CHAPTER 2
Hematological Tests

COLLECION OF VENOUS AND CAPILLARY BLOOD SAMPLES

Outline

- Introduction to sample collection
- Capillary blood collection
- Venous blood Collection
- Difference Between capillary and Venous Blood
- Complication of venous blood collection
- Arterial blood collection

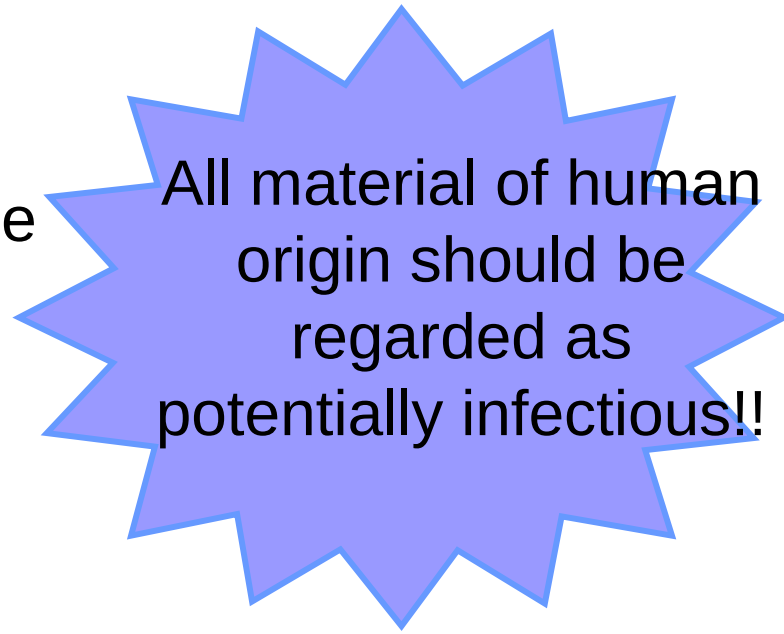
Introduction to sample collection

- proper collection and reliable processing of blood specimens is a vital part of the laboratory diagnostic process in hematology as well as other laboratory disciplines.

- Blood must be collected with care and adequate safety precautions to ensure:
  - test results are reliable
  - contamination of the test sample is avoided and
  - infection from the blood transmissible pathogens is prevented.

Introduction cont'd

- All material of human origin should be regarded as potentially infectious
- When collecting blood sample, the operator should wear **disposable rubber gloves**
- The operator is also strongly advised to cover any cuts, abrasions or skin breaks on the hand with adhesive tape before wearing gloves



Introduction cont'd

- Care must be taken when handling syringes and needles
- Do not recap used needles by hand
  - needle-stick injuries are the most commonly encountered accidents.
- Should a needle-stick injury occur:
  - immediately remove gloves
  - vigorously squeeze the wound while flushing the bleeding with running tap water
  - thoroughly scrub the wound with cotton balls soaked in 0.1% hypochlorite solution.
  - Report to supervisor immediately
- **Adhere to national guideline on HIV exposure risk regarding post exposure prophylaxis (PEP)**

Introduction cont’d

- Used disposable syringes , needles, other sharp items such as lancets must be placed in puncture-resistant container for subsequent decontamination or disposal.

Capillary blood collection

- Also referred to as microblood samples collection/dermal puncture
  - Is collecting blood after an incision is made to the skin with a lancet
- Preferred when only small quantities of blood are required
  - e.g., for hemoglobin quantitation, for WBC and RBC counts and for blood smear preparation



Capillary blood collection cont'd

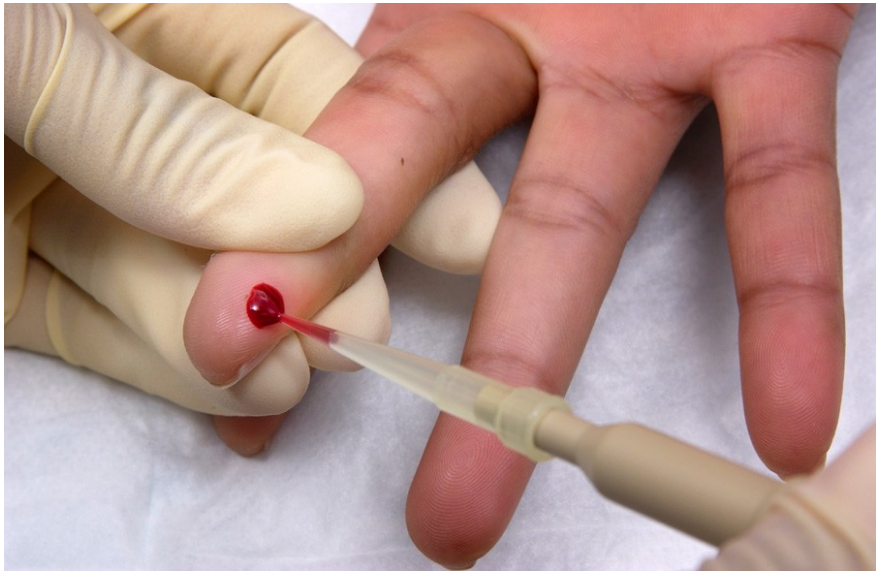
- also used when venipuncture is impractical, e.g.,
  - In infants
  - In cases of severe burns
  - In extreme obesity where locating the veins could be a problem
  - In patient whose arm veins are being used for intravenous medication

Capillary blood collection cont'd

- **Sites of Puncture**
  - Adults and children:
    - Palmer surface of the tip of the ring or middle finger or free margin of the ear lobe
  - Infants: plantar surface of the big toe or the heel.

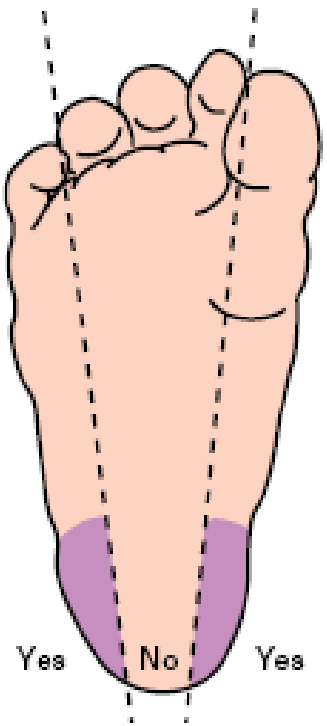
Finger Prick





Capillary blood collection cont'd

- The areas of the foot of a baby or infant that are suitable for obtaining capillary blood



Heel Prick



Capillary blood collection cont'd

Considerations:

- Edematous, congested and cyanotic sites should not be punctured.
- Cold sites should not be punctured as samples collected from cold sites give falsely high results of hemoglobin and cell counts.
- Site should be massaged until it is warm

Capillary sample collection method

- Materials Required
  - Cotton or gauze pads
  - 70% alcohol or other skin antiseptic
  - sterile disposable lancet (Automatic lancet)





Capillary sample collection method cont'd

Technique:

1. Rub the site vigorously with cotton or a gauze pad moistened with 70% alcohol
   - to remove dirt and epithelial debris and
   - to increase blood circulation in the area

- If the heel is to be punctured, it should first be warmed by immersion in a warm water or applying a hot towel compress. Otherwise values significantly higher than those in venous blood may be obtained.

Cont’d

2. After the skin has dried, make a puncture 2-3mm deep with a sterile lancet.
   - A rapid and firm puncture should be made with control of the depth.
     - A deep puncture is no more painful than a superficial one and makes repeated punctures unnecessary.

Cont’d

- The first drop of blood which contains tissue juices should be wiped away
- The site should not be squeezed or pressed to get blood since this dilutes it with fluid from the tissues.
  - a freely flowing blood should be taken or a moderate pressure some distance above the puncture site is allowable

Capillary blood collection cont'd

3. Stop the blood flow by applying slight pressure at the site preferably with a gauze pad
   - Cotton balls are not recommended, because they stick to the site and can initiate bleeding

- **Advantages of Capillary Blood**
  - obtained with ease.
  - the preferred specimen for making peripheral blood films since no anticoagulant is added that may affect cell morphology.

