Teaching and Learning
Content Area: Fundamentals of Care—Perioperative Care
Priority Concepts: Client Education; Gas Exchange
Reference: Perry, Potter, Ostendorf (2014), pp. 597–599, 893.

174. 3
Rationale: Antiplatelets alter normal clotting factors and increase the risk of bleeding after surgery. Aspirin has properties that can alter platelet aggregation and should be discontinued at least 48 hours before surgery. However, the client should always check with his or her health care provider regarding when to stop taking the aspirin when a surgical procedure is scheduled. Options 1, 2, and 4 are accurate client statements.
Test-Taking Strategy: Note the strategic words, needs additional teaching. These words indicate a negative event query and that you need to select the incorrect client statement. Eliminate options 1 and 2 first because they are comparable or alike. From the remaining options, recalling that aspirin has properties that can alter platelet aggregation will direct you to the correct option.
Review: Antiplatelet medications in the preoperative period
Level of Cognitive Ability: Evaluating
Client Needs: Physiological Integrity
Integrated Process: Teaching and Learning
Content Area: Fundamentals of Care—Perioperative Care
Priority Concepts: Client Education; Clotting
Reference: Ignatavicius, Workman (2016), p. 228.

175. 2
Rationale: Serous drainage is an expected finding at a surgical site. The other options indicate signs of wound infection. Signs and symptoms of infection include warm, red, and tender skin around the incision. Wound infection usually appears 3 to 6 days after surgery. The client also may have a fever and chills. Purulent material may exit from drains or from separated wound edges. Infection may be caused by poor aseptic technique or a contaminated wound before surgical exploration; existing client conditions such as diabetes mellitus or immunocompromise may place the client at risk.
Test-Taking Strategy: Focus on the subject, normal findings in the postoperative period. Eliminate options 1, 3, and 4 because they are comparable or alike and are manifestations of infection.
Review: Postoperative assessment
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Assessment
Content Area: Fundamentals of Care—Perioperative Care
Priority Concepts: Infection; Tissue Integrity
Reference: Ignatavicius, Workman (2016), p. 264.

176. 1
Rationale: Increasing restlessness is a sign that requires continuous and close monitoring because it could indicate a potential complication, such as hemorrhage, shock, or pulmonary embolism. A blood pressure of 110/70 mm Hg with a pulse of 86 beats/minute is within normal limits. Hypoactive bowel sounds heard in all 4 quadrants are a normal occurrence in the immediate postoperative period.
Test-Taking Strategy: Note the strategic word, most. Focus on the subject, a manifestation of an evolving complication in the immediate postoperative period. Eliminate each of the incorrect options because they are comparable or alike and are normal expected findings, especially given the time frame noted in the question.
Review: Postoperative assessment
Level of Cognitive Ability: Analyzing
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Analysis
Content Area: Fundamentals of Care—Perioperative Care
Priority Concepts: Clinical Judgment; Safety
Reference: Ignatavicius, Workman (2016), pp. 260-261, 741.

177. 1, 2, 3, 4
Rationale: Wound dehiscence is the separation of the wound edges. Wound evisceration is protrusion of the internal organs through an incision. If wound dehiscence or evisceration occurs, the nurse should call for help, stay with the client, and ask another nurse to contact the surgeon and obtain needed supplies to care for the client. The nurse places the client in a low Fowler's position, and the client is kept quiet and instructed not to cough. Protruding organs are covered with a sterile saline dressing. Ice is not applied because of its vasoconstrictive effect. The treatment for evisceration is usually immediate wound closure under local or general anesthesia. The nurse also documents the findings and actions taken.
Test-Taking Strategy: Focus on the subject, that the client is experiencing wound evisceration. Visualizing this occurrence will assist you in determining that the client would not be placed supine and that ice packs would not be placed on the incision.
Review: Evisceration
Level of Cognitive Ability: Analyzing
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Perioperative Care
Priority Concepts: Clinical Judgment; Tissue Integrity
Reference: Ignatavicius, Workman (2016), p. 264.

178. 1
Rationale: Routine screening tests include a complete blood count, serum electrolyte analysis, coagulation studies, and a serum creatinine test. The complete blood count includes the hemoglobin analysis. All of these values are within normal range except for hemoglobin. If a client has a low hemoglobin level, the surgery likely could be postponed by the surgeon.
Test-Taking Strategy: Focus on the subject, an abnormal laboratory result that needs to be reported. Use knowledge of the normal reference intervals to assist in answering correctly. The hemoglobin value is the only abnormal laboratory finding.
Review: Normal laboratory reference levels
Level of Cognitive Ability: Analyzing
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Perioperative Care
Priority Concepts: Clinical Judgment; Collaboration
Reference: Lewis et al. (2014), pp. 325, 626.

179. 1
Rationale: The first action of the nurse is to assess the patency of the airway and respiratory function. If the airway is not patent, the nurse must take immediate measures for the survival of the client. The nurse then takes vital signs followed by checking the dressing and the tubes or drains. The other nursing actions should be performed after a patent airway has been established.
Test-Taking Strategy: Note the strategic word, first. Use the principles of prioritization to answer this question. Use the ABCs—airway, breathing, and circulation. Ensuring airway patency is the first action to be taken, directing you to the correct option.
Review: Postoperative care
Level of Cognitive Ability: Analyzing
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Planning
Content Area: Fundamentals of Care—Perioperative Care
Priority Concepts: Care Coordination; Clinical Judgment
Reference: Ignatavicius, Workman (2016), p. 258.

180. 1
Rationale: Prednisone is a corticosteroid. With prolonged use, corticosteroids cause adrenal atrophy, which reduces the ability of the body to withstand stress. When stress is severe, corticosteroids are essential to life. Before and during surgery, dosages may be increased temporarily and may be given parenterally rather than orally. Ferrous sulfate is an oral iron preparation used to treat iron deficiency anemia. Cyclobenzaprine is a skeletal muscle relaxant. Conjugated estrogen is an estrogen used for hormone replacement therapy in postmenopausal women. These last 3 medications may be withheld before surgery without undue effects on the client.
Test-Taking Strategy: Focus on the subject, the medication that should be administered in the preoperative period. Use knowledge about medications that may have special implications for the surgical client. Prednisone is a corticosteroid. Recall that when stress is severe, such as with surgery, corticosteroids are essential to life.
Review: Corticosteroids in the preoperative period
Level of Cognitive Ability: Analyzing
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Analysis
Content Area: Fundamentals of Care—Perioperative Care
Priority Concepts: Clinical Judgment; Collaboration
Reference: Lewis et al. (2014), pp. 320–321.

CHAPTER 19

Positioning Clients

PRIORITY CONCEPT Mobility; Safety

CRITICAL THINKING What Should You Do?

The nurse is caring for a client who is receiving intermittent tube feedings via a nasogastric tube. In maintaining proper positioning for this client, what actions should the nurse take?
Answer located on p. 234.

For reference throughout the chapter, please see Figures 19-1, Figure 19-2, Figure 19-3, and Figure 19-4.

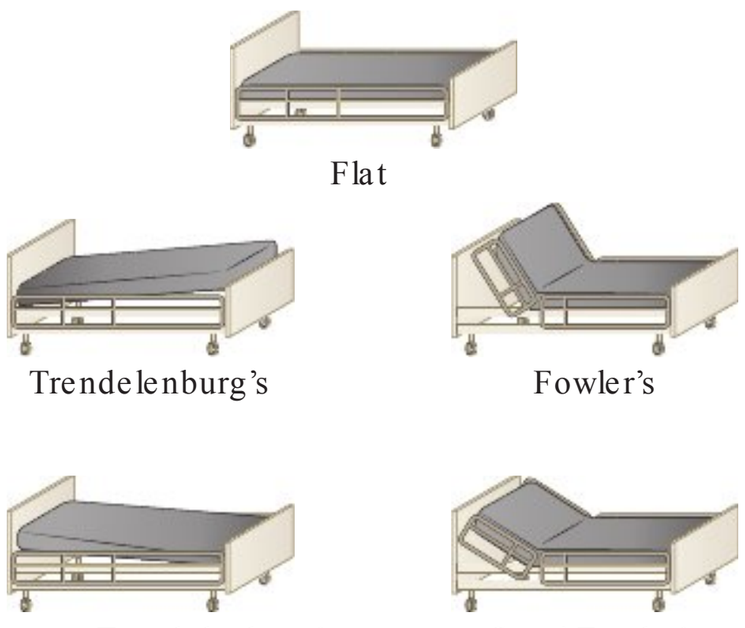


FIGURE 19-1 Bed positions.

I. Guidelines for Positioning

A. Client safety and comfort
   1. Position client in a safe and appropriate manner to provide safety and comfort.
   2. Select a position that will prevent the development of complications related to an existing condition, prescribed treatment, or medical or surgical procedure.

B. Ergonomic principles related to body mechanics (Box 19-1)

Always review the health care provider's (HCP's) prescription, especially after treatments or procedures, and take note of instructions regarding positioning and mobility.

BOX 19-1 Body Mechanics (Ergonomic Principles) for Health Care Workers

When planning to move a client, arrange for adequate help. Use mechanical aids if help is unavailable.
Encourage the client to assist as much as possible.
Keep the back, neck and pelvis, and feet aligned. Avoid twisting.
Flex knees, and keep feet wide apart.
Raise the client's bed so that the client's weight is at the level of the nurse's center of gravity.
Position self close to the client (or object being lifted).
Use arms and legs (not back).
Slide client toward yourself, using a pull sheet. When transferring a client onto a stretcher, a slide board is more appropriate.
Set (tighten) abdominal and gluteal muscles in preparation for the move.
Person with the heaviest load coordinates efforts of the team involved by counting to 3.

Adapted from Potter P, Perry A, Stockert P, Hall A: Fundamentals of nursing, ed 8, St. Louis, 2013, Mosby. Perry, Potter, Ostendorf (2014), pp. 197-198. St. Louis: Mosby.

II. Positions to Ensure Safety and Comfort

A. Integumentary system
   1. Autograft: After surgery, the site is immobilized usually for 3 to 7 days to provide the time needed for the graft to adhere and attach to the wound bed.
   2. Burns of the face and head: Elevate the head of the bed to prevent or reduce facial, head, and tracheal edema.
   3. Circumferential burns of the extremities: Elevate the extremities above the level of the heart to prevent or reduce dependent edema.
   4. Skin graft: Elevate and immobilize the graft site to prevent movement and shearing of the graft and disruption of tissue; avoid weight-bearing.

B. Reproductive system
   1. Mastectomy
      a. Position the client with the head of the bed elevated at least 30 degrees (semi-Fowler's

FIGURE 19-2 Lithotomy position for examination.

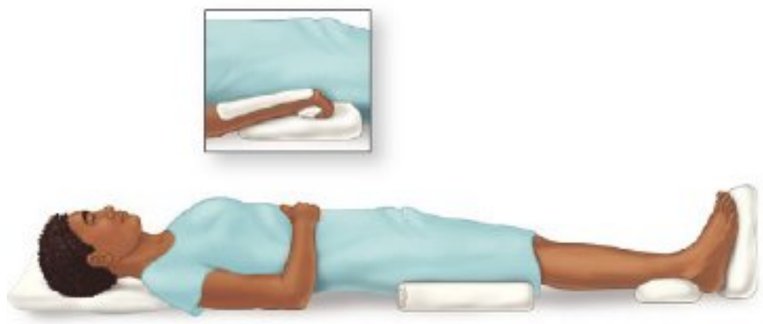
position), with the affected arm elevated on a pillow to promote lymphatic fluid return after the removal of axillary lymph nodes.

b. Turn the client only to the back and unaffected side.

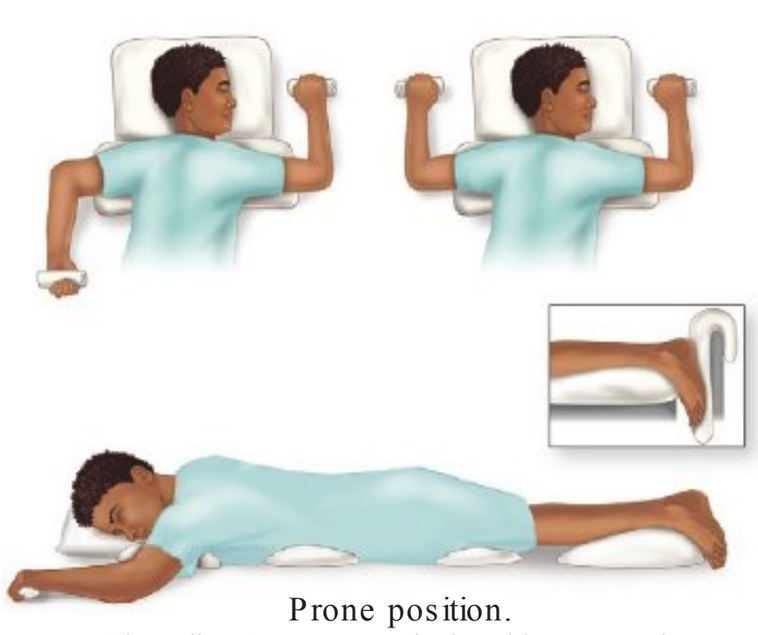
2. Perineal and vaginal procedures: Place the client in the lithotomy position.

Lateral (side-lying) position

Semiprone (Sims' or forward side-lying) position



Supine position



Prone position.
The client's arms and shoulders may be positioned in internal or external rotation.

FIGURE 19-3 Client positions.

