PROFESSIONAL SKILLS I

POFESSIONAL SKILLS I

Hand Hygiene

Research indicates that for hand hygiene to be effective, it must be performed at the times and places where transmission of organisms is most likely to occur—the point of care. Hand hygiene, properly performed at the appropriate point of care, is recognized as one of the most effective ways to prevent the spread of infection. The Centers for Disease Control and Prevention (CDC), the World Health Organization (WHO), and The Joint Commission have embraced hand hygiene as a standard of practice and critical component in infection control across health care settings, including the home setting.

Hand hygiene is a general term that refers to hand washing (with plain soap and water), antiseptic hand washing (with soap containing an antiseptic agent and water), antiseptic hand rubbing (rubbing an antiseptic agent, usually alcohol, on all surfaces of the hand), or surgical hand antisepsis (washing or rubbing with an antiseptic agent preoperatively).

The purpose of hand hygiene is to remove dirt, materials, and microbial organisms picked up by contact with other people or the environment. Merely rinsing hands under water or quickly rubbing them with alcohol is not sufficient to prevent the spread of infection. Proper hand hygiene requires using the right agent for the circumstances (soap, water, and a disposable towel, or an alcohol-based rub) and mechanical rubbing of all surfaces for a sufficient length of time. Although both methods of hand decontamination are effective if performed properly, a few smaller studies show rubbing with alcohol-based agents keeps microorganisms from returning to the skin for a slightly longer time. The key is to choose the right method for the right circumstance and to perform hand hygiene correctly whenever it is indicated. Antimicrobial agents or plain soap and water should be used in the following situations:

- When hands are visibly dirty or soiled with blood or other body fluids
- After using the bathroom
- After exposure or suspected exposure to spore-forming pathogens (e.g., *Clostridium difficile*)

When not contraindicated, alcohol-based products are considered the gold standard when performing routine patient care because they reduce bacterial counts more effectively than soap and water. An alcohol-based hand rub should be used for routinely decontaminating hands in situations other than those previously listed.

There is an increase in the number of bacteria colonized under jewelry such as rings and watches. Long fingernails, artificial nails, and chipped nail polish also harbor bacteria. Therefore, health care personnel should refrain from wearing rings and other jewelry when providing care and should keep fingernails well-trimmed, natural (no artificial nails or extenders), and polish free. If jewelry is worn, it must be removed before performing hand hygiene.

Regardless of the health care setting or the method used, hand hygiene is a requisite skill that every health care professional must perform at key times. These include before and after patient contact, after contact with blood or body fluids, after contact with contaminated surfaces, and before donning and after removing gloves. In the home setting, the patient, family, and caregivers need to perform hand hygiene and ensure health care team members do the same.

Sterile Gloving

Gloves help prevent the transmission of pathogens through direct and indirect contact. Gloves used in the health care setting are subject to Food and Drug Administration regulatory requirements. Health care team members don sterile gloves before initiating a sterile procedure.

Sterile gloves are available in various sizes; the correct-size sterile glove should be selected to maintain manual dexterity. Gloves should not stretch so tightly over the fingers that they can easily tear, yet they need to be tight enough that objects can be picked up easily. Most prepackaged kits, such as central line kits and urinary catheter kits, come with a pair of sterile gloves. However, “one size fits all” gloves may not provide the freedom of movement needed for the sterile procedure. A single pair of sterile gloves generally provides adequate barrier protection when used to protect against blood and bodily fluids during nonsurgical patient care.

After sterile gloves are donned for a sterile procedure, the health care team member must be conscious of the position of the hands. If a sterile glove touches a clean, contaminated, or questionably contaminated object, the glove is considered non-sterile, and a new sterile glove must be donned. The health care team member should interlock the fingers and hold the hands together in front of the body and above waist level while waiting to handle sterile items.

The integrity of the gloves’ sterility should be monitored throughout the entire sterile procedure. If a sterile glove develops a tear or perforation, it should be replaced immediately.

SUPPLIES

- Sterile gloves of proper size, either latex or synthetic non-latex
- PPE as indicated

ASSESSMENT AND PREPARATION

Assessment

- Perform hand hygiene before patient contact. Don appropriate personal protective equipment (PPE) based on the patient’s need for isolation precautions or the risk of exposure to bodily fluids.
- Introduce yourself to the patient.
- Verify the correct patient using two identifiers.
- Explain the procedure and ensure that the patient agrees to treatment.
- Consider the type of procedure to be performed and follow the organization’s practice concerning sterile glove use and double-gloving.
- Consider the patient's risk for infection (e.g., older adult, neonate, immunocompromised patient).
- Assess the patient for allergies or sensitivities to latex before donning latex gloves.
- Previous reaction to a latex product within hours of exposure, such as adhesive tape, dental or face mask, golf club grip, ostomy bag, rubber band, balloon, bandage, elastic underwear, IV tubing, rubber gloves, or condom
- Personal history of asthma, contact dermatitis, eczema, urticaria, or rhinitis

- History of food allergies, especially avocado, banana, peach, chestnut, raw potato, kiwi, tomato, or papaya
- History of adverse reactions during surgery or a dental procedure

Preparation

- Select the correct size and type of gloves. Ensure that additional sterile gloves are readily available in the operating room (OR) or procedure room before beginning the sterile procedure in the event that the sterile gloves become contaminated or need to be changed during the course of the sterile procedure.
- Inspect the sterile glove packaging.
- Evaluate the integrity of the sterile glove packaging of the new gloves for possible signs of contamination (e.g., perforation, puncture, tears). Ensure that the package is dry and intact with no water stains.

If the package integrity is in doubt, obtain a new package of sterile gloves.

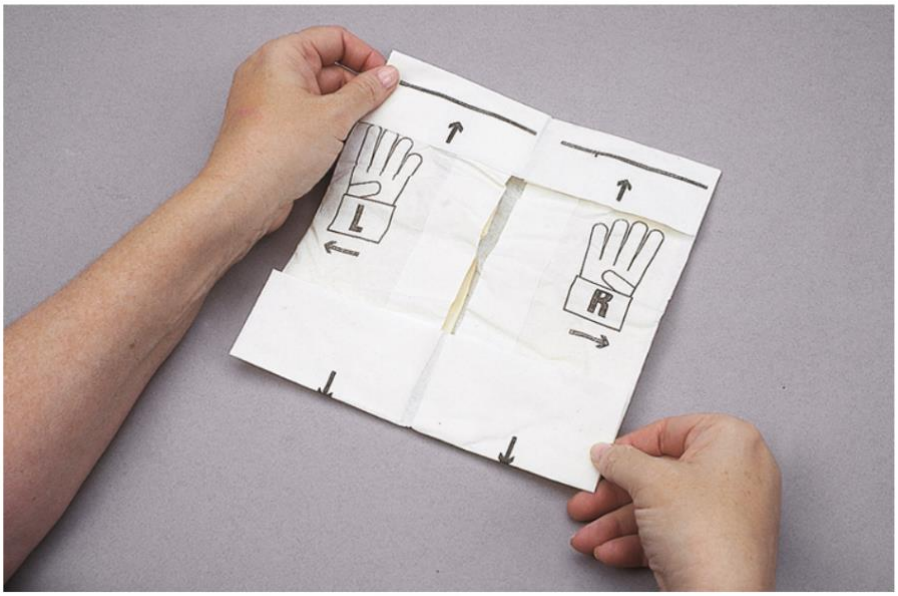
- Check the expiration date on the packaging to ensure that the date has not passed.
- Perform hand hygiene and don head covering, mask (if applicable), and eye protection or face shield per the organization's practice for a sterile procedure. Perform surgical hand antisepsis using surgical hand scrub or alcohol-based hand rub per the manufacturer's instructions for use or per the organization's practice.
- Remove the outer glove packaging by carefully separating and peeling apart the sides (Figure 1). (Rationale: The outer package is opened carefully to prevent the inner glove package from opening accidentally and touching contaminated objects. The inner package is considered sterile.)

Figure 1

Open outer glove package wrapper.

- Grasp the inner glove package and lay it on a clean, dry, flat surface at or above waist level. Open the inner package, keeping the gloves on the inside surface of the wrapper (Figure 2). (Rationale: A sterile object that falls below waist level is considered contaminated. The inner surface of the glove package is sterile.)

Figure 2



Open inner glove package on work surface

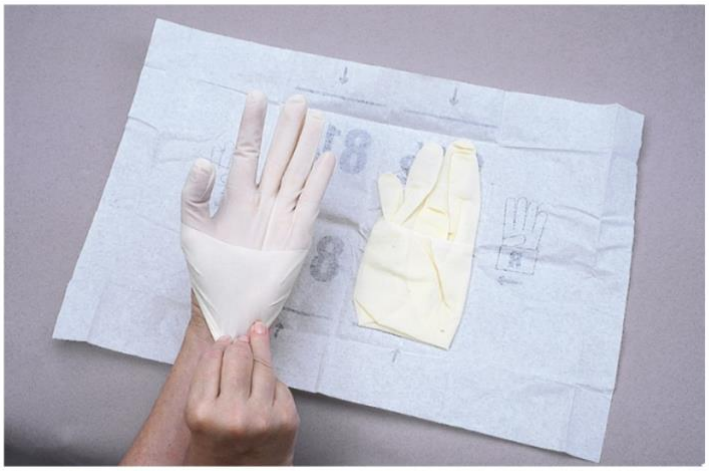
- Inspect the hands for cuts, hangnails, open lesions, abrasions, or any other breaks in skin integrity. Follow the organization's practice for health care team members who are allowed to cover an open lesion with a sterile, impervious transparent dressing.

PROCEDURE

Donning Sterile Gloves

1. Identify the right and left gloves (Figure 2). Don the glove for the dominant hand first. (Rationale: Proper identification of gloves prevents contamination by an improper fitting. Gloving the dominant hand first improves dexterity.)
2. Pick up the sterile glove at the cuff for the dominant hand with the thumb and first two fingers of the non-dominant hand, touching only the gloves inside folded surface (Figure 3). (Rationale: The inside surface of the cuff lies against the skin and is considered non-sterile once the glove is donned. Holding the glove so the fingers hang straight down helps keep the glove fingers open.)