Cont'd

- **Disadvantages of Capillary Blood**
  - only small amounts of blood can be obtained and repeated examinations require a new specimen.
  - Platelet count cannot be performed on capillary blood
    - some platelets are unavoidably lost by adherence onto the wound.
  - Precision is poorer in capillary than venous blood
    - because of variation in blood flow and dilution with interstitial fluid.
  - Blood in microtubes frequently hemolyse
    - hemolysis interferes with most laboratory tests.

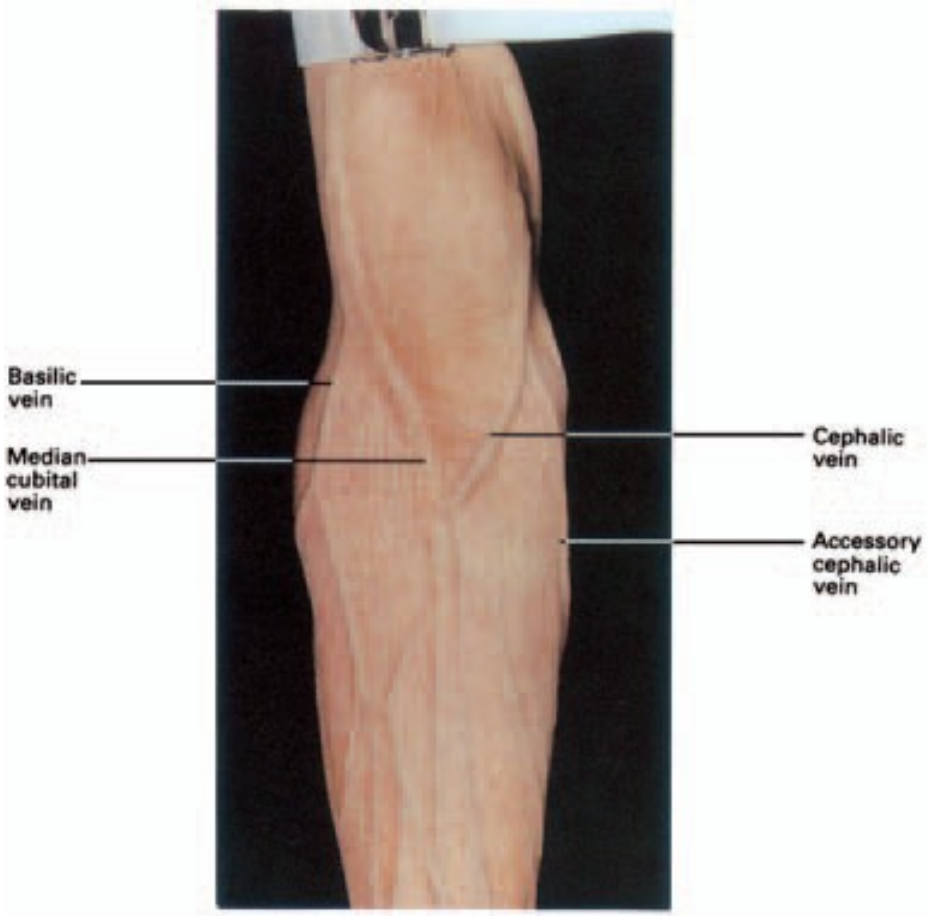
Venous Blood Collection

- Collection of blood from the vein (venipuncture)
- Also referred to as phlebotomy
- Necessary for most tests that require anticoagulation or larger quantities of blood, plasma or serum.

- **Sites of Puncture**
  - Veins of the forearm are preferred; wrist or ankle can also be used
  - veins in the **antecubital fossa** of the arm are the preferred sites
    - they are larger than those in the wrist or ankle regions
    - hence are easily located and palpated in most people.

-The three main veins in the forearm

1. Medial Cubital
   - First choice well anchored and easy to penetrate
2. Cephalic
   - On the outside surface
   - Well anchored
3. Basilic
   - Not well anchored, tends to roll, painful and can cause nerve damage



Anterior surface of the left arm showing veins most suitable for venepuncture.

Venous Blood Collection cont'd

Venous blood collection in infants and children

- presents special problems
  - small size of the veins
  - difficulty in controlling the patient; needs excellent interpersonal skill
  - Require experience
- Areas also used for obtaining blood
  - external jugular vein in the neck region
  - femoral vein in the inguinal

Venous Blood Collection cont'd

- **Materials**:
  - Gloves
  - vacutainer tube
  - vacutainer tube holder and Two-way needle
  - sterile syringe and needle (if the syringe method is used)
  - tourniquet
  - gauze pads or cotton,
  - 70% alcohol or suitable skin antiseptic
  - test tubes with or without anticoagulant (for syringe method)
  - Sharp container
  - Band Aid (to stop further bleeding)

Vacutainer Tubes color codes??

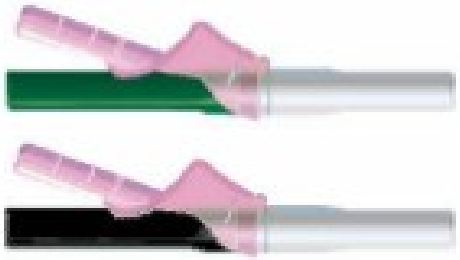


Vacutainer tube holder



Needles

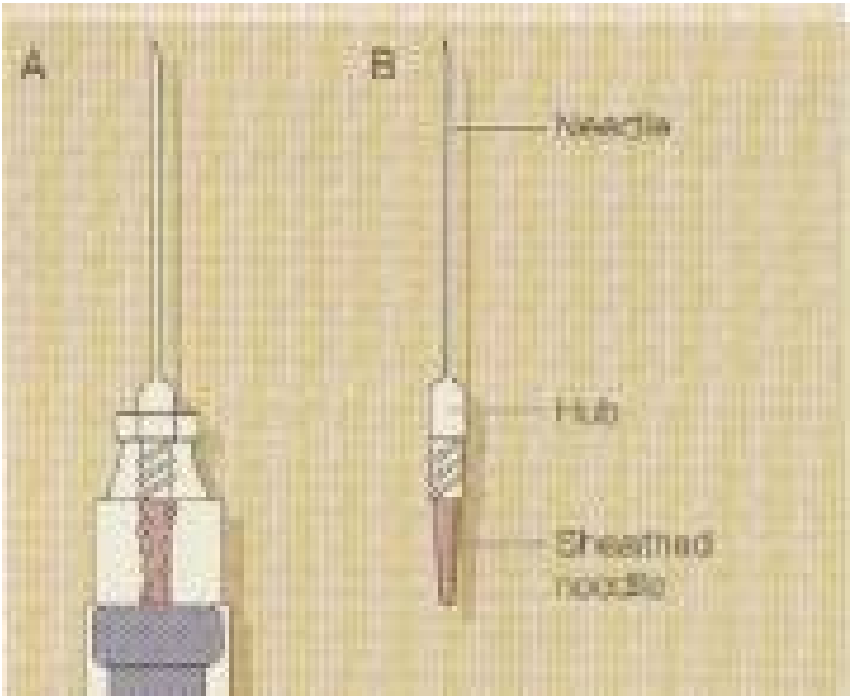
- Sterile, Disposal and for Single use only
- Color coded for size or gauge
- Hollow stainless steel shafts
- Bevel or slant at the end





Needle Features

- Bevel or slant:
  - Must face up
- Shaft:
  - cylindrical portion, length ranges from .65 to 3.80 cm
- Hub:
  - attaches the needle to the holder
- Gauge:
  - The size of the needle, refers to the diameter of the needle



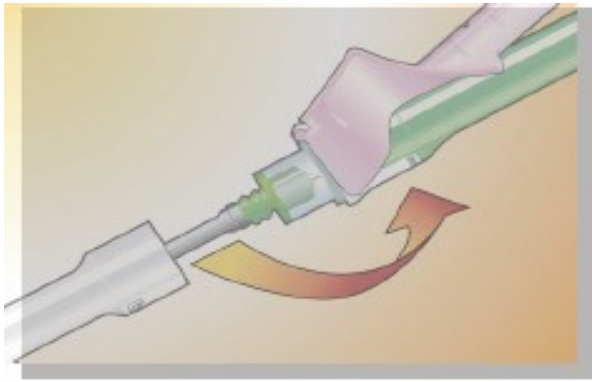
Needle

- Needle Size or Gauge depends on the size and depth of the vein to be punctured
- Gauge is the diameter of the needle
- The larger the gauge number the smaller the needle
- Range from 16 – 25
- Routine: 21 gauge
- Children: 23 gauge
- Most common used 21g by 3.80 cm
- Colored coded for size