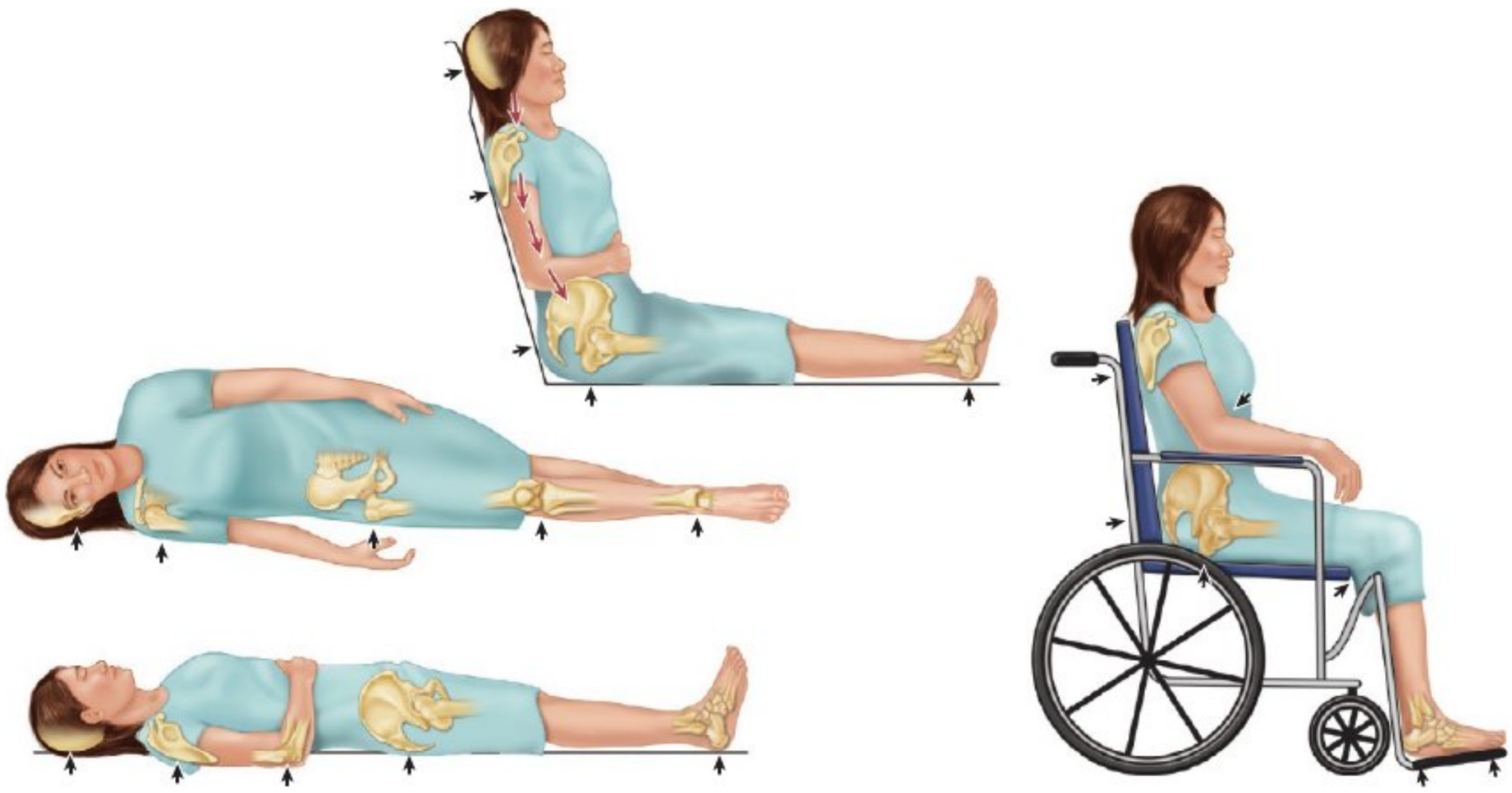


FIGURE 19-4 Pressure points in lying and sitting positions.

C. Endocrine system
   1. Hypophysectomy: Elevate the head of the bed to prevent increased intracranial pressure.
   2. Thyroidectomy
      a. Place the client in the semi-Fowler's to Fowler's position to reduce swelling and edema in the neck area.
      b. Sandbags or pillows or other stabilization devices may be used to support the client's head or neck.
      c. Avoid neck extension to decrease tension on the suture line.

D. Gastrointestinal system
   1. Hemorrhoidectomy: Assist the client to a lateral (side-lying) position to prevent pain and bleeding.
   2. Gastroesophageal reflux disease: Reverse Trendelenburg's position may be prescribed to promote gastric emptying and prevent esophageal reflux.
   3. Liver biopsy (see Priority Nursing Actions)

PRIORITY NURSING ACTIONS

Liver Biopsy

1. Explain the procedure to the client.
2. Ensure that informed consent has been obtained.
3. Position the client supine, with the right side of the upper abdomen exposed; the client's right arm is raised and extended behind the head and over the left shoulder.
4. Remain with the client during the procedure.
5. After the procedure, assist the client into a right lateral (side-lying) position and place a small pillow or folded towel under the puncture site.
6. Monitor vital signs closely after the procedure and monitor for signs of bleeding.
7. Document appropriate information about the procedure, client's tolerance, and postprocedure assessment findings.

For the client undergoing liver biopsy (or any invasive procedure), the procedure is explained to the client and informed consent is obtained by the health care provider performing the procedure. Since the liver is located on the right side of the upper abdomen, the client is positioned supine, with the right side of the upper abdomen exposed. In addition, the right arm is raised and extended behind the head and over the left shoulder. This position provides for maximal exposure of the right intercostal spaces. The nurse remains with the client during the procedure to provide emotional support and comfort. After the procedure, the client is assisted into a right lateral (side-lying) position and a small pillow or folded towel is placed under the puncture site for at least 3 hours or as prescribed, to provide pressure to the site and prevent bleeding. Vital signs are monitored closely after the procedure and the client is monitored for signs of bleeding. The nurse documents appropriate information about the procedure, the client's tolerance, and postprocedure assessment findings.

Reference

Lewis et al. (2014), pp. 882–883.

4. Paracentesis: Client is usually positioned in a semi-Fowler's position in bed, or sitting upright on the side of the bed or in a chair with the feet supported; client is assisted to a position of comfort following the procedure.
5. Nasogastric tube
   a. Insertion
      (1) Position the client in a high Fowler's position with the head tilted forward.
      (2) This position will help to close the trachea and open the esophagus.
   b. Irrigations and tube feedings
      (1) Elevate the head of the bed (semi-Fowler's to Fowler's position) to prevent aspiration.
      (2) Maintain head elevation for 30 minutes to 1 hour (per agency procedure) after an intermittent feeding.
      (3) The head of the bed should remain elevated for continuous feedings.

If the client receiving a continuous tube feeding needs to be placed in a supine position when providing care, such as when giving a bed bath or changing linens, shut off the feeding to prevent aspiration. Remember to turn the feeding back on and check the rate of flow when the client is placed back into the semi-Fowler's or Fowler's position.

6. Rectal enema and irrigations: Place the client in the left Sims' position to allow the solution to flow by gravity in the natural direction of the colon.
7. Sengstaken-Blakemore and Minnesota tubes
   a. Not commonly used because they are uncomfortable for the client and can cause complications, but their use may be necessary when other interventions are not feasible.
   b. If prescribed, maintain elevation of the head of the bed to enhance lung expansion and reduce portal blood flow, permitting effective esophagogastric balloon tamponade.

E. Respiratory system
   1. Chronic obstructive pulmonary disease: In advanced disease, place the client in a sitting position, leaning forward, with the client's arms over several pillows or an overbed table; this position will assist the client to breathe easier.
   2. Laryngectomy (radical neck dissection): Place the client in a semi-Fowler's or Fowler's position to maintain a patent airway and minimize edema.
   3. Bronchoscopy postprocedure: Place the client in a semi-Fowler's position to prevent choking or aspiration resulting from an impaired ability to swallow.

4. Postural drainage: The lung segment to be drained should be in the uppermost position; Trendelenburg's position may be used.
5. Thoracentesis
   a. During the procedure, to facilitate removal of fluid from the pleural space, position the client sitting on the edge of the bed and leaning over the bedside table with the feet supported on a stool, or lying in bed on the unaffected side with the client in Fowler's position.
   b. After the procedure, assist the client to a position of comfort.

! Always check the HCP's prescription regarding positioning for the client who had a thoracotomy, lung wedge resection, lobectomy of the lung, or pneumonectomy.

F. Cardiovascular system
   1. Abdominal aneurysm resection
      a. After surgery, limit elevation of the head of the bed to 45 degrees to avoid flexion of the graft.
      b. The client may be turned from side to side.
   2. Amputation of the lower extremity
      a. During the first 24 hours after amputation, elevate the foot of the bed (the residual limb is supported with pillows but not elevated because of the risk of flexion contractures) to reduce edema.
      b. Consult with the HCP and, if prescribed, position the client in a prone position twice a day for a 20- to 30-minute period to stretch muscles and prevent flexion contractures of the hip.
   3. Arterial vascular grafting of an extremity
      a. To promote graft patency after the procedure, bed rest usually is maintained for approximately 24 hours and the affected extremity is kept straight.
      b. Limit movement and avoid flexion of the hip and knee.
   4. Cardiac catheterization
      a. If the femoral vessel was accessed for the procedure, the client is maintained on bed rest for 4 to 6 hours (time for bed rest may vary depending on HCP preference and if a vascular closure device was used); the client may turn from side to side.
      b. The affected extremity is kept straight and the head is elevated no more than 30 degrees (some HCPs prefer a lower head position or the flat position) until hemostasis is adequately achieved.
   5. Heart failure and pulmonary edema: Position the client upright, preferably with the legs dangling over the side of the bed, to decrease venous return and lung congestion.

! Most often, clients with respiratory and cardiac disorders should be positioned with the head of the bed elevated.

   6. Peripheral arterial disease
      a. Obtain the HCP's prescription for positioning.
      b. Because swelling can prevent arterial blood flow, clients may be advised to elevate their feet at rest, but they should not raise their legs above the level of the heart because extreme elevation slows arterial blood flow; some clients may be advised to maintain a slightly dependent position to promote perfusion.
   7. Deep vein thrombosis
      a. If the extremity is red, edematous, and painful, traditional heparin sodium therapy may be initiated. Bed rest with leg elevation may also be prescribed for the client.
      b. Clients receiving low-molecular-weight heparin usually can be out of bed after 24 hours if pain level permits.
   8. Varicose veins: Leg elevation above heart level usually is prescribed; the client also is advised to minimize prolonged sitting or standing during daily activities.
   9. Venous insufficiency and leg ulcers: Leg elevation usually is prescribed.

G. Sensory system
   1. Cataract surgery: Postoperatively, elevate the head of the bed (semi-Fowler's to Fowler's position) and position the client on the back or the nonoperative side to prevent the development of edema at the operative site.
   2. Retinal detachment
      a. If the detachment is large, bed rest and bilateral eye patching may be prescribed to minimize eye movement and prevent extension of the detachment.
      b. Restrictions in activity and positioning following repair of the detachment depends on the HCP's preference and the surgical procedure performed.

H. Neurological system
   1. Autonomic dysreflexia: Elevate the head of the bed to a high Fowler's position to assist with adequate ventilation and assist in the prevention of hypertensive stroke.

! If autonomic dysreflexia occurs, immediately place the client in a high Fowler's position.

2. Cerebral aneurysm: Bed rest is maintained with the head of the bed elevated 30 to 45 degrees to prevent pressure on the aneurysm site.
3. Cerebral angiography
   a. Maintain bed rest for the length of time as prescribed.
   b. The extremity into which the contrast medium was injected is kept straight and immobilized for about 6 to 8 hours.
4. Stroke (brain attack)
   a. In clients with hemorrhagic strokes, the head of the bed is usually elevated to 30 degrees to reduce intracranial pressure and to facilitate venous drainage.
   b. For clients with ischemic strokes, the head of the bed is usually kept flat.
   c. Maintain the head in a midline, neutral position to facilitate venous drainage from the head.
   d. Avoid extreme hip and neck flexion; extreme hip flexion may increase intrathoracic pressure, whereas extreme neck flexion prohibits venous drainage from the brain.
5. Craniotomy
   a. The client should not be positioned on the site that was operated on, especially if the bone flap has been removed, because the brain has no bony covering on the affected site.
   b. Elevate the head of the bed 30 to 45 degrees and maintain the head in a midline, neutral position to facilitate venous drainage from the head.
   c. Avoid extreme hip and neck flexion.
6. Laminectomy and other vertebral surgery
   a. Logroll the client.
   b. When the client is out of bed, the client's back is kept straight (the client is placed in a straight-backed chair) with the feet resting comfortably on the floor.
7. Increased intracranial pressure
   a. Elevate the head of the bed 30 to 45 degrees and maintain the head in a midline, neutral position to facilitate venous drainage from the head.
   b. Avoid extreme hip and neck flexion.

! Do not place a client with a head injury in a flat or Trendelenburg's position because of the risk of increased intracranial pressure.

8. Lumbar puncture
   a. During the procedure, assist the client to the lateral (side-lying) position, with the back bowed at the edge of the examining table, the knees flexed up to the abdomen, and the neck flexed so that the chin is resting on the chest.
   b. After the procedure, place the client in the supine position for 4 to 12 hours, as prescribed.
9. Spinal cord injury
   a. Immobilize the client on a spinal backboard, with the head in a neutral position, to prevent incomplete injury from becoming complete.
   b. Prevent head flexion, rotation, or extension; the head is immobilized with a firm, padded cervical collar.
   c. Logroll the client; no part of the body should be twisted or turned, nor should the client be allowed to assume a sitting position.

I. Musculoskeletal system

1. Total hip replacement
   a. Positioning depends on the surgical techniques used (anterior or posterior approach), the method of implantation, the prosthesis, and surgeon's preference.
   b. Avoid extreme internal and external rotation.
   c. Avoid adduction; in most cases side-lying is permitted as long as an abduction pillow is in place; some surgeons allow turning to only 1 side.
   d. Maintain abduction when the client is in a supine position or positioned on the nonoperative side.
   e. Place a wedge (abduction) pillow between the client's legs to maintain abduction; instruct the client not to cross the legs
   f. Check the HCP's prescriptions regarding elevation of the head of the bed and hip flexion.
2. Devices used to promote proper positioning (Box 19-2)

CRITICAL THINKING What Should You Do?

Answer: For the client receiving intermittent tube feedings via a nasogastric tube, the nurse should position the client in an upright (semi-Fowler's or high Fowler's) position during the feeding and for 30 minutes to 1 hour following the feeding, per agency procedure. Positioning the client in an upright position prevents aspiration of the formula. For the client receiving a continuous tube feeding, an upright position should be maintained at all times.

Reference: Perry, Potter, Ostendorf (2014), p. 778.

BOX 19-2 Devices Used for Proper Positioning

Bed Boards

These plywood boards are placed under the entire surface area of the mattress and are useful for increasing back support and body alignment.

Foot Boots

Foot boots are made of rigid plastic or heavy foam and keep the foot flexed at the proper angle. They should be removed 2 or 3 times a day to assess skin integrity and joint mobility.

Hand Rolls

Hand rolls maintain the fingers in a slightly flexed and functional position and keep the thumb slightly adducted in opposition to the fingers.

Hand-Wrist Splints

These splints are individually molded for the client to maintain proper alignment of the thumb in slight adduction and the wrist in slight dorsiflexion.

Pillows

Pillows provide support, elevate body parts, splint incisional areas, and reduce postoperative pain during activity, coughing, or deep breathing. They should be of the appropriate size for the body part to be positioned.

Sandbags

Sandbags are soft devices filled with a substance that can be shaped to body contours to provide support. They immobilize extremities and maintain specific body alignment.

Side Rails

These bars, positioned along the sides of the length of the bed, ensure client safety and are useful for increasing mobility. They also provide assistance in rolling from side to side or sitting up in bed. Laws regarding the use of side rails vary state to state and these laws must be followed; therefore, agency policies must be followed.

Trapeze Bar

This bar descends from a securely fastened overhead bar attached to the bed frame. It allows the client to use the upper extremities to raise the trunk off the bed, assists in transfer from the bed to a wheelchair, and helps the client to perform upper arm–strengthening exercises.

Trochanter Rolls

These rolls prevent external rotation of the legs when the client is in the supine position. To form a roll, use a cotton bath blanket or a sheet folded lengthwise to a width extending from the greater trochanter of the femur to the lower border of the popliteal space.

Wedge Pillow

This triangular pillow is made of heavy foam and is used to maintain the legs in abduction following total hip replacement surgery.