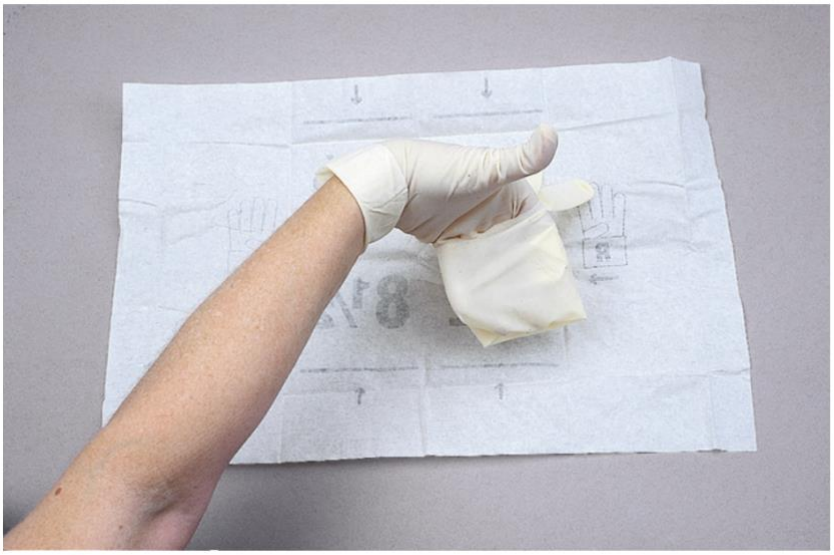
Figure 3



Pick up glove at cuff for dominant hand and insert fingers; pull glove completely over dominant hand (example is for left-handed person

3. Carefully pull the glove over the dominant hand, leaving it cuffed, and ensure that the cuff does not roll up the wrist. Ensure that the thumb and fingers are in the correct finger spaces. (Rationale: If the glove's outer surface touches the hand or wrist, the glove is contaminated.) Do not attempt to reposition the fingers of the glove if the glove is not correctly placed (e.g., two fingers in one spot); the fit can be readjusted after both gloves are on.
4. With the gloved dominant hand, slip fingers inside the second glove's cuff (Figure 4). (Rationale: The area under the cuff is sterile and protects the sterile gloved fingers from contamination.) Do not allow the fingers and thumb of the gloved dominant hand to touch any part of the exposed non-dominant hand. Keep the thumb of the dominant hand abducted.

Figure 4

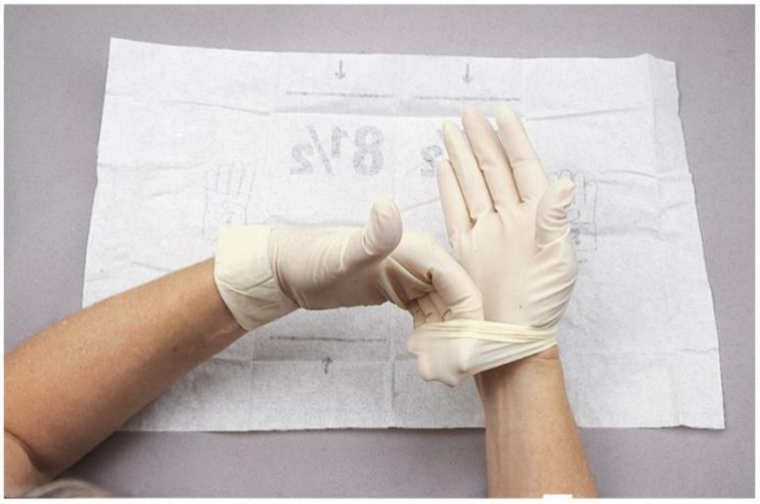


Pick up glove for nondominant hand.

5. Carefully pull the second sterile glove over the non-dominant hand, taking care not to allow the gloved dominant hand to contact the exposed non-dominant hand (Figure 5).(Rationale:

If the sterile gloved hand comes in contact with the exposed hand, the glove is contaminated.)

Figure 5

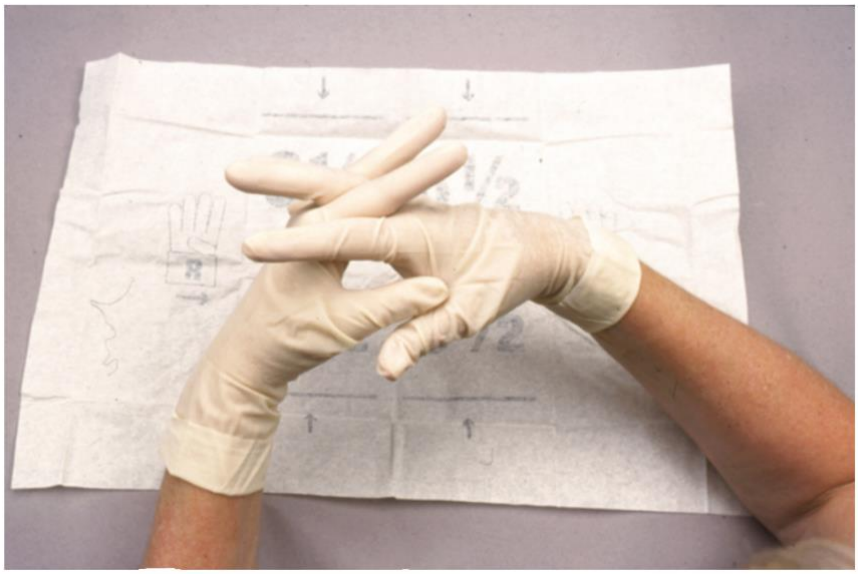


Pull second glove over nondominant hand.

After donning the second sterile glove:

6. Interlock the fingers of the hands (Figure 6), keeping the hands above waist level. (Rationale: Interlocking the fingers facilitates a smooth fit over the fingers. The cuffs usually unroll after application.) Touch only the sterile areas of the gloves. If necessary, reposition the gloves, taking care to touch only the sterile surface with the opposite sterile gloved hand.

Figure 6



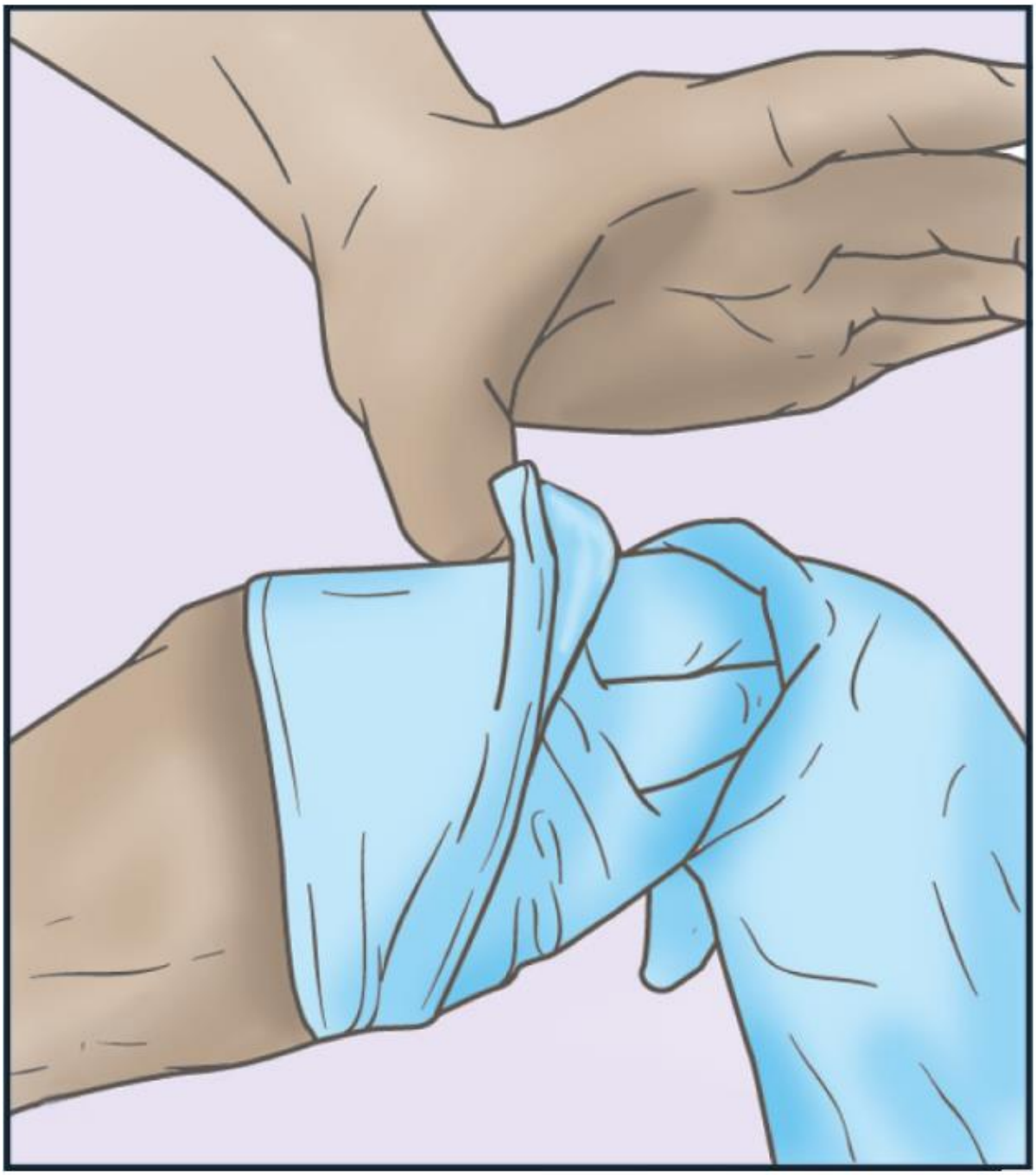
Interlock gloved hands.

After the gloves are in place, if any non-sterile object is touched, discard the gloves and replace them with a new pair of sterile gloves.

Discarding Gloves

7. Grasp the outside of one glove cuff with the other gloved hand; avoid touching the skin. (Rationale: Touching exposed skin increases the contamination risk; the outside of the gloves are contaminated.)
8. Pulling away from self, pull the glove off, turn it inside out, and place it in the other gloved hand. (Rationale: Turning the glove inside out and holding it with the other gloved hand prevents the outside (contaminated side) of the glove from touching the exposed skin surface.)
9. Tuck the thumb or fingers of the bare hand inside the cuff of the remaining glove (Figure 7). Peel the glove off inside out and over the previously removed glove (Figure 8). (Rationale: Touching only the inside surface of the glove prevents the fingers from touching the contaminated glove surface.)

Figure 7



Tuck the thumb or fingers of the bare hand inside the remaining glove cuff.

Figure 8

Remove the second glove by turning it inside out. (From Perry, A.G. and other

Discard both gloves into the proper trash receptacle per the organization's practice.

Perform hand hygiene.

VITAL SIGNS

- Respiratory rate (RR)
- Oxygen saturation (SpO_2)
- Temperature
- Systolic blood pressure (BP)
- Heart rate (HR)
- Level of consciousness

The equipment

- Pulse oximeter
- Blood pressure monitor
- Thermometer
- Watch

1. Introduce yourself to the patient, including your **name** and **role.**

2. Confirm the patient's **name** and **date of birth**.
3. Briefly **explain** what the procedure will involve using **patient-friendly language**.
4. **Gain consent** to proceed with recording observations (vital signs).
5. **Wash your hands** and **don PPE** if appropriate.
6. Ask if the patient has any **pain** before proceeding.

