Routes of Drug Administration NCLEX Review

Routes of Medication Administration

The route of administration refers to where the medication enters the body. It is included as one of the parts of a medication prescription. The route of administration selected depends on such factors as the characteristics of the pharmacological product (e.g., insulin is destroyed in the gastrointestinal [GI] system and therefore is administered subcutaneously); the purpose of the medication (e.g., local or systemic effect); and client characteristics (e.g., client is unconscious, is vomiting, or has an impaired GI system). Routes of administration include oral, enteral tubes, oral mucous membranes (e.g., sublingual, buccal, swish and spit, swish and swallow), skin, eye, ear, rectum, vagina, upper or lower respiratory tract, and parenteral (e.g., intramuscular, subcutaneous, intradermal, and intravenous). Each route has its indications for use, advantages and disadvantages, and specific techniques that must be employed to deliver the medication appropriately to the client. Nurses must be knowledgeable about these issues and possess the necessary skills to administer medications safely via a variety of routes.

A. Oral

1. Introduction.

- Product is administered through the mouth or a tube into the stomach.
- Product is absorbed in the stomach or small intestine.

2. Types of oral medication preparations.

- Capsule: Product encased in a hard or soft container or gelatin shell that dissolves in the stomach.
- Caplet: Gelatin-coated tablet that is easy to swallow and dissolves in the stomach.
- Tablet: Product molded into a disk or cylinder that is swallowed, chewed, or melted under the tongue (sublingual) and comes in different types.
    - Enteric-coated: Product encased in a substance that dissolves in the intestine.
    - Sustained-release: Product that is gradually released, ensuring a constant blood level of the drug.
    - Time-release: Product further enclosed in a smaller casing that releases a dose over time.
- Liquid: Substance that flows readily.
    - Aerosol: Aqueous product that is delivered as a fine mist into the nose or mouth and absorbed in the upper airway.
    - Elixir: Product in a solution of alcohol containing glycerin or sweeteners.
    - Emulsion: Liquid product that is distributed as small droplets in another liquid.
    - Suspension: Powder or particle that is dissolved in a liquid when shaken vigorously.
    - Syrup: Product that is dispersed in a sugar liquid.

3. Advantages.

- Convenient.
- Comfortable for the client.
- Chewable forms that appeal to children.
- Seldom causes client anxiety.
- Easy to administer.
- Economical and cost effective; does not require expensive equipment.
- Can cause a local effect.
- Can cause a systemic effect.

4. Disadvantages.

- Slower action than other routes.
- Can irritate the oral and gastric mucosa, stain teeth, or have an objectionable taste.
- Contraindicated for some clients.
    - Clients who have impaired GI function.
    - Clients who are unconscious or cognitively impaired and cannot swallow.
    - Clients who are nauseated, vomiting, on nothing-by-mouth (NPO) status, or receiving gastric decompression.
    - Clients at high risk for aspiration.

5. Commonalities of nursing interventions specific to administering oral medications.

- Verify whether the client is receiving a restricted diet, is having intake and output (I&O) measured, or is on NPO status to ensure that fluid intake is permitted and should be documented.
- Assess the presence of contraindications for administering a medication via the oral route, such as decreased level of consciousness, depressed gag reflex, presence of nausea or vomiting, and NPO status. Seek a prescription for an alternate route if any contraindications are present. Doing so ensures that the client can receive the medication via an alternate route without interruption of therapy.
- Encourage the client to drink 5 oz of water with ingestion of the medication to facilitate dissolution and absorption of the medication.
- Cut scored tablets with a cutting device or held within a tissue when splitting by hand. Ensure both halves of a tablet are equal in size to produce two equal doses (a cutting device is more effective than splitting tablets by hand) and to ensure an accurate dose.
- Follow agency policy regarding using or discarding unadministered split tablets.
- Crush crushable tablets and mix with applesauce when necessary to facilitate swallowing. Use only as much applesauce as necessary to mix with the medication to ensure ingestion of the entire dose.
- Observe the client while he or she is ingesting the medication.
- Inspect the mouth for “pocketed” medications (e.g., under the tongue or in the buccal cavity) after administration when ingestion is questionable, such as with difficulty swallowing, confusion, hoarding, or unilateral weakness, to ensure that the medication was ingested and reduce the risk of aspiration of an unswallowed medication.
- Do not leave medications at the bedside to be taken later to prevent the medication from becoming lost, not being taken, being taken without supervision, or being hoarded for a nontherapeutic purpose.

6. Nursing interventions specific to administering enteric-coated, (delayed-release) and extended

release (sustained-release, time-release) medications.

- Do not crush enteric-coated tablets to avoid deactivation by gastric juices and ensure delivery to the intestine, where it dissolves and is absorbed.
- Do not crush extended-release medications to prevent the activation of the medication at one time, resulting in an excessive dose.
- Notify the primary health-care provider if a client is unable to ingest a medication whole, necessitating a change in route.
- Assess for the therapeutic effect of the medication over the length of time expected.

7. Nursing interventions specific to administering liquid medications (aerosols, elixirs, emulsions, suspensions, and syrups).

- Follow the manufacturer's directions regarding whether a container should be vigorously shaken to ensure even distribution of constituents.
- Place an opened top of a container on a surface with the inside lid facing up to prevent contamination of the inside of the lid and subsequent contamination of the bottle when the lid is returned and closed.
- Measure oral liquids accurately.
    - Measure oral liquids in a calibrated medication cup at eye level.
    - Use a syringe without a needle to measure oral liquid volumes less than 5 mL and transfer them to a medication cup.
    - Avoid keeping oral liquid medications in a syringe to prevent accidental administration of an oral liquid via the parenteral route.
- Pour liquids with the label against the palm of the hand to prevent the liquid from dripping on and obscuring the label.
- Wipe the outside rim of the bottle with a clean paper towel before replacing the top.
- Use measures to make unpleasant tasting medications more palatable.
    - Refrigerate unpleasant tasting liquids unless contraindicated to lessen objectionable taste and odor.
    - Offer ice chips before giving unpleasant tasting medications to numb the taste buds.
    - Use a needleless syringe to place unpleasant tasting medications on the back of the tongue to minimize unpleasant taste.
    - Provide oral hygiene after administration of unpleasant tasting medications.

B. Gastrointestinal tubes

1. Introduction.

- Tube inserted into the stomach or intestine.
- Can be used to remove stomach secretions (gastric decompression) or intestinal secretions (intestinal decompression).
- Can be used to deliver formula feedings to the stomach or small intestine to meet nutritional needs.
- Can be used to deliver liquid, powder, or crushed medications even when the tube is being used for decompression or for formula feedings.

2. Types of GI tubes.

- Nasogastric (NG).
    - Tube passed through a nostril, the nasopharynx, and the esophagus with the distal end placed in the stomach.
    - Used for clients who are unable to ingest substances through the mouth or esophagus due to impaired swallowing, an absent gag reflex, or recent head and neck surgery or for decompression after abdominal surgery.
- Jejunostomy.
    - Tube passed through the nose, the esophagus, and the stomach with the distal end placed in the jejunum.
    - Used for clients with impaired gastric functioning so that formula feedings can enter the small intestine directly or to promote intestinal decompression in clients with a small bowel obstruction.
- Percutaneous endoscopic gastrostomy (PEG) or percutaneous endoscopic jejunostomy (PEJ).
    - Tube surgically or laparoscopically inserted through the skin and abdominal wall into the stomach or jejunum and sutured in place to maintain placement. Also held in place by an internal retention balloon and flat external bumper.
    - Traditionally used for long-term (6 to 8 weeks or longer) nutritional support but now used more frequently for short-term support because of ease of insertion.