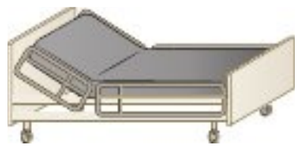
Adapted from Potter P, Perry A, Stockert P, Hall A: Fundamentals of nursing, ed 8, St. Louis, 2013, Mosby.

PRACTICE QUESTIONS

181. A client is being prepared for a thoracentesis. The nurse should assist the client to which position for the procedure?
   1. Lying in bed on the affected side
   2. Lying in bed on the unaffected side
   3. Sims' position with the head of the bed flat
   4. Prone with the head turned to the side and supported by a pillow

❖ 182. The nurse is caring for a client following a craniotomy, in which a large tumor was removed from the left side. In which position can the nurse safely place the client? Refer to the figures in options 1 to 4.

1.



2.

3.

4.

183. The nurse creates a plan of care for a client with deep vein thrombosis. Which client position or activity in the plan should be included?
   1. Out-of-bed activities as desired
   2. Bed rest with the affected extremity kept flat
   3. Bed rest with elevation of the affected extremity
   4. Bed rest with the affected extremity in a dependent position

184. The nurse is caring for a client who is 1 day postoperative for a total hip replacement. Which is the best position in which the nurse should place the client?
   1. Side-lying on the operative side
   2. On the nonoperative side with the legs abducted
   3. Side-lying with the affected leg internally rotated
   4. Side-lying with the affected leg externally rotated

185. The nurse is providing instructions to a client and the family regarding home care after right eye cataract removal. Which statement by the client would indicate an understanding of the instructions?
1. "I should sleep on my left side."
2. "I should sleep on my right side."
3. "I should sleep with my head flat."
4. "I should not wear my glasses at any time."

186. The nurse is administering a cleansing enema to a client with a fecal impaction. Before administering the enema, the nurse should place the client in which position?
1. Left Sims' position
2. Right Sims' position
3. On the left side of the body, with the head of the bed elevated 45 degrees
4. On the right side of the body, with the head of the bed elevated 45 degrees

187. A client has just returned to a nursing unit after an above-knee amputation of the right leg. The nurse should place the client in which position?
1. Prone
2. Reverse Trendelenburg's
3. Supine, with the residual limb flat on the bed
4. Supine, with the residual limb supported with pillows

188. The nurse is caring for a client with a severe burn who is scheduled for an autograft to be placed on the lower extremity. The nurse creates a postoperative plan of care for the client and should include which intervention in the plan?
1. Maintain the client in a prone position.
2. Elevate and immobilize the grafted extremity.
3. Maintain the grafted extremity in a flat position.
4. Keep the grafted extremity covered with a blanket.

189. The nurse is preparing to care for a client who has returned to the nursing unit following cardiac catheterization performed through the femoral vessel. The nurse checks the health care provider's (HCP's) prescription and plans to allow which client position or activity following the procedure?
1. Bed rest in high Fowler's position
2. Bed rest with bathroom privileges only
3. Bed rest with head elevation at 60 degrees
4. Bed rest with head elevation no greater than 30 degrees

190. The nurse is preparing to insert a nasogastric tube into a client. The nurse should place the client in which position for insertion?
1. Right side
2. Low Fowler's
3. High Fowler's
4. Supine with the head flat

ANSWERS

181. 2
Rationale: To facilitate removal of fluid from the chest, the client is positioned sitting at the edge of the bed leaning over the bedside table, with the feet supported on a stool; or lying in bed on the unaffected side with the head of the bed elevated 30 to 45 degrees. The prone and Sims' positions are inappropriate positions for this procedure.
Test-Taking Strategy: Focus on the subject, positioning for thoracentesis. To perform a thoracentesis safely, the site must be visible to the health care provider (HCP) performing the procedure. The client should be placed in a position where he or she is as comfortable as possible with access to the affected side. A prone position would not give the HCP access to the chest. Lying on the affected side would prevent access to the site.
Review: Positioning for thoracentesis
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Diagnostic Tests
Priority Concepts: Clinical Judgment; Safety
References: Lewis et al. (2014), pp. 493, 550; Perry, Potter, Ostendorf (2014), p. 1110.

182. 1
Rationale: Clients who have undergone crainotomy should have the head of the bed elevated 30 to 45 degrees to promote venous drainage from the head. The client is positioned to avoid extreme hip or neck flexion and the head is maintained in a midline neutral position. The client should not be positioned on the site that was operated on, especially if the bone flap was removed, because the brain has no bony covering on the affected site. A flat position or Trendelenburg's position would increase intracranial pressure. A reverse Trendelenburg's position would not be helpful and may be uncomfortable for the client.
Test-Taking Strategy: Focus on the subject, positioning following craniotomy. Remember that a primary concern is the risk for increased intracranial pressure. Therefore, use concepts related to gravity and preventing edema and increased intracranial pressure to answer this question.
Review: Positioning following craniotomy
Level of Cognitive Ability: Analyzing
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Safety
Priority Concepts: Intracranial Regulation; Safety
Reference: Ignatavicius, Workman (2016), p. 960.

183. 3
Rationale: For the client with deep vein thrombosis, elevation of the affected leg facilitates blood flow by the force of gravity and also decreases venous pressure, which in turn relieves edema and pain. A flat or dependent position of the leg would not achieve this goal. Bed rest is indicated to prevent emboli and to prevent pressure fluctuations in the venous system that occur with walking.
Test-Taking Strategy: Focus on the subject, the safe position or activity for the client with deep vein thrombosis. Think about the pathophysiology associated with this disorder and the principles related to gravity flow and edema to answer the question.
Review: Positioning for a venous disorder
Level of Cognitive Ability: Creating
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Planning
Content Area: Fundamentals of Care—Safety
Priority Concepts: Perfusion; Safety
Reference: Ignatavicius, Workman (2016), p. 731.

184. 2
Rationale: Positioning following a total hip replacement depends on the surgical techniques used, the method of implantation, the prosthesis, and the health care provider's (HCP's) preference. Abduction is maintained when the client is in a supine position or positioned on the nonoperative side. Internal and external rotation, adduction, or side-lying on the operative side (unless specifically prescribed by the HCP) is avoided to prevent displacement of the prosthesis.
Test-Taking Strategy: Focus on the strategic word, best. Use knowledge regarding care of clients following total hip replacement to answer this question. After a total hip replacement, the client should never have the extremity internally or externally rotated. Lying on the surgical side can cause damage to the surgical replacement site.
Review: Positioning after total hip replacement
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Implementation
Content Area: Fundamentals of Care—Safety
Priority Concepts: Mobility; Safety
Reference: Lewis et al. (2014), p. 1526.

185. 1
Rationale: After cataract surgery, the client should not sleep on the side of the body that was operated on to prevent edema formation and intraocular pressure. The client also should be placed in a semi-Fowler's position to assist in minimizing edema and intraocular pressure. During the day, the client may wear glasses or a protective shield; at night, the protective shield alone is sufficient.
Test-Taking Strategy: Focus on the subject, right cataract surgery. Use of the principles of gravity and edema formation will assist in answering this question. Remember to instruct the client to remain off the operative side and to rest with the head elevated to minimize edema formation. This will assist you when answering questions related to cataract surgery.
Review: Positioning following cataract surgery
Level of Cognitive Ability: Evaluating
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Evaluation
Content Area: Fundamentals of Care—Safety
Priority Concepts: Client Teaching; Sensory Perception
Reference: Lewis et al. (2014), pp. 393-394.

186. 1
Rationale: For administering an enema, the client is placed in a left Sims' position so that the enema solution can flow by gravity in the natural direction of the colon. The head of the bed is not elevated in the Sims' position.
Test-Taking Strategy: Focus on the subject, positioning for enema administration. Use knowledge regarding the anatomy of the bowel to answer the question. The descending colon is located on the lower left side of the body. The head of the bed should be flat during enema administration.
Review: Enema administration
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Skills
Priority Concepts: Elimination; Safety
Reference: Perry, Potter, Ostendorf (2014), pp. 853-854.

187. 4
Rationale: The residual limb is usually supported on pillows for the first 24 hours following surgery to promote venous return and decrease edema. After the first 24 hours, the residual limb usually is placed flat on the bed to reduce hip contracture. Edema also is controlled by limb-wrapping techniques. In addition, it is important to check health care provider prescriptions regarding positioning following amputation.
Test-Taking Strategy: Focus on the subject, positioning following amputation, and note that the client has just returned from surgery. Using basic principles related to immediate postoperative care and preventing edema will assist in directing you to the correct option.
Review: Positioning following amputation
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Perioperative Care
Priority Concepts: Perfusion; Tissue Integrity
Reference: Lewis et al. (2014), p. 1532.

188. 2
Rationale: Autografts placed over joints or on lower extremities are elevated and immobilized following surgery for 3 to 7 days, depending on the surgeon's preference. This period of immobilization allows the autograft time to adhere and attach to the wound bed, and the elevation minimizes edema. Keeping the client in a prone position and covering the extremity with a blanket can disrupt the graft site.
Test-Taking Strategy: Focus on the subject, positioning following autograft. Use general postoperative principles; elevating the graft site will decrease edema to the graft. The client should not be placed in a prone position or have it covered after surgery since it can disrupt a graft easily.
Review: Positioning following autograft
Level of Cognitive Ability: Creating

Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Planning
Content Area: Fundamentals of Care—Perioperative Care
Priority Concepts: Perfusion; Tissue Integrity
References: Ignatavicius, Workman (2016), p. 484.
Lewis et al. (2014), pp. 466–467.

189. 4
Rationale: After cardiac catheterization, the extremity into which the catheter was inserted is kept straight for 4 to 6 hours. The client is maintained on bed rest for 4 to 6 hours (time for bed rest may vary depending on the HCP's preference and on whether a vascular closure device was used) and the client may turn from side to side. The head is elevated no more than 30 degrees (although some HCPs prefer a lower position or the flat position) until hemostasis is adequately achieved.
Test-Taking Strategy: Focus on the subject, positioning following cardiac catheterization. Think about this diagnostic procedure and what it entails. Understanding that the head of the bed is never elevated more than 30 degrees and bathroom privileges are restricted in the immediate postcatheterization period will assist in answering this question.
Review: Positioning following cardiac catheterization
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Planning
Content Area: Fundamentals of Care—Diagnostic Tests
Priority Concepts: Perfusion; Safety
Reference: Ignatavicius, Workman (2016), p. 644.

190. 3
Rationale: During insertion of a nasogastric tube, the client is placed in a sitting or high Fowler's position to facilitate insertion of the tube and reduce the risk of pulmonary aspiration if the client should vomit. The right side, and low Fowler's and supine positions place the client at risk for aspiration; in addition, these positions do not facilitate insertion of the tube.
Test-Taking Strategy: Focus on the subject, insertion of a nasogastric tube. Visualize each position and think about how it may facilitate insertion of the tube. Also, recall that a concern with insertion of a nasogastric tube is pulmonary aspiration. Placing the client in a high Fowler's position with his or her chin to the chest will decrease the risk of aspiration.
Review: Positioning for nasogastric tube insertion
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Skills
Priority Concepts: Clinical Judgment; Safety
Reference: Perry, Potter, Ostendorf (2014), p. 778.

CHAPTER 20

Care of a Client with a Tube

PRIORITY CONCEPTS Caregiving, Safety

CRITICAL THINKING What Should You Do?

The nurse assesses a client with a closed chest tube drainage system. On inspection, the nurse notes that the system is cracked. What should the nurse do?
Answer located on p. 251.

I. Nasogastric Tubes

A. Description
   1. These are tubes used to intubate the stomach.
   2. The tube is inserted from the nose to the stomach.

B. Purpose
   1. To decompress the stomach by removing fluids or gas to promote abdominal comfort
   2. To allow surgical anastomoses to heal without distention
   3. To decrease the risk of aspiration
   4. To administer medications to clients who are unable to swallow
   5. To provide nutrition by acting as a temporary feeding tube
   6. To irrigate the stomach and remove toxic substances, such as in poisoning

C. Types of tubes
   1. Levin tube (Fig. 20-1)
      a. Single-lumen nasogastric tube
      b. Used to remove gastric contents via intermittent suction or to provide tube feedings
   2. Salem sump tube: A Salem sump is a double-lumen nasogastric tube with an air vent (pigtail) used for decompression with intermittent continuous suction (see Fig. 20-1).

The air vent on a Salem sump tube is not to be clamped and is to be kept above the level of the stomach. If leakage occurs through the air vent, instill 30 mL of air into the air vent and irrigate the main lumen with normal saline (NS).

D. Intubation procedures (Box 20-1)

E. Irrigation
   1. Assess placement before irrigating (see Box 20-1).
   2. Perform irrigation every 4 hours to assess and maintain the patency of the tube.
   3. Gently instill 30 to 50 mL of water or NS (depending on agency policy) with an irrigation syringe.
   4. Pull back on the syringe plunger to withdraw the fluid to check patency; repeat if the tube flow is sluggish.

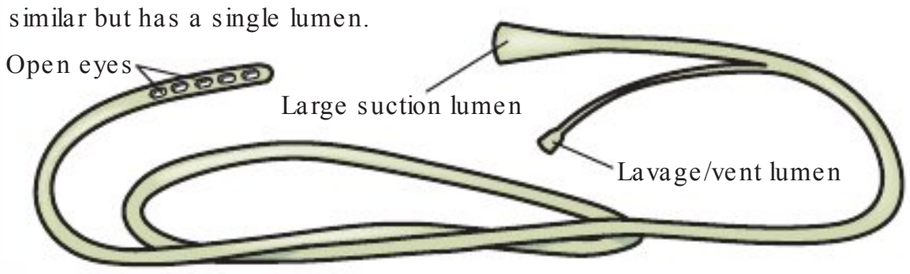
F. Removal of a nasogastric tube: Ask the client to take a deep breath and hold it; remove the tube slowly and evenly over the course of 3 to 6 seconds (coil the tube around the hand while removing it).

II. Gastrointestinal Tube Feedings

A. Types of tubes and anatomical placement
   1. Nasogastric: Nose to stomach
   2. Nasoduodenal-nasojejunal: Nose to duodenum or jejunum
   3. Gastrostomy: Stomach
   4. Jejunostomy: Jejunum

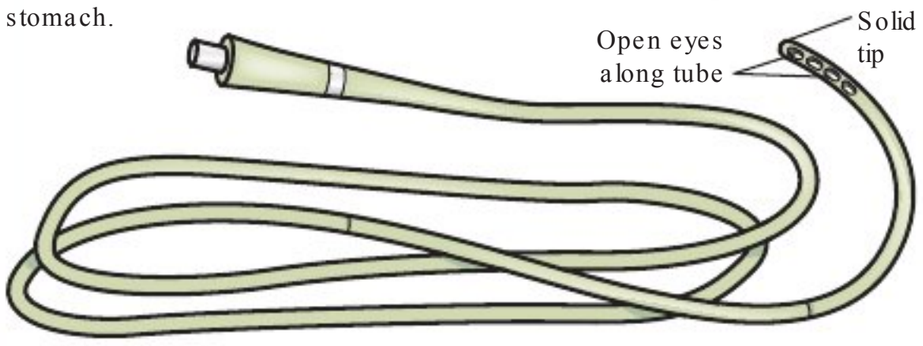
B. Types of administration
   1. Bolus
      a. A bolus resembles normal meal feeding patterns.
      b. Formula is administrated over a 30- to 60-minute period every 3 to 6 hours; the amount of formula and frequency can be recommended by the dietitian and is prescribed by the health care provider (HCP).
   2. Continuous
      a. Feeding is administered continually for 24 hours.
      b. An infusion feeding pump regulates the flow.
   3. Cyclical
      a. Feeding is administered in the daytime or nighttime for approximately 8 to 16 hours.
      b. An infusion feeding pump regulates the flow.
      c. Feedings at night allow for more freedom during the day.

