Phlebotomy
Learning Module for LPNs

ANBLPN | AIAANB

Association of New Brunswick Licensed Practical Nurses

L'Association des Infirmier(ère)s Auxiliaires Autorisé(e)s du Nouveau-Brunswick

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Introduction

Blood tests are one of the most common diagnostic tools used in the care and evaluation of clients. These tests allow healthcare professionals to screen clients for early signs of physical illness, monitor changes in acute or chronic diseases and evaluate responses to therapies.

The term phlebotomy is derived from the Greek words, *phlebo*, which relates to veins and *tomy*, which relates to cutting. In ancient time, phlebotomy was practiced withdrawing blood using various means, including knives, leeches, blood cups or bowls, pumps, and glass syringes. In some cultures, it was thought to cleanse or purify the body to get rid of unwanted spirits!

Today modern phlebotomy equipment and practices are advanced. The current definition of phlebotomy can be summarized as the "incision of a vein for collecting a blood sample for laboratory testing or therapeutic purposes."

The importance of a high-quality specimen that is correctly identified, collected, and transported is vital to the overall care of a patient.

Objectives:

1. Understand the anatomy and physiology of the circulatory system as it relates to venipuncture.
2. Understand the importance and techniques required to maintain infection prevention and control when performing venipuncture.
3. Identify and understand how to use the equipment required to perform venipuncture.
4. Recognize the importance of and ensure correct order of draw.
5. Understand complications and special implications for venipuncture.
6. Demonstrate competence in venipuncture procedures:
    a) Use of Tourniquet and Vein Palpation
    b) Performing a Venipuncture Using the Evacuated Tube Method
    c) Performing Hand Vein Venipuncture Using a Winged Infusion/Butterfly Set
    d) Performing the Syringe Method
    e) Decontamination of the Site for Blood Cultures
    f) Performing Blood Cultures
7. Understand Special Considerations Affecting Venipuncture Practices.
8. Test Knowledge and Skills Related to Venipuncture.

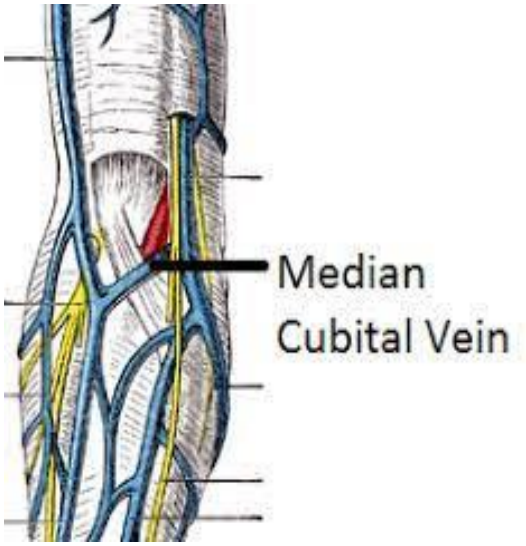
Phlebotomy was added into the practical nursing curriculum in 2012 and is now considered an entry level competency skill for all LPNs. LPNs who have not received this skill in their education programs may participate in workplace education or formal education through ANBLPN or a community college

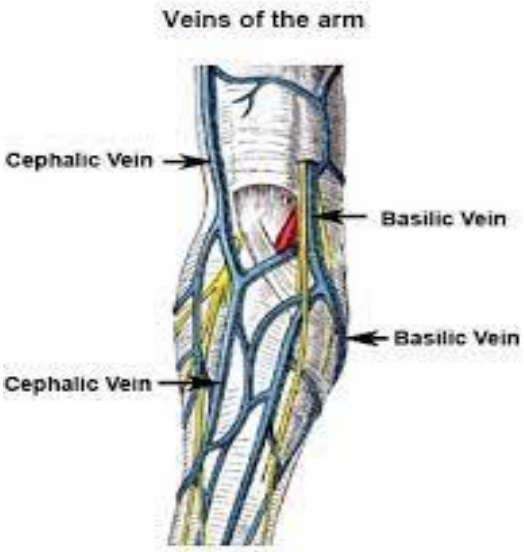
Anatomy & Physiology

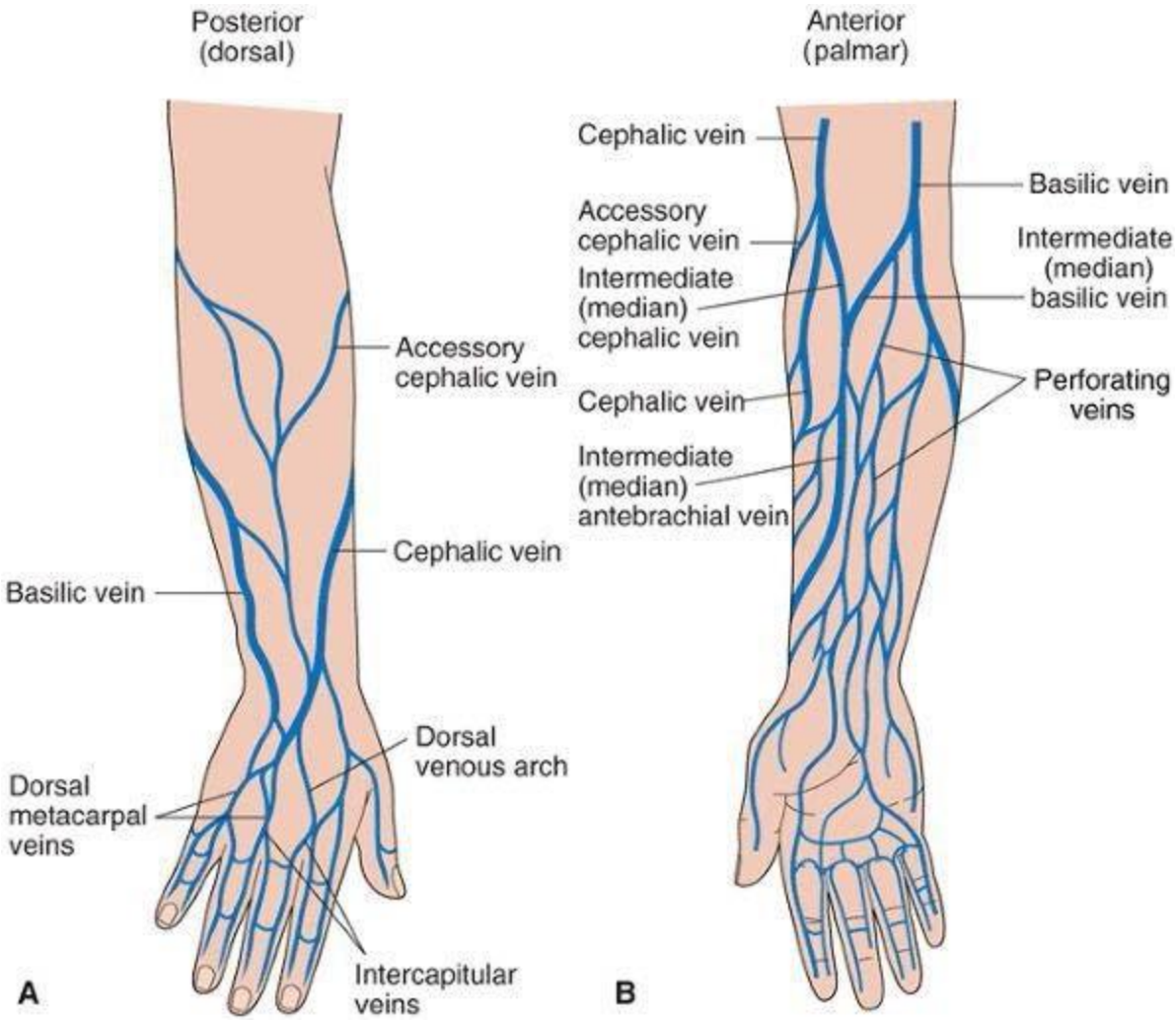
When assessing for an appropriate site to perform venipuncture, the **antecubital area** is the preferred location. Healthcare professionals should assess the antecubital area of both arms to determine the best vein to utilize.