3. Advantages.

- Provide a route for administering medication that otherwise would need to be delivered parenterally.
- PEG tube considered the most comfortable feeding tube.

4. Disadvantages.

- Increased risk of aspiration that can lead to pneumonia, infection, abscess formation, and respiratory distress syndrome (RDS); risk is greater with an NG tube than with gastrostomy or jejunostomy tubes because an NG tube can curl up within the esophagus and enter the trachea and bronchi.
- Requires use of an enteral tube and a piston syringe for insertion of medication, which is more costly than most other routes.
- Requires shutting off a tube used for decompression for 30 minutes after medication administration to allow time for absorption.
- Does not permit administration of enteric coated, time-release, or sustained-release medications because they would require crushing a tablet or emptying a capsule, which would expose the client to the entire dose at once.
- Requires more time for administration than do other routes.

5. Nursing interventions specific to administering medications via GI tubes.

- Administer liquid forms of medication when available to prevent clogging the tube.
- Crush crushable tablets into a fine powder and mix with 30 mL of warm water; avoid administering whole or undissolved medications to prevent clogging the tube.
- Identify placement of the tube in the stomach or intestine before medication administration. Doing so ensures that medication is administered into the appropriate place rather than into the respiratory system. (See “Ensure accurate placement of the tube using several

methods” in the section “Nursing Care for Clients Receiving Enteral Nutrition” in Chapter 20, Nutrition.)
- Flush the tube with 15 to 30 mL of water before medication administration to ensure tube patency.
- Give each medication separately and flush with 15 to 30 mL of water between each and after the last medication. If necessary, modify the procedure if the client has a fluid restriction.
- Shut off a nasogastric tube used for decompression for 30 minutes after medication administration to enhance medication absorption and then reestablish decompression.

C. Oral mucous membranes (sublingual, buccal, swish and spit, swish and swallow)

1. Introduction.

- The mucous membranes of the oral cavity line the entire cavity, including inside the lips, under the tongue (sublingual), between the gum and cheeks (buccal cavity), and the posterior oropharyngeal area, including the uvula and tonsils.
- Products for these routes are designed to dissolve or circulate in the mouth and produce either a local or a systemic effect.
- Sublingual: Tablet is dissolved under the tongue (e.g., nitroglycerine).
- Buccal cavity: Troche or lozenge is dissolved between a cheek and the gum.
- Swish and spit/swish and swallow: Solution dispersed throughout the oral cavity and esophagus (when swallowed).

2. Advantages.

- Same as oral route, plus information below.
- Sublingual.
    - Enters the blood, bypassing the liver, allowing for a quick effect.
    - Administered for a systemic effect.

Buccal.

- Dissolves slowly between the cheek and gum to affect the mucous membranes of the oral cavity.
- Administered for a local effect.

- Swish and spit/swish and swallow.
    - Solution circulated in the mouth and expelled or swallowed.
    - Administered for a local effect (e.g., mucous membranes of the mouth and esophagus if swallowed).

3. Disadvantages.

- Contraindicated for individuals who are unable to maintain a tablet in place until dissolved or unable to follow directions regarding dispersing a solution throughout the oral cavity.
- Sublingual: Must remain under the tongue until completely dissolved for best effect.
- Buccal: Must remain in the buccal cavity until completely dissolved for best effect and may cause irritation of the mucous membranes.

- Swish and spit/swish and swallow: Client may accidentally aspirate the solution or swallow the solution meant to be expelled.

4. Commonalities of nursing interventions specific to administering medications via oral mucous membranes.

- Ensure that the client is physically able and mentally aware of the need to keep the tablet, troche, or lozenge in place until dissolved to ensure that the medication dissolves in the mouth, minimizing the risk of aspiration.
- Inform the primary health-care provider if the client is unable to keep the medication in place until dissolved and seek a prescription for a route that can be tolerated.
- Teach the client not to chew or swallow the tablet.
- Assess the mucous membranes for irritation; inform the primary health-care provider if any occurs, and suggest a change in route.

5. Nursing interventions specific to administering medications via the sublingual route. a. Instruct the client to keep the tablet under the tongue until the medication dissolves. b. Assess for a therapeutic effect immediately to promote evaluation and documentation of the client's response (sublingual route has a quick absorption rate).

6. Nursing interventions specific to administering medications via the buccal route.

- Instruct the client to place the troche or lozenge against the mucous membrane of the cheek and gum until it dissolves.
- Ensure that the client stays awake until the troche or lozenge dissolves to reduce the risk of aspiration.
- Advise the client to alternate cheeks when taking additional doses to minimize the risk of mucosal irritation.

7. Nursing interventions specific to administering medications via swish and spit/swish and swallow.

- Instruct the client to keep the lips closed and puff the cheeks in and out to ensure that the solution is dispersed to all mucous membranes in the oral cavity.
- Instruct the client to expel the solution from the mouth for swish and spit to ensure that the solution is in contact with only the oral mucous membranes.
- Instruct the client to swallow the solution for swish and swallow to ensure that the solution is in contact with the mucous membranes of the oral cavity and the esophagus.

D. Skin

1. Introduction.

- Skin is the largest organ of the body (integumentary system); it protects underlying tissue, helps to regulate body temperature, secretes sebum, transmits sensations through nerve endings, and produces and absorbs vitamin D.
- The product is designed to be absorbed through the skin and produce either a local or systemic effect.
    - Topical: Applied to the skin to provide a local or systemic effect, depending on the

site, but usually used for a local effect.
    - Transdermal: Applied to the skin for a systemic effect.

2. Types of preparations.

- Liniment: Alcohol, oil, or soapy emollient containing a medicated substance.
- Lotion: Medication in a liquid suspension often used to clean, cool, or protect the skin.
- Ointment (salve or cream): Semisolid substance containing a medication.
- Paste: Thick ointment that is absorbed slowly through the skin and generally is used for skin protection.
- Transdermal patch: Impregnated sheath that releases a controlled amount of medication to produce a systemic response.

3. Advantages.

- Topical.
    - Easy to apply.
    - Generally painless.
- b. Transdermal.
    - Provides a prolonged systemic effect (1 to 7 days, depending on the medication).
    - Convenient when used for 72 hours or longer.
    - Replaces daily administration of a medication.

4. Disadvantages.

- Topical.
    - Risk for fast absorption and a systemic effect in the presence of impaired skin integrity, such as excoriation or a break in the skin.
    - May irritate the skin.
    - May cause adverse systemic effects.
    - May leave oily matter on the skin that can soil clothing.
- Transdermal.
    - May require shaving of hair to facilitate adherence of the patch.
    - May cause skin irritation.

5. Commonalities of nursing interventions specific to administering medications via the skin.

- Follow standard precautions (e.g., don gloves) when applying topical medications to prevent exposure to the medication and contact with blood and body fluids.
- Maintain sterile technique if the client’s skin lacks integrity to reduce the risk of infection.
- Assess for irritation at the site and report to the primary health-care provider if any occurs.

6. Nursing interventions specific to administering liniments, lotions, ointments, and pastes.

- Clean the skin before application to improve medication absorption.
- Place the lid of a container on a surface with the inside facing upward to prevent contamination of the inside of the lid.
- Use a separate sterile tongue blade each time when obtaining paste from a container to maintain the sterility of the inside of the container.