Multi Sample Needle

- Used for multiple samples during a single venipuncture
- Composed of a double pointed needle
- The hub screws into the needle holder
- Open with a twist motion



Safety Needles

- Allows the user’s hand to remain behind the needle
- Always use a safety needle when available
- Minimizing exposure to blood borne pathogens



Tourniquet

- Slow down venous flow without affecting arterial flow
- To enlarge the vein for easier location and easier penetration
- To assess the width, direction and depth of veins
- Should be left on for no longer than **one minute**



Gloves

- ‘Universal Precautions” require the wearing of gloves
- Gloves provide protection from infection
- A new pair of gloves must be worn for each client and for each new procedure
- Types: “A good fit is essential”
  - Nitrile
  - Vinyl
  - Latex Free



Sharp container



Vacutainer technique of venous blood collection

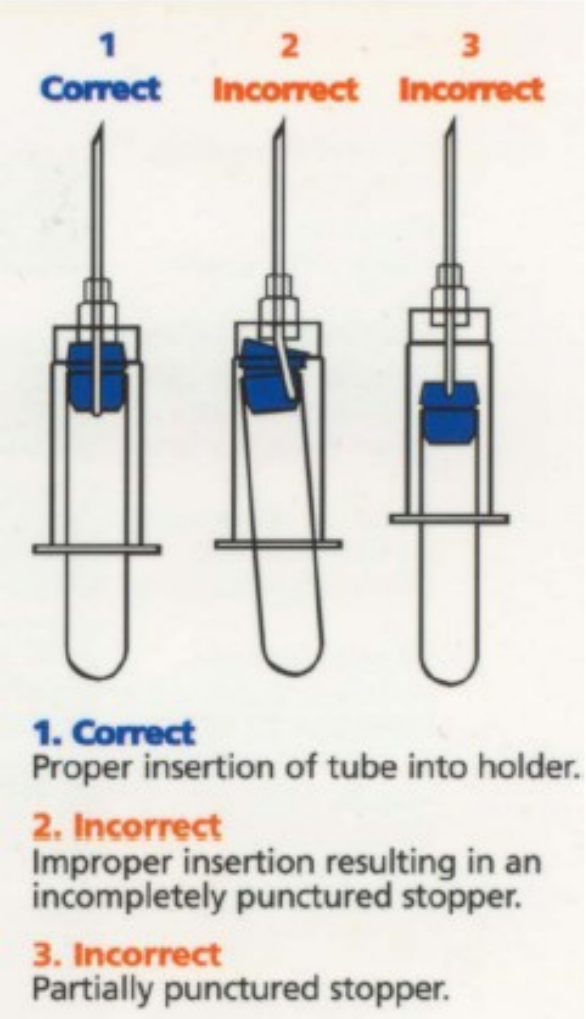
- Techniques

1. Assemble the necessary materials and equipment
2. thread the short end of the double-pointed needle into the holder and push the tube forward until the top of the stopper meets the guide mark on the holder.

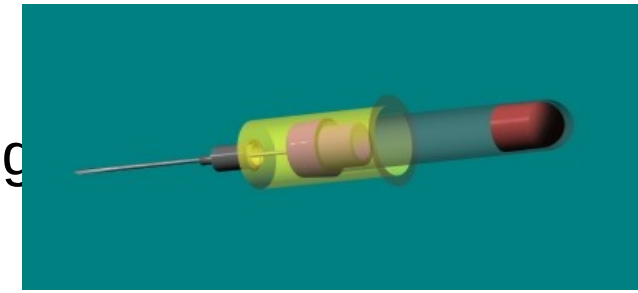
Vacutainer technique cont'd

Needle Holder and Adapter

- The second pointed needle with rubber sleeve resides in the holder
- Push the tube directly into the middle of the holder for proper collection
- Second needle will penetrate top of tube



Vacutainer technique cont’d



- The point of the needle will thus be embedded in the stopper without puncturing it and loosing the vacuum in the tube.

3. Identify **the right patient** and allow him/her to sit comfortably preferably in an armchair stretching his/her arm.
4. Reassure the patient
5. Apply the tourniquet
6. Prepare the arm by swabbing the antecubital fossa with a gauze pad or cotton moistened with 70% alcohol.

Vacutainer technique cont'd

Tourniquet Application

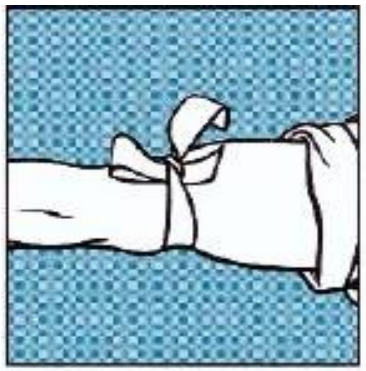
- Position the tourniquet 7.5 – 10 cm above the venipuncture site with strip equal on both sides
- Pull Left side over the Right side and make an X

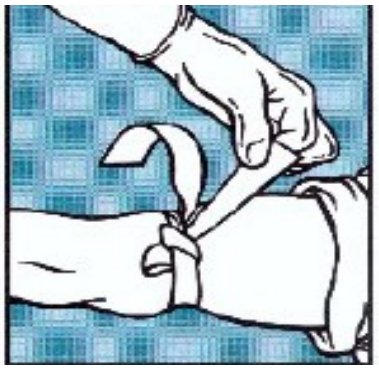




Tourniquet Application cont'd

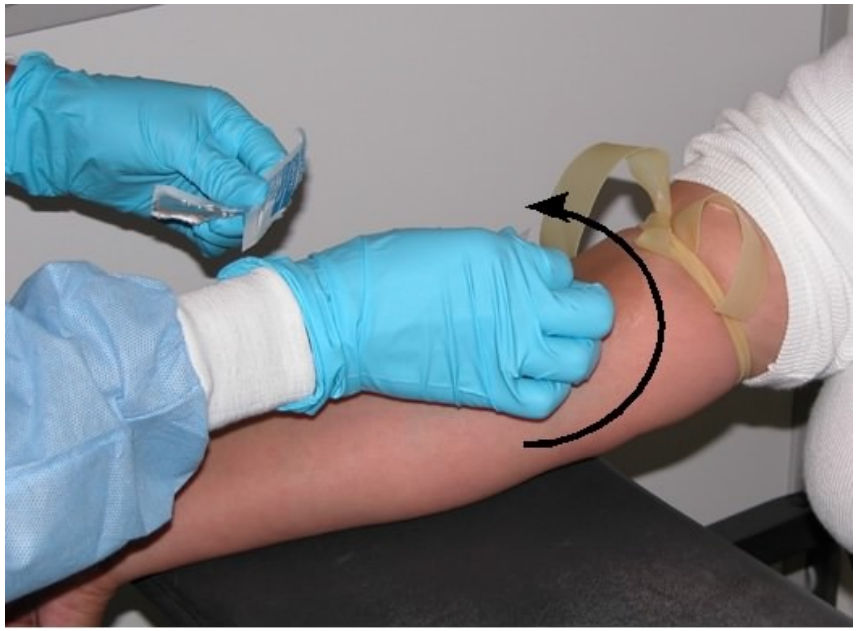
- With X in place, tuck a loop
- Have both ends of strip facing up
- End of the tourniquet that is facing up is used for easy removal





Cleaning the Arm

- Clean the arm using 70% isopropyl alcohol
- Clean area in concentric circles starting at site and ending outside of site. Do not re-touch the cleaned area
- Let air dry



Vacutainer technique cont'd

7. Grasp the back of the patient's arm at the elbow and anchor the selected vein by drawing the skin slightly taut over the vein
8. insert the needle properly into the vein;
   - the index finger is placed along side of the hub of the needle with the bevel facing up
   - The needle should be pointing in the same direction as the vein.
9. Then the point of the needle is advanced 0.5-1.0cm into the subcutaneous tissue (at an angle of 45^0) and is **pushed forward** at a lesser angle to pierce the vein wall.