There are four main sites that can be used for venipuncture:

1. **Median Cubital Vein** – primary site of the antecubital area, running closer to the fifth digit ("pinky" finger) of the forearm
2. **Cephalic Vein** – opposite side of the median cubital vein, running closer to the thumb side of the forearm
3. **Dorsal Metacarpal Vein** – back of the hand
4. **Basilic Vein** – not recommended as is located very close to the brachial artery and if nicked it can cause excessive bleeding and bruising.







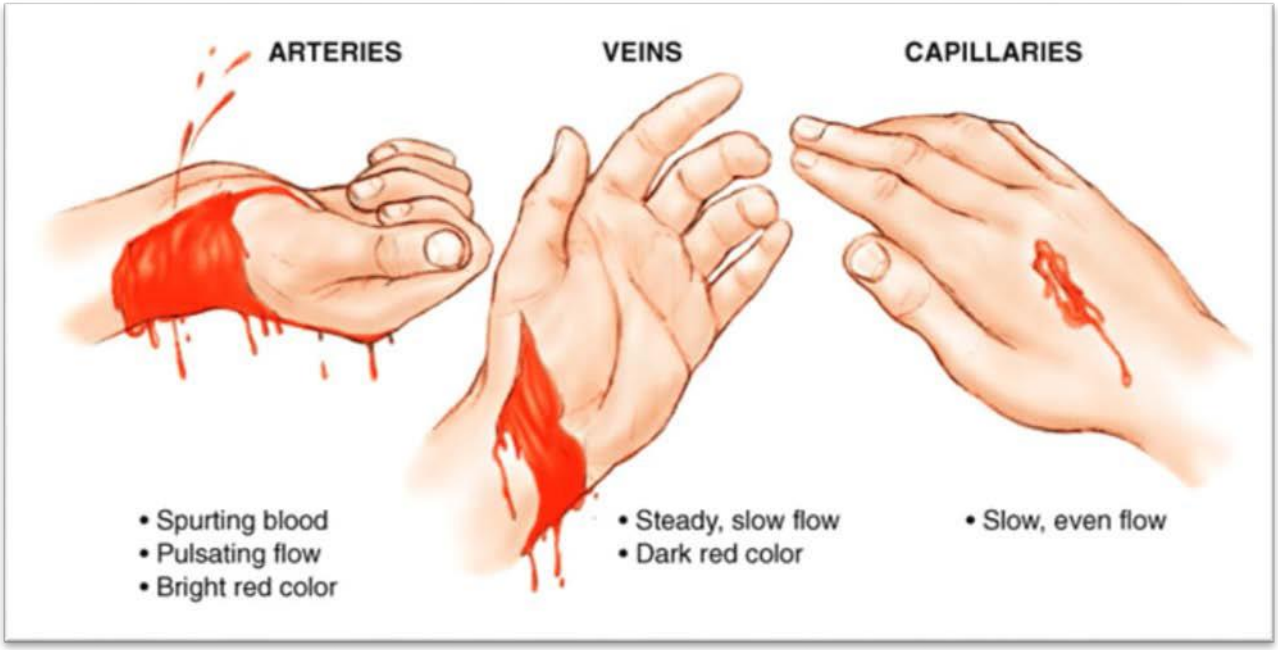
Vessels and Circulation

There are palpable differences between arteries and veins. Since they are sometimes located close together, you must be familiar with the differences.

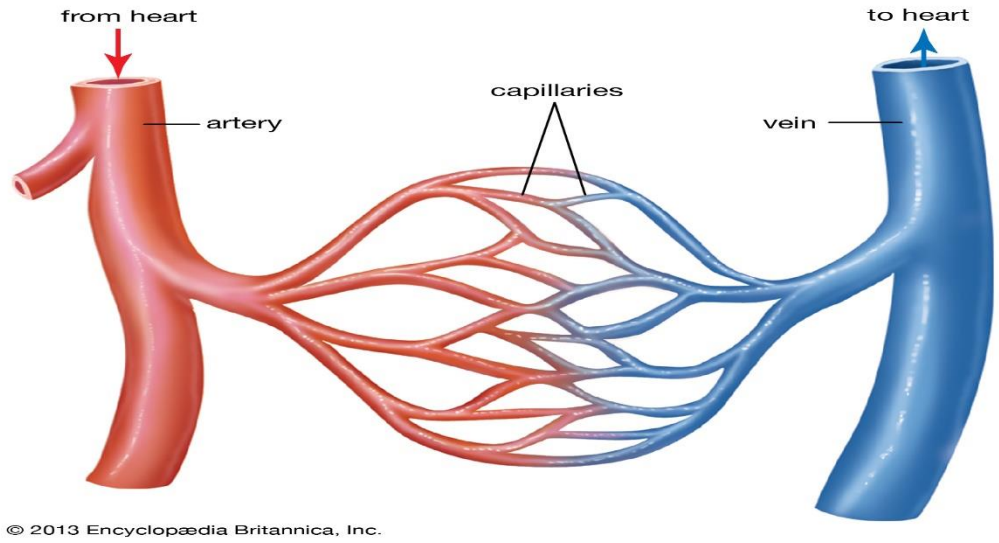
Arteries: Arteries are highly oxygenated vessels that carry blood away from the heart. They branch into smaller vessels, called arterioles, and then into capillaries. Arteries appear brighter red in colour, have thicker elastic walls than veins do, and have a pulse.

Veins: Blood is carried toward the heart by the veins. All veins (except the pulmonary veins) contain deoxygenated blood. Veins appear bluish in colour under the skin and have thinner walls than arteries. They do NOT have a pulse.

Capillaries: Capillaries are tiny, microscopic vessels that connect or link arteries and veins and may be so small in diameter as to allow only one blood cell to pass through at any given time. They are the only vessels that permit the exchange of gases. Blood in the capillary bed is a mixture of arterial and venous blood.