- Apply in a thin or thick layer, according to the manufacturer's directions.
- Apply onto the skin with the degree of rubbing recommended by the manufacturer.

7. Nursing interventions specific to administering medications via a transdermal patch.

- Follow standard precautions when administering a patch.
- Remove the previous patch before applying a new one to minimize the risk of overdose.
- Contain and dispose of a used patch to protect others from exposure to the active substance still on the patch.
- Wash and dry the skin after removing a used patch. Doing so removes any lingering medication and minimizes the risk of overdose.
- Shave hair on the skin with the client's consent if the hair interferes with patch adherence.
- Apply the patch to a different location than the previous patch and gently compress the patch with a gloved hand for 10 seconds to facilitate adherence.
- Write the date, the time, and your initials on a patch.

E. Eye

1. Introduction.

- Ophthalmic medications: Medicinal substances administered into an eye.
- Ophthalmic medications produce a local effect.

2. Advantages.

- Provides medication directly to the desired site.
- Allows medication of one or both eyes.

3. Disadvantages.

- Difficult to self-administer, particularly if the client has impaired vision.
- Damage may occur to the eye if the tip of the dropper or tube touches the eye or drops fall directly on the cornea.
- Infection may occur if the tip of the dropper or tube touches the eye because this contaminates the medication container.

4. Nursing interventions specific to administering eye medications.

- Clean the eyelid and lashes with sterile normal saline solution–soaked cotton balls. Use a new one for each stroke, moving from the inner canthus to outer canthus. Doing so cleans the eye and reduces the risk of debris entering the lacrimal duct.
- Tilt the client's head slightly back and toward the eye being medicated to prevent the solution from flowing toward the other eye.
- Have the client look up to reduce the risk of blinking.
- Place a finger just below the lower eyelashes and exert gentle downward pressure over the bony prominence of the cheek to expose the conjunctival sac.
- Hold the dropper close to the eye without touching it and administer the prescribed number

of drops so they fall into the conjunctival sac and not on the eyeball.
- Apply ointment along the edge of the lower conjunctival sac without touching the eye with the tube to maintain the sterility of the ointment tube.
- Release the lower lid and instruct the client to close the eyes gently to prevent the medication from being squeezed out of the eye.
- Apply gentle pressure over the inner canthus to prevent medication from flowing into the lacrimal duct.
- Teach the client not to rub the medicated eye to avoid irritation and contamination of the hands, which may contaminate the other eye, surfaces in the environment, and other people.

F. Ear

1. Introduction.

- Otic medications: Medicinal substances administered into an ear.
- Otic medications produce a local effect.

2. Advantages.

- Provides medication directly to the desired site.
- Allows medication of one or both ears.

3. Disadvantages.

- May require removal of earwax (cerumen) for the medication to reach the involved tissue.
- May cause damage if drops fall directly onto the tympanic membrane.

4. Nursing interventions specific to administering ear medications.

- Warm the solution to room temperature by holding the container of medication in the palm of a hand for several minutes to minimize discomfort.
- Clean the external ear of drainage with normal saline solution–moistened cotton balls.
- Place the client in the side-lying position with the affected ear facing toward the ceiling to help retain the drops in the ear.
- Gently pull up and back on the cartilaginous part of the pinna for an adult and a child older than 3 years of age. Pull the cartilaginous part of the pinna down and back for an infant or child younger than age 3 years.
- Place the drops on the side of the ear canal so that the drops flow down the wall of the ear canal, but avoid touching the canal with the dropper to protect the dropper from contamination and avoid injury to the tympanic membrane.
- Release the pinna and gently press on the tragus several times to move the medication along the canal to the tympanic membrane.
- Maintain the client in the side-lying position with the affected ear facing the ceiling for 5 minutes after medication administration. Doing so uses gravity to ensure drug contact with the structures within the ear canal.
- Loosely insert a cotton ball into the external canal, if prescribed, to prevent the drug from leaking out of the ear canal.

G. Rectum

1. Introduction.

- The rectum is the last 7 to 8 inches of the large intestine. The last inch of the rectum is called the anal canal, and the opening itself is called the anus.
- Products must be inserted through the anus and anal canal to reach the rectum.
- Products include creams that are inserted with an applicator or a cone-shaped, firm substance (suppository) that can be inserted with a gloved finger.
- Products are designed to dissolve and be absorbed through the mucous membranes of the rectum.

2. Advantages.

- Provides for a local or systemic effect, depending on the medication (e.g., laxative or anti inflammatory for a local effect; sedative or analgesic for a systemic effect).
- Allows medication to be released at a slow, steady rate.
- Provides an alternate administration site when the client is vomiting or oral medication has an objectionable taste.

3. Disadvantages.

- Rates of absorption are unpredictable.
- Is contraindicated if the client had rectal surgery or has rectal bleeding.
- May be perceived by the client as unpleasant or cause client embarrassment.
- May soil or stain clothing.

4. Nursing interventions specific to administering medications via the rectum.

- Store foil-wrapped suppositories in a refrigerator to help the suppository retain its form for ease of insertion.
- Follow standard precautions, including donning gloves, to prevent exposure to body fluids.
- Close the door and pull the curtain around the bed to provide privacy.
- Position the client in the left-lateral position.
- Drape the client with a sheet, exposing only the perianal area to provide privacy.
- Identify whether the client has a fecal mass in the rectum. If a mass is present, the product must be inserted between the fecal mass and the rectal wall to promote its effect.
- Lubricate the suppository and the index finger of your gloved hand to facilitate insertion and prevent tissue trauma.
- Direct insertion toward the umbilicus, using the full length of an index finger. Doing so ensures placement past the anal canal, anal sphincter, and anal-rectal ridge, which promotes retention of the suppository. Please see picture below
- Instruct the client to remain in the lateral or supine position for 10 to 20 minutes after insertion to keep the suppository in place, which facilitates absorption.

H. Vagina

1. Introduction.

- The vagina is a 3-inch long area (vaginal canal) extending from the cervix of the uterus to the vaginal opening (vaginal introitus).
- Products must be inserted through the vaginal introitus and be placed deep within the vaginal canal.
- Products include creams, foams, jellies, or tablets that are inserted with an applicator or a cone-shaped, firm substance (suppository) that can be inserted with a gloved finger.
- Products are designed to dissolve and be absorbed through the mucous membranes of the vagina.

2. Advantages.

- Provides a local effect.
- Provides an alternate route for a contraceptive other than oral or intradermal.

3. Disadvantages.

- May be perceived by the client as unpleasant or cause client embarrassment.
- May soil or stain clothing.

4. Nursing interventions specific to administering medications via the vagina.

- Store foil-wrapped suppositories in a refrigerator to help the suppository retain its form for ease of insertion.
- Follow standard precautions, including donning gloves to prevent exposure to body fluids.
- Have the client void before insertion of the medication to eliminate the pressure of a full bladder, which may cause discomfort during insertion.
- Close the door and pull the curtain around the bed to provide privacy.
- Provide perineal care with soap and water before inserting the medication to remove debris and minimize the presence of microorganisms.
- Position the client in the dorsal recumbent position.
- Drape the client with a sheet, exposing only the vaginal area to provide privacy.
- Lubricate the vaginal suppository and your gloved index finger with a water-soluble jelly or expel a small amount of vaginal cream at the tip of the applicator supplied by the manufacturer to facilitate insertion and limit tissue trauma.
- Direct insertion downward and backward using the full length of the applicator or index finger. Doing so follows the contour of the vaginal anatomy and ensures that the medication is inserted deep in the vaginal canal.
- Use a rolling motion when inserting a cream with an applicator. Doing so spreads lubricant along the vaginal lining, easing insertion.
- Fully compress the plunger of the applicator to ensure disbursement of the cream or placement of the tablet deep in the vaginal canal.