Vacutainer technique cont'd

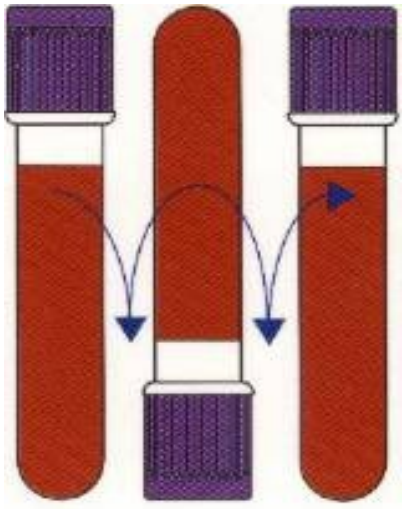
10. When the needle is properly in the vein, the vacuum tube is pushed into the needle holder all the way so that the blood flows into the tube under vacuum.
11. The tourniquet should be released the moment blood starts entering the vacuum tube
    - otherwise, some hemoconcentration will develop after one minute of venous stasis.
12. After drawing the required blood sample, apply a ball of cotton to the puncture site and gently withdraw the needle.
13. Instruct the patient to press on the cotton

Vacutainer technique cont'd

14. Remove the tube from the vacutainer holder and if the tube is with anticoagulant, gently invert several times
    - Invert 8-10 times for EDTA tube
15. Label the tubes with patient's name, hospital number and other information required by the hospital (before the patient leaves the collection area)
16. Re-inspect the venipuncture site to ascertain that the bleeding has stopped.
17. Do not let the patient go until the bleeding stops
    - If bleeding does not stop apply band aid
18. Bid farewell to the patient with smile

Inverting and Mixing the Tubes

- Tubes with additives must be gently mixed
- Gently invert several times for proper mixing



Vacutainer technique cont'd

1



2



1. Venepuncture technique using an evacuated container; the distal end of the needle has been screwed into the holder and the proximal needle has then been unsheathed and inserted into a suitable vein.
2. Venepuncture technique using an evacuated container; the evacuated container has been inserted into the holder and forced onto the sharp end of the needle.

ANTICOAGULANT PREPARATION AND MODE OF ACTION

Outline

- About anticoagulants
- Ethylene diamine tetraacetic acid (EDTA)
- Sodium Citrate
- Balanced or Double Oxalate
- Heparin

Anticoagulants

- Whole blood is necessary for most hematological investigations.
- The sample, must therefore, be mixed with an anticoagulant to prevent coagulation.
- Anticoagulants are chemical substances that are added to blood to prevent coagulation
- certain steps are involved in blood coagulation, but if one of the factors is removed or inactivated, the coagulation reaction will not take place.
- The substances responsible for this removal or inactivation are called anticoagulants.

Ethylenediamine tetra-acetic acid (EDTA)

- Disodium, dipotassium or tripotassium salts are used.
- Is the best anticoagulant for hematological tests
  - Is very efficient and has complete anticoagulation effect
  - Insignificant effect on the size (morphology) or number of blood cells in the specimen when used in the right concentration and proportion
- Is the preferred anticoagulant for cell counts and morphological studies.

EDTA cont….

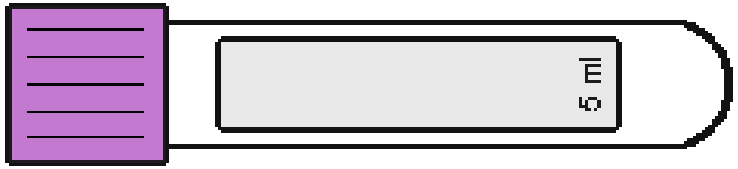
- It is the anticoagulant of choice especially for platelet counts and platelet function tests since it prevents platelet aggregation.
- Na_2EDTA is less soluble than the potassium salts.
- K_3EDTA causes undesirable cell shrinkage, which is reflected in a lower microhematocrit

EDTA CONT….

- It exerts its effect by tightly binding (chelating) ionic calcium thus effectively blocking coagulation.
- The amount of EDTA necessary for the complete chelation of Ca^{++} is balanced with the desire to minimize cellular damage
- concentration of 1.5 $\pm$ 0.25mg of Na_2, $K_{2,}$ or K_3 EDTA per 1ml of blood is recommended
- 0.02ml of 10% (W/V) solution of K_3EDTA is used for 1ml of blood.
- This concentration does not appear to adversely affect any of the erythrocyte or leukocyte parameters

Anticoagulants

- EDTA ethylenediaminetetra acetic acid in a tripotassium or disodium base (Purple): prevents clotting by binding Ca.
- Used in Heamatology or TBC and CD4



Sodium Citrate

- Sodium citrate combines with calcium preventing the conversion of prothrombin to thrombin and hence preventing coagulation
- Trisodium citrate is the salt of choice.
- Has the same anticoagulation effect as EDTA
- A 3.1% (30.88g/l) solution is isotonic and is used in the proportion of :
  - 1 part of citrate to 4 parts of blood in ESR determination by the Westergren method.
  - 1 part of citrate to 9 parts of blood in the investigation of the clotting disorders.

Sodium Citrate cont…

- Sodium Citrate (Light Blue): prevents clotting by binding the calcium.
- Used for coagulation workup (PT and APTT)



Balanced or Double Oxalate

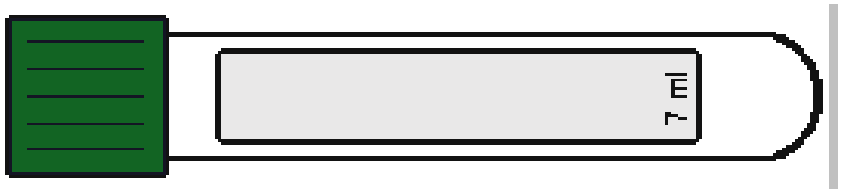
- Salts of oxalic acid
  - have the ability to bind and precipitate Ca^{++} as calcium oxalate
  - serve as suitable anticoagulants for many hematologic investigations.
- 3 parts of ammonium oxalate is balanced with 2 parts of potassium oxalate
  - neither salt is suitable by itself, i.e., ammonium oxalate causes cellular swelling and potassium oxalate causes erythrocyte shrinkage
- It is used in the proportion of 1-2mg/ml of blood.

Heparin

- This is an excellent natural anticoagulant extracted from mammalian liver or pancreas
- It is more expensive than the artificial ones and has a temporary effect of only 24 hours
- Prevents clotting by inactivating thrombin, thus preventing conversion of fibrinogen to fibrin.
- It is the best anticoagulant when absolute minimal hemolysis is required
  - Osmotic fragility test and
  - hematocrit determi

Heparin cont…

- Heparin (Green): Three types: ammonium, lithium, and sodium. Prevents clotting by inhibiting thrombin. Used for plasma chemistry testing
  - Use appropriate type of heparin



Heparin cont..

- It is unsatisfactory for leucocyte and platelet counts
  - causes cell clumping
- also unsatisfactory for blood film preparation
  - it causes a troublesome diffuse blue background in Wright-stained smears.
- It is used in the proportion of 0.1-0.2mg of the dry salt for 1ml of blood.

Order of Draw with the Evacuated Tube System

- Blood Cultures: sterile specimen
- Light Blue: sodium citrate for coagulation. Tube should be full and well mixed
- Gel Separator with or without clot activator

  Glass or Plastic Tubes
- Green: heparin or plasma chemistry
- Purple: EDTA for Hematology, CBC, CD4
- Gray: oxalate/fluoride, glucose testing

3.3.2. Syringe method of blood collection

- Remove the syringe from its protective wrapper and the needle from the cap
- assemble them allowing the cap to remain covering the needle until use.
- Attach the needle so that the bevel faces in the same direction as the graduation mark on the syringe
- Check to make sure:
  - the needle is sharp
  - the syringe moves smoothly
  - there is no air left in the barrel

Syringe method cont’d

- Identify **the right patient** and allow him/her to sit comfortably preferably in an armchair stretching his/her arm.
- Reassure the patient
- Apply the tourniquet
- Prepare the arm by swabbing the antecubital fossa with a gauze pad or cotton moistened with 70% alcohol.
- Grasp the back of the patient’s arm at the elbow and anchor the selected vein by drawing the skin slightly taut over the vein

Syringe method cont’d

- Using the assembled syringe and needle, enter the skin first and then the vein
- insert the needle properly into the vein;
  - the index finger is placed along side of the hub of the needle with the bevel facing up
  - The needle should be pointing in the same direction as the vein.