Function of Blood	Specific Action
Transportation	Carry oxygen from the lungs to the tissues. Carry carbon dioxide from the tissues to the lungs. Transport waste products to sites such as the kidneys for excretion. Transport antibodies and white blood cells to defend against pathogenic microbes and viruses.
Disbursement of nutrients	Distribute nutrients absorbed in the digestive tract to all organs of the body. Take nutrients released from fat, muscle, and tissues for use in other parts of the body.
Regulation	Regulate the blood PH in all parts of the body. Regulate electrolyte balance to maintain a "steady state" condition. Control body temperature by redistribution of heat.
Hemostasis	Restrict fluid loss when blood vessels are damaged. Formation of blood clots to prevent bleeding.



Arteries	Veins
- Deep - Protected - Walls have 3 layers - Firm walls - More contractile - No valves - Arteriospasm painful - Pulsate - Atypical locations	- Superficial - Less “fixed” - Walls have 3 thin layers - Collapse easily - Distend easily - Valve structures are present - Vasospasm less severe - No pulse

The Blood

Circulating blood provides nutrients, oxygen, chemical substances, and waste removal for each of the billions of individual cells in the body and is essential to homeostasis and to sustaining life. Any region of the body that is deprived of blood and oxygen soon becomes oxygen deficient, and the tissues may die within minutes. This condition is called **hypoxia**.

Human bodies contain approximately 5 quarts of whole blood with is composed of water, solutes, and cells. The volume of blood in an individual varies according to body weight. For instance, adult men usually have 5 – 6 liters of whole blood, and women usually have 4 – 5 liters. Whole blood is normally composed of 50 – 60% of plasma and 40 – 45% of cells. So, if a blood specimen is withdrawn into a test tube from a vein and centrifuged, about 55% will be plasma and 45% will be cells. The plasma portion is 92% water and 8% solutes such as protein, albumin, fibrinogen, glucose, nitrogen, amino acids, sodium, potassium, calcium, magnesium, and chloride.

Infection Control Principles

The cornerstones for infection protection of healthcare professionals, particularly when collecting blood, are **aseptic techniques**, which include the following:

- Frequent hand hygiene (handwashing or alcohol-based hand rubs)
- Use of barrier garments and personal protective equipment
- Waste management of contaminated materials
- Use of proper cleaning solutions
- Use of standard precautions
- Use of sterile procedures when necessary

These protective measures must become part of a healthcare professional's routine procedures and standards for practice.

Blood-Borne Pathogen

Examples of body fluids that can potentially carry blood-borne pathogens include the following:

- Blood
- Saliva in dental procedures
- Cerebrospinal fluid
- Cell cultures
- Human tissues
- Semen and vaginal secretions
- All body fluids containing blood

Transmission Routes:

- Exposure to broken skin
- Increased risk if contact involves a large area of skin or contract is prolonged
- Increased risk with increased blood borne pathogen levels
- Misuse of sharps (splashes)

Engineering Controls:

- Leak proof containers
- Sharps containers
- Needleless devices

Personal Protective Equipment

- Gloves
- Lab coats, scrub suits, gowns
- Goggles, safety glasses

Use of Standard Precautions

1. Use personal protective equipment (PPE) to prevent exposure when contact with blood or other body fluids of any client is anticipated.

    a. Gloves should be worn for
        i. handling object or surfaces soiled with blood or body fluids.
        ii. Performing venipunctures, skin punctures, and IV-line collections
    b. Gloves should be changed after contact with each client and hands washed or alcohol hand sanitizers used after glove removal and before donning new gloves.
    c. Masks and protective eyewear or face shields should be worn to prevent exposure of mucous membranes of the mouth, nose, and eyes during procedures that are likely to cause droplets or splashes of blood or other body fluids.
    d. A personal respirator should be used if the risk of tuberculosis is present.
    e. Footwear that protects against broken glass possibly contaminated with blood or other body fluids should be worn. Flip flops, sandals, and clogs are NOT recommended.

2. Hands and other skin surfaces should be washed immediately and thoroughly if contaminated with blood or other body fluids. Hands should be washed immediately after gloves are removed.

    a. If your hands are visibly soiled, soap and water are required – antiseptic is not recommended.
    b. Wash hands every third time with soap/water versus hand sanitizer repeatedly.

3. Take precautions to prevent skin injuries caused by needles and other sharp instruments or devices.

    a. During blood collection
    b. During the disposal of used needles, lancets, etc.
    c. When handling any sharp instruments after procedures

4. To prevent infections from blood-borne pathogens because of needlestick injuries, health care workers should:

    a. Use only safety engineered needle sharps devices
    b. Not recap needles, purposely bend or break them by hand, remove them from disposable syringes or holders, or handle them for any reason
    c. Immediately dispose of the blood tube holder and safety needle as a single unit after blood collection.
    d. Place disposable syringes and needles, lancets, and other sharp items, after they are used, in puncture-resistant containers for transport to the biohazard waste center

Resources for LPNs related to Infection Prevention and Control

https://ipac-canada.org/ – Infection Prevention and Control Canada

https://www.cdc.gov/ – Centers for Disease Control and Prevention

www.who.org – World Health Organization

Introduction to Blood Collection Equipment

Healthcare professionals use several types of supplies and safety equipment in the collection of blood and its transportation. The following supplies are generally required:

10% povidone iodine
70% alcohol swabs
2% Chlorohexidine with 70% alcohol swab sticks/wipes

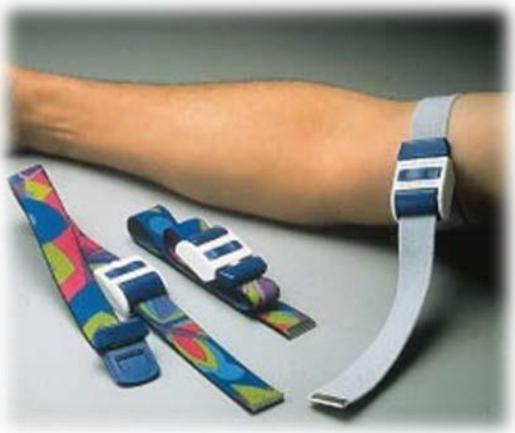
Adhesive bandage or tape gauze
Gloves
Specimen bags
Specimen labels (per facility)
Tourniquet
PPE as required
Hand sanitizer
Vacutainers

Blood culture bottles (aerobic/anaerobic/pediatric)
Blood tubes, as required
Needles as determined by venipuncture site: straight needles 20g, 21g, 22g; butterfly 21g, 23g
Sharps container
Transfer device
Tube holder

Use of Tourniquet and Vein Palpation

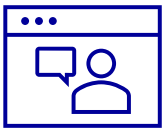
The tourniquet is the key to a successful venipuncture. It provides a barrier to slow down the venous flow. They are used to apply enough pressure to the arm to slow the return of venous blood to the heart. This slowing of venous return causes pooling of the blood in the veins, which makes the veins more visible and easier to feel and find.