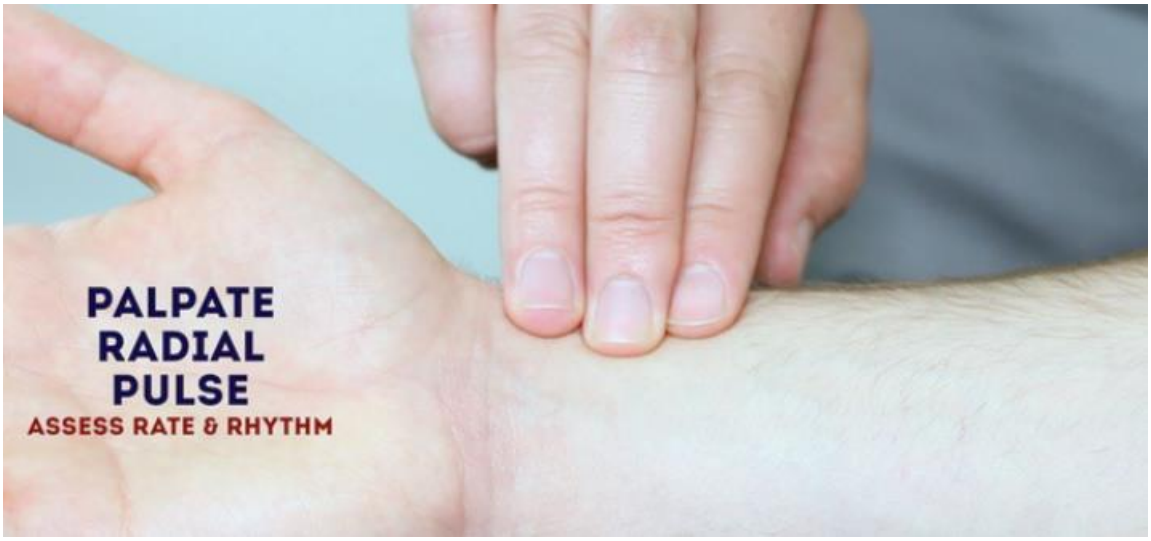
Assessing heart rate

1. Palpate the patient's **radial pulse**, located at the radial side of the wrist, with the **tips** of your **index** and **middle fingers** aligned longitudinally throughout the artery.

2. Once you have located the radial pulse, assess the **rate** and **rhythm**.

You can calculate the heart rate in several ways, including measuring for 60 seconds, measuring for 30 seconds, and multiplying by two or measuring for 15 seconds and multiplying by 4.

For **irregular rhythms**, you should measure the pulse for a **full 60 seconds** to improve accuracy.



In healthy adults, the pulse should be between **60 – 100 bpm**. An **irregular rhythm** is most commonly caused by **atrial fibrillation**, but other causes include ectopic beats in healthy individuals and atrioventricular blocks.

- A pulse **<60 bpm** is known as **bradycardia** and has a wide range of aetiologies (e.g., healthy athletic individuals, atrioventricular block, medications, sick sinus syndrome).
- A pulse of **>100 bpm** is known as **tachycardia** and also has a wide range of aetiologies (e.g., anxiety, supraventricular tachycardia, hypovolaemia, hyperthyroidism).

Assessing respiratory rate

1. While still palpating the radial pulse (but no longer counting it), **assess the patient's respiratory rate**. Palpation of the radial pulse at this stage purely to avoid making the patient aware you are directly observing their breathing, as this can alter the respiratory rate.

2. Note any **asymmetries** in the **expiratory** and **inspiratory phases** of respiration (e.g., the expiratory phase is often prolonged in asthma exacerbations and patients with COPD).

3. Assess the patient's respiratory rate for 30 seconds and multiply by 2 to calculate the number of breaths per minute.

In healthy adults, the respiratory rate should be between **12-20 breaths per minute**.

- A respiratory rate of **fewer than 12 breaths per minute** is referred to as **bradypnoea** (e.g., opiate overdose).
- A respiratory rate of **more than 20 breaths per minute** is referred to as **tachypnoea** (e.g., acute asthma).

Oxygen saturation (SpO_2)

Oxygen saturation is measured using a **pulse oximeter**. When recording oxygen saturations, note whether the patient is on supplemental oxygen or breathing room air.

1. Select an appropriate site for the pulse oximeter. If using the fingernail, ensure no nail varnish or dirt is covering the nail.

2. Switch on the pulse oximeter.

3. Place the pulse oximeter over the fingernail.

4. Wait for the oxygen saturation level to appear and note the reading.

Target oxygen saturation

- **Scale 1** has a target oxygen saturation of ≥ 96% and is used for most patients.
- **Scale 2** has a target oxygen saturation of 88 – 92% and is used for patients at risk of hypercapnic respiratory failure (e.g., patients with COPD).

Blood pressure (BP)

Measurement of blood pressure can be performed manually using a stethoscope and sphygmomanometer or an automatic blood pressure monitor.

The NEWS2 score only assigns a score based on **systolic blood pressure**. However, the diastolic blood pressure should be recorded on the chart.

Attach the blood pressure cuff

1. Ensure the cuff size appears appropriate.

2. Wrap the cuff around the patient's **upper arm.**

3. Line up the cuff marker with the **brachial artery** slightly medial to the biceps brachii tendon.

Estimate an approximate systolic blood pressure

1. Palpate the **radial pulse**.

2. Inflate the cuff until you can **no longer feel** this pulse.

3. Note the reading on the sphygmomanometer. This is a rough estimate of the **systolic blood pressure.**

Measure the blood pressure accurately

1. Place your stethoscope's diaphragm over the **brachial artery**.

2. Re-inflate the cuff to 20 – 30 mmHg above your approximate **systolic blood pressure** measured earlier.

3. Begin to slowly deflate the cuff at around 2-3 mmHg per second.

4. Listen carefully; you will begin to hear a **thumping pulsatile noise** known as the 1st Korotokoff sound. The pressure at which this 1st sound is heard is the **systolic blood pressure.**

5. Continue to deflate the cuff, continuing to listen until the sounds completely disappear. The point at which you hear the last sound is the 5th Korotkoff sound, which is the **diastolic blood pressure**.

If the patient is hypertensive (>140/90) or hypotensive, you should **re-check the blood pressure** after 2 minutes to confirm this is an accurate result. Use the other arm and consider if the cuff size is appropriate.

See our full guide to measuring blood pressure with a video demonstration for more details.

Level of consciousness

A patient's level of consciousness can be measured using the **ACVPU scale**:

- **Alert**: the patient is fully alert with spontaneous eye-opening
- **Confusion (new)**: the patient is awake but confused or disorientated
- **Voice**: the patient responds to a verbal stimulus.
- **Pain**: the patient responds to a pain stimulus only.
- **Unresponsive**: no response to agent or pain stimulus.

Temperature

Temperature is usually assessed using a **tympanic thermometer** as this is a quick and non-invasive way of recording temperature.

Other methods for recording temperature include **oral**, **rectal**, and **axillary** readings.

Measure temperature using a tympanic thermometer

The exact method of use will depend on the brand of the tympanic thermometer. Always follow the **manufacturer's instructions** and local guidelines.

1. Ensure the tympanic thermometer is switched on, clean, and in good working order.

2. Place a **disposable cover** over the probe end.

3. Place the probe into the ear canal and gently advance until the probe seals the opening of the ear canal.

4. Record the tympanic temperature.

5. Remove and dispose of the tympanic thermometer cover.

Recording observations on a chart

The measured observations should be recorded on a **chart**.

Medication Administration

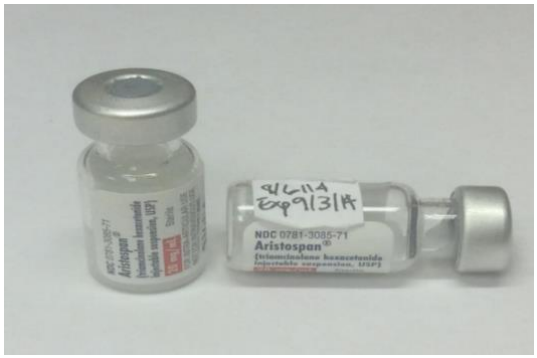
Injection Preparation from Ampules and Vials

Ampules contain single doses of injectable medication in a liquid form and are available in a variety of volumes (Figure 1). An ampule is made of glass or plastic with a constricted, pre-scored neck that must be snapped off to allow access to the medication; a colored ring around the neck indicates where the ampule is pre-scored. Medication is aspirated from the ampule with a filter needle and syringe. After the medication has been withdrawn from the ampule, the filter needle is removed from the syringe and an appropriate-size needle is placed on the syringe.

Figure 1: Medication in ampules

A vial is a single-dose or multi-dose glass or plastic container with a rubber seal at the top, which is protected by a metal or plastic cap that is removed when the vial is prepared for use (Figure 2). Vials contain liquid or dry forms of medications. Medications that are unstable in solution are packaged dry; the vial label should specify the solvent or diluent used to dissolve the medication and the amount of diluent needed to prepare a desired drug concentration. Sterile distilled water and 0.9% sodium chloride solution are solutions commonly used to dissolve medications. Single-dose vials do not contain antimicrobials; therefore, accessing the vial multiple times places the patient at risk for infection.

Figure 2: Medication in vials



SUPPLIES

Ensure that all necessary supplies and durable medical equipment are available.

- Practitioner's order
- Small, sterile gauze pad
- Alcohol swab
- Sharps container or medication waste receptacle

Medication in an Ampule

- Syringe, needle, and filter needle or filter “straw”
- Medication ampule
- Disposable ampule breaker

Medication in a Vial

- Syringe
- Needles
    - Blunt-tip vial access cannula (if needleless system used) or needle for drawing up medication (if needed)
    - Needle for injection
- Diluent (if indicated)
- Medication vial

PROCEDURE

1. Perform hand hygiene.
2. Introduce yourself to the patient, family, and caregivers.
3. Verify the correct patient using two identifiers.
4. Explain the procedure to the patient, family, and caregivers and ensure that the patient agrees to treatment.
5. Verify the practitioner’s order and assess the patient for pain.
6. Prepare an area in a clean, convenient location and assemble the necessary supplies.
7. Obtain, update, and compare the medication information the patient is currently taking with the medications ordered for the patient to identify and resolve discrepancies.
8. Assess the patient’s baseline vital signs.
9. Assess the patient’s history of allergies, including drug allergies. Determine the types of allergies and the patient’s normal allergic response.
10. Assess the patient for specific contraindications to receiving the medication and advise the practitioner accordingly.
11. Plan medication administration at a time that best avoids interruptions during medication preparation.
12. Obtain the patient’s actual weight in kilograms. Reweigh the patient if appropriate. Stated, estimated, or historical weight should not be used.
13. Obtain the medication, check the practitioner’s order, verify the expiration date, and inspect the medication for particulates, discoloration, or other loss of integrity.