- The plunger is drown back to create suction pressure to draw the blood

Advantages of Venous Blood:

- various tests to be repeated in case of accident or breakage
- checking of a doubtful result
- performance of additional tests
- aliquots of the specimen (plasma and serum) may be frozen for future reference.
- reduces the possibility of errors resulting from
  - tissue dilution with interstitial fluid
  - constriction of skin vessels by cold that may occur in taking blood by skin puncture.

Disadvantages of Venous Blood:

- lengthy procedure
- technically difficult in children, obese individuals and in patients in shock.
- more likelihood of occurrence of Hemolysis
  - hemolysis must be prevented because it leads to lowered red cell counts and interferes with many chemical tests.
- Hematoma (or blood clot formation inside or outside the veins) may also occur

Difference Between capillary and Venous Blood:

- Higher values in peripheral blood than in venous blood for
  - PCV
  - RBC
  - Hgb
  - WBC
  - Neutro
  - Mono (by about 12%)

- Higher values in venous than peripheral blood for
  - Platelet (by about 9%); may be due to adhesion of platelets to the site of the skin puncture.

Arterial blood collection

- An ideal specimen for many analyses because its composition is consistent throughout the body whereas venous blood varies relative to the metabolic needs of the areas of the body it serves
- Not used for routine tests
  - More invasive
  - Technically difficult
  - Lots of pre-analytical interferences:
    - Exposure to air before testing
    - Delay in transport

Advantages of the Vacutainer Method of Venous Blood Collection:

- an ideal means of collecting multiple samples with ease
- eliminates many of the factors that cause hemolysis.
- no preparation of anticoagulants and containers needed.
- One can choose among a wide range of tube size with or with out anticoagulant.
- Because the evacuated tubes are sterile, avoids possible bacterial contamination
  - Thus, an ideal blood sample for microbiological analysis

Arterial blood collection cont'd

- An ideal specimen for many analyses because its composition is consistent throughout the body whereas venous blood varies relative to the metabolic needs of the areas of the body it serves
- Not used for routine tests
  - More invasive
  - Technically difficult
  - Lots of pe-analytical
    - **Exposure to air before testing**
    - **Delay in transport**
    - **Proper speciment collection**
    - **Patients with metabolic diseases difficult to differentiate whether it is venous or arterial**
- **Primarily for evaluation of arterial blood gases (ABGs)**
  - **For the diagnosis and management of respiratory diseases**

Prevention of Hemolysis

- Use syringe, needle and test tubes that are dry and free from detergent
  - traces of water or detergent cause hemolysis
- Use smooth and good quality sharp needles
- Avoid rough handling of blood at any stage
  - Do NOT eject the blood from the syringe through the needle as this may cause mechanical destruction of the cells
  - Transfer the blood from the syringe by gently ejecting down the side of the tube
  - Mix blood with anticoagulant by gentle inversion not by shaking

Prevention of Hemolysis cont'd

- Tourniquet should NOT be too tight and should be released before blood is aspirated
- If examination is to be delayed beyond 1-3 hrs, do not allow the sample to stand unplugged or at room temperature.
  - Apply stopper and store in a refrigerator at 4^0C overnight

Prevention of Hemolysis cont'd

- Blood should NOT be stored in a freezer because the red cells will hemolyse on thawing
- Make sure that all solutions with which blood is to be mixed or diluted are correctly prepared and are isotonic
  - Hypotonic solutions will lead to hemolysis.
- When obtaining blood by skin puncture:
  - Make sure the skin is dry before pricking
  - Use sharp, 2-3mm lancets that produce clean puncture wounds
  - Allow the blood to flow freely

Complications cont'd

- Bruise/Echymoses caused by leakage of a small amount of fluid around the tissue
  - To prevent apply direct pressure to the venipuncture site
  - Do NOT advise patients to bend his arm at the elbow
- Petichae
  - Small red spots due to escape of small amount of blood to skin

Complications cont'd

- Hematoma
  - Leakage of a large amount of fluid around the puncture site and the area swell
  - **Apply enough pressure at the venipuncture**

- Fainting/syncope
  - If it occurs:
    - Lower patient's hand and apply cold compress to the back of patient's neck
    - Apply ammonia inhalation

Adult Venipuncture Steps

1. PREPARE PAPERWORK
2. IDENTIFY YOUR SELF AND THE CLIENT
3. VERIFY DIET RESTRICTIONS
4. ASSEMBLE EQUIPMENT
5. WASH HANDS AND PUT ON GLOVES
6. REASSURE AND POSITION CLIENT

Adult Venipuncture Steps, cont'd

7. APPLY TOURNIQUET
8. SELECT VENIPUNCTURE SITE
9. CLEANSE SITE
10. PICK UP NEEDLE AND REMOVE COVER AND INSPECT
11. ANCHOR VEIN WITH THUMB
12. INSERT THE NEEDLE INTO THE VEIN AT A 15 – 30 DEGREE ANGLE WITH THE BEVEL FACED UP

Adult Venipuncture Steps, cont’d

13. FILL TUBES IN ORDER OF DRAW, MIX TUBES WELL, RELEASE THE TOURNIQUET AFTER THE FIRST TUBE IS FILLED, WITHDRAW LAST TUBE FROM HOLDER
14. WITHDRAW NEEDLE
15. DISPOSE OF NEEDLE
16. LABEL TUBES
17. CHECK CLIENT'S ARM AND APPLY BANDAGE

Adult Venipuncture Steps, cont'd

18. DISPOSE OF CONTAMINATED MATERIALS
19. THANK CLIENT
20. REMOVE GLOVES, WASH HANDS

Adult Vein puncture Procedure

Client Identification

- **The most important step in specimen collection is client identification**
- Misidentification of a client can be grounds for dismissal
- When identifying a client, ask them to state his or her full name
  - **NEVER SAY: “ARE YOU MRS SMITH?”**

Client Identification

- Verbal: Spell their last name followed by their first
  Make sure their name is spelt correctly
- Ask them to state their birth date or check an identification number for a second form if identification

- Two forms of identification are needed

Inpatient or Ward Contact

- Before entering a patient's room
  - Always knock before entering
  - Greet patient in a friendly manner
  - Always make your presence know before proceeding into the room and pulling back the curtain

Identifying Yourself

- **State your name**, where are from and the purpose of you visit
- If a patient is sleeping, wake gently
- Speak softly
- Never turn on a bright light
- Never attempt to draw blood from a sleeping patient

Unconscious Patient

- **Identify yourself** and inform the patient of your intent
- Ask caregiver to identify the patient
- Compare this information to the identification bracelet
- Continue to speak to the patient
- Ask for help in holding the patient because they can sense pain but can not control their reactions

Doctors and Visitors

- If a doctor is with a patient, don’t interrupt but come back latter
- If the blood work is needed immediately, excuse yourself and explain why you are there
- If visitors are present, it is best to ask them to step out of the room
- If a patient is not in the room, find out where they are or notify the nurse in charge

Inpatient or Ward Identification

- **Emergency Room patients**:
  - should have a identification band on, can be asked directly if conscious or put a temporary band on
  - Always make sure all information matches
- **Young children**:
  - confirmed by parents or relatives

- Two identifiers are needed for any person that is to be drawn

Inpatient or Ward Identification

- It is very important for healthcare professional to ensure that specimens are drawn from the correct patient
- Ask the patient to state his/her full name, birth date or identification number
- Compare the information given with the information on the patient’s identification bracelet
- Report any error before drawing the patient

Inpatient or Ward Identification

- Any discrepancy between ID band and request slips should be verified
- ID bracelet missing on wrist, check ankle
- If band is not on patient but on the wall, bed or night table the patient **Can Not be Drawn**
- A new band must be issued and placed on the patient