1. The pliable strap – disposable
2. The blood pressure cuff
3. The Velcro type



The tourniquet is placed on the client and applied at a minimum of **8- 10 cm above** the intended venipuncture site and with only enough tension to restrict blood flow. When possible, the tourniquet may be placed over the client's sleeve. A blood pressure cuff may also be used to distend the veins during venipuncture by inflating it to a level of 40 mmhg if it does not interfere with the selected site.

WARNING: If the skin appears blanched above and below the tourniquet, it is too tight. Palpate distal pulse below tourniquet. If pulse is not palpable, reapply tourniquet more loosely.



Watch this VIDEO to learn how to apply the different types of tourniquets!

Rationale:

Tourniquet application causes veins to fill with blood, thereby assisting in the location of a suitable venipuncture site and enabling easier blood flow once the needle has been inserted. Palpating the vein helps the healthcare professional establish size, angle, and depth of the vein.

A single use policy is usually adopted for each tourniquet to minimize the risk of transmitting infections from one client to the next. However, sometimes one tourniquet can be allotted to one client for multiple venipunctures. In this case, it should not be shared or used for other clients.

Equipment:

- Latex free, clean, single use tourniquet
- Gloves
- Alcohol based hand disinfectants

Preparation:

1. Identify the client properly.
2. Wash or sanitize your hands using appropriate agents, then dry them.
3. Ask the client to extend the arm fully.

Procedure:

1. Use a clean latex-free tourniquet.
2. Stretch the ends of the tourniquet around the client's arm about 8 – 10 cm above the venipuncture area (antecubital area). Hold both ends of the tourniquet in one hand while the other hand tucks in a section next to the skin and makes a partial loop with the tourniquet.
3. Make sure the tourniquet is tight but not painful to the client. **Do not leave it on for more than 1 minute.** Do not place it over sores or burned skin; however, depending on the policies of each health care facility, it may be placed over a hospital gown sleeve or a piece of gauze.
4. Palpate the antecubital area to locate the safest vein.
5. Once the vein is selected, begin the decontamination procedure. If gloves were not put on earlier, put gloves on now and proceed.

Order of Draw for Venipuncture

There are a variety of blood tests that can be ordered for clients and the type of blood test ordered will determine which vacutainer tube can be used to collect the specimen. Healthcare professionals must be knowledgeable on the order of draw to ensure proper collection of the blood specimen.

Blood specimens must also be gently inverted after collected – **NEVER** shake a specimen bottle. Depending on the test ordered, there are different inversion times for each test that healthcare professionals must adhere to.

BLOOD CULTURE BOTTLES

If blood cultures are ordered, they must always be drawn first.

You require two different bottles for blood culture collection.

1. **GREEN:** Aerobic (with air)
2. **ORANGE:** Anaerobic (without air)

Using the acronym "GO" – will help you remember which comes first!

LIGHT BLUE TOPPED TUBES

- Used for INR, PT/PTT.
- If the tube is under filled, coagulation results will be prolonged.
- If the tube is over filled, coagulation results will be shortened.
- Fill to the FILL line.
- Gently invert 3 – 4 times as soon as blood is collected.

BLACK TOPPED TUBES

- Contains **sodium citrate**.
- Determines ESR (erythrocyte sedimentation rate)
- Gently invert 3 – 4 times after blood collection.

RED TOPPED TUBES

- Does not have anticoagulant or polymer barrier and is used for the collection of serum.
- The blood WILL clot in this tube.
- These can be used for chemistry testing as well as routine blood donor screening and diagnostic testing of serum for infectious diseases.
- Gently invert 5 times as soon as blood is collected

GOLD TOPPED TUBES

- Used for serum separation. They contain a polymer barrier that is present in the bottom of the tube.
- These can be used for chemistry, immunohematology as well as therapeutic drug monitoring.
- Gently invert 5 times as soon as blood is collected.

GREEN TOPPED TUBES – HEPARIN

- The anticoagulants **sodium heparin, ammonium heparin and lithium heparin** are found in green-topped vacuum tubes.
- Can be used for STAT blood work since clotting won't happen with this tube.
- These can be used for BUN, ionized calcium, creatinine, electrolyte studies, thyroid and more
- Gently invert 8 – 10 times as soon as blood is collected.

PURPLE (LAVENDER) TOPPED TUBES

- Contains **EDTA** (Ethylenediaminetetraacetic acid)
- Used for hematology procedures such as CBC, platelets, immunology, A1C and hemoglobin.
- This tube must be gently inverted 8 – 10 times after blood collection to avoid the possibility of micro clots forming from lack of proper mixing of the EDTA with the blood.

PINK TOPPED TUBES

- Contains **EDTA**.
- Used for blood bank collections. Has the pink closure and a label that meets the AABB required for blood banks.
- Gently invert 8 – 10 times after blood collection.

ROYAL BLUE TOPPED TUBES

- Used to collect blood for nutritional studies and toxicology.
- Contains **EDTA**.
- Gently invert 8 times following blood collections.

GREY TOPPED TUBES

- Contain a white powder in bottom of tube that has **potassium oxalate** and **sodium fluoride**. These ingredients prevent the breakdown or metabolism of glucose by blood cells.
- Used for blood glucose levels (PC and AC).
- Gently invert 8 times immediately following blood collection.

YELLOW TOPPED TUBES

- Used to collect blood for clients diagnosed with Anemia of Chronic Disease (ACD)
- Invert 3 to 4 times following blood collection

Healthcare professionals must ensure that they check the expiry date on all specimen bottles and check for fill lines. You should also inspect any fluids in the vacutainer to ensure it is not discolored.

Correct order of draw for venipuncture

Order	Description	Mixing	Picture
1	Blood Cultures 1. Aerobic 2. Anaerobic 3. Pediatric	**8-10x**	
2	Citrate tube - (**Blue**) ***Must be completely filled – use discard tube when using a winged collection set**	**3-4x**	
3	Citrate tube – ESR (Black)	**3-4x**	
4	Plain Serum Tubes (**Red**)	**5x**	
5	Serum tube with/without clot activator/gel (**Gold**)	**5x**	
6	Lithium Heparin with Gel, PST (**Green**) Heparin tube (**Green**)	**8-10x**	 
7	EDTA tube **Lavender** **Pink** **Royal Blue**	**8-10x**	  
8	Oxalate/Fluoride tube (Gray)	**8-10x**	
9	ACD (light **yellow**)	**3-4x**	

Potential Complications

Listed below are some possible complications and steps to be taken if complication is encountered: *this list is not all inclusive*.

Pediatric Patients:

For children, use comfort measures and developmentally appropriate interventions to decrease pain and anxiety during phlebotomy procedures. Examples include; skin to skin, breastfeeding, swaddling, positioning of child, non-nutritive sucking(soothers), sucrose solution, family presence, preparation of child and family, creating a calm environment, distraction, relaxation, and coping techniques.

Fainting/loss of consciousness:

Many clients become dizzy, frightened, or faint at the thought or sight of blood. This may also occur when clients are fasting. The healthcare professional will ask new or nervous clients if there is a history of fainting.