Lavacuator tube
An orogastric tube with a large suction lumen and a smaller lavage/vent lumen that provides continuous suction because irrigating solution enters the lavage lumen while stomach contents are removed through the suction lumen. Used to remove toxic substances from the stomach. An ewald tube is similar but has a single lumen.

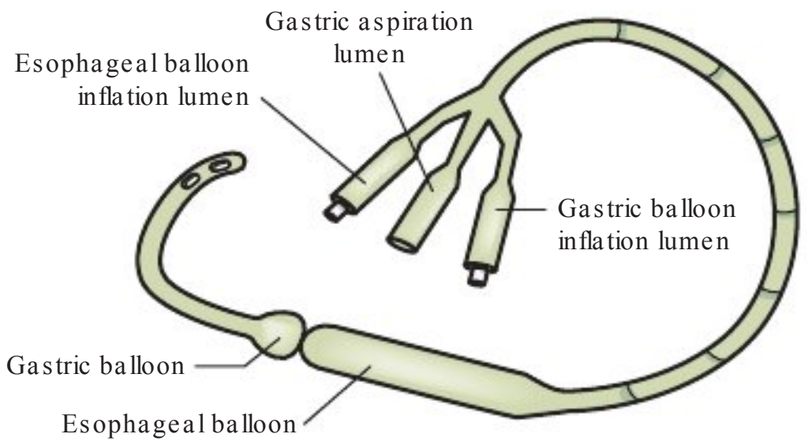


Cantor tube
A single-lumen long tube with a small inflatable bag at the distal end. A special substance (tungsten) is injected with a needle (gauge 21 or smaller or balloon may leak) and syringe into the bag of the tube.

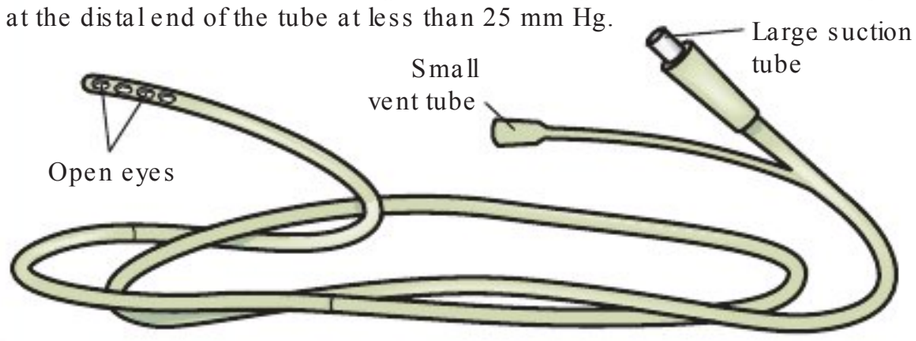
Levin tube
A plastic or rubber single-lumen tube with a solid tip that may be inserted into the stomach via the nose or mouth. Used to drain fluid and gas from the stomach.



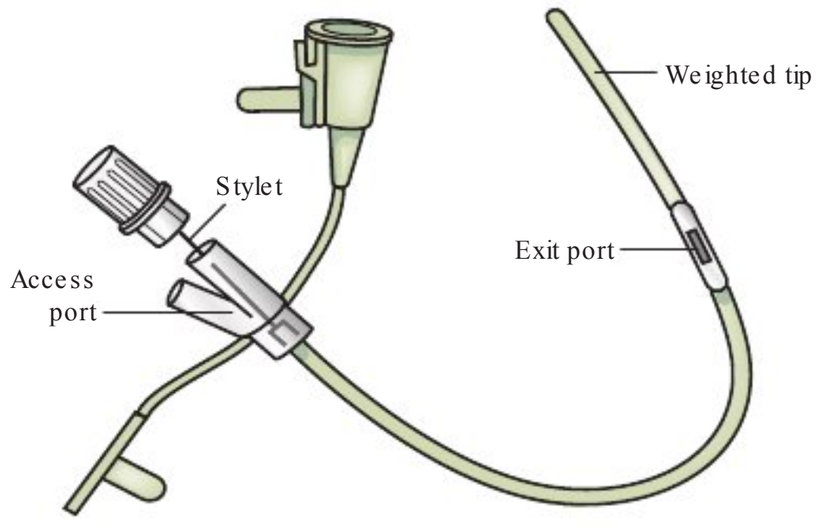
Sengstaken-Blakemore tube
A three-lumen tube. Two ports inflate an esophageal and a gastric balloon for tamponade, and the third is used for nasogastric suction. This tube does not provide esophageal suction, but a nasogastric tube may be inserted in the opposite naris or the mouth and allowed to rest on top of the esophageal balloon. Esophageal suction is then possible, reducing the risk of aspiration.



Salem sump tube
A double-lumen tube. The small vent tube within the large suction tube prevents mucosal suction damage by maintaining the pressure in open eyes at the distal end of the tube at less than 25 mm Hg.



Weighted flexible feeding tube with stylet
Access port with irrigation adaptor allows maintenance of the tube without disconnecting the feeding set.



Miller-Abbott tube
A long double-lumen tube used to drain and decompress the small intestine. One lumen leads to a balloon that is filled with a special substance (tungsten) once it is in the stomach; the second is for irrigation and drainage.

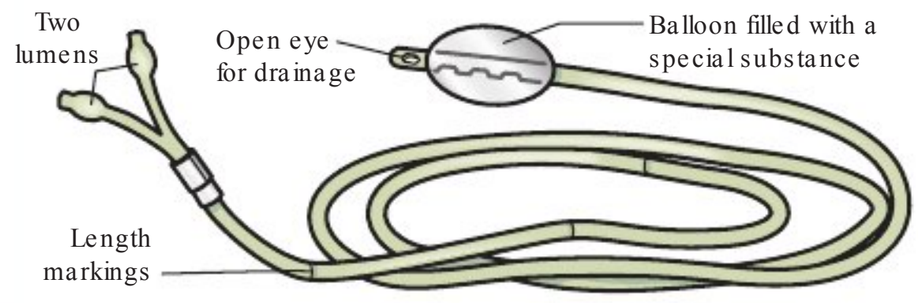


FIGURE 20-1 Comparison of design and function of selected gastrointestinal tubes.

C. Administration of feedings
1. Check the HCP's prescription and agency policy regarding residual amounts; usually, if the residual is less than 100 mL, feeding is administered; large-volume aspirates indicate delayed gastric emptying and place the client at risk for aspiration.
2. Assess bowel sounds; hold the feeding and notify the HCP if bowel sounds are absent.
3. Position the client in a high Fowler's position; if comatose, place in high Fowler's and on the right side.
4. Assess tube placement by aspirating gastric contents and measuring the pH (should be 3.5 or lower).
5. Aspirate all stomach contents (residual), measure the amount, and return the contents to the stomach to prevent electrolyte imbalances (unless the color or characteristics of the residual is abnormal or the amount is greater than 250 mL).
6. Warm the feeding to room temperature to prevent diarrhea and cramps.
7. Use an infusion feeding pump for continuous or cyclic feedings.
8. For bolus feeding, maintain the client in a high Fowler's position for 30 minutes after the feeding. Use an infusion pump or allow the feeding to infuse via gravity. Do not plunge the feeding into the stomach.
9. For a continuous feeding, keep the client in a semi-Fowler's position at all times.

BOX 20-1 Nasogastric Tubes: Intubation Procedures

1. Follow agency procedures.
2. Explain the procedure and its potential discomfort to the client.
3. Position the client in a high Fowler's position with pillows behind the shoulders.
4. Determine which nostril is more patent.
5. Measure the length of the tube from the bridge of the nose to the earlobe to the xiphoid process and indicate this length with a piece of tape on the tube (remember the abbreviation NEX, which stands for nose, earlobe, and xiphoid process).
6. If the client is conscious and alert, have him or her swallow or drink water (follow agency procedure).
7. Lubricate the tip of the tube with water-soluble lubricant.
8. Gently insert the tube into the nasopharynx and advance the tube.
9. When the tube nears the back of the throat (first black measurement on the tube), instruct the client to swallow or drink sips of water (unless contraindicated). If resistance is met, slowly rotate and aim the tube downward and toward the closer ear; in the intubated or semiconscious client, flex the head toward the chest while passing the tube.
10. Immediately withdraw the tube if any change is noted in the client's respiratory status.
11. Following insertion, obtain an abdominal x-ray study to confirm placement of the tube.
12. Connect the tube to suction, to either the intermittent or the continuous suction setting, as prescribed if the purpose of the tube is for decompression.
13. Secure the tube to the client's nose with adhesive tape and to the client's gown (follow agency procedure and check for client allergy to tape).
14. Observe the client for nausea, vomiting, abdominal fullness, or distention and monitor gastric output.
15. Check residual volumes every 4 hours, before each feeding, and before giving medications. Aspirate all stomach contents (residual) and measure the amount. Reinstill residual contents to prevent excessive fluid and electrolyte losses, unless the residual contents appear abnormal or the volume is large (greater than 250 mL). Always follow agency procedure. Withhold a feeding if the residual amount is more than 100 mL or according to agency or nutritional consult recommendations.
16. Before the instillation of any substance through the tube (i.e., irrigation solution, feeding, medications), aspirate stomach contents and test the pH (a pH of 3.5 or lower indicates that the tip of the tube is in a gastric location).
17. If irrigation is indicated, use normal saline solution (check agency procedure).
18. Observe the client for fluid and electrolyte balance.
19. Instruct the client about movement to prevent nasal irritation and dislodgment of the tube.
20. On a daily basis, remove the adhesive tape that is securing the tube to the nose and clean and dry the skin, assessing for excoriation; then reapply the tape.

Note: Gastrostomy or jejunostomy tubes are surgically inserted. A dressing is placed at the site of insertion. The dressing needs to be removed, the skin needs to be cleansed (with a solution determined by the health care provider or agency procedure), and a new sterile dressing needs to be applied every 8 hours (or as specified by agency policy). The skin at the insertion site is checked for signs of excoriation, infection, or other abnormalities, such as leakage of the feeding solution.
Adapted from Potter P, Perry A, Stockert P, Hall A: Fundamentals of nursing, ed 8, St. Louis, 2013, Mosby.

D. Precautions

Always assess the placement of a gastrointestinal tube before instilling feeding solutions, medications, or any other solution. If the tube is incorrectly placed, the client is at risk for aspiration.

1. Change the feeding container and tubing every 24 hours or per agency policy.
2. Do not hang more solution than is required for a 4-hour period; this prevents bacterial growth.
3. Check the expiration date on the formula before administering.
4. Shake the formula well before pouring it into the container (feeding bag). Some feedings require the use of a bag in which formula is added, or require the use of bottles that feeding tubing can be attached to directly. The tubing sometimes has a Y-site connection so a regular flush can be programmed using the pump rather than using a piston syringe.
5. Always assess bowel sounds; do not administer any feedings if bowel sounds are absent.
6. Administer the feeding at the prescribed rate or via gravity flow (intermittent bolus feedings) with a 50- to 60-mL syringe with the plunger removed.
7. Gently flush with 30 to 50 mL of water or NS (depending on agency policy) using the irrigation syringe after the feeding.

E. Prevention of complications

1. Diarrhea
   a. Assess the client for lactose intolerance.
   b. Use fiber-containing feedings.
   c. Administer feeding slowly and at room temperature.
2. Aspiration
   a. Verify tube placement.
   b. Do not administer the feeding if residual is more than 100 mL (check HCP's prescription and agency policy).
   c. Keep the head of the bed elevated.
   d. If aspiration occurs, suction as needed, assess respiratory rate, auscultate lung sounds, monitor temperature for aspiration pneumonia, and prepare to obtain a chest radiograph.

3. Clogged tube
   a. Use liquid forms of medication, if possible.
   b. Flush the tube with 30 to 50 mL of water or NS (depending on agency policy) before and after medication administration and before and after bolus feeding.
   c. Flush with water every 4 hours for continuous feeding.
4. Vomiting
   a. Administer feedings slowly and, for bolus feedings, make feeding last for at least 30 minutes.
   b. Measure abdominal girth.
   c. Do not allow the feeding bag to empty.
   d. Do not allow air to enter the tubing.
   e. Administer the feeding at room temperature.
   f. Elevate the head of the bed.
   g. Administer antiemetics as prescribed.

If the client vomits, stop the tube feeding and place the client in a side-lying position; suction the client as needed.

F. Administration of medications (see Priority Nursing Actions)

III. Intestinal Tubes

A. Description
   1. The intestinal tube is passed nasally into the small intestine.
   2. It may be used to decompress the bowel or to remove accumulated intestinal secretions when other interventions to decompress the bowel are not effective.
   3. The tube enters the small intestine through the pyloric sphincter because of the weight of a small bag containing tungsten at the end.

B. Types of tubes include the Cantor tube (single lumen) and the Miller-Abbott tube (double lumen) (see Fig. 20-1).

C. Interventions
   1. Assess the HCP's prescriptions and agency policy for advancement and removal of the tube and tungsten.
   2. Position the client on the right side to facilitate passage of the weighted bag in the tube through the pylorus of the stomach and into the small intestine.
   3. Do not secure the tube to the face with tape until it has reached final placement (may take several hours) in the intestines.
   4. Assess the abdomen during the procedure by monitoring drainage from the tube and the abdominal girth.
   5. If the tube becomes blocked, notify the HCP.
   6. To remove the tube, the tungsten is removed from the balloon portion of the tube with a

PRIORITY NURSING ACTIONS

Administering Medications via a Nasogastric, Gastrostomy, or Jejunostomy Tube

1. Check the health care provider's (HCP's) prescription.
2. Prepare the medication for administration.
3. Ensure that the medication prescribed can be crushed or is a capsule that can be opened; use elixir forms of medications if available.
4. Dissolve crushed medication or capsule contents in 15 to 30 mL of water.
5. Verify the client's identity and explain the procedure to the client.
6. Check tube placement and residual contents before instilling the medication; check for bowel sounds.
7. Pour medication into a catheter tip syringe that is attached to clamped tubing. Unclamp tubing immediately and allow medication to infuse via gravity.
8. Flush with 30 to 50 mL of water or normal saline (NS), depending on agency policy.
9. Clamp the tube for 30 to 60 minutes, depending on medication and agency policy.
10. Document the administration of the medication and any other appropriate information.