Bed Side Manner

- Gain the client's or patient's trust and confidence
- Put the client/patient at ease
- Use a cheerful and pleasant manner
- A phlebotomist who has a professional appearance and behaves in a professional manner will convey confidence to the client

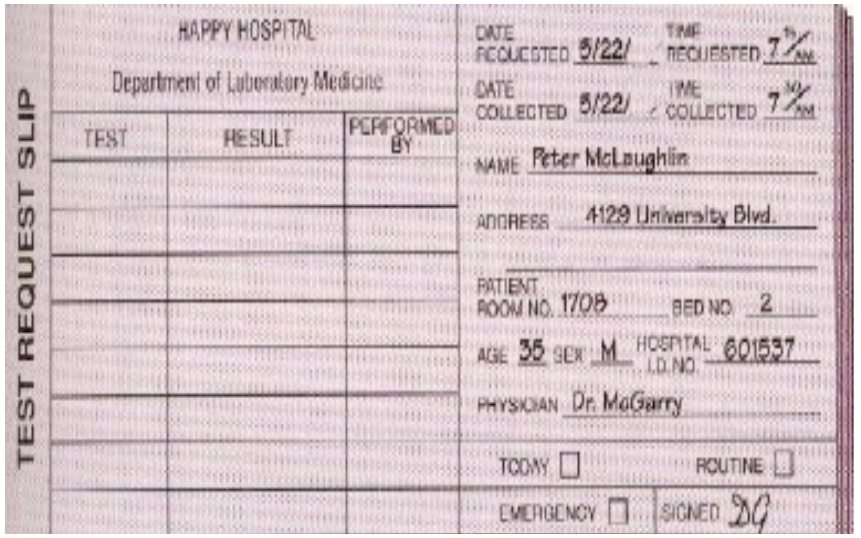


Handling Difficult Clients

- Remain calm and professional
- Treat the client in a caring manner under any circumstances
- Never force a client to do anything that they do not want to do

Test Request Form

- Lists the information needed for collection
- Includes:
  - Client's complete name
  - Client's date of birth/age
  - Date and Time specimen is to be drawn
  - Types of tests
  - Physician name


TEST REQUEST SLIP

HAPPY HOSPITAL

Department of Laboratory Medicine

TEST	RESULT	PERFORMED BY

DATE REQUESTED 5/22/ TIME REQUESTED 7 AM

DATE COLLECTED 5/22/ TIME COLLECTED 7 AM

NAME Peter McLaughlin

ADDRESS 4129 University Blvd.

PATIENT ROOM NO. 1708 BED NO. 2

AGE 35 SEX M HOSPITAL I.D. NO. 601537

PHYSICIAN Dr. McGarry

TODAY ☐ ROUTINE ☐

EMERGENCY ☐ SIGNED DG

Explain the Procedure

- Some clients may have had their blood drawn for testing
- State to the client “I’m going to draw some blood from you today.”
  - Serves two purposes:
    - client aware of what is to happen and gives you consent to proceed

Client Inquiry About Tests

- Most often asked question is

  “What are these tests for?”
- If you do not feel comfortable about the question, refer them to their doctor
- If the tests are routine and non threatening you can explain “ a kidney function test”
- All test results are given to the doctor

If the Client Objects

- The client has the right to refuse
- Never force a client
- You may try to convince them how important the procedure is
- Ask for assistance

Assemble Equipment

Requires:

- Gloves
- Tourniquet
- Alcohol Pad
- Gauze Pad
- Appropriate Tubes
- Needle and Holder
- Band Aid



Wash Hands

- Proper hand washing
- Followed by glove application
- Always put a clean pair of gloves for each client and each new procedure

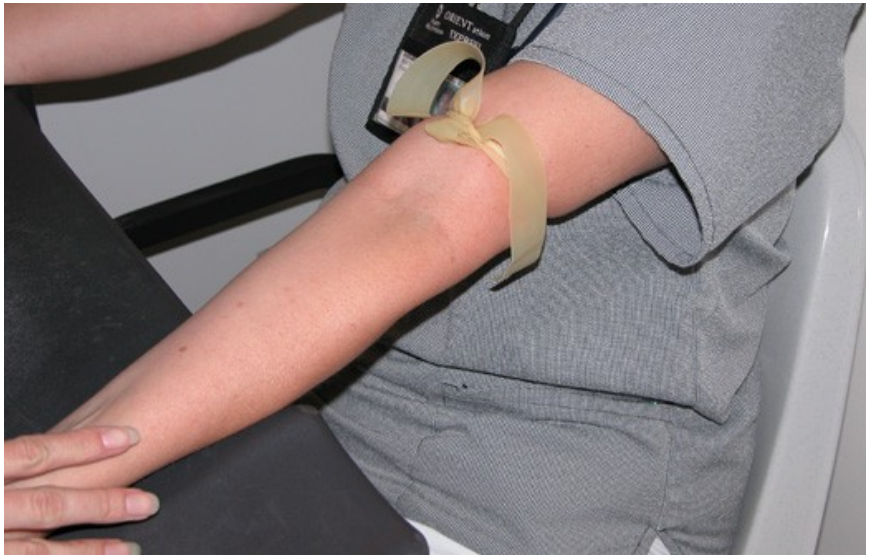


Position Client

- Reassure the client
- Always have the arm in comfortable position for the client and for you
- Have the arm in a downward position
- Client should be in a chair or lying down

Apply Tourniquet

- Applied to increase pressure in the veins and aid in site selection
- Applied 7.5 – 10 cm above the intended site
- Should not be left on for no longer than ONE minute



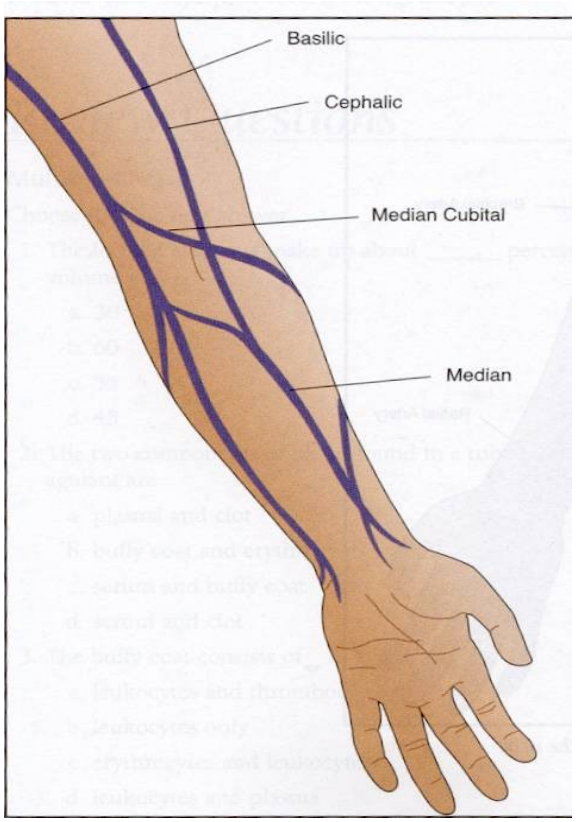
Vein Selection

- Have client make a fist
- Use tip of index finger to palpate the vein
- Determine size, depth and direction
- A vein has a bounce to it



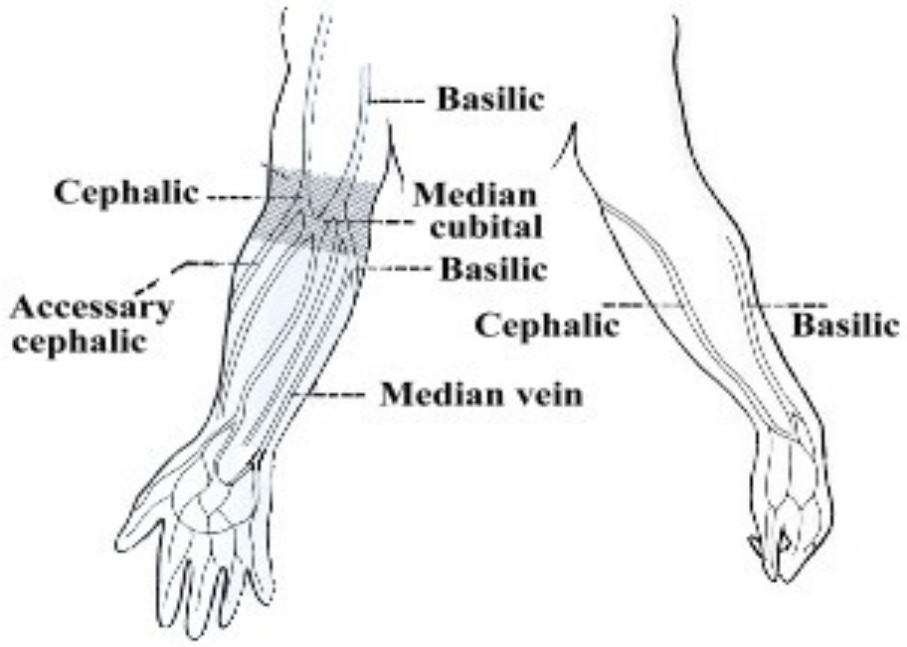
Veins Used for Phlebotomy

- Antecubital Region
  - 1st: Median Cubital
  - 2nd: Cephalic
  - 3rd: Basilic
- Volar Venous network (hand)