If client indicates that they feel faint, the healthcare professional may:

a. terminate the procedure and remove the needle as required
b. lower the client's head and arms if they are in the sitting position
c. ask client to breathe deeply
d. request the assistance of a co-worker to move client to a secure position
e. apply a cold wet towel to client's forehead and neck area
f. ask client if they would like juice or water
g. remain with client for at least thirty (30) minutes, or report to nursing to ensure patient is monitored.

If client faints, the healthcare professional will:

a. terminate procedure
b. remove needle
c. place client in a secure lying/reclined position, request assistance from a co-worker to slide client to the floor if necessary
d. apply cold compresses to client's forehead and/or neck
e. ensure client who has fainted has recovered completely before being allowed to leave the department
f. request that the client remain in department for at least thirty (30) minutes
g. instruct client not to drive for at least one hour

Hematoma:

When area around puncture site starts to swell, usually blood is leaking into the tissue and causing an ecchymosis and/or hematoma. This complication can occur when the needle has gone completely through the vein, the bevel opening is partially in the vein, or not enough pressure is applied to the puncture site after puncture. The healthcare professional will make every effort to avoid situations that may cause ecchymosis and/or hematoma.

To prevent a hematoma when performing a venipuncture, the healthcare professional will:

1. Ensure proper positioning of the needle in the vein.
2. Remove/loosen tourniquet before removing needle and within one minute of application.
3. Use major superficial veins.

If a hematoma begins to form:

1. remove the tourniquet and needle
2. Apply direct pressure to the puncture site for a minimum 2 minutes and reassess.
3. Immediately If bleeding continues past 15 minutes:
   i. recommend the client go to the Emergency/Urgent Care Department

Vomiting:

In the event of vomiting, there is the risk that the client may aspirate. The procedure for dealing with a client who is vomiting is:

a) if client is sitting, have them lean forward and use an emesis basin or trash can
b) if client is lying down, turn their head to the side and provide an emesis basin or trash can
c) provide client with tissues or towels
d) apply cold compresses to client's forehead
e) be patient and compassionate, do not make client feel that they are imposing on you, or taking too much of your time

Convulsions/ Seizures:

Convulsions/ seizures may be caused by the client's pre-existing condition or a reaction to the pain caused by the needle. If the healthcare professional observes that a client is convulsing or seizing, they will:

a) remove needle
b) do not place anything in client's mouth
c) protect client from hitting their head or hurting themselves without restraining movements of client extremities completely

Nerve Damage:

Nerves are neither visible nor palpable, so healthcare professionals must be knowledgeable about the location of nerves in the antecubital area. Nerve injury is an inherent risk of phlebotomy (venous or capillary); however most nerve injuries are the result of poor techniques.

To prevent nerve damage, the healthcare professional will:

1. Be knowledgeable about location of nerves in the antecubital area.
2. Not enter the vein at an excessive angle of insertion.
3. Avoid excessive probing.

Signs that a nerve has been compromised include, but are not limited to:

- Shooting electrical pain sensation.
- Tingling or numbness down the arm to the fingers.
- Lack of grip strength and/or mobility of the arm.
- Sharp pain on insertion of the needle.
- Client states: "I have never felt anything like that before."

If the healthcare professional suspects nerve damage, they will:

a) immediately remove needle and perform venipuncture on a different site, preferably opposite arm
b) ask client to wiggle fingers and move arm
c) apply ice if necessary
d) inform client if pain persists seek medical assistance

Arterial Nick:

Arteries do not feel like veins. Arteries pulsate, are more elastic and have a thick wall. Due to the proximity of the brachial artery to the basilic vein, healthcare professionals will avoid drawing blood from basilic vein when possible. Nicks to the brachial artery are not always evident. If undetected, hemorrhaging can occur and continue long after puncture.

In the event of an arterial nick or entering an artery instead of a vein, the blood entering the tube will be bright red and will enter the tube with great force. If the healthcare professional suspects an arterial nick or puncture, they will:

a) remove needle immediately
b) apply pressure for at least 10 minutes or longer until bleeding has stopped
c) apply ice if necessary
d) inform client that a bruise may occur

Prolonged/Excessive Bleeding:

A client should stop bleeding within five (5) minutes of venipuncture. Clients on anticoagulant therapy, arthritis medication, other medications, or inherited blood disorder may bleed for a longer period. In the event of prolonged/ excessive bleeding, the healthcare professional will:

a) inquire about medication history/ bleeding disorder
b) continue to apply pressure until the bleeding stops
c) if bleeding continues for more than fifteen (15) minutes recommend the client go to the Emergency /Urgent Care Department,
d) complete an incident report

Collapsed Vein:

If a syringe plunger is withdrawn too quickly or vacuum draw of a tube is too great, the vein may collapse, especially when blood is being collected from smaller veins and veins in geriatric clients. The healthcare professional will:

a) pull slowly on the syringe plunger or use an evacuated tube with a smaller volume when performing a venipuncture procedure on clients with smaller veins and geriatric clients
b) not probe a collapsed vein
c) immediately remove needle if a collapsed vein is suspected
d) attempt procedure one more time using a smaller gauge needle/winged infusion set, and if unsuccessful after two attempts, ask another healthcare professional, to perform the procedure, to a **maximum of four (4) total attempts**

Tremors:

If the client suffers from tremors, when possible, have an additional employee hold the arm to stabilize the collection site.

Patient/client with Burns:

Clients with burns are highly susceptible to infection. When possible, burned areas will be avoided.

Diabetic Clients:

When a diabetic client presents for blood work, they may be experiencing hyperglycemia (high blood glucose), or hypoglycemia (low blood glucose). If the client is not feeling well the client should be prioritized so that the client is seen immediately. In the case of a hypoglycemic client a drink or snack may be provided, if available, after the blood is collected.

Edema:

Some clients develop abnormal accumulation of fluid in the intercellular spaces of the body. This swelling may be localized or diffused over a large area of the body.

Excessive swelling can alter the composition of the blood passing through the affected limb. Veins in these areas are difficult to palpate. Avoid drawing blood from these sites.

Hemolysis:

Hemolysis is the result of the rupture of erythrocytes, (red blood cells), and the release of hemoglobin into the blood. Depending on the degree of hemolysis, the serum/plasma may appear pink/red. Hemolysis can seriously affect test results and healthcare professionals will make every effort to prevent hemolysis.

Hemolysis may be caused by, but is not limited to:

- Improper phlebotomy techniques such as using a needle that is too small, pulling a syringe plunger back too fast, expelling blood vigorously into a tube instead of allowing the vacuum to draw blood into the tube, and mixing tubes vigorously
- Exposure of blood specimens to extreme heat or cold
- Delay in transporting blood to the laboratory
- Residual alcohol at skin puncture site
- Milking of capillary collection site
- Collection/ improper collection using indwelling lines
  NOTE: Some clients may exhibit hemolysis from certain medical conditions.

Mastectomy:

During mastectomy, clients undergo the removal of lymph nodes which control fluid balance in the arm on the same side and produce infection fighting lymphocytes. Therefore, mastectomy clients have an increased susceptibility to infection and a painful, long-lasting fluid imbalance (lymphoedema) when venipunctures and finger punctures are performed on the affected side. Blood drawn from the limb may be altered from that of the general circulation and may present the physician with misleading results.