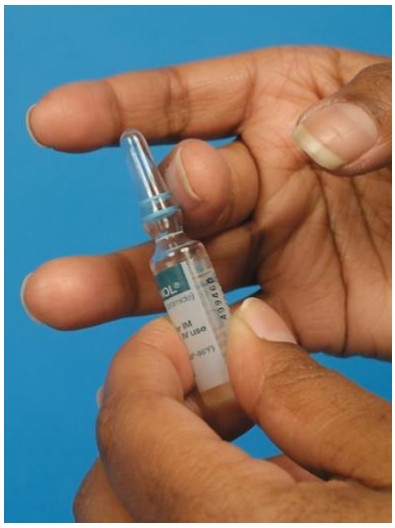
    Do not use medication that is cloudy or precipitated unless such is indicated by its manufacturer as being safe.

14. Review medication reference information pertinent to the medication’s action, purpose, onset of action and peak action, normal dose, and common side effects and implications.
15. Ensure the six rights of medication safety: right medication, right dose, right time, right route, right patient, and right documentation. Compare the medication administration record to the patient’s identifiers.

<u>Preparing Medication from an Ampule</u>

1. Tap the top of the ampule lightly and quickly with a finger until fluid moves from the neck of the ampule (Figure 3). (Rationale: Tapping the top dislodges any fluid that collects above the neck of the ampule; all solution must be moved into the lower chamber.)

   Figure 3: Tapping ampule moves fluid down neck.



2. Place a sterile gauze pad or disposable ampule breaker around the neck of the ampule (Figure 4). Rationale: Placing a pad around the neck of the ampule or using a disposable ampule breaker protects the nurse's fingers from trauma as the tip is broken off.

   Figure 4: Gauze pad placed around the neck of ampule

3. Holding the neck of the ampule with the gauze pad, snap the neck of the ampule quickly and firmly outward away from the hands (Figure 5). (Rationale: Snapping the neck of the ampule

away from the hands and holding the neck with a gauze pad helps protect the fingers and face from shattering glass or plastic.)

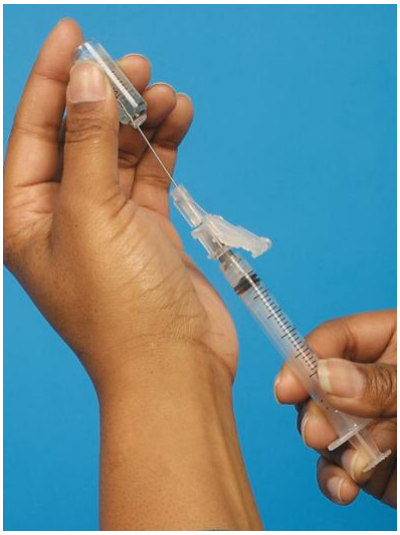
Figure 5: Neck snapped away from hands

4. Set the ampule on a flat surface.
5. Obtain the correct size syringe and a filter needle.
6. Withdraw medication by inverting the ampule and placing the filter needle tip in the liquid without touching the rim of the ampule (Figure 6) or by tipping the ampule and placing the filter needle in the liquid without touching the rim. Reposition the ampule so the needle tip remains in the liquid. (Rationale: The broken rim of the ampule is considered contaminated. Filter needles prevent glass or plastic particles from being drawn into the syringe.)

   Failure to filter glass or plastic particles places the patient at increased risk for inflammatory reactions, pulmonary micro emboli and thrombi, and possible bacterial contamination.

   a. Draw up the medication quickly, keeping the needle tip under the surface of the liquid.
   b. Tip the ampule to bring all fluid within reach of the needle. (Rationale: Medication should be drawn up quickly because the broken ampule is open to airborne contaminants. Keeping the needle tip in the liquid and tipping the ampule help prevent aspiration of air bubbles.)

Figure 6: Medication aspirated with ampule inverted



7. If air bubbles are aspirated, do not expel the air into the ampule. Instead, to expel excess air bubbles:
    a. Remove the needle from the ampule.
    b. Hold the syringe with the needle pointing up.
    c. Tap the side of the syringe to cause bubbles to rise toward the needle.
    d. Draw back slightly on the plunger and then push the plunger upward to eject air; do not eject fluid. (Rationale: If air is expelled into the ampule, the air pressure forces fluid out of the ampule, and medication is lost. Holding the syringe vertically allows fluid to settle in the bottom of the barrel. Withdrawing the plunger too far removes it from the barrel. Pulling back on the plunger and then pushing the plunger upward allows fluid in the needle to enter the barrel; this ensures that fluid is not expelled as the nurse expels the air from the top of the barrel and within the needle.)
8. If the syringe contains excess fluid, discard it into the appropriate medication waste receptacle per the organization's practice.
    a. Hold the syringe vertically with the needle tip up and slanted slightly toward the medication waste receptacle.
    b. Slowly eject excess fluid into the medication waste receptacle.
    c. Recheck the fluid level in the syringe by holding it vertically. (Rationale: Positioning the needle tip up and slanted slightly allows the nurse to expel medication without it flowing down the needle shaft. Rechecking the fluid level in the syringe ensures that the proper dose remains.)
9. Carefully cover the needle with its safety sheath or cap. Engage the sheath so that it locks.
10. Remove the filter needle and replace it with a needleless access device or an appropriate-size needle for injection. Discard the filter needle in the appropriate sharps container. (Rationale: Correctly using the needleless access device minimizes needle sticks. Filter needles cannot be used for injection.)
11. Place the broken ampule and the needle or needleless access device in the appropriate waste receptacle. (Rationale: Correct disposal of medication containers and needles into the appropriate waste receptacle prevents accidental injury.)

Follow the organization's practice for safe disposal of ampules, vials, needles, and supplies.

12. Clean the work area.
13. Discard or store supplies and perform hand hygiene.
14. Document the procedure in the patient's record.

Preparing Medication from a Vial Containing a Solution

Never transport vials in clothing or pockets; doing so increases contamination risk.

1. Remove the cap covering the top of an unused vial to expose the rubber seal.

   The cap for a multi dose vial may have been removed previously. Vials come packaged with a cap that cannot be replaced after the seal has been removed.

2. Firmly and briskly wipe the surface of the rubber seal with an alcohol swab, being sure to apply friction, and allow it to dry. (Rationale: Not all drug manufacturers guarantee that rubber seals of unused vials are sterile; therefore, the seal must be swabbed with alcohol while applying friction before preparing medication. Allowing alcohol to dry prevents it from coating the needle and mixing with medication.)
3. Draw up the medication into the syringe.
   a. Pick up the syringe and remove the needle cap or the cap covering the needleless vial access device.
   b. Pull back on the plunger to draw a volume of air into the syringe equivalent to the volume of medication to be aspirated from the vial.
   c. With the vial on a flat surface, firmly insert the tip of the needle or needleless vial access device through the center of the rubber seal (Figure 7). (Rationale: The center of the seal is thinner and easier to penetrate. Using firm pressure prevents dislodging rubber particles that could enter the vial or needle.)

      Figure 7: Invert the needle through center of vial diaphragm

d. Inject air into the vial's air space, holding on to the plunger with firm pressure. (Rationale: Air must be injected before aspirating fluid. Injecting air into the vial's air space prevents bubble formation and dose inaccuracy. Firm pressure is necessary so that the plunger is not forced backward by air pressure in the vial.)

e. Invert the vial while keeping a firm hold on the syringe and plunger (Figure 8). (Rationale: Inverting the vial allows fluid to settle in the lower half of the container.

Figure 8: Withdraw fluid with vial inverted

f. Hold the vial with the non-dominant hand. Grasp the end of the syringe barrel and plunger with the dominant hand to counteract pressure in the vial (Figure 8). (Rationale: Correct hand position prevents forceful movement of the plunger and permits easy manipulation of the syringe.)

g. Keep the tip of the needle in the fluid while withdrawing the medication. (Rationale: Keeping the tip of the needle in the fluid helps to prevent air from entering the syringe.)
h. Allow air pressure from the vial to fill the syringe gradually with the medication. If necessary, pull back slightly on the plunger to obtain the correct amount of medication. (Rationale: Positive pressure within the vial forces fluid into the syringe.)

4. When the desired volume has been obtained, position the needle in the vial's air space; tap the side of the syringe barrel gently to dislodge any air bubbles. Eject any air remaining at the top of the syringe into the vial.

   Forcefully striking the barrel while the needle is in the vial may bend the needle. Accumulated air in the syringe displaces medication and may cause dose errors.

5. Remove the needle or needleless vial access device by pulling back on the barrel of the syringe. Avoid pulling the plunger. (Rationale: Pulling the plunger rather than the barrel causes the plunger to separate from the barrel, resulting in loss of medication.)

   Never leave a needle or needleless access device in the vial because of the risk of contamination.

6. Hold the syringe vertically at eye level to verify the correct volume and the absence of air bubbles. (Rationale: Holding the syringe vertically allows fluid to settle in the bottom of the barrel.)
7. Remove any remaining air.
   a. Tap the barrel to dislodge any air bubbles.
   b. Draw back slightly on the plunger and then push it upward to eject air. Do not eject fluid. (Rationale: Pulling back on the plunger allows fluid in the needle to enter the barrel so it is not expelled when air at the top of the barrel and in the needle is expelled.)
8. Recheck the volume of the medication.
9. If the medication is to be injected into the patient's tissue, ensure that the needle is the appropriate gauge and length depending on the required route of medication administration.
10. For a multi dose vial:
    a. Open or access the multi dose vial and date it 28 days from the date of access, unless the manufacturer specifies a different time frame for the opened vial.
    b. Discard multi dose vials per the organization's practice. (Rationale: Some drugs must be discarded within a certain time after being mixed.)
11. Ask the patient, family member, or caregiver to verify the medication per the organization's practice.
12. Place all single-dose and empty multi dose vials and the needle or needleless access device in the appropriate waste receptacle. (Rationale: Correct disposal of medication containers and needles into the appropriate waste receptacle prevents accidental injury to staff.)

    Follow the organization's practice for safe disposal of ampules, vials, needles, and supplies.

13. Clean the work area.
14. Discard or store supplies and perform hand hygiene.

15. Document the procedure in the patient's record.

Preparing Medication from a Vial Containing a Powder (Reconstituting Medications)

Never transport vials in clothing or pockets because doing so increases contamination risk.