The nurse always checks the HCP's prescription before administering any medication to a client. Once the prescription is verified, the medication is prepared for administration. The nurse determines the reason for administration, checks for any contraindications to administering the medication, and checks for any potential interactions. When preparing medications for administration through a nasogastric, gastrostomy, or jejunostomytube, the nurse needs to ensure that the medication prescribed can be crushed or is a capsule that can be opened. Whole tablets or capsules cannot be administered through a tube because they can cause a tube blockage. Elixir forms of medications can also be used if available. The nurse then dissolves the crushed medication or capsule contents in 15 to 30 mL of water. Client identity is always verified before medication administration and the procedure is explained to the client. The nurse checks tube placement and residual contents before instilling the medication and checks for bowel sounds. The nurse also performs any additional assessments, such as checking the apical heart rate for cardiac medications or checking the blood pressure for antihypertensives. The medication is poured into a catheter tip syringe that is attached to clamped tubing. The tubing is unclamped immediately and the medication is allowed to infuse via gravity. The tube is flushed with 30 to 50 mL of water or NS (depending on agency policy) to ensure that all medication has been instilled. The tube is then clamped for 30 to 60 minutes (depending on the medication and agency policy) to ensure that it is absorbed (if the tube is not clamped and is reattached to suction, the medication will be aspirated out with the suction). The nurse then documents the administration of the medication and any other appropriate information.

Reference

Perry, Potter, Ostendorf (2014), pp. 501-503. St. Louis, Mosby.

syringe; the tube is removed gradually (6 inches [15 cm] every hour) as prescribed by the HCP.

IV. Esophageal and Gastric Tubes

A. Description
   1. May be used to apply pressure against bleeding esophageal veins to control the bleeding when other interventions are not effective or they are contraindicated
   2. Not used if the client has ulceration or necrosis of the esophagus or has had previous esophageal surgery because of the risk of rupture

B. Sengstaken-Blakemore tube and Minnesota tube (see Fig. 20-1)
   1. The Sengstaken-Blakemore tube, used only occasionally, is a triple-lumen gastric tube with an inflatable esophageal balloon (compresses esophageal varices), an inflatable gastric balloon (applies pressure at the cardioesophageal junction), and a gastric aspiration lumen. A nasogastric tube also is inserted in the opposite naris to collect secretions that accumulate above the esophageal balloon.
   2. More commonly used is the Minnesota tube, which is a modified Sengstaken-Blakemore tube with an additional lumen (a 4-lumen gastric tube) for aspirating esophagopharyngeal secretions.
   3. A radiograph of the upper abdomen and chest confirms placement.

C. Interventions
   1. Check patency and integrity of all balloons before insertion.
   2. Label each lumen.
   3. Place the client in the upright or Fowler's position for insertion.
   4. Immediately after insertion, prepare for radiography to verify placement.
   5. Maintain head elevation once the tube is in place.
   6. Double-clamp the balloon ports to prevent air leaks.
   7. Keep scissors at the bedside at all times; monitor for respiratory distress, and if it occurs, cut the tubes to deflate the balloons.
   8. To prevent ulceration or necrosis of the esophagus, release esophageal pressure at intervals as prescribed and per agency policy.
   9. Monitor for increased bloody drainage, which may indicate persistent bleeding and rupture of the varices.
   10. Monitor for signs of esophageal rupture, which include a drop in blood pressure, increased heart rate, and back and upper abdominal pain. (Esophageal rupture is an emergency, and signs of esophageal rupture must be reported to the HCP immediately.)

V. Lavage Tubes

A. Description: Used to remove toxic substances from the stomach

B. Types of tubes
   1. Lavacuator (see Fig. 20-1)
      a. The Lavacuator is an orogastric tube with a large suction lumen and a smaller lavage–vent lumen that provides continuous suction.
      b. Irrigation solution enters the lavage lumen while stomach contents are removed through the suction lumen.
   2. Ewald tube: A single-lumen large tube used for rapid 1-time irrigation and evacuation

VI. Urinary and Renal Tubes

A. Types of urinary catheters
   1. Single lumen: Usually used for straight catheterization to empty the client's bladder, obtain sterile urine specimens, or check the residual amount of urine after the client voids
   2. Double lumen: Used when an indwelling catheter is needed for continuous bladder drainage; one lumen is for drainage and the other is for balloon inflation.
   3. Triple lumen: Used when bladder irrigation and drainage is necessary; 1 lumen is for instilling the bladder irrigant solution, 1 lumen is for continuous bladder drainage, and 1 lumen is for balloon inflation.
   4. Strict aseptic technique is necessary for insertion and care of the catheter.

B. Routine urinary catheter care
   1. Use gloves and wash the perineal area with warm soapy water.
   2. With the nondominant hand, pull back the labia or foreskin to expose the meatus (in the adult male, return the foreskin to its normal position).
   3. Cleanse along the catheter with soap and water.
   4. Anchor the catheter to the thigh.
   5. Maintain the catheter bag below the level of the bladder.

C. Ureteral and nephrostomy tubes (Fig. 20-2)
   1. Never clamp the tube.

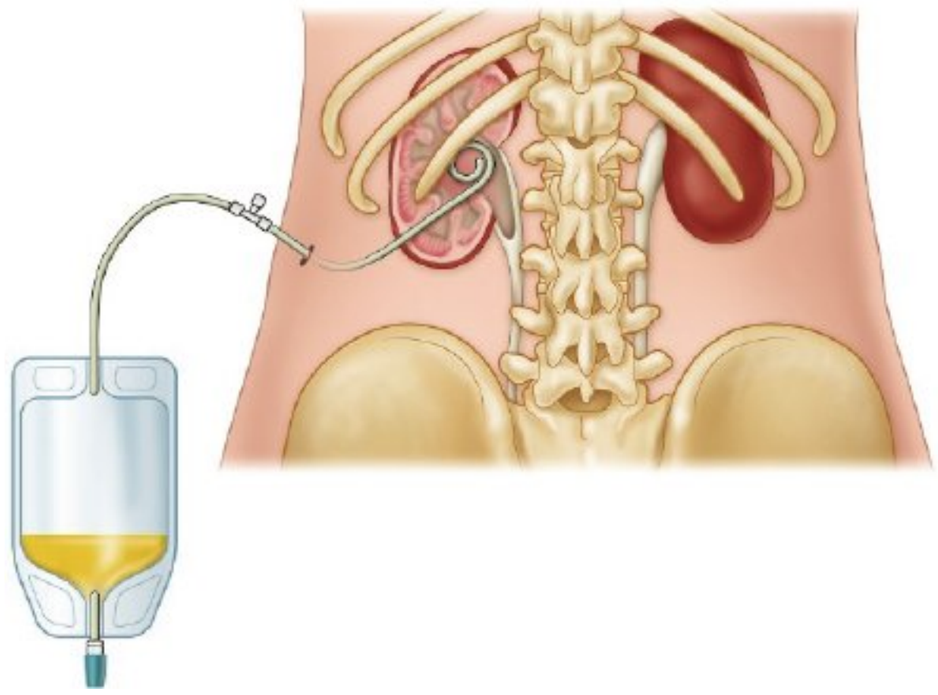


FIGURE 20-2 Ureteral and nephrostomy tubes.

2. Maintain patency.
3. Irrigate only if prescribed by the HCP, using strict aseptic technique; a maximum of 5 mL of sterile NS is instilled slowly and gently.
4. If patency cannot be established with the prescribed irrigation, notify the HCP immediately.

D. Catheter insertion and removal (Box 20-2)

⚠ If the client has a ureteral or nephrostomy tube, monitor output closely; urine output of less than 30 mL/hour or lack of output for more than 15 minutes should be reported to the HCP immediately.

BOX 20-2 Urinary Catheters: Insertion and Removal Procedures

Urinary Catheters: Insertion Procedure

1. Follow agency procedures.
2. Explain the procedure and its potential discomfort to the client.
3. Place the client in position for catheterization:
   Female: Assist to dorsal recumbent position (supine with knees flexed). Support legs with pillows to reduce muscle tension and promote comfort.
   Male: Assist to supine position with thighs slightly abducted.
4. Wearing clean gloves, wash perineal area with soap and water as needed; dry thoroughly. Remove and discard gloves; perform hand hygiene.
5. Open outer wrapping of the catheter kit, remembering that all components of the catheterization tray are sterile (all supplies are arranged in the box in order of sequence of use).
6. Apply waterproof sterile drape (when packed as first item in tray).
7. Urinary catheter procedure with specifics for male and female:
   a. Place a sterile drape with plastic side down under the client's buttocks.
   b. Don sterile gloves using sterile technique.
   c. Pick up fenestrated drape from tray. Allow it to unfold without touching nonsterile surface. Apply drape over perineum, exposing labia or penis.
   d. While maintaining sterility, open packet of lubricant and squeeze out on sterile field. Lubricate catheter tip by dipping it into water-soluble gel, 2.5 to 5 cm (1 to 2 inches) for women and 12.5 to 17.5 cm (5 to 7 inches) for men. Attach prefilled syringe to balloon port. Prepare cotton balls or swab sticks for cleansing perineal area.
   e. Remember with a sterile technique, the sterile field and gloved hands must be maintained above the level of the waist, the 1-inch (2.5 cm) border on the field is considered contaminated, and the nurse cannot turn his or her back to the field at any time.
   f. Catheter insertion
      Female: The female should be positioned in a dorsal recumbent position with the legs open to allow for full visualization and maintenance of the sterile field. With nondominant hand, fully expose urethral meatus by spreading labia, taking care to not allow the labia to close. Using forceps in sterile dominant hand, pick up cotton ball or swab sticks saturated with antiseptic solution, wiping from front to back (from clitoris toward anus). Using a new cotton ball or swab for each area you clean, wipe far labial fold, near labial fold, and directly over center of urethral meatus. Pick up and hold catheter 7.5 to 10 cm (3 to 4 inches) from catheter tip. Advance catheter a total of 7.5 cm (3 inches) in adult or until urine flows out of catheter end. When urine appears, advance catheter another 2.5 to 5 cm (1 to 2 inches). Do not use force to insert catheter.
      Male: Use of square sterile drape is optional; you may apply fenestrated drape with fenestrated slit resting over penis. Grasp penis at shaft just below glans. (If client is not circumcised, retract foreskin with nondominant hand.) With dominant hand, pick up antiseptic-soaked cotton ball with forceps or swab stick and clean penis. Move cotton ball or swab in circular motion from urethral meatus down to base of glans. Repeat cleaning 2 more times, using clean cotton ball/stick each time. Pick up catheter with gloved dominant hand and insert catheter by lifting penis to position perpendicular to client's body and apply light traction. Advance catheter 17.5 to 22.5 cm (7 to 9 inches) in adult or until urine flows out of catheter end. Advance an additional 2.5 to 5 cm (1 to 2 inches) after urine appears. Lower penis and hold catheter securely in nondominant hand.
8. Inflate balloon fully per manufacturer's directions and gently pull back on the catheter until resistance is felt.
9. Secure catheter tubing to inner thigh with agency-approved securing device, such as a StatLock®.
10. Record type and size of catheter inserted, amount of fluid used to inflate the balloon, characteristics and amount of urine, specimen collection if appropriate, client's response to procedure, and that teaching was completed.

Urinary Catheters: Removal Procedure

1. Follow agency procedures.
2. Explain the procedure and its potential discomfort to the client.
3. Position the client in the same position as during catheterization.
4. Remove the securing device and place the towel between a female client's thighs or over a male client's thighs.
5. Insert a 10-mL syringe into the balloon injection port. Slowly withdraw all of the solution to deflate the balloon totally.
6. After deflation, explain to the client that he or she may feel a burning sensation as the catheter is withdrawn. Pull the catheter out smoothly and slowly.
7. Assess the client's urinary function by noting the first voiding after catheter removal and documenting the time and amount of voiding for the next 24 hours.

Adapted from Potter P, Perry A, Stockert P, Hall A: Fundamentals of nursing, ed 8, St. Louis, 2013, Mosby.

VII. Respiratory System Tubes

A. Endotracheal tubes (Fig. 20-3)

1. Description
   a. The endotracheal tube is used to maintain a patent airway.
   b. Endotracheal tubes are indicated when the client needs mechanical ventilation.
   c. If the client requires an artificial airway for longer than 10 to 14 days, a tracheostomy may be created to avoid mucosal and vocal cord damage that can be caused by the endotracheal tube.
   d. The cuff (located at the distal end of the tube), when inflated, produces a seal between the trachea and the cuff to prevent aspiration and ensure delivery of a set tidal volume when mechanical ventilation is used; an inflated cuff also prevents air from passing to the vocal cords, nose, or mouth.
   e. The pilot balloon permits air to be inserted into the cuff, prevents air from escaping, and is used as a guideline for determining the presence or absence of air in the cuff.
   f. The universal adapter enables attachment of the tube to mechanical ventilation tubing or other types of oxygen delivery systems.
   g. Types of tubes: orotracheal and nasotracheal
2. Orotracheal tubes
   a. Inserted through the mouth; allows use of a larger diameter tube and reduces the work of breathing
   b. Indicated when the client has a nasal obstruction or a predisposition to epistaxis
   c. Uncomfortable and can be manipulated by the tongue, causing airway obstruction; an oral airway may be needed to keep the client from biting on the tube.
3. Nasotracheal tubes
   a. Inserted through a nostril; this smaller tube increases resistance and the client's work of breathing.
   b. Its use is avoided in clients with bleeding disorders.
   c. It is more comfortable for the client, and the client is unable to manipulate the tube with the tongue.
4. Interventions
   a. Placement is confirmed by chest x-ray film (correct placement is 1 to 2 cm above the carina).
   b. Assess placement by auscultating both sides of the chest while manually ventilating with a resuscitation (Ambu) bag (if breath sounds and chest wall movement are absent in the left side, the tube may be in the right main stem bronchus).
   c. Perform auscultation over the stomach to rule out esophageal intubation.
   d. If the tube is in the stomach, louder breath sounds will be heard over the stomach than over the chest, and abdominal distention will be present.
   e. Secure the tube with adhesive tape immediately after intubation.
   f. Monitor the position of the tube at the lip or nose.
   g. Monitor skin and mucous membranes.
   h. Suction the tube only when needed.
   i. The oral tube needs to be moved to the opposite side of the mouth daily to prevent pressure and necrosis of the lip and mouth area, prevent nerve damage, and facilitate inspection and cleaning of the mouth; moving the tube to the opposite side of the mouth should be done by 2 HCPs.