Mastectomy clients are susceptible to infection in the affected limb from even the smallest skin break. It is advisable that blood is not collected from the affected arm. Blood can be drawn only as a last resort and must have a completed Phlebotomy Deviation form, (Lab only), to use the arm on the side on which a mastectomy was performed.

Single Mastectomy:

a. If a client informs the healthcare professional that they have had a mastectomy (breast removal), the healthcare professional will draw blood from the arm opposite the mastectomy site when possible.
b. Never use a tourniquet on the arm of the side that has had a mastectomy.

Double Mastectomy:

a. If client informs the healthcare professional that they have had a double mastectomy and expresses concern about having their blood drawn and/or has signs of edema, the healthcare professional will not draw blood from client.
b. The healthcare professional must have written permission from the Authorized Provider and client will be informed of this process.
c. Never use a tourniquet.

Obesity:

Obese clients generally have veins that are difficult to palpate and feel because their veins are much further from the surface.

Course of Action:

a. The healthcare professional will attempt venipuncture only twice (2), maximum of 4 total attempts.
b. The healthcare professional will not probe excessively with the needle.
c. If a vein cannot be found, refer to Site Selection for alternative sites or use a vein finder if available.

Petechia:

Small red spots appearing on a client's skin may indicate that minute amounts of blood have escaped into skin epithelium. This complication may be a result of a coagulation abnormality such as platelet defects or defective capillary walls. Petechia is very common in leukemia and chemotherapy clients, which may result in prolonged bleeding.

If petechia does appear and if the petechia advances; recommend that they see their primary care provider or after-hours clinic.

Osteomyelitis:

Heel punctures for capillary sampling may cause osteomyelitis of the heel bone if puncture is too deep or puncture is performed outside the approved area. All healthcare professionals must ensure correct procedures are followed for collection of heel punctures.

Sclerosed/Scarred/Thrombosed Veins/Skin Disorders:

Sclerosed veins are veins that have hardened because of inflammation and disease of interstitial substances. Clients' veins that have been punctured repeatedly often become scarred and feel hard when palpated. Thrombi are solid masses derived from constituents that reside in blood vessels. A thrombosis may partially or fully occlude a vein or artery and should be avoided. Blood is not easily collected from sclerosed/ scarred/ thrombosed veins.

The healthcare professional will avoid collecting blood from:

- sclerosed/scarred/thrombosed veins
- sites with rashes, burned, scarred or otherwise injured
- sites with bruising
- sites with inflammation
- sites with infection

Skin Breakdown:

Skin breakdown can occur from repeated use of adhesive strips, particularly in the young or very elderly clients. This can be avoided by applying sufficient pressure at the puncture site until bleeding has stopped and trying a paper tape product.

AV Fistula:

Blood should never be drawn from an AV fistula since access may induce an infection necessitating reparative surgery because of the potential for complications. All draws to an arm containing an AV fistula should be avoided.

Please refer to **Appendix I**: "*Don't Go There*" for areas to avoid for venipuncture.

Decontamination of the Puncture Site (Routine Venipuncture)

Rationale:

To provide a clean/decontaminated area of the skin in which to make the needle puncture.

Equipment:

- Gloves
- Commercially packaged alcohol pads
- Blood culture decontamination swabs (e.g., chlorhexidine)

Preparation:

1. Identify the client properly (full name, DOB and PPRN)
2. Wash or sanitize your hands using appropriate agents, dry them and put on gloves.

Procedure:

1. Once the site is selected, cleanse it with a commercially packaged alcohol pad
2. Rub the site with the alcohol pad, working in concentric circles from the inside out. If the skin is dirty, repeat the process with a new alcohol pad.
3. Remember to cleanse the site again if you intend to touch or palpate the site again. Allow the site to air dry or use a sterile dry gauze to wipe once in a downward motion.
4. Allow the area to air dry for 30 seconds. Do NOT attempt to "fan" the area to speed up drying time.
5. After the site has been cleansed, reapply the tourniquet and proceed with the venipuncture procedure.

Watch this VIDEO to l earn how to cleanse the puncture site.

Performing a Venipuncture Using the Evacuated Tube Method

Rationale:

To provide a safe, reliable, effective, and efficient method to obtain blood specimens.

Equipment:

- Personal protective equipment (PPE) as required
- Lab requisition and/or labels
- Evacuated specimen tubes and blood culture bottles
- Sterile, single use safety needles
- Tube holders
- Non-latex tourniquets
- Antiseptics – alcohol pads and/or chlorhexidine as required
- Marking pens
- 2 x 2 gauze
- Tape

Preparation:

1. After greeting, assessing, and identifying the client, decontaminate your hands and check the antecubital area for a suitable vein.
2. Assemble supplies and double check expiration dates and integrity of tubes. Gently tap the tubes containing additives to remove any additive that may be adhering to the closure/stopper.
3. Offer to answer questions for the client while putting on your gloves.
4. Position the client's arm in a straight downward manner that is comfortable and cleanse the puncture site.

Procedure:

5. Prepare specific supplies according to the manufacturer's instructions, including attaching a needle onto the holder when necessary. Be sure that the needle is securely attached so that it does not unthread or detach during use.
6. Apply the tourniquet, ask the client to "make a fist" and check for potential sites in this order:

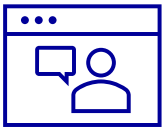
a. Arm (antecubital – median cubital, cephalic veins)
b. Back of hand
c. Wrist (excluding palm side)
d. Foot/ankle

7. If unable to a find suitable site after checking both sides, consider applying heat for 10 minutes to site prior to attempting venipuncture.
8. Cleanse the site chosen with alcohol in a circular motion from inside to outside. Allow the site to air dry. **Do not blow on it or fan the area!** Do not touch the venipuncture area after cleansing it.

9. Remove the needle cap carefully to not touch anything that would contaminate it. Check the needle for defects and replace it if it is defective.
10. Hold the needle assembly in one hand while the thumb of the other hand anchors the vein 1 to 2 inches below the puncture site.
11. Position the needle so that it is in the same direction as the vein, and it is at a slight angle (**30 degrees or less**) with the skin surface.
12. With the **bevel side up**, insert the needle quickly. A slight "pop" should be felt as the needle enters the vein.
13. While keeping the needle assembly stable in the vein, center the first collection tube in the holder and gently push it onto the holder. As it is pushed into the holder, the blood should begin to flow into the tube.
14. If the blood does not flow, palpate gently above the puncture to feel for the vein and possibly reorient the needle slightly. DO NOT PROBE.
15. As the blood begins to flow, instruct the client to open the fist. The tourniquet can be left on until all the tubes have been filled if it appears that blood flow is slow and it has not been on for over a minute; however, remember that prolonged tourniquet use causes other complications. **ALWAYS remove the tourniquet before the needle.**
16. Allow the blood to flow into each collection tube until it stops so that proper dilution of blood to additive can occur. Watch carefully to see when the blood flow ceases. If multiple sample tubes are to be collected, remove each tube from the holder with a gentle twist-and-pull motion and replace it with the next tube.