- Remove the applicator slowly to prevent tissue trauma.
- Instruct the client to remain in a supine position for 10 to 20 minutes after insertion to keep the medication in place, which facilitates absorption.

I. Upper and lower respiratory tracts

1. Introduction.

- The upper respiratory tract consists of the nose, nasopharynx, sinuses, oropharynx, laryngopharynx, and larynx.
- The lower respiratory tract consists of the trachea, all segments of the bronchial tree, and the alveoli.
- Medications are introduced into the upper respiratory tract through the nose via drops or sprays.
- Medications are introduced into the lower respiratory tract usually through the mouth via a fine spray, fog, powder, or mist.
- Most medications are delivered to achieve a local effect, improving ventilation and oxygenation (e.g., bronchodilators, anti-inflammatory agents, antihistamines, and nasal decongestants).
- Intranasal mists may be given for a systemic effect (e.g., flu vaccine, naloxone).

2. Types of respiratory tract medication delivery systems.

- Upper respiratory tract.
    - Drops: Drops of medicated solution are introduced into a nostril by a dropper.
    - Nasal sprays: Sprays suspend droplets of medication that are propelled into the nose by depressing a cartridge adaptor or squeezing the container.

- Lower respiratory tract.

Metered-dose inhaler (MDI):A pressurized container propels medication as a fine spray through a mouthpiece that is then inhaled into the lower respiratory tract.

    - Non-pressurized aerosol (handheld nebulizer):Medication is changed to a fine mist or fog so that it can be inhaled deep into the lower respiratory tract; generally administered via a mouthpiece but can be delivered with a mask to infants or children or an adult who has difficulty using the mouthpiece.
    - Dry powder disk inhaler: Multiple-dose disks deliver dry powder to the lower respiratory tract when inhaled through the mouth.

3. Advantages.

- Lower respiratory tract delivery systems: Promote inhalation of medication deep into respiratory passages.
- Have a rapid, efficient local effect due to the highly vascular nature of airways and alveoli.
- Some can be administered to an unconscious client.

4. Disadvantages.

- Requires sufficient inhalation flow rates to deliver inhaled medication to the lower respiratory tract
- Metered-dose and dry powder disk inhalers require coordination with device activation and inhalation.
- May cause unwanted systemic effects (e.g., tachycardia and palpitations with some bronchodilators) or irritate the mucous membranes of the respiratory tract, depending on the medication.
- Some delivery systems cannot be used for children and cognitively impaired persons who

cannot follow directions.
- Requires the use of special equipment that needs to be cleaned.

5. Commonalities of nursing interventions specific to administering medications via the upper and lower respiratory tract.

- Assess respiratory function.
    - Rate, rhythm, and effort.
    - Sounds: crackles, rhonchi, stridor, wheezing, diminished.
    - Use of accessory muscles.
    - Nasal flaring.
    - Orthopnea.
    - Pulse oximetry: 95% and higher is normal.
    - Cough: Productive or nonproductive; characteristics.
    - Secretions: Amount, color, odor, and consistency.
    - Nasal congestion.
    - Gross abnormalities of the visible mucosa, such as lesions, irritation, or inflammation.
- Wear gloves if contamination is likely to prevent exposure to blood and body fluids.
- Encourage the client to blow the nose and cough up respiratory tract secretions. Doing so clears excess secretions from the respiratory tract and permits the medication to reach the mucous membranes.
- Position the client's head as indicated for the specific delivery system to facilitate distribution of the medication to the appropriate site.
- Avoid sharing sprays, droppers, and inhalers to minimize the risk of cross-contamination.
- Clean equipment after each use or weekly, based on the manufacturer's recommendations, to minimize the risk of bacterial contamination of equipment and prepare the equipment for the next dose.
- Discard expired inhalers, sprays, and drops. h. Instruct the client to rinse the mouth after administration to remove any unpleasant taste, if present, and minimize the risk of candidiasis (with steroidal agents).

6. Nursing interventions specific to administering medications via an MDI. **Teach the client to:**

- Shake the canister before each depression to mix the propellant with the medication.
- Attach the mouthpiece to the medication canister.
- Exhale slowly and completely through pursed lips to ensure air is exhaled fully from the lower lobes of the lungs and prepare the lungs for full inhalation.
- Hold the inhaler 2 cm from the mouth (open mouth method) or insert the mouthpiece beyond the teeth and instruct the client to form a tight seal with the lips (closed-mouth method, see picture below).

- Depress the device while inhaling slowly and deeply and hold the breath for 5 to 10 seconds at the height of inhalation. Doing so disperses the medication deep in the respiratory tract and prolongs contact of the medication with the respiratory mucosa.

- Exhale slowly and completely through pursed lips to keep the smaller airways open during exhalation.
- Use a spacer device for better results because the medication is released into the spacer and is then inhaled via a mouthpiece. Doing so eliminates the need to coordinate inhalation with canister compression and promotes larger droplets to fall to the bottom of the spacer and increases the volume of smaller droplets reaching the lungs.

7. Nursing interventions specific to administering medications via a nasal spray. Teach the client to:

- Insert the tip of the nasal device into one nostril while occluding the other by gently pressing on the nostril toward the midline. Doing so minimizes the aerosol from entering the other nostril.
- Press the adapter cartridge or squeeze the container while inhaling through the accessed nostril to discharge a measured dose into the accessed nostril.
- Exhale slowly through the mouth to help retain the medication in the nasal passage.
- Insert the tip into the other nostril and, while breathing in slowly through the nose, squirt the spray into the nostril; do not occlude the first nostril. Doing so discharges one measured dose in the accessed nostril; occluding the first nostril may expel previously administered medication.
- Exhale slowly through the mouth to help retain medication in the nasal passage.
- Tilt the head backward to allow the spray to reach the back of the nose.
- Wait 1 minute before administering a prescribed second dose to allow time for the first dose to take effect.
- Clean the outside of the container weekly according to the manufacturer's recommendations to minimize the risk of bacterial contamination of equipment.
- Avoid excessive use of OTC nasal decongestants; limit use to 7 days. Increased congestion can occur after the therapeutic effect subsides with excessive use (rebound congestion).

8. Nursing interventions specific to administering medications via an aerosol handheld nebulizer. **Teach the client to:**

- Place the medication and a small volume of saline (if required) in a cup connected to a handheld nebulizer that has a mouthpiece. Doing so mixes the medication and saline, preparing it for aerosolization.
- Attach the nebulizer to wall oxygen or a nebulizer compressor to propel oxygen or air through the medication cup, changing the medication solution to a mist.
- Sit in an upright position to promote thoracic excursion by allowing the abdominal organs to drop by gravity.
- Insert the mouthpiece beyond the teeth and form a tight seal with the lips to ensure that the mist does not escape from the mouth.
- Inhale and exhale slowly and deeply through the mouth without removing the mouthpiece to deliver the medication deep into the small respiratory airways.

- Tap the side of the nebulizer occasionally to dislodge the solution from the sides of the cup down to where it can be misted.