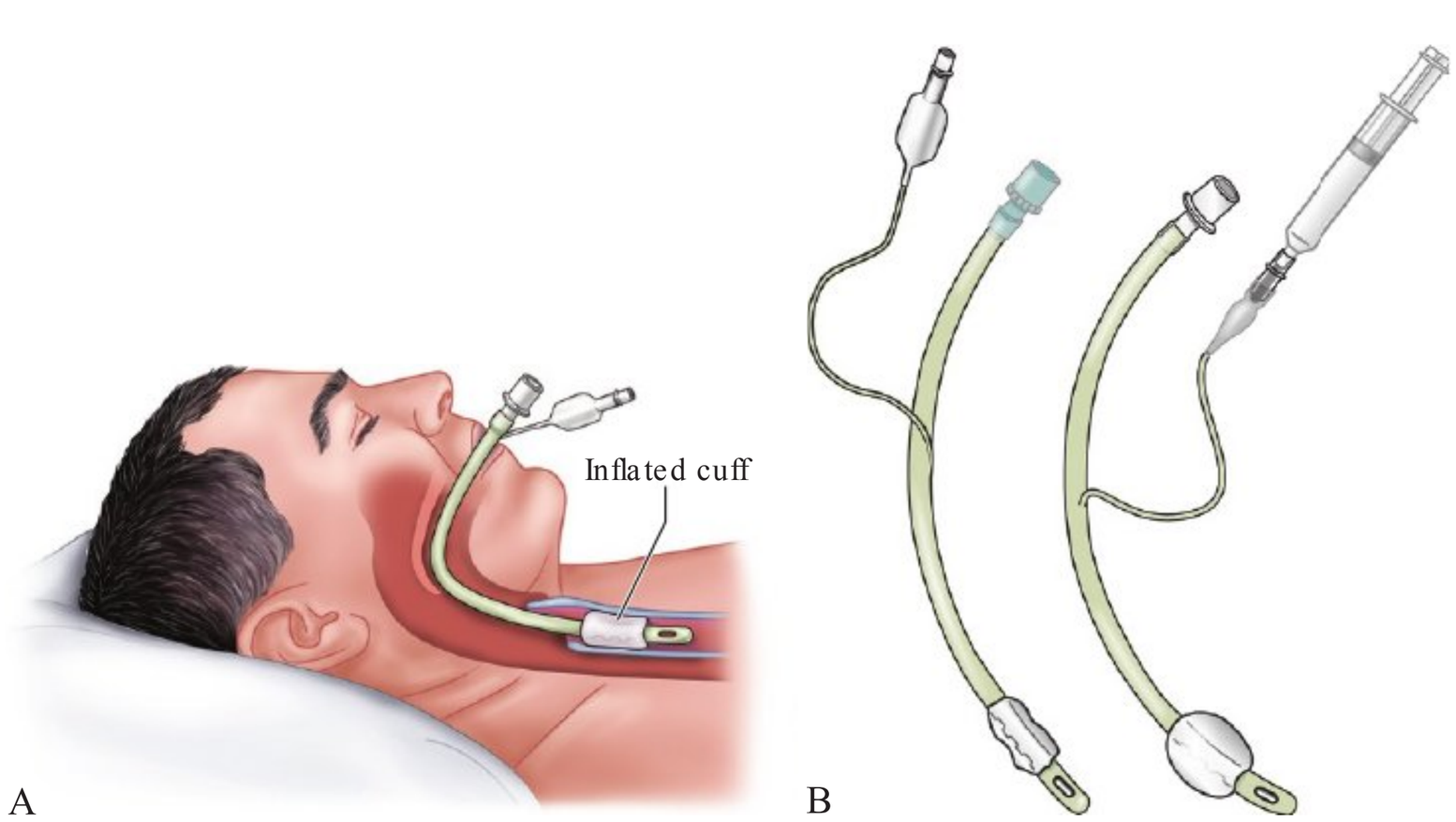


FIGURE 20-3 A, Endotracheal (ET) tube with inflated cuff. B, ET tubes with uninflated and inflated cuffs and syringe for inflation.

j. Prevent dislodgment and pulling or tugging on the tube; suction, coughing, and speaking attempts by the client place extra stress on the tube and can cause dislodgment.
k. Assess the pilot balloon to ensure that the cuff is inflated; maintain cuff inflation, which creates a seal and allows complete mechanical control of respiration.
l. Monitor cuff pressures at least every 8 hours per agency procedure to ensure that they do not exceed 20 mm Hg (an aneroid pressure manometer is used to measure cuff pressures); minimal leak and occlusive techniques are used for cuff inflation to check cuff pressures.

A resuscitation (Ambu) bag needs to be kept at the bedside of a client with an endotracheal tube or a tracheostomy tube at all times.

5. Minimal leak technique
   a. This is used for cuff inflation and checking cuff pressures for cuffs without pressure relief valves.
   b. Inflate the cuff until a seal is established; no harsh sound should be heard through a stethoscope placed over the trachea when the client breathes in, but a slight air leak on peak inspiration is present and can be heard.
   c. The client cannot make verbal sounds, and no air is felt coming out of the client's mouth.
6. Occlusive technique
   a. This is used for cuff inflation and checking cuff pressures for cuffs with pressure relief valves.
   b. Provides an adequate seal in the trachea at the lowest possible cuff pressure.
   c. Uses same procedure as minimal leak technique, without an air leak.
7. Extubation
   a. Hyperoxygenate the client and suction the endotracheal tube and the oral cavity.
   b. Place the client in a semi-Fowler's position.
   c. Deflate the cuff; have the client inhale and, at peak inspiration, remove the tube, suctioning the airway through the tube while pulling it out.
   d. After removal, instruct the client to cough and deep-breathe to assist in removing accumulated secretions in the throat.
   e. Apply oxygen therapy, as prescribed.
   f. Monitor for respiratory difficulty; contact the HCP if respiratory difficulty occurs.
   g. Inform the client that hoarseness or a sore throat is normal and that the client should limit talking if it occurs.

B. Tracheostomy
1. Description
   a. A tracheostomy is an opening made surgically directly into the trachea to establish an airway; a tracheostomy tube is inserted into the opening and the tube attaches to the mechanical ventilator or another type of oxygen delivery device (Fig. 20-4).
   b. The tracheostomy can be temporary or permanent. (See Box 20-3 for types of tracheostomy tubes.)
2. Interventions
   a. Assess respirations and for bilateral breath sounds.
   b. Monitor arterial blood gases and pulse oximetry.
   c. Encourage coughing and deep breathing.
   d. Maintain a semi-Fowler's to high Fowler's position.
   e. Monitor for bleeding, difficulty with breathing, absence of breath sounds, and crepitus (subcutaneous emphysema), which are indications of hemorrhage or pneumothorax.
   f. Provide respiratory treatments as prescribed.
   g. Suction fluids as needed; hyperoxygenate the client before suctioning.
   h. If the client is allowed to eat, sit the client up for meals and ensure that the cuff is inflated (if the tube is not capped) for meals and for 1 hour after meals to prevent aspiration.
   i. Monitor cuff pressures as prescribed.
   j. Assess the stoma and secretions for blood or purulent drainage.
   k. Follow the HCP's prescriptions and agency policy for cleaning the tracheostomy site and inner cannula (many inner cannulas are disposable); usually, half-strength hydrogen peroxide is used.
   l. Administer humidified oxygen as prescribed, because the normal humidification process is bypassed in a client with a tracheostomy.
   m. Obtain assistance in changing tracheostomy ties; after placing the new ties, cut and remove the old ties holding the tracheostomy in place (some securing devices are soft and made with Velcro to hold the tube in place).
   n. Keep a resuscitation (Ambu) bag, obturator, clamps, and spare tracheostomy tube of the same size at the bedside.
3. Complications of a tracheostomy (Table 20-1)

Never insert a plug (cap) into a tracheostomy tube until the cuff is deflated and the inner cannula is removed; prior insertion prevents airflow to the client.

VIII. Chest Tube Drainage System

A. Description
1. The chest tube drainage system returns negative pressure to the intrapleural space.
2. The system is used to remove abnormal accumulations of air and fluid from the pleural space (Fig. 20-5).

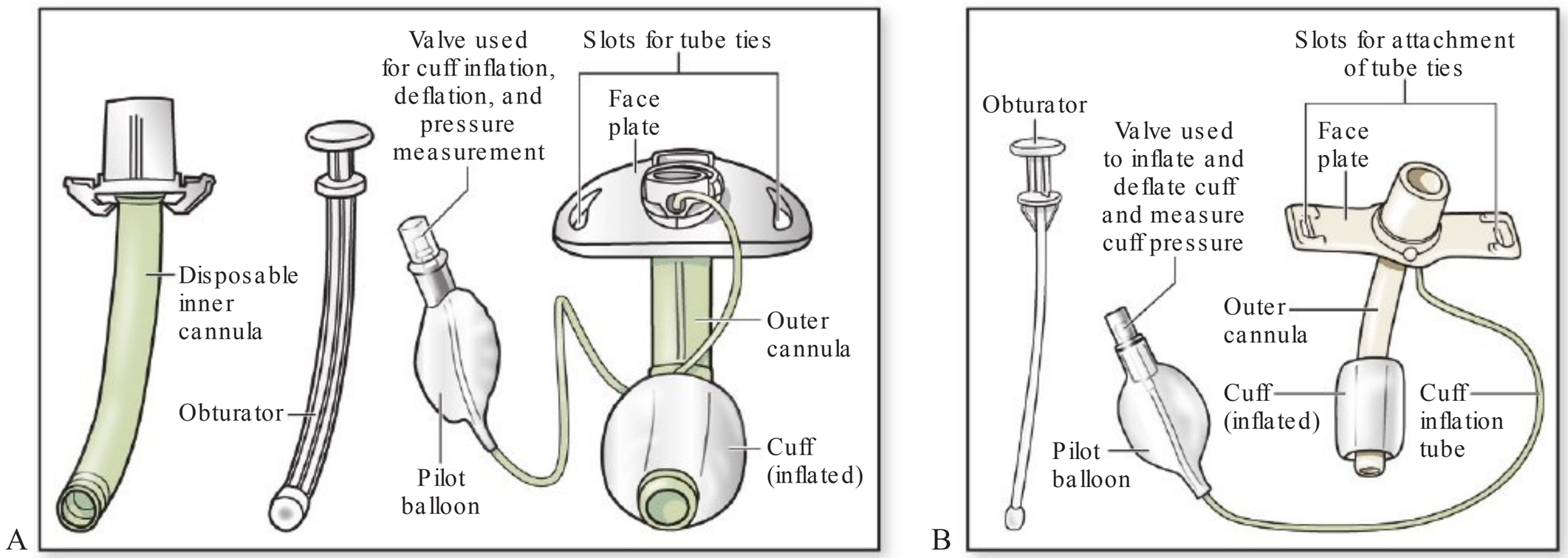


FIGURE 20-4 Tracheostomy tubes. A, Double-lumen cuffed tracheostomy tube with disposable inner cannula. B, Single-lumen cannula cuffed tracheostomy tube. C, Double-lumen cuffed fenestrated tracheostomy tube with plug (red cap).

BOX 20-3 Some Types of Tracheostomy Tubes

Double-Lumen Tube

The double-lumen tube has the following parts:

Outer cannula—fits into the stoma and keeps the airway open. The face plate indicates the size and type of tube and has small holes on both sides for securing the tube with tracheostomy ties or another device.

Inner cannula—fits snugly into the outer cannula and locks into place. It provides the universal adaptor for use with the ventilator and other respiratory therapy equipment. Some may be removed, cleaned, and reused; others are disposable.

Obturator—a stylet with a smooth end used to facilitate the direction of the tube when inserting or changing a tracheostomy tube. The obturator is removed immediately after tube placement and is always kept with the client and at the bedside in case of accidental decannulation.

Cuff—when inflated, seals the airway. The cuffed tube is used for mechanical ventilation, preventing aspiration of oral or gastric secretions, or for the client receiving a tube feeding to prevent aspiration. A pilot balloon attached to the outside of the tube indicates the presence or absence of air in the cuff.

Single-Lumen Tube

The single-lumen tube is similar to the double-lumen tube except that there is no inner cannula. More intensive nursing care is required with this tube because there is no inner cannula to ensure a patent lumen.

Fenestrated Tube

The fenestrated tube has a precut opening (fenestration) in the upper posterior wall of the outer cannula. The tube is used to wean the client from a tracheostomy by ensuring that the client can tolerate breathing through his or her natural airway before the entire tube is removed. This tube allows the client to speak.

Cuffed Fenestrated Tube

The cuffed fenestrated tube facilitates mechanical ventilation and speech and often is used for clients with spinal cord paralysis or neuromuscular disease who do not require ventilation at all times. When not on the ventilator, the client can have the cuff deflated and the tube capped (see Fig. 20-4 for cuffed fenestrated tube with red cap) for speech. A cuffed fenestrated tube is never used in weaning from a tracheostomy because the cuff, even fully deflated, may partially obstruct the airway.

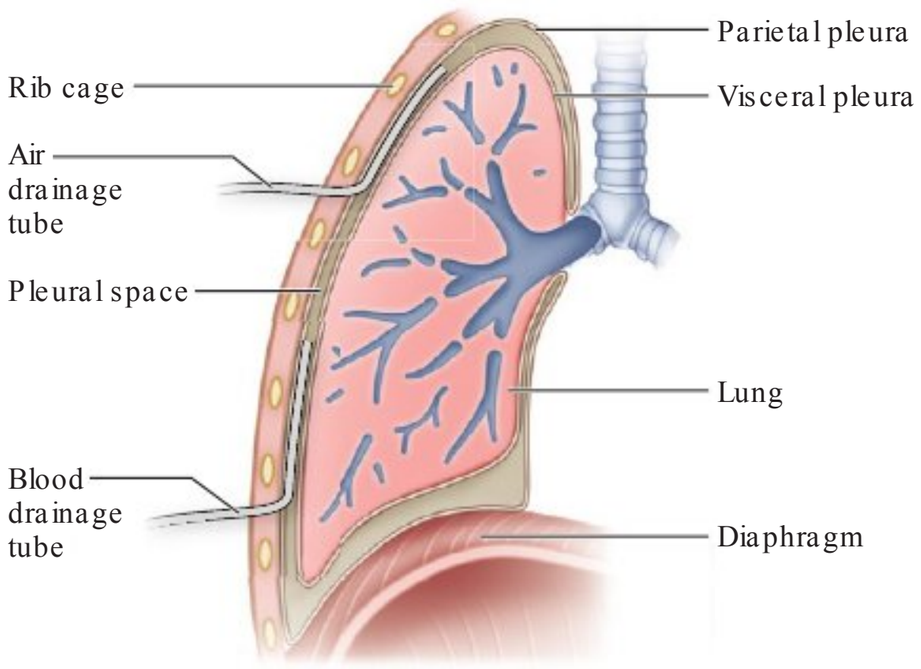
TABLE 20-1 Complications of a Tracheostomy