- Hold the needle apparatus firmly and motionlessly so that the needle remains comfortable and in the vein during tube changes.
- Keep additive tubes in a downward position.
- Follow the correct "order of draw"
- Always remove the last tube of blood from the tube holder's inner needle before removing the needle from the patient's vein.
- Remember that blood stops flowing between tube changes because of the inner needle design, which allows a sleeve to block blood flow if is not in use.

17. When all the tubes have been filled and removed from the holder, remove the tourniquet if it has not already been done, withdraw the needle, and hold a gauze pad over the site.
18. Activate the safety device on the needle and discard in an appropriate container.
19. If the client is capable, instruct them to apply pressure to the site using the gauze. If necessary, continue gentle inversion of the specimen tubes for complete mixing of additives with the blood.
20. Apply pressure until the bleeding has stopped, then apply a bandage.
21. Label the specimens appropriately using preprinted labels or handwritten ones (client's first and last name, PPRN, date, time of collection and healthcare professional's initials) Reconfirm identity of client with labels.



Watch this VIDEO to view venipuncture using the evacuated tube

Hand Vein Venipuncture Using a Winged Infusion/Butterfly Set

Rationale:

Winged infusion or butterfly needle devices are useful for venipuncture for smaller veins and geriatric clients. Use of this system requires training and practice, and smaller veins require more care as the site is being selected and prepared. Many clients report that these types of devices are less painful, perhaps due to a smaller needle size.

Equipment/Supplies:

- Personal protective equipment (as required)
- Lab requisitions and/or labels
- Evacuated specimen tubes and blood culture bottles
- Sterile, single-use safety needles
- Tube holders
- Nonlatex tourniquet
- Antiseptics – alcohol pads and/or other skin disinfectants
- Marking pens
- 2 x 2 gauze
- Tape

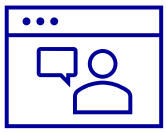
Preparation:

1. After greeting, assessing, and identifying the client, decontaminate your hands and check the antecubital area for a suitable vein.
2. Assemble supplies and double check expiration dates and integrity of tubes. Gently tap the tubes containing additives to remove any additive that may be adhering to the closure/stopper.
3. Offer to answer questions for the client while putting on your gloves.
4. Position the client's arm in a straight downward and/or hand in a manner that is comfortable, apply the tourniquet in the correct location and cleanse the puncture site.

Procedure:

1. Note that hand veins are smaller and may "roll" more easily than veins in the antecubital area of the arm. If the hand is made into a relaxed fist, the veins are slightly more taut and more stable.
2. When the site is selected, apply the tourniquet, and cleanse the site with an alcohol pad as described in previous procedures.
3. Position the needle at a slight angle to the skin. If using a hand vein, the angle of insertion is smaller than for venipuncture in the antecubital area of the arm. It is inserted almost parallel to the vein. Hold the needle by the "wings" (with the bevel side up), which allows for a close and precise needle insertion point.
4. If the procedure is progressing quickly, the tourniquet can be left on while the tubes are filling. However, if it has been more than 1 minute, remove the tourniquet as the tubes fill.
5. When the last tube has filled, remove the tube, and prepare to hold clean sterile gauze to the puncture site. Activate the safety device while the needle is still in the vein, and place clean sterile gauze on the site.

6. If the client is capable, instruct them to apply pressure to the site using the gauze. If necessary, continue gentle inversion of the specimen tubes for complete mixing of additives with the blood.
7. Apply pressure until the bleeding has stopped, then apply a bandage.
8. Label the specimens appropriately using preprinted labels or handwritten ones (client's first and last name, PPRN, date, time of collection and healthcare professional's initials) Reconfirm identity of client with labels.



Watch this VIDEO to view venipuncture using a butterfly needle!

Syringe Method

Rationale:

Syringes are not routinely used for venipuncture because of many safety concerns; issues of accidental cross-contamination of anticoagulants if the blood specimen is injected into multiple evacuated tubes using the same needle and syringe, excessive or forceful withdrawal such that the sample is adversely affected, and potential clotting in the syringe. However, use of a blood transfer device can minimize some of these problems. There are also circumstances where a syringe is helpful, such as for veins that collapse easily. In this case, syringes help because the pressure withdrawing the blood can be more easily and gently controlled.

Equipment:

- Personal protective equipment as required.
- Lab requisitions and/or labels
- Evacuated specimen tubes and blood culture bottles
- Safety needles
- Safety syringes and blood transfer devices
- Tube holders
- Non latex tourniquet
- Antiseptics
- Marking pens
- 2 x 2 gauze
- Tape

Preparation:

1. After greeting, assessing, and identifying the client, decontaminate your hands and check the antecubital area for a suitable vein.
2. Assemble supplies and double check expiration dates and integrity of tubes. Gently tap the tubes containing additives to remove any additive that may be adhering to the closure/stopper.
3. Offer to answer questions for the client while putting on your gloves.
4. Position the client's arm in a straight downward and/or hand in a manner that is comfortable, apply the tourniquet in the correct location and cleanse the puncture site.

Procedure:

1. Using a syringe and needle with a safety device, assemble the two. Before the needle is inserted into the puncture site, remove the needle cap, and move the syringe plunger back and forth to allow for free movement and to expel all are from the barrel of the syringe. (Remember a syringe can also be connected to a butterfly needle)
2. Use the same approach for needle insertion as is used for the evacuated tube method (hold the skin taut, check the bevel orientation, and verify the insertion angle). Orient the syringe so that the graduated markings are visible.
3. Hold the needle/syringe in one hand while the thumb of the other hand anchors the vein 2.5 – 5.0 cm below the puncture site. Position the needle/syringe so that it is oriented in the same direction as the vein and is at an angle of **30 degrees or less** with the skin surface. With **bevel side up**, insert the needle quickly. A slight "pop" should be felt as the needle enters the vein.
4. Once the needle is in the vein, take care to keep it stable while the syringe plunger is drawn back slowly until the required amount of blood is drawn. Try not to accidentally withdraw the needle while pulling back on the syringe and do not pull hard enough to cause hemolysis (rupture of the cells) or collapse the vein.
5. Release the tourniquet as soon as blood begins to flow.
6. After tourniquet release and collection of the appropriate amount of blood, withdraw the entire needle/syringe assembly quickly. Activate the safety device immediately according to the manufacturer's specifications. Apply a sterile, dray gauze pad to the puncture site and ask the client to assist in applying gentle pressure.
7. Remove the covered needle (or butterfly) that is attached to the syringe and discard it appropriately.
8. After applying a syringe transfer device, immediately fill the evacuated collection tubes using the same "order of draw" as for the evacuated tube method of venipuncture.
9. Fill each tube by inserting it into the syringe transfer device. Do not push the plunger to expel the blood; the tubes will fill because of the vacuum in the collection tube. Carefully watch as the tube fills until it stops. This will assure the correct ratio of blood to additive. Remove the first tube and replace it with the next one.
10. Mix additive tubes by gently inverting them according to manufacturer's instructions.