1. Remove the cap covering the vial of powdered medication and the cap covering the vial of appropriate diluent.
2. Firmly swab both rubber seals with an alcohol swab and allow the alcohol to dry. (Rationale: Vials come packaged with caps that cannot be replaced after the seal has been removed. Not all drug manufacturers guarantee that rubber seals of unused vials are sterile; therefore, the seal must be swabbed with alcohol before preparing medication. Allowing alcohol to dry prevents it from coating the needle and mixing with medication.)
3. Draw up the appropriate type and volume of diluent into the syringe per the manufacturer's recommendation.
    a. Pick up the syringe and remove the needle cap or cap covering the needleless vial access device.
    b. Pull back on the plunger to draw a volume of air into the syringe equivalent to the volume of medication to be aspirated from the vial.
    c. With the vial on a flat surface, firmly insert the tip of the needle or needleless vial access device through the center of the rubber seal. (Rationale: The center of the seal is thinner and easier to penetrate. Using firm pressure prevents dislodging rubber particles that could enter the vial or needle.)
    d. Inject air into the vial's air space, holding on to the plunger with firm pressure. (Rationale: Air must be injected before aspirating fluid. Injecting air into the vial's air space prevents bubble formation and dose inaccuracy. Firm pressure is necessary so that the plunger is not forced backward by air pressure within the vial.)
    e. Invert the vial while keeping a firm hold on the syringe and plunger. (Rationale: Inverting the vial allows fluid to settle in the lower half of the container.)
    f. Hold the vial with the non-dominant hand. Grasp the end of the syringe barrel and plunger with the dominant hand to counteract pressure in the vial. (Rationale: Correct hand position prevents forceful movement of the plunger and permits easy manipulation of the syringe.)
    g. Keep the tip of the needle in the fluid while withdrawing liquid. (Rationale: Keeping the tip of the needle in the fluid helps to prevent air from entering the syringe.)
4. Insert the tip of the needle or needleless access device through the center of the rubber seal of the vial of powdered medication.
5. Inject the diluent into the vial; remove the needle. (Rationale: Diluent is injected into the powder to dissolve and reconstitute the medication.)
6. Mix the medication thoroughly. Roll the vial between the palms; do not shake. (Rationale: Mixing the medication ensures its proper dispersal throughout the solution and prevents the formation of air bubbles.)
7. Read the label carefully to determine the dose after reconstitution. (Rationale: Once the diluent is added, the concentration of medication (mg/ml) determines the dose given.
8. Draw up the reconstituted medication into the syringe.)
    a. With the vial on a flat surface, firmly insert the tip of the needle or needleless vial access device through the center of the rubber seal. (Rationale: The center of the

seal is thinner and easier to penetrate. Using firm pressure prevents dislodging rubber particles that could enter the vial or needle.)

b. Inject air into the vial's air space, holding on to the plunger with firm pressure. (Rationale: Air must be injected before aspirating fluid. Injecting air into the vial's air space prevents bubble formation and dose inaccuracy. Firm pressure is necessary so that the plunger is not forced backward by air pressure within the vial.)
c. Invert the vial while keeping a firm hold on the syringe and plunger with the dominant hand to counteract pressure in the vial.
d. Keep the tip of the needle in the fluid while withdrawing the medication. (Rationale: Keeping the tip of the needle in the fluid helps to prevent air from entering the syringe.)
e. Allow air pressure from the vial to fill the syringe gradually with medication. If necessary, pull back slightly on the plunger to obtain the correct amount of medication. (Rationale: Positive pressure within the vial forces fluid into the syringe.)

9. When the desired volume has been obtained, position the needle into the vial's air space; tap the side of the syringe barrel gently to dislodge any air bubbles. Eject any air remaining at the top of the syringe into the vial.

Forcefully striking the barrel while the needle is in the vial may bend the needle. Accumulated air in the syringe displaces medication and may cause dose errors.

10. Remove the needle or needleless vial access device by pulling back on the barrel of the syringe. Avoid pulling the plunger. (Rationale: Pulling the plunger rather than the barrel causes the plunger to separate from the barrel, resulting in loss of medication.)

Never leave a needle or needleless access device in the vial because of the risk of contamination.

11. Hold the syringe vertically and at eye level to verify the correct volume and absence of air bubbles. (Rationale: Holding the syringe vertically allows fluid to settle in the bottom of the barrel.)
12. Remove any remaining air.
    a. Tap the barrel to dislodge any air bubbles.
    b. Draw back slightly on the plunger and then push it upward to eject air. Do not eject fluid. (Rationale: Pulling back on the plunger allows fluid in the needle to enter the barrel so it is not expelled when air at the top of the barrel and in the needle is expelled.)
13. Recheck the volume of medication.
14. If medication is to be injected into the patient's tissue, ensure that the needle is the appropriate gauge and length according to the required route of medication administration.
15. For a multi dose vial:
    a. Open or access the multi dose vial and date it 28 days from the date of access, unless the manufacturer specifies a different time frame for the opened vial.
    b. Discard multi dose vials per the organization's practice. (Rationale: Some drugs must be discarded within a certain time after being mixed.)
16. Ask the patient, family member, or caregiver to verify the medication per the organization's practice.

17. Place all single-dose and empty multi dose vials and the needle or needleless access device in the appropriate waste receptacle. (Rationale: Correct disposal of medication containers and needles into the appropriate waste receptacle prevents accidental injury to staff.)

    Follow the organization's practice for safe disposal of ampules, vials, needles, and supplies.

18. Clean the work area.
19. Discard or store supplies and perform hand hygiene.
20. Document the procedure in the patient's record.

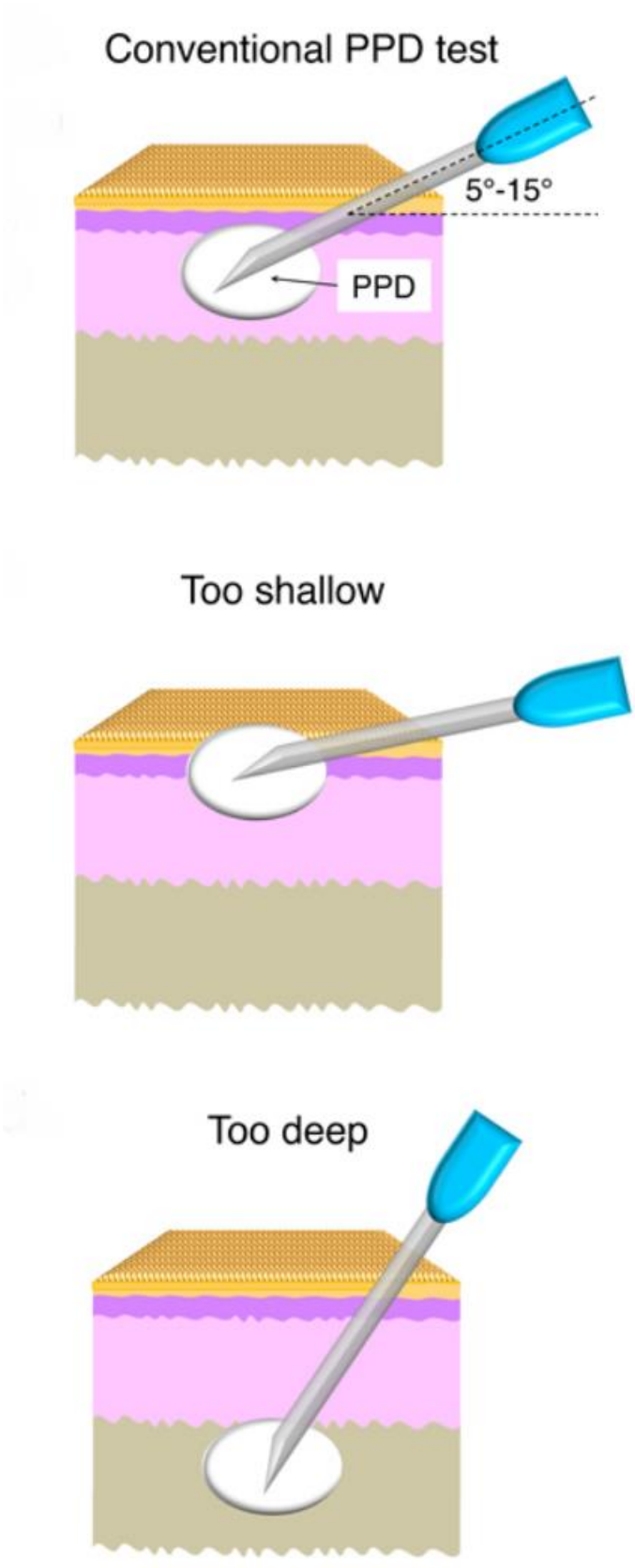
Intradermal Injections

Typically, intradermal injections are given for skin testing (e.g., tuberculin [TB] skin test, allergy tests). For allergy skin testing, an allergen extract is injected under the skin.For the Mantoux TB skin test, a substance called purified protein derivative (PPD), which is derived from TB, is injected under the skin. Because these substances are potent, they are injected into the dermis, where the blood supply is reduced and drug absorption occurs slowly. A patient may have an anaphylactic reaction if the substance enters his or her circulation too rapidly.

Intradermal sites must be free of lesions and injuries and relatively hairless. The inner forearm and upper back are ideal locations.

For the Mantoux technique, a TB syringe with a short, fine-gauge (27-G) needle and a short bevel is used to administer an intradermal injection. The correct needle insertion angle is just beneath the surface of the skin at 5 to 15 degrees (Figure 9). Only small amounts of the PPD (0.1 ml) are injected intradermally. If a bleb does not appear or if the site bleeds after needle withdrawal, the medication may have entered subcutaneous tissues, and TB skin test results are invalid

Figure 9: PPD test


Conventional PPD test
5°-15°
PPD
Too shallow
Too deep

PROCEDURE

Administration of TB Skin Test

1. Perform hand hygiene and don gloves.
2. Introduce yourself to the patient.
3. Verify the correct patient using two identifiers.
4. Explain the procedure to the patient and ensure that he or she agrees to treatment.
5. Ensure that adverse reactions to the medication are communicated to the clinical team leader per the organization's practice.
6. Determine the patient's history of allergies, including drug allergies.
7. Evaluate the patient for specific contraindications to receiving PPD and advise the practitioner accordingly.
8. Obtain the patient's actual weight in kilograms. Stated, estimated, or historical weight should not be used.
9. Check accuracy and completeness of the practitioner's original order.
10. Obtain the medication and verify the expiration date.
11. Inspect the medication for particulates, discoloration, or other loss of integrity.

    Do not use any substance that is cloudy or precipitated unless such is indicated by its manufacturer as being safe; otherwise, this may lead to harmful reactions.