Complication and Description	Manifestations	Management	Prevention
Tracheomalacia: Constant pressure exerted by the cuff causes tracheal dilation and erosion of cartilage	▪ An increased amount of air is required in the cuff to maintain the seal ▪ A larger tracheostomy tube is required to prevent an air leak at the stoma ▪ Food particles are seen in tracheal secretions ▪ The client does not receive the set tidal volume on the ventilator	▪ Monitor client; no special management is needed unless bleeding or airway problems occur	▪ Use an uncuffed tube as soon as possible ▪ Monitor cuff pressure and air volume closely to detect changes
Tracheal stenosis: Narrowed tracheal lumen is the result of scar formation from irritation of tracheal mucosa by the cuff	▪ Stenosis is usually seen after the cuff is deflated or the tracheostomy tube is removed ▪ The client has increased coughing, inability to expectorate secretions, or difficulty breathing and talking	▪ Tracheal dilation or surgical intervention is used	▪ Prevent pulling of and traction on the tracheostomy tube ▪ Properly secure the tube in the midline position ▪ Maintain cuff pressure ▪ Minimize oronasal intubation time
Tracheoesophageal fistula (TEF): Excessive cuff pressure causes erosion of the posterior wall of the trachea. A hole is created between the trachea and the anterior esophagus. The client at highest risk also has a nasogastric tube present	Similar to tracheomalacia: ▪ Food particles are seen in tracheal secretions ▪ Increased air in cuff is needed to achieve a seal ▪ The client has increased coughing and choking while eating ▪ The client does not receive the set tidal volume on the ventilator	▪ Suction; manually administer oxygen by mask to prevent hypoxemia ▪ Use a small soft feeding tube instead of a nasogastric tube for tube feedings ▪ A gastrostomy or jejunostomy may be performed ▪ Monitor the client with a nasogastric tube closely; assess for TEF and aspiration	▪ Maintain cuff pressure ▪ Monitor the amount of air needed for inflation to detect changes ▪ Progress to a deflated or cuffless tube as soon as possible
Trachea–innominate artery fistula: A malpositioned tube causes its distal tip to push against the lateral wall of the trachea. Continued pressure causes necrosis and erosion of the innominate artery. This is a medical emergency	▪ The tracheostomy tube pulsates in synchrony with the heartbeat ▪ There is heavy bleeding from the stoma ▪ This is a life-threatening complication	▪ Remove the tracheostomy tube immediately ▪ Apply direct pressure to the innominate artery at the stoma site ▪ Prepare the client for immediate repair surgery	▪ Use the correct tube size and length, and maintain the tube in midline position ▪ Prevent pulling or tugging of the tracheostomy tube ▪ Immediately notify the health care provider (HCP) of a pulsating tube
Tube obstruction	▪ Difficulty breathing ▪ Noisy respirations ▪ Difficulty inserting the suction catheter ▪ Thick, dry secretions ▪ Unexplained peak pressures if client is on a mechanical ventilator	▪ The HCP repositions or replaces the tube if obstruction occurs as a result of cuff prolapse over the end of the tube	▪ Assist the client to cough and deep-breathe ▪ Provide humidification and suctioning ▪ Clean the inner cannula regularly
Tube dislodgment	▪ Difficulty breathing ▪ Noisy respirations ▪ Restlessness ▪ Excessive coughing ▪ Audible wheeze or stridor	▪ Be familiar with institutional policy regarding replacement of a tracheostomy tube as a nursing procedure ▪ During the first 72 hours following surgical placement of the tracheostomy, the nurse manually ventilates the client by using a manual resuscitation (Ambu) bag while another nurse calls the Rapid Response Team for help	▪ Secure the tube in place ▪ Minimize manipulation of and traction on the tube ▪ Ensure that the client does not pull on the tube ▪ Ensure that a tracheostomy tube of the same type and size is at the client's bedside

TABLE 20-1 Complications of a Tracheostomy—cont'd

Complication and Description	Manifestations	Management	Prevention
		■ 72 hours following surgical placement of the tracheostomy: ■ Extend the client's neck and open the tissues of the stoma to secure the airway ■ Grasp the retention sutures (if they are present) to spread the opening ■ Use a tracheal dilator (curved clamp) to hold the stoma open ■ Prepare to insert a tracheostomy tube; place the obturator into the tracheostomy tube, replace the tube, and remove the obturator ■ Maintain ventilation by resuscitation (Ambu) bag ■ Assess airflow and bilateral breath sounds ■ If unable to secure an airway, call the Rapid Response Team and the anesthesiologist	

From Ignatavicius D, Workman ML: Medical-surgical nursing: patient-centered collaborative care, ed 7, Philadelphia, 2013, Saunders.



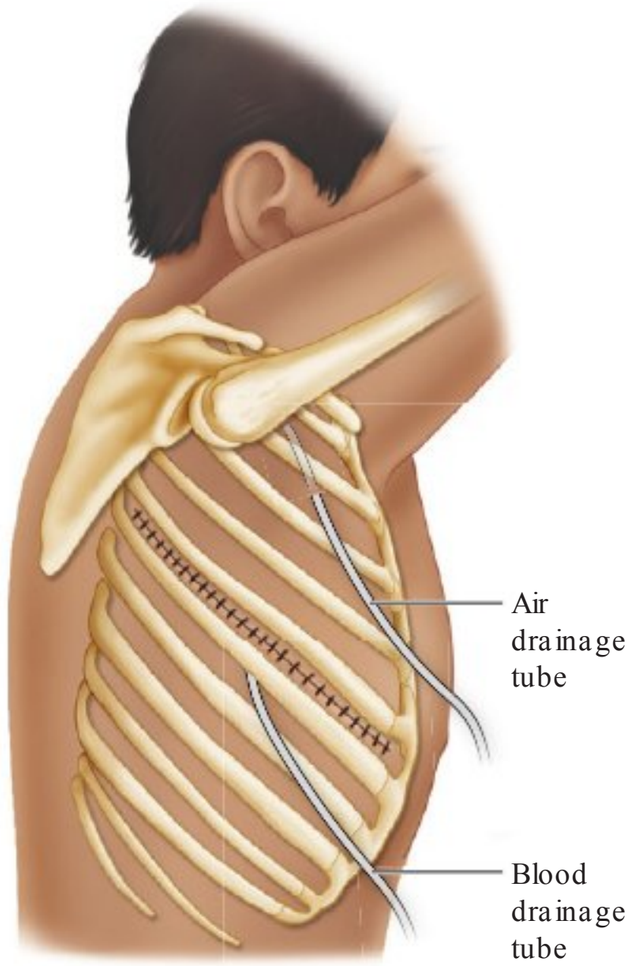


FIGURE 20-5 Chest tube placement.

B. Drainage collection chamber (Fig. 20-6)
   1. The drainage collection chamber is located where the chest tube from the client connects to the system.
   2. Drainage from the tube drains into and collects in a series of calibrated columns in this chamber.

C. Water seal chamber (see Fig. 20-6)
   1. The tip of the tube is underwater, allowing fluid and air to drain from the pleural space and preventing air from entering the pleural space.
   2. Water oscillates (moves up as the client inhales and moves down as the client exhales).
   3. Excessive bubbling indicates an air leak in the chest tube system.

D. Suction control chamber (see Fig. 20-6)
   1. The suction control chamber provides the suction, which can be controlled to provide negative pressure to the chest.
   2. This chamber is filled with various levels of water to achieve the desired level of suction; without this control, lung tissue could be sucked into the chest tube.
   3. Gentle bubbling in this chamber indicates that there is suction and does not indicate that air is escaping from the pleural space.

E. Dry suction system (see Fig. 20-6)
   1. This is another type of chest drainage system. Because this is a dry suction system, absence of bubbling is noted in the suction control chamber.
   2. A knob on the collection device is used to set the prescribed amount of suction; then the wall suction source dial is turned until a small orange floater valve appears in the window on the device (when the orange floater valve is in the window, the correct amount of suction is applied).

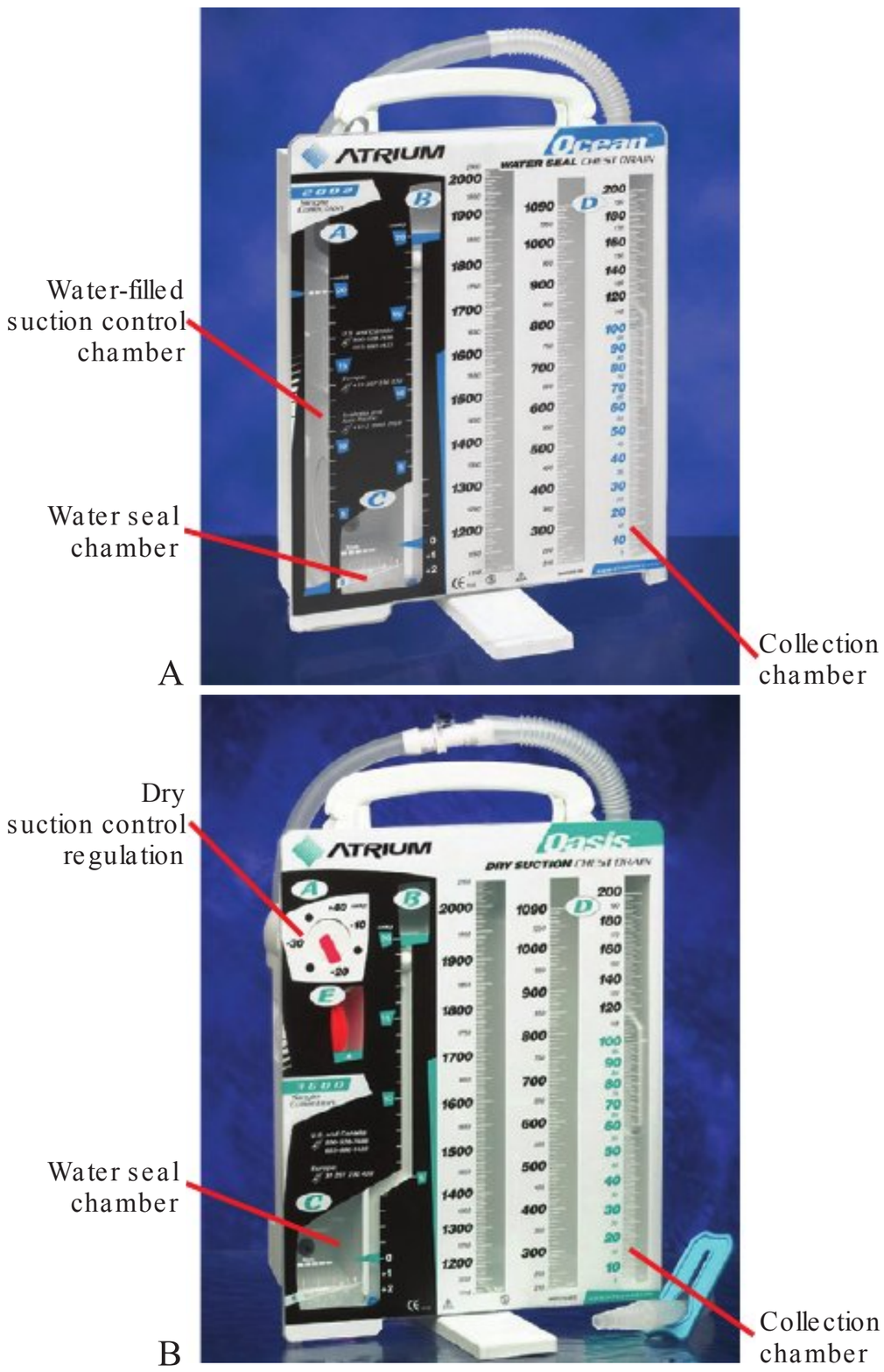


FIGURE 20-6 Chest drainage system. A, Wet system. B, Dry system. (From Lewis et al., 2011. From Atrium Medical Corporation, Hudson, N.H.)

F. Portable chest drainage system: Small and portable chest drainage systems are also available and are dry systems that use a control flutter valve to prevent the backflow of air into the client's lung. Principles of gravity and pressure, and the nursing care involved, are the same for all types of systems, and these systems allow greater ambulation and allow the client to go home with the chest tubes in place.

G. Interventions
   1. Collection chamber
      a. Monitor drainage; notify the HCP if drainage is more than 70 to 100 mL/hour or if drainage becomes bright red or increases suddenly.
      b. Mark the chest tube drainage in the collection chamber at 1- to 4-hour intervals, using a piece of tape.
   2. Water seal chamber
      a. Monitor for fluctuation of the fluid level in the water seal chamber.
      b. Fluctuation in the water seal chamber stops if the tube is obstructed, if a dependent loop exists, if the suction is not working properly, or if the lung has reexpanded.
      c. If the client has a known pneumothorax, intermittent bubbling in the water seal chamber is expected as air is drained from the chest, but continuous bubbling indicates an air leak in the system.
      d. Notify the HCP if there is continuous bubbling in the water seal chamber.
   3. Suction control chamber: Gentle (not vigorous) bubbling should be noted in the suction control chamber of a wet suction system.
   4. An occlusive sterile dressing is maintained at the insertion site.
   5. A chest radiograph assesses the position of the tube and determines whether the lung has reexpanded.
   6. Assess respiratory status and auscultate lung sounds. Assess chest tube dressing for drainage and palpate surrounding tissue for crepitus.
   7. Monitor for signs of extended pneumothorax or hemothorax.
   8. Keep the drainage system below the level of the chest and the tubes free of kinks, dependent loops, or other obstructions.
   9. Ensure that all connections are secure.
   10. Encourage coughing and deep breathing.
   11. Change the client's position frequently to promote drainage and ventilation.
   12. Do not strip or milk a chest tube unless specifically directed to do so by the HCP and if agency policy allows it.
   13. Keep a clamp (may be needed if the system needs to be changed) and a sterile occlusive dressing at the bedside at all times.
   14. Never clamp a chest tube without a written prescription from the HCP; also, determine agency policy for clamping a chest tube.
   15. If the drainage system cracks or breaks, insert the chest tube into a bottle of sterile water, remove the cracked or broken system, and replace it with a new system.
   16. Depending on the HCP's preference, when the chest tube is removed, the client may be asked to take a deep breath and hold it, and the tube is removed. Or, the client may be asked to take a deep breath, exhale, and bear down (Valsalva maneuver). A dry sterile dressing, petroleum gauze dressing, or Telfa dressing (depending on the HCP's preference) is taped in place after removal of the chest tube.

If the chest tube is pulled out of the chest accidentally, pinch the skin opening together, apply an occlusive sterile dressing, cover the dressing with overlapping pieces of 2-inch (5 cm) tape, and call the HCP immediately.

CRITICAL THINKING What Should You Do?

Answer: If the nurse notes that the chest tube drainage system is cracked, the chest tube should be disconnected from the system and submerged in a bottle of sterile water in order to maintain the water seal. The system will then need to be replaced. A clamp should be kept at the bedside in case the system needs to be changed. However, the nurse should never clamp a chest tube without a written prescription from the health care provider and per agency policy. The drainage system (chest tube and bottle of sterile water) should also be maintained below the level of the chest if this complication occurs.

Reference: Ignatavicius, Workman, (2016), p. 579.

PRACTICE QUESTIONS

191. The nurse is preparing to administer medication using a client's nasogastric tube. Which actions should the nurse take before administering the medication? Select all that apply.
- ❑ 1. Check the residual volume.
- ❑ 2. Aspirate the stomach contents.
- ❑ 3. Turn off the suction to the nasogastric tube.
- ❑ 4. Remove the tube and place it in the other nostril.
- ❑ 5. Test the stomach contents for a pH indicating acidity.