- Continue for several minutes until the misting stops to ensure the entire dose is delivered.
- Disassemble the nebulizer, mouthpiece, and cup; clean them with soap and water; and reassemble when dry to minimize the risk of infection.

9. Nursing interventions specific to administering medications via a dry-powder inhaler or disk haler. **Teach the client to:**

- Hold the disk horizontal in one hand throughout administration; put the thumb in the notch and push it away from the body until the mouthpiece appears. Doing so accesses the mouthpiece of the inhaler.
- Use a thumb to slide the lever away from the body until it clicks to ensure the medication is ready for delivery.
- Seal the lips around the mouthpiece and breathe in quickly and deeply through the mouth to move medication into the respiratory tract.
- Remove the disk from the mouth and hold the breath for 5 to 10 seconds to lengthen the time the medication is in contact with the respiratory mucosa.
- Use the thumb to slide the notch back to shut the disk, preparing it for the next dose.

10. Nursing interventions specific to administering nose drops. **Teach the client to:**

- Hyperextend the head slightly (place a rolled towel behind the shoulders or place the head over the edge of the bed) to promote distribution of the solution over the surfaces of the nasal mucosa.
- Hold the dropper over the nostril without touching the nose to avoid contamination of the dropper.
- Apply the prescribed number of drops.
- Avoid swallowing the medication to ensure that the medication stays in contact with the nasal mucosa.
- Maintain the head tilt for a few minutes after insertion of drops to prevent the solution from exiting the nose via gravity.
- Return the dropper to the bottle and then close the bottle tightly to maintain the integrity of the medication and dropper.

J. Parenteral routes

1. Introduction.

- Parenteral: Means other than the alimentary canal (GI tract).
- Parenteral medications are administered intramuscularly, subcutaneously, intradermally, or intravenously.

2. Advantages.

- Avoids the GI tract when the GI tract is impaired, the medication is too irritating to the mucosa, or the GI tract inactivates the medication.
- Has more rapid onset than the oral route.
- Has more predictable results than other routes.
- Can be administered to unconscious clients.

3. Disadvantages.

- Punctures the skin, increasing the risk of infection.
- May cause tissue injury if the solubility or pH of the medication is inappropriate for the tissue being accessed.
- Requires sterile equipment and is a more complex procedure than oral or topical medication administration (e.g., use of sterile technique, multiplicity of sites that can be used, safe disposal of equipment).

4. Characteristics of syringes and needles.

- Type of syringe.
    - Consists of a barrel, plunger, hub, needle (cannula, shaft), and safety device to prevent a needlestick injury; measurement calibrations are on the barrel.
    - Generally packaged with an attached needle; however, the needle should be changed after drawing up a caustic drug or when a more appropriate needle gauge or length is desired.
    - Luer-Lok syringe: Marked in 0.1 (tenths); requires a special needle that twists on the tip of the syringe and locks into place.
    - Tuberculin syringe: Marked in 0.01 (hundredths) for doses less than 1 mL and has a very narrow barrel.
    - Insulin syringe: Marked in either 50 or 100 units and has a narrow barrel. (6) Prefilled single-dose syringe: May require a drug calculation before administering the correct dose; larger volumes of the drug than that which is prescribed may have to be wasted.
- **Pre-filled Single-dose syringes -**
- Volume of syringe.
    - Sizes vary, with volumes, from 0.5 mL to 60 mL.
    - Syringes with volumes of 1 mL or less usually are used for subcutaneous (Sub-Q) injections.
    - Syringes with volumes of 3 mL usually are used for IM injections.
    - Syringes with volumes larger than 3 mL are used to administer intravenous (IV) medications, add solutions to IV bags, or irrigate tubes or wounds.
- Needle length (shaft).
    - Vary in length from 1?4 to 3 inches.
    - Shorter needles (5?8, 1?2, and 1 inch) are used for infants, children, and thin adults and for subcutaneous injections.
    - Longer needles (11?2 inch) are used for IM injections.
    - Needles longer than 11?2 inches in length are used for obese clients and invasive procedures that require insertion of a needle, such as biopsies, paracentesis, and thoracentesis.
    - Needles in different size gauges and lengths are packaged in individual sterile sheaths or come attached to a packaged syringe.
    - Syringe needles can be replaced with a different-gauge or -length needle as necessary.
- Needle gauge (diameter of shaft).
    - Gauge: Diameter of a needle; varies in size from #18 to #28 gauge.
    - The smaller the needle gauge, the larger the diameter of the needle; the larger the

needle gauge, the smaller the diameter of the needle.
    - Larger gauge needles cause less tissue damage when inserted.
    - Viscous solutions require a smaller gauge needle.
- Needle bevel.
    - Tips of needles are slanted (beveled) to create a narrow slit in the skin when inserted; when the needle is removed, the slit in the skin closes to prevent leakage of fluid.
    - Long-beveled needles are more pointy and sharp; generally used for IM and Sub-Q injections.
    - Short-beveled needles are used for intradermal injections because the risk of the bevel becoming occluded is less likely.

5. Commonalities of nursing interventions specific to administering medications via all parenteral routes.

- Perform hand hygiene to prevent infection.
- Select an appropriate-size syringe, needle gauge, and needle length to ensure that the medication is deposited at the correct tissue depth.
- Maintain sterile technique (the outside of the barrel and tip of the plunger can be touched but not the hub or the shaft of the plunger).
- Aspirate the prescribed volume of solution.
- Recap the sterile needle using a hands-free method to prevent a needlestick injury and maintain the sterility of the needle.

- Close the door and curtain to provide privacy.
- Put on clean gloves to prevent contact with blood and body fluids.
- Select the injection site.
    - Check the MAR for the site of the last injection and select a new site; systematically rotate sites to minimize underlying tissue damage, which may decrease absorption.
    - Inspect the potential injection site for bruises, inflammation, edema, and signs of prior injections; avoid the area if any of these signs are present because they can interfere with absorption.
    - Use landmarks to select a site to minimize trauma to underlying structures, such as nerves and bones.
- Assist the client into a comfortable position that permits access to the selected injection site.
- Drape the client to expose only the injection site to provide for privacy.
- Clean the injection site with an alcohol wipe in a circular motion from the center outward to minimize the risk of infection.
- Pinch, spread, or move skin to the side, based on the injection type, to position the skin and underlying tissue for insertion of the needle into the correct tissue layer.
- Insert the needle at a 15- to 90-degree angle to the skin, depending on the type of injection.

- Stabilize the syringe with your nondominant hand; use your other hand to depress the plunger smoothly and slowly to reduce discomfort and inject the medication into the tissue.
- Aspirate or avoid aspiration, depending on the type of injection; see IM, Sub-Q, and intradermal injections for specifics regarding aspiration.
- Move the nondominant hand away from the site slightly; apply pressure with an antiseptic swab but not too close to the needle; quickly but carefully withdraw the needle in one

smooth motion along the line of insertion to minimize discomfort and reduce the risk of a needlestick injury.
- Massage the area if directed by the medication's instructions to increase drug distribution and absorption and stimulate circulation. Avoid massaging when administering insulin or anticoagulants to limit bleeding and bruising.
- Institute precautions to prevent a needlestick injury.
- Dispose of used gloves in an appropriate receptacle.