12. Understand drug reference information pertinent to the medication's action, purpose, onset of action and peak action, normal dose, and common side effects.
13. Ensure the six rights of medication safety: right medication, right dose, right time, right route, right patient, and right documentation.
14. Label all medications, medication containers, and other solutions, including those that are on a sterile field. The only exceptions are medications that are still in their original container or medications that are administered immediately by the person who prepared them.
15. Select an injection site on the palm side of the forearm about 5 to 10 cm (2 to 4 in) below the elbow. Use the left or right forearm according to the organization's practice. If the forearm cannot be used, inspect the upper back. Check the skin surface over the site for bruises, inflammation, or edema. Avoid areas of lesions or skin discoloration.
16. Choose the appropriate needle gauge and size for the intradermal injection.
17. Assist the patient to a comfortable position. Have the patient extend his or her elbow and support it and the forearm on a flat surface.
18. Cleanse the site with an alcohol wipe. Apply the wipe at the center of the site and rotate outward, allowing the area to dry before the injection. (Rationale: The mechanical action of wiping removes secretions containing microorganisms. Allowing the skin to dry ensures adequate contact time, which decreases the risk of contamination).
19. Hold the swab or gauze between the third and fourth fingers of the non-dominant hand. (Rationale: Holding the swab in the described manner keeps the gauze or swab readily accessible for use when withdrawing the needle).
20. Ensure that the needle is locked in place. Remove the needle cap from the needle by pulling it straight off. (Rationale: Locking the needle in place prevents it from touching the sides of the cap, avoiding contamination and ensuring that the syringe and needle are correctly joined).

21. Hold the syringe between the thumb and the forefinger of the dominant hand with the bevel of the needle pointing up. (Rationale: Smooth injection requires proper manipulation of the syringe parts. Keeping the bevel up aids proper technique and makes the deposition of medication into tissues below the dermis less likely).
22. With the non-dominant hand, stretch the skin over the site with the forefinger or thumb. (Rationale: A needle pierces tight skin more easily than it pierces loose skin).
23. Use a TB needle for the Mantoux technique. With the needle almost against the patient's skin and the bevel of the needle facing upward, insert the needle slowly at a 5- to 15-degree angle until resistance is felt. Advance the needle through the epidermis below the skin surface; the needle tip should be seen through the skin (Figure 10 and 11). (Rationale: This technique helps ensure that the needle tip is in the dermis. Inaccurate results are obtained if the needle is not inserted at the correct angle and depth).

Figure 10: The Mantoux Technique. The skin has to be stretched, and the needle has to be inserted parallel to the skin surface.

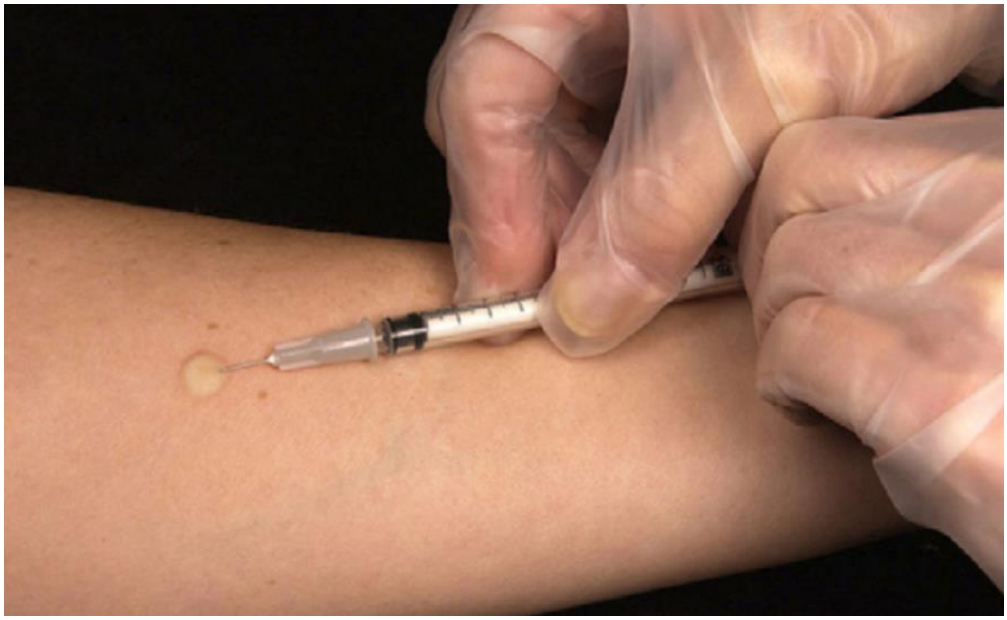
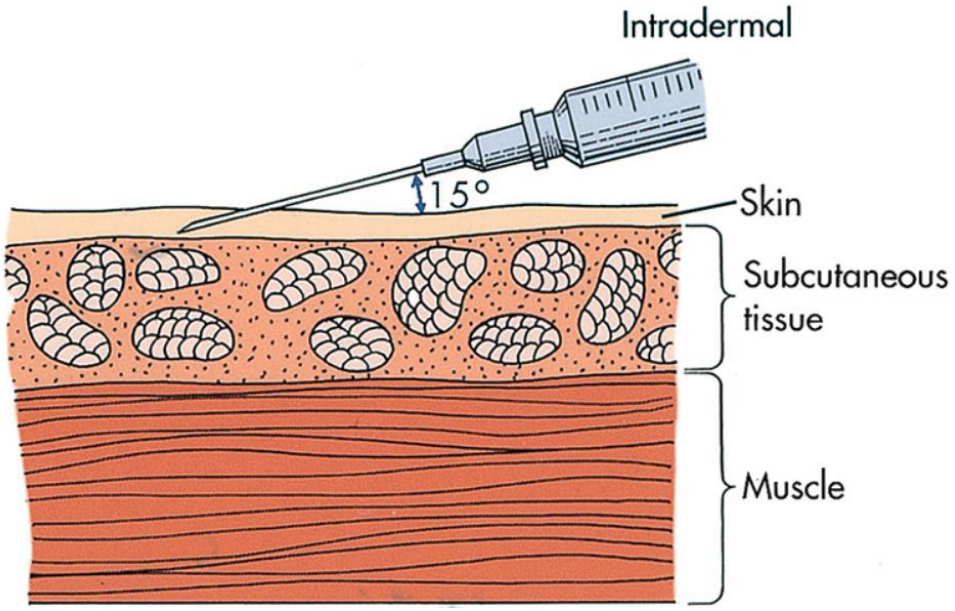


Figure 11: Intradermal needle tip inserted into dermis



24. Inject the medication slowly. If resistance is not felt, the needle is too deep; remove it and begin again. (Rationale: Slow injection minimizes discomfort at the site. Resistance with an intradermal injection is normal; the dermal layer is tight and does not expand easily when the solution is injected).
25. While injecting medication, observe the site for the expected small bleb (approximately 6 mm to 10 mm), which resembles a mosquito bite (Figure 10). (Rationale: A bleb indicates that the medication has been deposited into the dermis).
26. Touch the site lightly with gauze or cotton ball. Do not massage the site. (Rationale: Massage damages underlying tissue. Massaging the intradermal site or applying pressure may disperse medication into underlying tissue layers and alter the test results).
27. If the TB test must be repeated, attempt administration at least 5 cm (2 in) from the original site or use an appropriate alternative location. (Rationale: Inadequate results occur if the needle angle is too shallow or deep. The TB test may have to be repeated if a bleb does not develop after injection because the bevel of the needle was inserted too deeply. Leakage at the injection site may indicate that the bevel of the needle was not inserted deeply enough).
28. Monitor the patient for adverse and allergic reactions to the PPD. Recognize and immediately treat dyspnea, wheezing, and circulatory collapse, which are signs of a severe anaphylactic reaction. Follow the organization's practice for emergency response.
29. Read the TB test results in 48 to 72 hours. Inspect the bleb. If preferred, use a skin pencil and draw a circle around the perimeter of the injection site. Induration (hard, dense, raised area) of the skin around the injection site is a positive TB reaction. The size of the indurated area varies depending on the patient's condition:
    a. 15 mm or more in patients with no known risk factors for tuberculosis[1,3]
    b. 10 mm or more in patients who are recent immigrants; injection drug users; residents or employees of high-risk settings; Mycobacteriology laboratory personnel; patients with certain chronic illnesses; children younger than 5 years old; and infants, children, and adolescents exposed to high-risk adults
    c. 5 mm or more in patients with HIV-positive results or fibrotic changes on chest radiogram consistent with previous tuberculosis infection or those who have had an organ transplant or are immunosuppressed.

The manufacturer's directions determine when to read the test results.

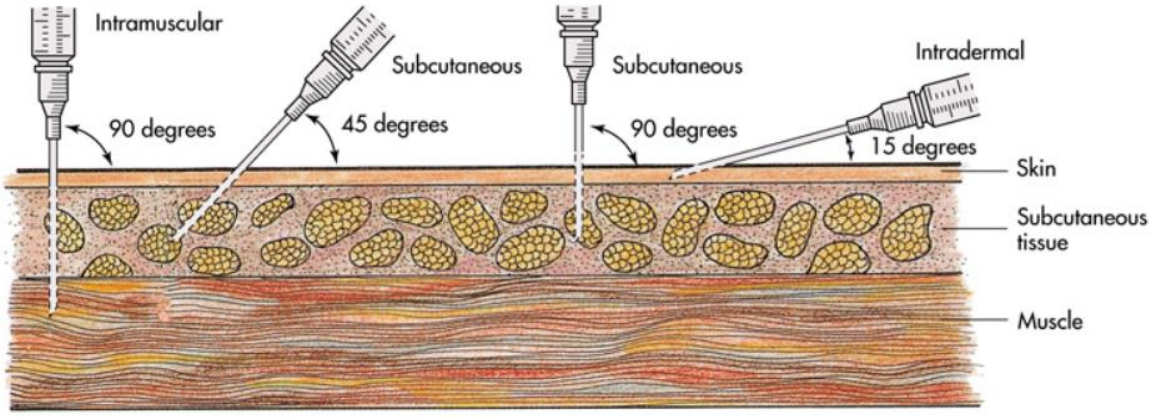
30. Discard supplies, remove gloves, and perform hand hygiene.
31. Document the procedure in the patient's record.

Intramuscular Injection

The IM injection route deposits medication into deep muscle tissue, which has a rich blood supply, allowing medication to be absorbed faster than it would be by the subcutaneous route. This rich blood supply, however, increases the risk for injecting drugs directly into blood vessels. Any factor that interferes with local tissue blood flow affects the rate and extent of drug absorption.

An IM injection may require a longer and larger-gauge needle to penetrate deep muscle tissue. The needle is inserted at a 90-degree angle; this varies from the angle used for subcutaneous and intradermal injections (Figure 12).

Figure 12: Comparison of the angles of insertion of intramuscular (90 degrees), subcutaneous (45-90 degrees), and intradermal (15 degrees) injections



The appropriate needle length is determined by the patient's age and weight, injection site, and the amount of adipose tissue in the chosen injection site. The needle must be long enough to reach the muscle tissue but not too long to present the risk of hitting underlying neurovascular structures or bone.