192. The nurse is preparing to administer medication through a nasogastric tube that is connected to suction. To administer the medication, the nurse should take which action?
1. Position the client supine to assist in medication absorption.
2. Aspirate the nasogastric tube after medication administration to maintain patency.
3. Clamp the nasogastric tube for 30 to 60 minutes following administration of the medication.
4. Change the suction setting to low intermittent suction for 30 minutes after medication administration.

193. The nurse is assessing for correct placement of a nasogastric tube. The nurse aspirates the stomach contents, checks the gastric pH, and notes a pH of 7.35. Based on this information, which action should the nurse take at this time?
1. Retest the pH using another strip.
2. Document that the nasogastric tube is in the correct place.
3. Check for placement by auscultating for air injected into the tube.
4. Call the health care provider to request a prescription for a chest radiograph.

194. The nurse caring for a client with a chest tube turns the client to the side and the chest tube accidentally disconnects from the water seal chamber. Which initial action should the nurse take?
1. Call the health care provider (HCP).
2. Place the tube in a bottle of sterile water.
3. Replace the chest tube system immediately.
4. Place a sterile dressing over the disconnection site.

195. The registered nurse is preparing to insert a nasogastric tube in an adult client. To determine the accurate measurement of the length of the tube to be inserted, the nurse should take which action?
1. Mark the tube at 10 inches (25.5 cm).
2. Mark the tube at 32 inches (81 cm).
3. Place the tube at the tip of the nose and measure by extending the tube to the earlobe and then down to the xiphoid process.
4. Place the tube at the tip of the nose and measure by extending the tube to the earlobe and then down to the top of the sternum.

196. The nurse is assessing the functioning of a chest tube drainage system in a client who has just returned from the recovery room following a thoracotomy with wedge resection. Which are the expected assessment findings? Select all that apply.
- ❑ 1. Excessive bubbling in the water seal chamber
- ❑ 2. Vigorous bubbling in the suction control chamber
- ❑ 3. Drainage system maintained below the client's chest
- ❑ 4. 50 mL of drainage in the drainage collection chamber
- ❑ 5. Occlusive dressing in place over the chest tube insertion site
- ❑ 6. Fluctuation of water in the tube in the water seal chamber during inhalation and exhalation

197. The nurse is assisting a health care provider with the removal of a chest tube. The nurse should instruct the client to take which action?
1. Stay very still.
2. Exhale very quickly.
3. Inhale and exhale quickly.
4. Perform the Valsalva maneuver.

198. While changing the tapes on a newly inserted tracheostomy tube, the client coughs and the tube is dislodged. Which is the initial nursing action?
1. Call the health care provider to reinsert the tube.
2. Grasp the retention sutures to spread the opening.
3. Call the respiratory therapy department to reinsert the tracheotomy.
4. Cover the tracheostomy site with a sterile dressing to prevent infection.

199. The nurse is caring for a client immediately after removal of the endotracheal tube. The nurse should report which sign immediately if experienced by the client?
1. Stridor
2. Occasional pink-tinged sputum
3. Respiratory rate of 24 breaths/minute
4. A few basilar lung crackles on the right

200. The nurse checks for residual before administering a bolus tube feeding to a client with a nasogastric tube and obtains a residual amount of 150 mL. What is the most appropriate action for the nurse to take?
1. Hold the feeding and reinstill the residual amount.
2. Reinstill the amount and continue with administering the feeding.
3. Elevate the client's head at least 45 degrees and administer the feeding.
4. Discard the residual amount and proceed with administering the feeding.

201. The nurse caring for a client with a pneumothorax and who has had a chest tube inserted notes continuous gentle bubbling in the water seal chamber. What action is most appropriate?
1. Do nothing, because this is an expected finding.
2. Check for an air leak, because the bubbling should be intermittent.
3. Increase the suction pressure so that the bubbling becomes vigorous.
4. Clamp the chest tube and notify the health care provider immediately.

202. The nurse is inserting a nasogastric tube in an adult client. During the procedure, the client begins to cough and has difficulty breathing. What is the most appropriate action?
1. Insert the tube quickly.
2. Notify the health care provider immediately.
3. Remove the tube and reinsert it when the respiratory distress subsides.
4. Pull back on the tube and wait until the respiratory distress subsides.

ANSWERS

❖ 191. 1, 2, 3, 5

Rationale: By aspirating stomach contents, the residual volume can be determined and the pH checked. A pH less than 3.5 verifies gastric placement. The suction should be turned off before the tubing is disconnected to check for residual volume; in addition, suction should remain off for 30 to 60 minutes following medication administration to allow for medication absorption. There is no need to remove the tube and place it in the other nostril in order to administer a feeding; in fact, this is an invasive procedure and is unnecessary.
Test-Taking Strategy: Focus on the subject, instilling medication into the nasogastric tube, and visualize the procedure when answering this question. Read each option carefully and eliminate option 4 because it is not necessary and is an invasive procedure.
Review: Medication administration via a nasogastric tube
Level of Cognitive Ability: Analyzing
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Skills
Priority Concepts: Clinical Judgment; Safety
Reference: Perry, Potter, Ostendorf (2014), pp. 502, 786-788.

192. 3

Rationale: If a client has a nasogastric tube connected to suction, the nurse should wait 30 to 60 minutes before reconnecting the tube to the suction apparatus to allow adequate time for medication absorption. The client should not be placed in the supine position because of the risk for aspiration. Aspirating the nasogastric tube will remove the medication just administered. Low intermittent suction also will remove the medication just administered.
Test-Taking Strategy: Eliminate options 2 and 4 first because these actions are comparable or alike and will produce the same effect of removing medication administered. The client should not be placed in a supine position due to the risk of reflux and aspiration.
Review: Medication administration via a nasogastric tube
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Skills
Priority Concepts: Clinical Judgment; Safety
Reference: Perry, Potter, Ostendorf (2014), pp. 501-502.

193. 4

Rationale: If the nasogastric tube is in the stomach, the pH of the contents will be acidic. Gastric aspirates have acidic pH values and should be 3.5 or lower. A pH of 7.35 indicates a neutral pH, which may indicate that the tube is no longer in the stomach. Based on this information, the nurse should call the health care provider to request a prescription for a chest radiograph to determine if placement is accurate. Retesting the pH using another strip is unnecessary and checking for placement by auscultating for air injected into the tube is not a definitive method of checking for tube placement. The nurse should not document that the tube is in the correct place because the data indicate this may not be the case.
Test-Taking Strategy: Note the subject, verifying correct tube placement. Recalling that gastric contents are acidic and the definitive methods of assessing for accurate tube placement will direct you to the correct option.
Review: Assessing placement of a nasogastric tube
Level of Cognitive Ability: Analyzing
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Assessment

Content Area: Fundamentals of Care—Safety
Priority Concepts: Clinical Judgment; Safety
Reference: Perry, Potter, Ostendorf (2014), p. 784.

194. 2
Rationale: If the chest drainage system is disconnected, the end of the tube is placed in a bottle of sterile water held below the level of the chest. The HCP may need to be notified, but this is not the initial action. The system is replaced if it breaks or cracks or if the collection chamber is full. Placing a sterile dressing over the disconnection site will not prevent complications resulting from the disconnection.
Test-Taking Strategy: Note the strategic word, initial. This indicates that a nursing action is required that will prevent a serious complication as a result of the disconnection. Eliminate options 1 and 3 because these actions delay required and immediate intervention. From the remaining options, recalling the complications that can occur from a disconnection and the purpose of a chest tube system will direct you to option 2.
Review: Nursing actions related to chest tube complications
Level of Cognitive Ability: Analyzing
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Critical Care: Emergency Situations/Management
Priority Concepts: Clinical Judgment; Gas Exchange
Reference: Perry, Potter, Ostendorf (2014), p. 665.

195. 3
Rationale: Measuring the length of a nasogastric tube needed is done by placing the tube at the tip of the client's nose and extending the tube to the earlobe and then down to the xiphoid process. The average length for an adult is about 22 to 26 inches (56 to 66 cm). The remaining options identify incorrect procedures for measuring the length of the tube.
Test-Taking Strategy: Focus on the subject, insertion of a nasogastric tube, and visualize this procedure. Eliminate options 1 and 2 first because 10 inches (25.5 cm) is short and 32 inches (81 cm) is too long. Also, remember the abbreviation NEX, which stands for nose, earlobe, and xiphoid process, to assist in answering questions similar to this one.
Review: Nasogastric tube insertion procedure
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Assessment
Content Area: Fundamentals of Care—Skills
Priority Concepts: Clinical Judgment; Safety
Reference: Perry, Potter, Ostendorf (2014), p. 778.

❖ 196. 3, 4, 5, 6
Rationale: The bubbling of water in the water seal chamber indicates air drainage from the client and usually is seen when intrathoracic pressure is higher than atmospheric pressure, and may occur during exhalation, coughing, or sneezing. Excessive bubbling in the water seal chamber may indicate an air leak, an unexpected finding. Fluctuation of water in the tube in the water seal chamber during inhalation and exhalation is expected. An absence of fluctuation may indicate that the chest tube is obstructed or that the lung has reexpanded and that no more air is leaking into the pleural space. Gentle (not vigorous) bubbling should be noted in the suction control chamber. A total of 50 mL of drainage is not excessive in a client returning to the nursing unit from the recovery room. Drainage that is more than 70 to 100 mL/hour is considered excessive and requires notification of the health care provider. The chest tube insertion site is covered with an occlusive (airtight) dressing to prevent air from entering the pleural space. Positioning the drainage system below the client's chest allows gravity to drain the pleural space.
Test-Taking Strategy: Focus on the subject, expected findings associated with chest tube drainage systems. Thinking about the physiology associated with the functioning of a chest tube drainage system will assist in answering this question. The words excessive bubbling and vigorous bubbling will assist in eliminating these assessment findings.
Review: Chest tubes
Level of Cognitive Ability: Analyzing
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Assessment
Content Area: Adult Health/Respiratory
Priority Concepts: Clinical Judgment; Gas Exchange
Reference: Ignatavicius, Workman (2016), p. 579.

197. 4
Rationale: When the chest tube is removed, the client is asked to perform the Valsalva maneuver (take a deep breath, exhale, and bear down). The tube is quickly withdrawn, and an airtight dressing is taped in place. An alternative instruction is to ask the client to take a deep breath and hold the breath while the tube is removed.
Test-Taking Strategy: Focus on the subject, removal of a chest tube. Eliminate options 2 and 3 because they are comparable or alike. Next, visualize the procedure, client instructions, and the effect of each of the actions in the options to answer correctly.
Review: Chest tube removal
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Adult Health/Respiratory
Priority Concepts: Clinical Judgment; Gas Exchange
Reference: Perry, Potter, Ostendorf (2014), pp. 669-670.

198. 2
Rationale: If the tube is dislodged accidentally, the initial nursing action is to grasp the retention sutures and spread the opening. If agency policy permits, the nurse then attempts to replace the tube immediately. Calling ancillary services or the health care provider will delay treatment in this emergency situation. Covering the tracheostomy site will block the airway.
Test-Taking Strategy: Note the strategic word, initial. Eliminate options 1 and 3 first because they are comparable or alike and will delay the immediate intervention needed. Covering the tracheostomy opening will block the airway.
Review: Management of complications of tracheostomy
Level of Cognitive Ability: Analyzing
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Critical Care: Emergency Situations/Management
Priority Concepts: Clinical Judgment; Gas Exchange
Reference: Lewis et al. (2014), p. 510.

199. 1
Rationale: Following removal of the endotracheal tube the nurse monitors the client for respiratory distress. The nurse reports stridor to the health care provider (HCP) immediately. This is a high-pitched, coarse sound that is heard with the stethoscope over the trachea. Stridor indicates airway edema and places the client at risk for airway obstruction. Although the findings identified in the remaining options require monitoring, they do not require immediate notification of the HCP.
Test-Taking Strategy: Note the strategic word, immediately. Recall that the primary concern after removal of an artificial airway is the client's inability to maintain a patent airway and breathe independently. Because stridor indicates laryngeal edema and possible airway obstruction, it is the symptom that must be reported immediately.
Review: Endotracheal tube removal
Level of Cognitive Ability: Analyzing
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Critical Care: Emergency Situations/Management
Priority Concepts: Clinical Judgment; Gas Exchange
Reference: Ignatavicius, Workman (2016), p. 622.

200. 1
Rationale: Unless specifically indicated, residual amounts greater than 100 mL require holding the feeding, but this is individualized and each agency's policy should be checked. The residual amount should be reinstilled unless it is greater than 250 mL or per agency policy. In addition, the feeding is not discarded unless its contents are abnormal in color or characteristics.
Test-Taking Strategy: Note the strategic words, most appropriate. Note that the residual amount is 150 mL. Also note that options 2, 3, and 4 are comparable or alike and indicate administering the feeding.
Review: Nasogastric tubes
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Safety
Priority Concepts: Clinical Judgment; Safety
References: Perry, Potter, Ostendorf (2014), pp. 790, 792.

201. 2
Rationale: Fluctuation with inspiration and expiration, not continuous bubbling, should be noted in the water seal chamber. Intermittent bubbling may be noted if the client has a known pneumothorax, but this should decrease as time goes on and as the pneumothorax begins to resolve. Therefore, the nurse should check for an air leak. If a wet chest drainage system is used, bubbling would be continuous in the suction control chamber and not intermittent. In a dry system, there is no bubbling. Increasing the suction pressure only increases the rate of evaporation of water in the drainage system; in addition, increasing the suction can be harmful and is not done without a specific prescription to do so if using a wet system. Dry systems will allow for only a certain amount of suction to be applied; an orange bellow will appear in the suction window, indicating that the proper amount of suction has been applied. Chest tubes should be clamped only with a health care provider's prescription.
Test-Taking Strategy: Note the strategic words, most appropriate. Think about the physiology associated with each chamber of the chest tube drainage system. Remember that continuous gentle bubbling in the suction control chamber is expected if a wet system is used, but this finding is not normal in the water seal chamber.
Review: Expected assessment findings associated with chest tubes
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Adult Health/Respiratory
Priority Concepts: Clinical Judgment; Gas Exchange
Reference: Lewis et al. (2014), p. 546.

202. 4
Rationale: During the insertion of a nasogastric tube, if the client experiences difficulty breathing or any respiratory distress, withdraw the tube slightly, stop the tube advancement, and wait until the distress subsides. It is not necessary to notify the health care provider immediately or remove the tube completely. Quickly inserting the tube is not an appropriate action because, in this situation, it is likely that the tube has entered the bronchus.
Test-Taking Strategy: Note the strategic words, most appropriate. Eliminate option 1 because of the word quickly. Visualizing the procedure and anticipating potential complications will assist in eliminating options 2 and 3 as necessary actions at this time. If a client has respiratory distress, the tube has entered the bronchus and insertion should not be continued. It is not necessary to remove the tube completely at this time.
Review: Nasogastric tubes
Level of Cognitive Ability: Applying
Client Needs: Physiological Integrity
Integrated Process: Nursing Process—Implementation
Content Area: Fundamentals of Care—Skills
Priority Concepts: Clinical Judgment; Safety
Reference: Perry, Potter, Ostendorf (2014), p. 780.