After the procedure:

11. Discard the syringe attached to the blood transfer device as one unit. Also discard used supplies and label the specimens; check the patient to see if bleeding has stopped.
12. Apply a bandage and instruct client to leave it on for 15 minutes.

Watch this VIDEO to view venipuncture using the syringe method!

Site Preparation for Blood Culture Collection

Rationale:

To obtain a sterile puncture site because bacteria normally located on the skin can contaminate a blood culture if it is not properly cleansed before the venipuncture.

Equipment:

- Personal protective equipment as required.
- Isopropyl alcohol preps
- 2 chlorhexidine gluconate swab sticks (2 packages)
- 2 blood culture bottles (1 for anaerobic microorganisms and 1 for aerobic microorganisms) check expiry date for each bottle
- Tourniquet

Preparation:

1. Identify the client properly and explain the test.
2. Wash or sanitize your hands with an alcohol hand rinse, put on gloves and prepare and assemble equipment and supplies next to patient. Place tourniquet on arm.

Procedure:

1. Locate the vein, loosen the tourniquet, scrub the site of the venipuncture with 70% alcohol for 60 seconds to rid the site of excess dirt. Then scrub the site with a chlorhexidine gluconate swab for at least 30 seconds. The chlorhexidine swab should initially be placed at the site of needle insertion then moved outward in concentric circles to a diameter of approximately 2.5 inches. SCRUB WITH FRICTION!! Allow to dry for 30 seconds.
2. Collect blood following safety syringe method or butterfly method.

Watch this VIDEO to view cleansing a site for blood culture collection

Safety Butterfly Assembly Blood Culture Collection

Rationale:

To perform a blood culture collection using a safety butterfly.

Equipment:

- Personal protective equipment as required.
- Isopropyl alcohol preps
- 2 chlorhexidine gluconate swab sticks (2 packages)
- 2 blood culture bottles (1 for anaerobic microorganisms and 1 for aerobic microorganisms) check expiry date for each bottle
- Safety needles or blood collection set
- Safety sterile syringe or evacuated safety tube assembly and blunt tipped cannula for syringe and direct draw holder/adapter
- Sterile gauze pads
- Tourniquet
- Pen
- Zip lock bags

Preparation:

1. Identify the client properly and explain the test.
2. Wash or sanitize your hands with an alcohol hand rinse, put on gloves and prepare and assemble equipment and supplies next to patient. Place tourniquet on arm.

Procedure:

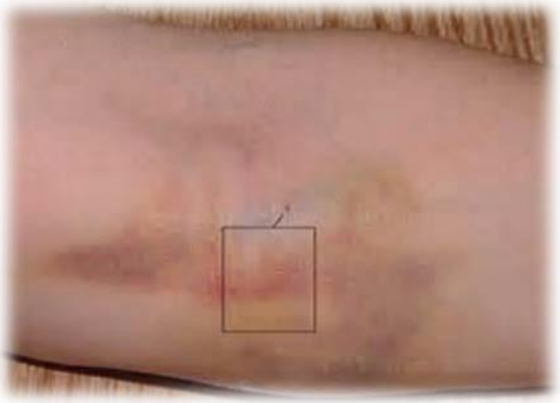
1. Locate the vein, loosen the tourniquet. Disinfect the rubber septum on the blood culture bottles with 70% isopropyl alcohol and allow it to dry.
2. Scrub the site of the venipuncture with 70% alcohol for 60 seconds to rid the site of excess dirt. Then scrub the site with a chlorhexidine gluconate swab for at least 30 seconds. The chlorhexidine swab should initially be placed at the site of needle insertion then moved outward in concentric circles to a diameter of approximately 2.5 inches. SCRUB WITH FRICTION!! Allow to dry for 30 seconds.
3. Reapply the tourniquet, anchor the vein and smoothly insert the needle, bevel up.
4. Use a safety butterfly assembly for insertion of the butterfly needle into the venipuncture site after the appropriate skin preparation.
5. It can be helpful to place a strip of tape over the butterfly wings to keep the needle in place as the blood culture bottles are filled with blood.
6. Transfer the blood to the microbiology bottles via a direct draw adapter that fits directly over the blood culture bottle.
7. Using this method, blood is transferred to the aerobic bottle first, since the assembly tubing contains air.

8. At the client's bedside, label the tubes and/or bottles and label each culture bottle with the site of the specimen collection. Double check the patients name and date of birth.
9. Place tubes in sealable collection bag for transport.
10. Document the date and time the specimen was obtained and the site of the specimen collection.
11. Discard the safety butterfly collection set in the sharps biohazardous container.

Special Considerations

Reducing Hematoma Complications

Hematomas are caused by blood leakage into the surrounding tissues. Methods for reducing the likelihood of hematoma formation include the following:



- Strive to insert the needle at the correct angle through the upper vein wall, but not through the lower vein wall.
- When collecting blood into multiple tubes, hold the needle very steady when changing tubes so that the needle does not slip out of or completely through the vein wall.
- Remove the tourniquet prior to removing the needle from the client's arm.
- Use the recommended antecubital veins.
- Check for hematoma formation during the procedure and immediately after the needle is withdrawn from the skin and apply pressure to the gauze.

Avoiding Specimen Hemolysis

Methods for avoiding specimen hemolysis include the following:

- After decontamination with alcohol, allow the site to air dry.
- Do not collect a blood specimen in a site that has a hematoma.
- When using syringe method, attach the needle securely to the syringe; otherwise, "frothing" may occur, which causes damage to red blood cells.
- When using the syringe method, avoid pulling the syringe plunger back too quickly, because it will cause excessive force as the blood enters the syringe, causing cellular damage.
- When mixing blood tubes containing additives, do not shake the tubes; instead, gently invert them.
- Follow manufacturers recommendations to ensure all equipment is compatible

Avoiding Specimen Rejection from Lab

Laboratory departments have policies in place on the acceptance of specimens for lab testing. Specimens that are unusable for various reasons include the following:

- Identity discrepancies between requisition forms and labeled tubes
- Identity completely lacking or illegible
- Inadequate amount of blood resulting in unacceptable additive to blood ratios
- Hemolyzed specimens
- Specimens in the wrong collection tubes
- Specimens that were improperly transported/stored
- Anticoagulated specimens that contain blood clots
- Use of outdated equipment or supplies
- Contaminated specimens
- Client not adequately instructed about dietary restrictions
- A timed sample drawn at the wrong time or with the time recorded incorrectly.

Client Refusal

Every health care facility should have procedures for documenting a client's refusal to have blood collected. All clients have the right to refuse treatment. The healthcare professional can explain to the client that lab results are used to help the physician/nurse practitioner make an accurate diagnosis, establish proper treatment, and monitor the client's health status. If the client continues to refuse, the healthcare professional must acknowledge the client's right to refuse. Documentation of the refusal should be made, and the physician or nurse practitioner should be notified

Appendix 1: "Don't Go There"

References

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