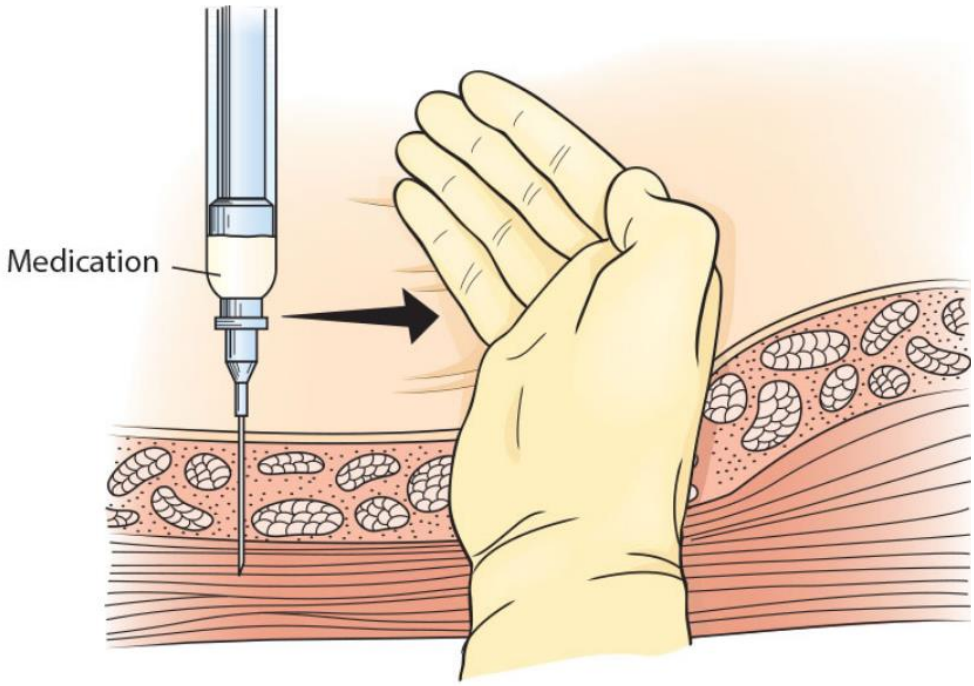
Aspiration before injection and slow injection of the medication are not required for vaccine administration. The vastus lateralis and deltoid muscle are the only two sites recommended for vaccine administration because they do not contain large vessels that are within reach of the needle. For all other medications there is no evidence to support abandoning the practice of aspiration before administration. More research is needed to investigate the practice of aspiration before administering an IM injection with medications other than

vaccines. The recommended route and site for each vaccine is included in the manufacturer's instructions for use.

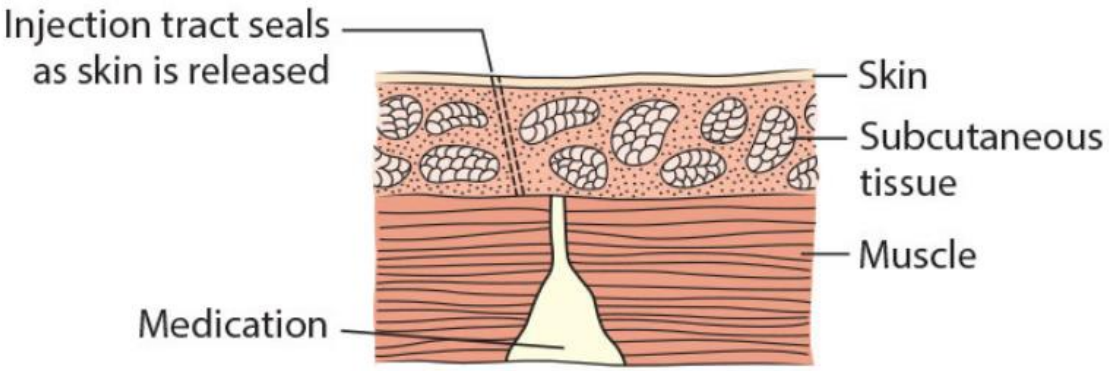
Muscle tissue is less sensitive to irritating and viscous medications than subcutaneous tissue. Smaller muscles absorb smaller volumes. For a well-developed adult, no more than 4 to 5 ml of medication should be administered in a single IM injection because the muscle tissue does not absorb it well. For "deep" IM injections, the recommended volume ranges from 2 to 5 ml. If the patient's available muscle tissue is limited and the dorsogluteal muscle must be used, volumes of up to 4 ml can be administered into this site. The ventrogluteal muscle can accommodate up to 2.5 ml, with a maximum volume of 3 ml. The rectus femoris and vastus lateralis remain the recommended sites for volumes up to 5 ml in adults. A maximum of 2 ml is recommended for older adults and thin patients.

The Z-track method (pulling the skin laterally before injection) can be used if the overlying tissue can be displaced. This technique prevents medication leakage into subcutaneous tissue, seals medication in the muscle, and minimizes irritation. To use the Z-track method in an adult, the appropriate-size needle is attached to the syringe, and an IM site is selected. The overlying skin and subcutaneous tissues are pulled to the side with the ulnar side of the non-dominant hand. The skin is held in this position until the injection has been administered. After the site is cleansed, the needle is injected deep into the muscle, and the medication is injected slowly. After the needle is withdrawn, the skin is released. The displacement of the skin and muscle layer closes off the needle track when the skin is released (Figure 13). The Z-track method should not be used with infant vaccinations where skin is compressed.

Figure 13: A, Pulling on overlying skin with dorsum of the hand during intramuscular injection moves tissue to prevent later tracking. B, the Z track left after injections prevents deposit of medication through sensitive tissue



A During injection



B After release

Injection Sites

For IM injections, the nurse selects a site that is free of pain, infection, necrosis, bruising, and abrasions. The location of underlying bones, nerves, and blood vessels and the volume of medication to be administered are also considered. Because of the sciatic nerve location, the dorsogluteal muscle is not recommended as an injection site. If a needle hits the sciatic nerve, the patient may experience partial or permanent paralysis of the leg.

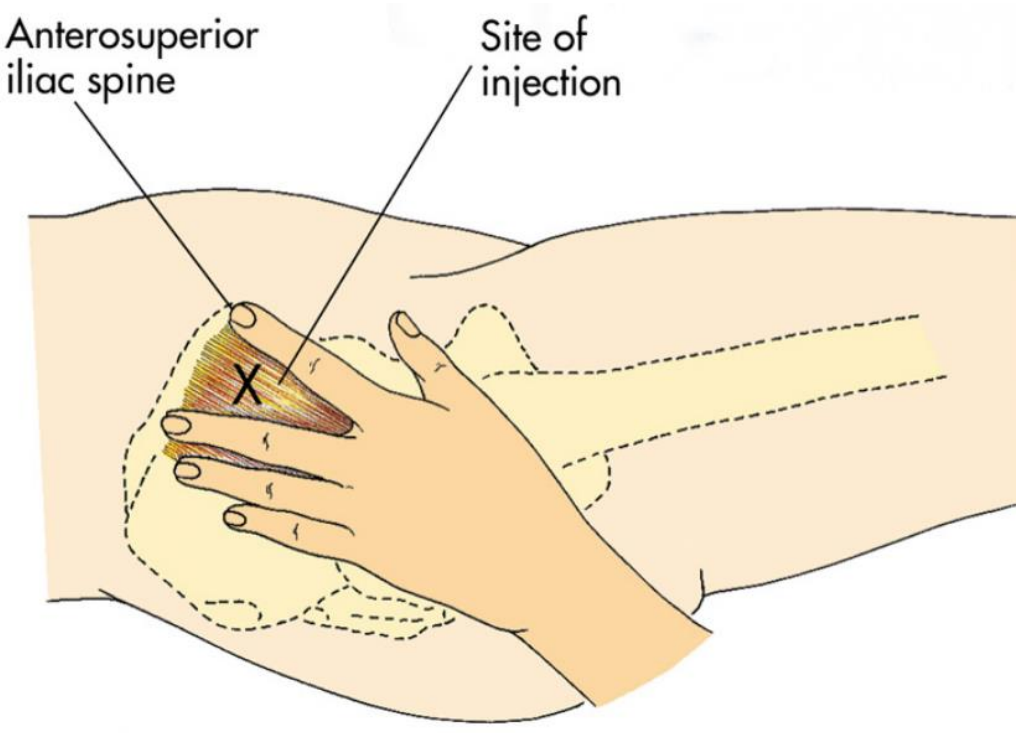
Ventrogluteal Site

The ventrogluteal site involves the gluteus medius and minimus muscles and is a safe injection site for adults, children, and infants. This site provides the greatest thickness of gluteal muscle that is free of penetrating nerves and blood vessels and it has a narrower layer of fat.

The dorsogluteal site is closer to neurovascular structures than the ventrogluteal site and is not a recommended site for injection. However, the thickness of the muscle in the dorsogluteal region is greater than muscle in the ventrogluteal region. Selected site for IM injections is based on clinical assessment of the patient.

To locate the ventrogluteal site, the heel of the hand is placed over the greater trochanter of the patient's hip with the wrist almost perpendicular to the femur. The right hand is used for the left hip, and the left hand is used for the right hip. The thumb is pointed toward the patient's groin, with the index finger pointing to the anterior superior iliac spine, and the middle finger is extended back along the iliac crest toward the patient's buttock. The index finger, the middle finger, and the iliac crest form a V-shaped triangle, with the injection site at the center of it (Figure 14). To relax this muscle site, the patient should lie flat and supine and flex the knee and hip, or the patient may lie on the side.

Figure 14: Anatomical view of ventrogluteal injection site

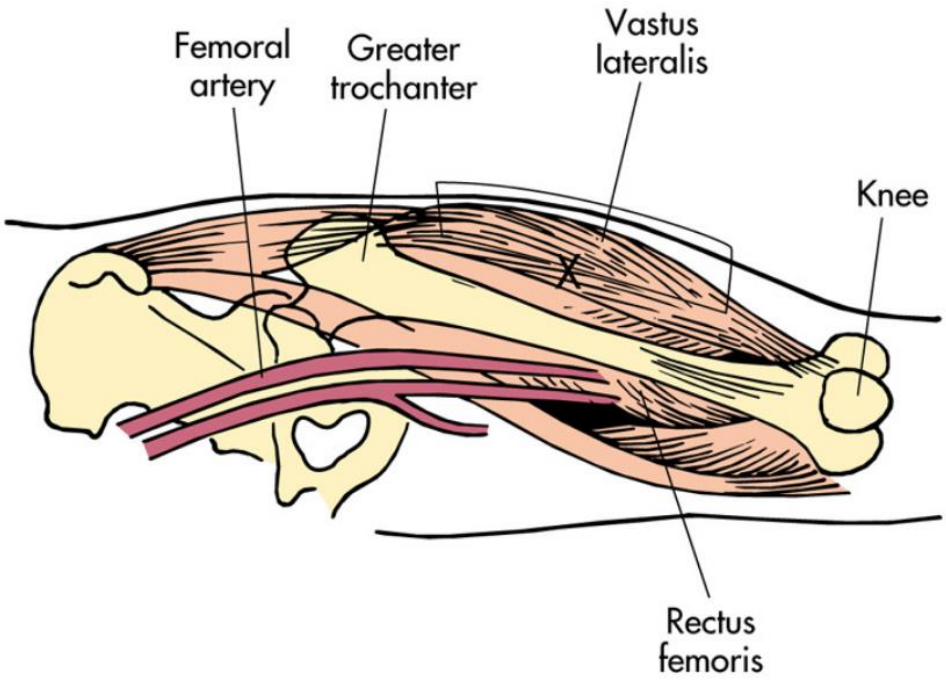


Vastus Lateralis Site

The vastus lateralis muscle is another injection site used in adults, children, and infants. The muscle is thick and well developed, and it is located on the anterior lateral aspect of the thigh. In an adult, the vastus lateralis extends from just above the knee to just below the

greater trochanter of the femur (Figure 13). The middle third of the muscle is used for the IM injection site. To help relax this muscle site, the patient should lie flat, supine, flex the knee slightly, and externally rotate the foot, or the patient may assume a sitting position.