6. Withdrawing fluid from an ampule.

- Introduction.
    - Ampule: Characteristically shaped glass container that has a prescored, generally colored ring around a constricted neck.
    - Ampules generally hold a single dose of a drug but may hold up to 10 mL or more.
- Nursing interventions.
    - Flick the top of the ampule repeatedly if fluid is trapped to move the fluid below the constricted neck to ensure the entire dose is in the ampule for withdrawal.
    - Position a plastic ampule opener over the top of the constricted neck and snap off the top to protect the hands from injury.
    - Use a filter needle to aspirate the fluid into the syringe to prevent aspiration of glass particles.
    - Aspirate fluid into the syringe.
        - Invert the ampule, place the needle into the liquid, and aspirate the required volume. Doing so allows surface tension to hold the solution inside the ampule until the syringe's negative pressure pulls the solution into the syringe.
        - Place the ampule on a counter, insert the needle, and aspirate the solution.
    - Change the filter needle to a needle suitable for the injection.
    - Dispose of the used ampule, glass top, and filter needle in a sharps container to prevent a puncture injury.

7. Withdrawing fluid from a vial.

- Introduction.
    - Vial: Glass rubber-sealed container covered with a metal cap that maintains sterility of the seal until the metal cap is removed.
    - Vials hold single or multiple doses.
    - Medication is supplied as a liquid or a powder that requires reconstitution because it is stable only for a short period of time when in solution.
- Nursing interventions.

- Remove the metal cap that keeps the rubber seal sterile to provide access to the top seal of the vial.
- Clean the rubber seal by wiping its surface with a 70% alcohol swab in a firm circular motion from the center, working outward when accessing a multiple-dose vial that has no metal cap, to ensure sterility of the seal.
- Dissolve a medication supplied as a dry powder (reconstitution).
    - Instill fluid into the vial (diluent) with a syringe, following the manufacturer's instructions on the label of the vial for the type and amount of fluid in milliliters.
    - Remove the syringe and then gently roll the vial between the palms of the hands to prevent the formation of bubbles, which may result in withdrawal of an inaccurate dose.
    - Indicate on the label of a multidose vial the amount of solution that provides a specific dose, along with the date, time, and your initials if you plan to use the vial again in the near future.
    - Be aware that some reconstituted drugs must be given within 15 minutes of preparation to prevent degradation of the medication.
    - Do not use a vial that has been reconstituted by another nurse. Only use vials that you have reconstituted to ensure that you know the accuracy of the dose per milliliter.
- Select an appropriate syringe and needle and draw air into the barrel to the calibration mark indicating the volume of desired medication. Doing so ensures that an equal volume of air is injected into the vial to ease removal of the same volume of medication.
- Insert the needle into the vial above the level of the solution and slowly inject the air to prevent turbulence that can cause bubbles.
- Invert the vial and gently pull on the plunger until the calibration mark indicates that the desired volume of medication is withdrawn; keep the tip of the needle below the surface of the solution to prevent air from being aspirated into the syringe.
- Remove the needle from the vial and replace it with an appropriate needle for the situation. Doing so provides a sharp, capped needle and eliminates medication on the outside of the needle that could irritate tissue along the needle tract during insertion.
- Administer the medication immediately to prevent errors and degradation of the medication if it was reconstituted.

8. Mixing two medications in one syringe.

- Introduction.
    - Two medications can be mixed in one syringe, if compatible, to limit the number of injections reducing the risk of infection.
    - Do not mix more than two drugs in one syringe to minimize the risk of medication incompatibility.
    - Ensure medications are compatible by reading package inserts or consulting with a pharmacist, medication formulary, or textbook; administer drugs separately if compatibility is undetermined to prevent an incompatibility reaction.
- Commonalities of nursing interventions when mixing two medications in one syringe.
    - Determine the volume of each medication as well as the total volume to ensure that the right volume of each medication when added together equals the expected total

volume of medication.
    - Maintain sterile technique throughout the procedure to reduce the risk of contaminating the medication and reduce the risk of infection.
    - Observe the combined solution in the syringe for cloudiness or precipitate formation, which indicates an incompatibility; discard the solution if this occurs and prepare the doses in separate syringes.
    - Recap the sterile needle using a safety capping device or a hands-free method to prevent a needlestick injury and maintain the sterility of the needle.
    - Administer the medication immediately to prevent drug degradation.

9. Preparing a dose from one multidose vial and one single-dose vial.

- Insert air into both vials to facilitate aspiration of the medication from the vials.
- Withdraw the required volume from the multidose vial first to prevent contamination of the multidose vial with medication from the single-dose vial.
- Withdraw the required volume from the single-dose vial last.

10. Preparing a dose from one multidose vial and an ampule.

- Withdraw the required volume from the multidose vial first. By drawing the solution from the multidose vial first, medication from the ampule will not contaminate the multidose vial.
- Withdraw the required volume from the ampule last.

11. Preparing a dose from two multidose vials.

- Identify which medication should be in vial 1 and which should be in vial 2: Vial 1 is the medication that should not be diluted accidentally with medication from vial 2 (e.g., regular insulin is vial 1 and NPH insulin is vial 2).
- Instill air into the NPH insulin first and then the regular insulin.
- Withdraw the prescribed dose from the regular insulin first and then the NPH insulin.

K. Intramuscular (IM) injections

1. Introduction.

- IM injection: Insertion of medication into a muscle below the subcutaneous layer.
- The volume of solution injected depends on the site being used and client characteristics (e.g., age, weight).
    - Up to 3 mL can be inserted in a large muscle, such as the ventrogluteal site, in a well-developed adult.
    - Divide the dose when more than 3 mL is prescribed.
    - Insert only 1 to 2 mL in less-developed muscles associated with children, older adults, and thin clients.
    - Insert only 0.5 to 1 mL in the deltoid muscle in an adult.

- The length of the needle depends on the site being used and the client's age and weight.
    - Adults: Use a 1-inch-length needle for the deltoid muscle and 11?2-inch for all other intramuscular sites.
    - Obese adults: May have to use a 2-inch needle to pass through the layer of fatty tissue above the subcutaneous tissue to reach the muscle.
    - Infants and children: Generally use a 5?8- to 1-inch-length needle, depending on size and depth of the muscle at the selected site.
- d. The gauge of the needle depends on the viscosity of the solution (e.g., #20 for thick [viscid] solutions and #22 for thin solutions).

2. Advantages.

- Can use two medications in one syringe.
- Allows rapid absorption because of more ample blood supply in the muscles than in the subcutaneous tissue.

3. Disadvantages.

- Carries a risk of tissue injury if landmarks are not used to select the site.
- Is more painful than a Sub-Q injection because it uses a smaller gauge and longer needle.
- May cause fibrosis, abscess, nerve damage, pain, tissue necrosis, and muscle contraction.
- Has variable absorption depending on the adequacy of circulation at the injection site.

4. Selection of an IM injection site depends on multiple variables (e.g., advantages, disadvantages, and client characteristics).

5. Nursing interventions specific to administering an IM injection.

- Select the appropriate gauge needle to ensure the needle gauge is strong enough to pass through the tissue and reach the muscle.
- Select the appropriate needle length to permit passage through the tissue to penetrate a deep muscle.
- Alternate sites among the deltoid, vastus lateralis, and ventrogluteal muscles, when appropriate, to minimize tissue injury and facilitate absorption.
- Position the client in a comfortable, appropriate position and identify landmarks to ensure the needle is inserted into the muscle, avoiding undesirable body structures.
- Spread the skin taut between the index finger and thumb to facilitate needle insertion and minimize discomfort.
- Insert the needle at a 90-degree angle to ensure that the needle tip reaches muscle tissue.
- Aspirate by pulling the plunger back gently; check the manufacturer's instructions to determine whether aspiration is contraindicated.
    - If no blood appears, continue with the procedure because the needle is outside a blood vessel.
    - If blood appears, withdraw the needle because it is in a blood vessel; prepare a new syringe. h. Inject the medication.
        - Inject the medication quickly for a child or an infant to minimize client anxiety.