Vein Selection

- 1st choice
  - Median Cubical
- 2nd choice
  - Cephalic
- 3rd choice
  - Basilic



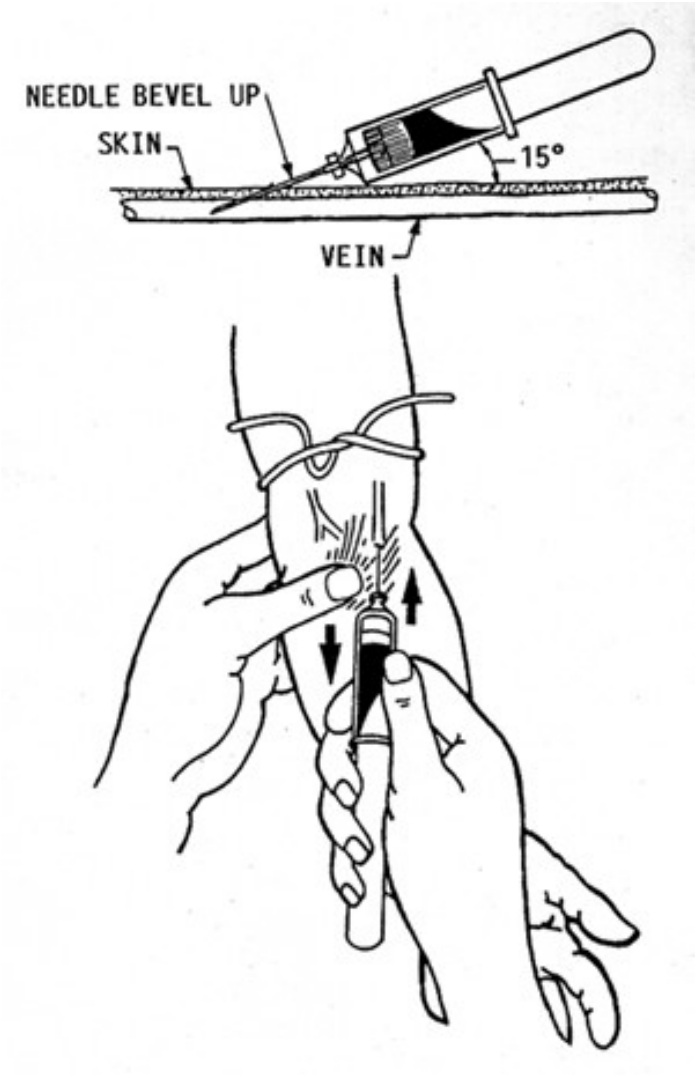
Cleanse Site

- 70% isopropyl alcohol
- Clean site using a circular motion starting from the center moving outward
- Let alcohol dry or dry site
- **DO NOT TOUCH THE SITE AFTER IT HAS BEEN CLEANED**



Anchor the Vein

- Use thumb to pull vein taut but not tight
- This helps the vein not to move or roll
- Pick up needle and visually inspect
- Needle should be bevel side up
- Insert needle at a 15 to 30 degree angle using a quick smooth motion



Fill Tubes

- As soon as blood appears in the tube the tourniquet is to be released
- When changing tubes hold the needle and holder in correct position
- Hold Steady
- Follow order of draw
- Mix all tubes with additives



Withdraw Needle

- After last tube is full remove the tube from the holder
- Remove needle in one quick motion
- Have gauze ready to apply pressure.
- Apply pressure to the arm. Hold in a straight position. **DO NOT HAVE THE client BEND HIS ARM UP**
- **Make sure tourniquet is removed before last tube is filled**

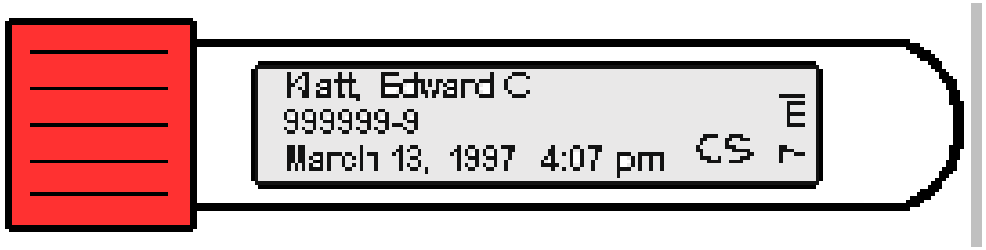
Needle Disposal

- Needle disposal is done immediately after the draw
- Dispose needle in a Biohazard SHARPS container
- Needle and holder are disposed of together
- Do Not Re-Use Needles or holders
- They are for single use only



Specimen Labeling

- Label all tubes after blood is in them
- Should contain:
  - Client's full name
  - ID number
  - Time of collection
  - Date
  - Phlebotomist initials



Last Steps

- Check clients arm and apply band aid
- Dispose of contaminated materials
- Thank client
- Remove gloves and Wash hands

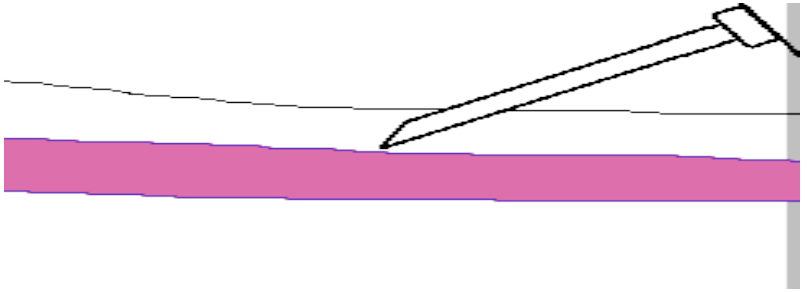


Failure to Obtain Blood

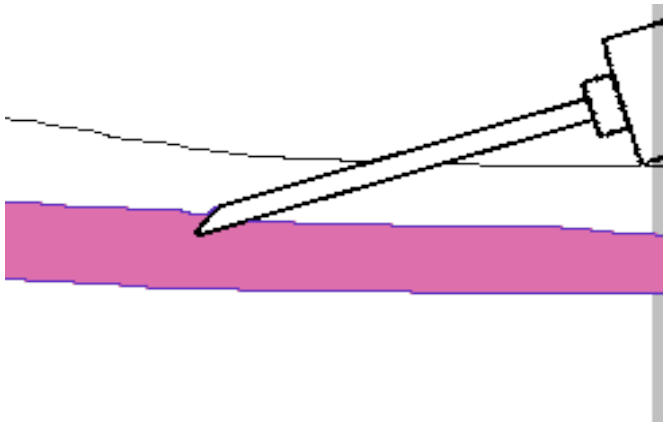
- REMAIN CALM
- Check:
  - Needle Position
    - Reposition
  - Vacuum of the tube
    - replace with a new tube
  - Tube position
    - Lift up or down