Figure 13: Landmarks for vastus lateralis site

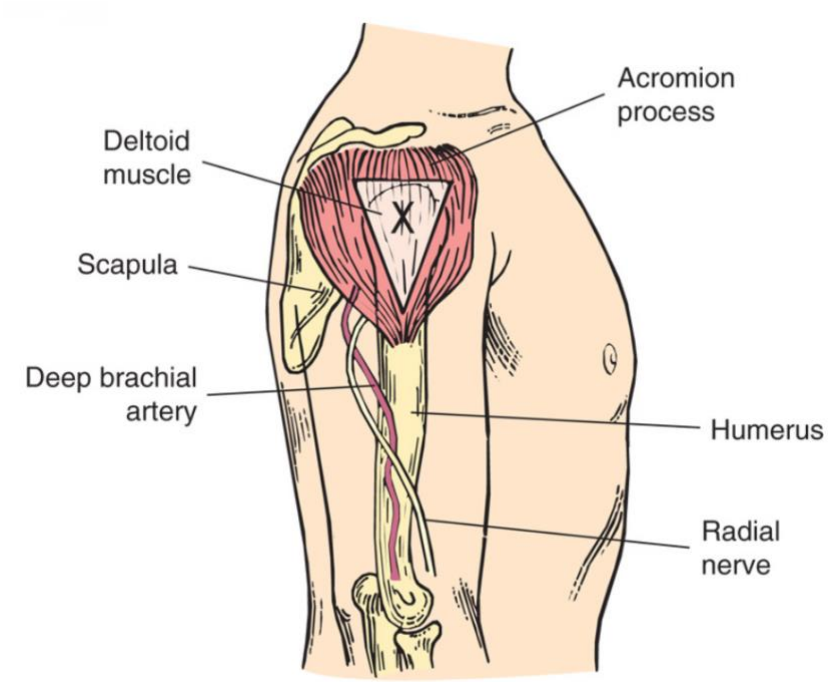


Deltoid Site

The deltoid site is easily accessible in many adults, but the muscle tends to be underdeveloped, which causes a potential for injury because the axillary, radial, brachial, and ulnar nerves and the brachial artery lie within the upper arm (Figure 16). This site can be used for small medication volumes (2 ml or less) and for administration of routine immunizations in children more than 2 years old and adults with acceptable muscle mass and development, and when other sites are inaccessible because of dressings or casts.

The deltoid muscle is located by fully exposing the patient's upper arm and shoulder. The lower edge of the acromion process, which forms the base of a triangle in line with the midpoint of the lateral aspect of the upper arm, is palpated, and the injection site is found in the center of the triangle (Figure 16). To help relax this muscle site, the patient may sit, stand, or lie down. The patient should be instructed to relax the arm at the side, or the patient's arm may be supported while flexed at the elbow.

Figure 16: Landmarks for deltoid site



PROCEDURE

1. Perform hand hygiene. Don appropriate personal protective equipment (PPE) based on the patient's need for isolation precautions or the risk of exposure to bodily fluids.
2. Introduce yourself to the patient.
3. Verify the correct patient using two identifiers.
4. Explain the procedure to the patient and ensure that the patient agrees to treatment.
5. Ensure that evaluation findings are communicated to the clinical team leader per the organization's practice.
6. Assess the patient for specific contraindications to receiving an IM injection and advise the practitioner accordingly. Evaluate for factors such as muscle atrophy, reduced blood flow, compromised skin condition, and circulatory shock.
7. Determine the patient's current symptoms (if applicable) before initiating medication therapy to evaluate medication effectiveness after administration.
8. Determine the patient's knowledge regarding the medication to be received.
9. Ask the patient about a history of allergies, including any drug allergies, type of allergens, and normal allergic reaction.
10. Review the patient's previous verbal and nonverbal responses to injections.

11. Obtain the patient's actual weight in kilograms. Stated, estimated, or historical weight should not be used.
12. Check accuracy and completeness of the practitioner's original order.
13. Obtain the medication and verify the expiration date.
14. Inspect the medication for particulates, discoloration, or other loss of integrity.

    Do not use any medication that is cloudy or precipitated unless such is indicated by its manufacturer as being safe; otherwise, this may lead to harmful reactions.

15. Understand drug reference information pertinent to the medication's action, purpose, onset of action and peak action, normal dose, and common side effects.
16. Ensure the six rights of medication safety: right medication, right dose, right time, right route, right patient, and right documentation.
17. Label all medications, medication containers, and other solutions. The only exceptions are medications that are still in their original container or medications that are administered immediately by the person who prepared them.

    Medications or other solutions in unlabeled containers are unidentifiable. Errors, sometimes tragic, have resulted from medications and other solutions removed from their original containers and placed into unlabeled containers. This unsafe practice neglects basic principles of medication management safety, yet has been routine in many organizations.[5]

18. Assemble the appropriate-size needles, syringes, and other administration supplies, as needed.
19. Perform hand hygiene and don gloves. Don additional PPE based on the patient's need for isolation precautions or the risk of exposure to bodily fluids.
20. Select the appropriate site for injection based on the patient's age, weight, muscle tissue mass, and medication volume and viscosity.
21. Assist the patient to a comfortable position that is appropriate for the chosen injection site (e.g., sitting, or lying flat, on side, or prone). (Rationale: A comfortable position reduces strain on the muscle and minimizes injection discomfort).
22. Ensure that the patient's injection site is accessible. If necessary, assist the patient with removing clothing.
    a. Inspect the skin surface over sites for bruises, inflammation, or edema. (Rationale: Injection sites should be free of abnormalities that interfere with drug absorption (e.g., bruising, signs associated with infection).
    b. Note the integrity and size of the muscle. Palpate for tenderness or hardness and avoid hardened areas. If the patient receives frequent injections, rotate sites. (Rationale: Sites used repeatedly become hardened from lipohypertrophy (increased growth in fatty tissue)).
23. Locate the injection site again using anatomic landmarks. The ventrogluteal site is a safe injection site for adults and children receiving irritating or viscous solutions and is the site of choice for administering IM injections to adults. In addition, this site provides the greatest thickness of gluteal muscle, is free of penetrating nerves and blood vessels, and has a narrower layer of fat. (Rationale: Injection into the correct anatomic site prevents injury to nerves, bone, and blood vessels).

24. Cleanse the site with alcohol or an antiseptic swab, per the organization's practice. Allow the skin to dry completely. *Optional:* Use a vapocoolant spray (e.g., ethyl chloride) for pain relief just before injection. (Rationale: A vapocoolant spray decreases pain at injection site).
25. Hold a clean swab or dry gauze between the third and fourth fingers of the nondominant hand. (Rationale: The swab or gauze remains readily accessible for use when withdrawing the needle).
26. Remove the needle cap by pulling it straight off. (Rationale: Pulling the cap straight off prevents the needle from touching the sides of the cap, thus preventing contamination).
27. Hold the syringe between the thumb and forefinger of the dominant hand as if holding a dart, palm down. (Rationale: A quick, smooth injection requires proper manipulation of the syringe parts).
28. Administer the injection.
    a. Z-track method
        i. Position the ulnar side of the nondominant hand just below the site and pull the skin laterally. Hold this position until the medication is injected.
        ii. With the dominant hand, inject the needle quickly into the muscle at a 90-degree angle using a steady and smooth motion.

    Rationale: The Z-track technique creates a zigzag path through tissues that seals the needle track to avoid tracking medication. A quick, dart-like injection reduces discomfort. Z-track injections may be used for all IM injections.

        iii. After the needle pierces the skin, use the thumb and forefinger of the nondominant hand to hold the syringe barrel while still pulling on the skin. Move the dominant hand to the end of the plunger. Avoid moving the syringe.

    Rationale: Smooth manipulation of the syringe reduces discomfort from needle movement. Skin remains pulled until after medication is injected to ensure Z-track administration.

        iv. *Optional:* If the patient's muscle mass is small, grasp the body of muscle between the thumb and forefingers of the nondominant hand while still pulling the skin laterally.

    Rationale: Grasping the muscle body helps ensure that the medication reaches the muscle mass.

        v. Pull back on the plunger. If no blood appears, inject the medication. If blood appears in the syringe, remove the needle, discard the medication, obtain a new syringe, and try again.

    Rationale: Aspiration of blood into the syringe indicates possible placement into a vein.

        vi. Smoothly, quickly, and steadily withdraw the needle and release the skin. Apply a dry cotton ball or gauze with light pressure for several seconds over the site.
    b. Vaccine administration
        i. Use the vastus lateralis or deltoid muscle.

Rationale: The vastus lateralis and deltoid muscle are the only two sites recommended for vaccine administration.[2]

ii. Spread the skin taut between the thumb and forefinger over the selected muscle or grasp the tissue and bunch up the muscle (commonly used for children or older adult patients).
iii. Inject the vaccine into the tissue and withdraw the needle.[2]

29. Apply gentle pressure to the site; do not massage. Evaluate the site and apply a bandage if needed.

    Rationale: Massage damages underlying tissue.

30. Replace the patient's clothing and assist the patient to a comfortable position.
31. Discard the uncapped needle (or needle enclosed in the safety shield) and attached syringe into a puncture-proof and leakproof receptacle.

    Rationale: Discarding the uncapped needle helps prevent injury to the patient and health care team members. Recapping needles increases the risk for a needlestick injury.

32. Monitor the patient for adverse and allergic reactions to the medication. Recognize and immediately treat respiratory distress and circulatory collapse, which are signs of a severe anaphylactic reaction. Follow the organization's practice for emergency response.
33. Discard supplies, remove PPE, and perform hand hygiene.
34. Document the procedure in the patient's record.