- Inject the medication over 5 to 10 seconds for an adult to minimize discomfort and allow time for drug dispersal.

6. Nursing interventions specific to administering an IM injection via the Z-track method.

- Change the needle after drawing the medication into the syringe to prevent tissue irritation caused by the drug adhering to the outside of the needle.
- Use the ulnar side of the hand or thumb of the nondominant hand to pull the skin laterally 1 to 1.5 inches (2.5 to 3.5 cm) ; hold until the dominant hand injects the medication if there was no blood return on aspiration; remove the needle after 10 seconds and then release the skin. Doing so ensures that a zigzag path is established before needle insertion, which seals the needle track as the tissue planes slide across each other upon release, confining the drug in the muscle, minimizing irritation, and preventing tissue discoloration caused by some medication.

L. Subcutaneous (Sub-Q) injections

1. Introduction.

- Sub-Q injection: Insertion of medication between the dermis and muscle.
- The volume of solution injected should be less than 1 mL.
- The length of the needle depends on the angle of needle insertion; for example, usually a 3?8- or 1?2-inch needle for a 90-degree angle and 5?8- or 1-inch needle for a 45-degree angle.
- The gauge of the needle usually is #25 to #30.
- The type of syringe used depends on the type of medication (e.g., an insulin syringe should be used for insulin).

2. Advantages.

- Is more comfortable than an IM injection because it uses a larger gauge and shorter length needle.
- Is commonly used for drugs given multiple times daily, such as heparin and insulin.
- Allows slower absorption of drugs than IM route because of less-rich blood supply in subcutaneous tissue versus muscle.

3. Disadvantages.

- Allows administration of a maximum of only 1 mL of solution.
- Cannot be used for many drugs because they are irritating to subcutaneous tissue.

4. Selection of a Sub-Q injection site depends on multiple variables (e.g., advantages, disadvantages, and type of medication).

5. Nursing interventions specific to administering a Sub-Q injection.

- Select the appropriate gauge needle.
- Select the appropriate length needle (should be half the width of a pinched skinfold) to ensure the drug is inserted into the subcutaneous layer.
- Select the appropriate site.
- Alternate the site from recent injections; use a body flow chart to identify various sites by number. Doing so minimizes tissue injury, facilitates absorption, and minimizes lipodystrophy and lipohypertrophy.
- Position the client so the site is accessible and the client is comfortable to provide accessibility to the injection site and relax the client for needle insertion.
- Pinch a fold of skin between your fingers and thumb to elevate subcutaneous tissue and insert the needle at a determined angle using a smooth movement. The angle depends on the volume of subcutaneous tissue and needle length.
    - If you can pinch 2 inches of tissue, use a 90-degree angle.
    - If you can pinch only 1 inch of tissue, use a 45-degree angle.
    - For obese adults, inject deep into the tissue fold to avoid injecting the medication into adipose tissue.
- Release the pinch and hold the syringe steady with the nondominant hand to minimize discomfort. Push the plunger slowly with the dominant hand to limit tissue discomfort and damage (see the information below on anticoagulants regarding holding a pinch); aspiration is not necessary because piercing a blood vessel is rare.
- Follow the drug manufacturer’s instructions regarding massage of the site to limit local tissue trauma; do not massage for insulin and anticoagulants.

6. Nursing interventions specific to administering insulin.

- Check the client’s blood glucose level before administration to evaluate response to insulin therapy and guide the next dose.
- Generally, use a large gauge, short needle to minimize trauma and discomfort (a larger gauge needle is less painful than a smaller gauge needle).
- Check documentation of the previous site and rotate sites to support absorption and minimize the risk of lipodystrophy and lipohypertrophy.
- Leave the needle in place for 5 seconds after the injection of solution to ensure disbursal of the solution prior to needle removal.

7. Nursing interventions specific to administering an anticoagulant (e.g., heparin, low-molecular weight heparin).

- Observe injection sites daily for signs of complications, such as bleeding, bruising, pain, swelling, and heat; withhold the medication and notify the primary health-care provider if any are present.
- Check coagulation laboratory results, such as International Normalized Ratio (INR); notify the primary health-care provider if findings are outside the expected parameters.
- Have protamine sulfate (antidote for heparin) readily available if the client is receiving heparin.
- Add 0.2 mL of air when preparing the correct dose. Do not expel the air bubble in a prefilled syringe; allow the air bubble to follow the medication into the needle tract, which limits bleeding and bruising.

- Select the appropriate site.
    - Heparin: Inject in the abdomen, level with the iliac crest, at least 2 inches from the umbilicus.
    - Low-molecular-weight heparin: Inject in the anterolateral and posterolateral abdominal wall (“love handles”).
- Hold the pinch throughout the procedure and insert the full length of the needle to ensure the solution enters the subcutaneous tissue; do not aspirate.
- Inject solution slowly over 30 seconds, including the air bubble, to allow for drug dispersal and minimize pain and bleeding.
- Leave the needle in place for 10 seconds after the injection of solution to ensure delivery and dispersal of the anticoagulant dose.
- Keep the plunger depressed while removing the needle to ensure that the bubble stays in the needle track.
- Do not massage the site to minimize trauma and bleeding.
- Document the site used to promote rotation of sites.
- Institute sharps precautions, such as avoiding the use of blade razors, to protect the client from injury.
- Avoid giving and tell the client to avoid taking aspirin and other OTC drugs that can decrease platelet aggregation, causing bruising and bleeding.

M. Intradermal (ID) injections

1. Introduction.

- ID injection: Insertion of medication into the dermis, which is just below the epidermis and above the subcutaneous tissue.
- The volume of solution generally is 0.01 to 1 mL of solution.
- The length of the needle generally is 1?4 to 5?8 inch.
- The gauge of the needle generally is #25 to #28.
- The type of syringe used generally is a 1-mL or tuberculin syringe.

2. Advantages.

- Avoids the need to use more invasive and risky anesthetic agents when used as a local anesthetic.
- Is less expensive than other methods for testing for TB or allergens.

3. Disadvantages.

- Local inflammatory response may be uncomfortable or painful.
- Can cause an anaphylactic reaction to allergens being injected.

4. Nursing interventions specific to administering an ID injection.

- Select a tuberculin syringe with a gauge of #25 to #28 and a needle length of 1?4 to 5?8 inch to ensure the needle is inserted into the dermis.
- Select the appropriate site: Choose the inner aspect of the forearm, upper chest, or upper

back; avoid pigmented areas or areas with excessive hair.
- Use your nondominant hand to stretch the skin over the site with your forefinger and thumb to facilitate needle insertion.
- Insert the needle slowly at a 10- to 15-degree angle no more than 1?8 inch below the surface of the skin with the bevel facing upward to ensure the solution is injected upward within the dermis rather than down toward the subcutaneous tissue.
- Slowly inject the solution until a small bleb forms under the surface of the skin, indicating the solution was deposited into the dermis.
- Do not massage the area; massage will disperse solution into local tissue, which may alter test results.
- Draw a circle around the site to identify the site for future analysis. h. Instruct the client to return to the primary health-care provider at the time indicated (usually 24 to 48 hours); measure the area of redness and induration in millimeters and document the results.

N. Intravenous (IV) medication administration

1. Introduction.

- IV medications are administered directly into a vein.
- Methods of administration.
    - Addition of a medication, such as potassium chloride or vitamins, to a large-volume bag of IV fluid that is running continuously.
    - Bolus (“push”):Single dose of a medication in a syringe or in a small amount of IV fluid administered through a primary IV line or a venous access device, such as a heparin or saline lock. Heparin or saline locks are used for intermittent IV medications to allow the client more freedom of movement.
    - “Piggyback” infusion: Single dose of medication mixed with a small volume of fluid in its own IV bag administered via secondary tubing attached to a current IV line (primary line).
        - May be administered concurrently through the primary line.
        - May interrupt the primary line solution while the medication solution is administered.
- Method of IV medication preparation.
    - Most large-volume bags of IV fluid that contain medication are prepared and labeled by the manufacturer or pharmacy.
    - Most piggyback infusions are prepared and labeled by the pharmacy.
    - Some piggyback infusions and bolus infusions are prepared by the nurse administering the medication.

2. Advantages.

- Is rapid acting, making it useful in an emergency.
- Used for clients who cannot take drugs via the oral route.
- Avoids barriers to drug absorption associated with other routes.
- Allows larger volumes to be administered than by IM or Sub-Q routes.
- Provides for slow administration of a drug when required.
- Is more comfortable than administering an irritating drug into a muscle or subcutaneous tissue.
- Provides for a continuous blood level of a drug.

3. Disadvantages.

- Carries a greater risk of adverse reactions because of rapid action and is difficult to reverse if the client has an adverse reaction or received an excessive dose; bolus method is most dangerous because the medication is not diluted in a larger volume of solution.
- May irritate the blood vessel, particularly with a bolus dose.
- Carries a greater risk of complications, such as bleeding, infection, fluid overload, and extravasation, as well as phlebitis and thrombosis, which cause discomfort and pain.

4. Nursing interventions common to administering all intravenous medications.

- Double-check all calculations to ensure accuracy and prevent dosage errors.
- Assess the IV site for signs of infiltration, such as swelling and edema, and check whether the flow rate is accurate.
- Assess the IV site for clinical indicators of phlebitis, such as redness, swelling, and heat.

5. Nursing interventions specific to administering medication via a large-volume infusion.

- Spike the IV bag with appropriate tubing, flush the air out of the tubing (prime the tubing), and connect it to the venous access device. Doing so prepares the tubing and ensures that air is flushed from the tubing.
- Ensure that the IV fluid is compatible with the medication to be added to prevent drug and fluid incompatibilities.
- Prepare the syringe with the prescribed drug. d. Wipe the IV additive port with an alcohol wipe to reduce the risk of infection.
- Insert the needle or needleless syringe into the center of the IV additive port and inject the medication; then withdraw the syringe. Doing so allows the IV additive port to self-seal; using the sides of a port may produce leaks and cause fluid contamination.
- Gently turn the IV bag end to end to mix the solutions without causing bubbles.
- Attach the label with the client’s name, medication, dose, date, time, and nurse’s initials.
- Hang the IV bag and open the roller clamp on the tubing to the prescribed rate of infusion if administered by gravity OR use an infusion pump and set the rate accordingly.

6. Nursing interventions specific to administering medication via a bolus infusion (“IV push”).

- Ensure that medication is administered by a registered nurse; do not delegate this procedure to a licensed practical nurse.
- Determine the rate of solution administration by considering the volume of solution to be administered in relation to the amount of time the medication is to be given, such as 4 mL over 2 minutes (therefore, instill 0.5 minims every 30 seconds). Doing so ensures the medication is diluted slowly in the client’s blood, preventing excessive intake in a short amount of time that may irritate the vein or cause an unwanted reaction.
- Cleanse the insertion port with an alcohol wipe to limit the risk of infection.
- Access the insertion port.
    - Heparin or saline lock.
        - Follow agency policy and procedure for identifying patency and flushing the venous access device before a bolus dose.

        - Insert the syringe into the venous access device and instill the medication.
        - Withdraw the syringe and follow agency policy and procedure for flushing the venous access device after the bolus dose to ensure that the entire dose is received and that the venous access device is free from medication.
    - Currently running IV infusion.

        - Pinch the IV tubing just above the injection port closest to the venipuncture site to stop the flow of IV fluid from the IV bag temporarily, which allows the drug to be instilled toward the client rather than up the tubing.
        - Insert the syringe into the port and aspirate until a slight amount of blood appears in the syringe or tubing to ensure that the device is in a vein and that the bolus will be injected into the vein.
        - Inject the medication at the prescribed rate.
        - Remove the syringe and release the pinch in the tubing to allow the primary solution to flow.
- Dispose of the syringe in the nearest sharps container.
- Monitor the client closely for adverse drug reactions.

7. Nursing interventions specific to administering a medication via an intermittent (piggyback) infusion.

- Ensure the medication bag has a label with the client's name, medication, dose, time/ frequency, date, and nurse's initials.
- Attach the tubing to the medication bag; prime the tubing without losing more than 1 drop of the solution. Doing so prepares the equipment for use, removes air from the tubing, and ensures that the client receives the entire dose.
- Wipe the insertion port with alcohol to prevent infection.
- Access the insertion port.
    - Heparin or saline lock: Attach the medication tubing directly to the venous access device or use a needleless piercing device.
    - Currently running IV (primary) line.
        - When a primary line is not interrupted to deliver a piggyback: Use the tubing port closest to the insertion site; keep both bags at the same height; open the clamp on the medication bag; control the flow of solution from both bags using the clamp on the primary tubing.

        - When a primary line is interrupted to deliver a piggyback: Use the tubing port farthest from the insertion site; drop the primary infusion bag lower than the medication bag; open the clamp on the medication tubing and control the flow using the clamp on the primary tubing. Doing so ensures that the primary infusion will flow (via gravity) after the medication bag is empty.
- Depending on the critical nature of the medication, use an infusion pump to ensure an accurate flow rate.
- Reestablish the prescribed flow rate of the primary infusion, if one is present, to maintain continuity of IV fluid administration.

8. Nursing interventions specific to administering IV medication via a volume-controlled infusion set

- Prepare a syringe with the prescribed medication.
- Fill the set by opening the clamp between the set and main IV tubing until the desired volume of IV fluid enters the set and then clamp the main IV tubing.
- Cleanse the injection port on the set with an alcohol wipe to reduce the risk of infection.
- Inject the medication into the medication port of the set and gently mix the solutions to ensure even distribution of medication in the IV fluid and prevent formation of bubbles.
- Open the clamp below the set, and adjust it to the prescribed flow rate (usually delivered over 30 to 60 minutes).

X. Medication Calculation Formula

A. IV drop rate formula

1. IV tubing drop factor: The number of drops it takes for specific tubing to deliver 1 mL of fluid.

2. The drop factor is a component of the formula when calculating the IV flow rate when using a specific IV set.

3. Drop factors are indicated on the tubing box. For example:

- Macro-drops: Drop factor of 10 delivers 10 drops/1 mL; drop factor of 15 = 15 drops/1 mL; drop factor of 20 = 20 drops/1 mL.
- Micro-drops: Drop factor of 60 = 60 drops/1 mL.