Needle Position

- Needle not deep enough: slightly push the needle back in

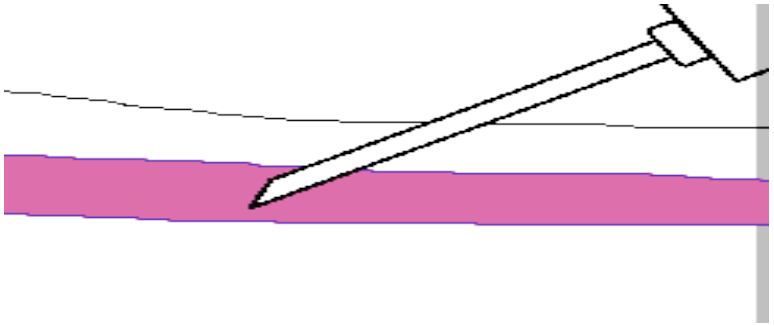


- Needle bevel against vein wall: blood flow will be impaired if the bevel is not in the up position

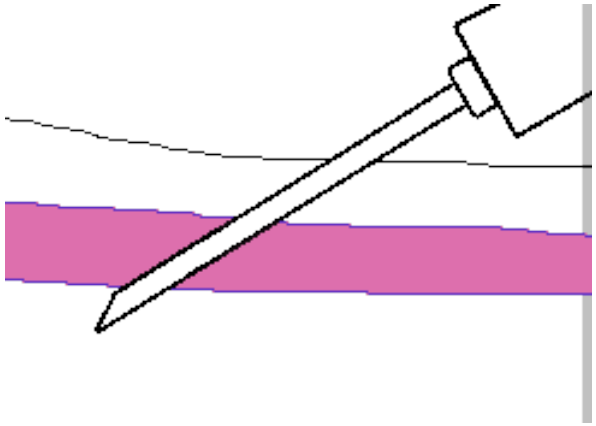


Needle Position

- Correct angle



- Needle too deep: Pull back slightly



Needle Position

- Needle has slipped beside vein:
  - Vein not anchored well, try to redirect slightly
- Needle position can not be determined:
  - Try to feel for the vein above or below the site of the needle
  - If you can feel the vein, again try to redirect

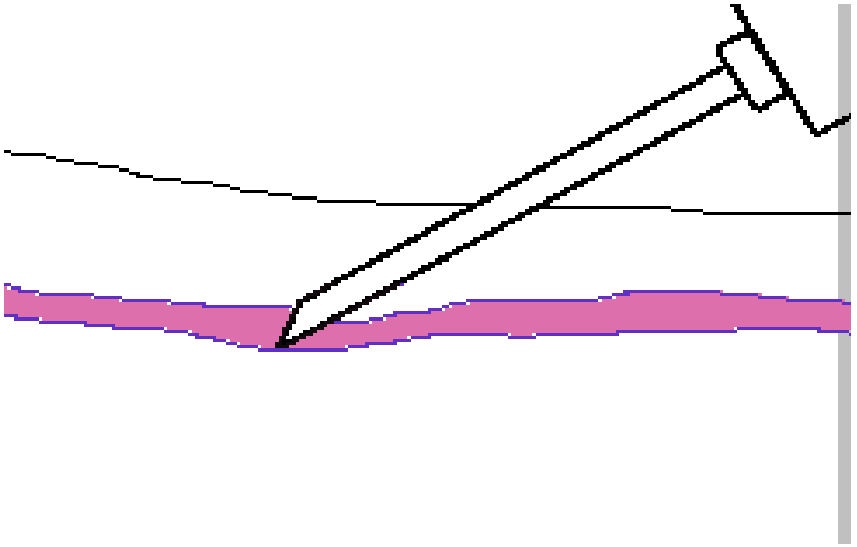
Needle position

- If you can’t feel the vein,

  DO NOT PROBE BLINDLY, IT HURTS
  - Remove the needle and begin again
- A phlebotomist should only attempt **twice** to obtain the specimen

Collapsed Vein

- Sometimes the vacuum in the tube will cause the vein to disappear
- Reapply the tourniquet; it may increase the flow into the area
- If you still don’t feel the vein, remove the needle and begin again

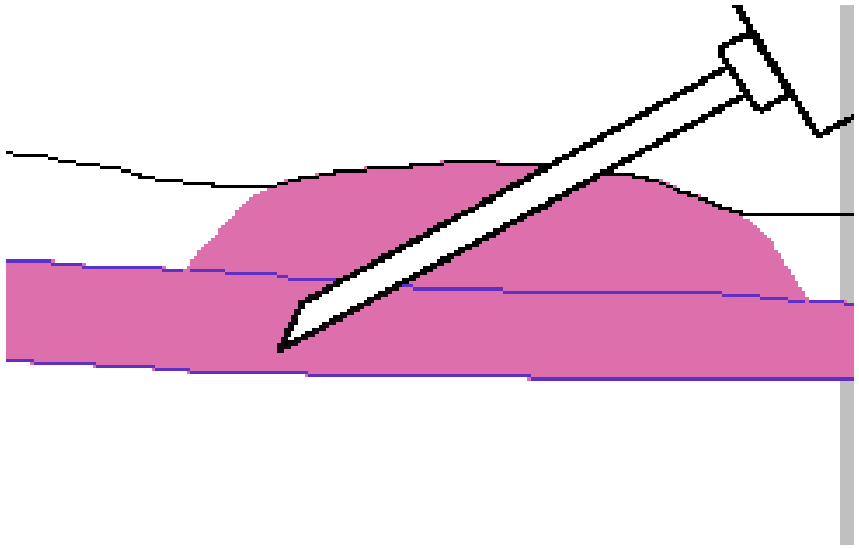


Complications Associated with Blood Collection

- **SITE SELECTION**
- Avoid scars and burns
- **Mastectomy:**
  - Venipuncture should never be performed from the arm on the same side of the mastectomy
- **Edema**:
  - Abnormal accumulation of fluid in the tissues. Lab results will be inaccurate

Complications Associated with Blood Collection

- Hematoma: is a swelling or mass of blood under the skin. This area is usually sore and painful.
- Should be avoided



Complications Associated with Blood Collection

- **Obesity**:
  - Veins may be deep. The cephalic is the vein of choice
- **Damaged veins**:
  - Feel hard and cord like, difficult to penetrate and should be avoided

Complications Affecting the Client

- **Allergies**:
  - May have a reaction to the alcohol or band-aid
- **Seizures**:
  - Remove the needle immediately
  - Hold pressure to the site without restriction of the client's movements
- **Excessive Bleeding**:
  - Pressure should be maintained for more than 5 minutes

Complications Affecting the Client

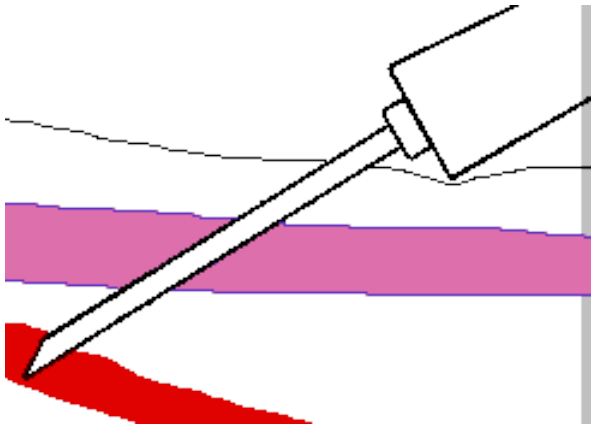
- **Fainting:**
  - If there is history, lie the client down.
  - If the client faints during the procedure, remove the needle immediately.
  - Put the client's head between their knees and make them take deep breaths.
- **Hematoma**:
  - If one starts to form during the procedure, remove needle and apply pressure

Complications Affecting the Client

- **Nausea**:
  - client should be made comfortable, deep breaths
- Infection:
  - Rare occurrence, clean site properly and apply a band-aid
- **Pain**:
  - A little pain is associated with the procedure
  - No blind probing
- **Petechiae:**
  - Red spots under the skin which appear when a tourniquet is left on.
  - Usually there is capillary fragility

Inadvertent Arterial Puncture

- Hold pressure for at least 5 minutes
- Arterial blood has a bright red color and the tube fills very quickly
- The lab should be aware that it is arterial blood
- Lab values are different



Collection Techniques Affecting the Specimen

- **Hemoconcentration**:
  - Prolonged application of the tourniquet, vigorous and probing
- **Hemolysis**: results from the destruction of the red cells
  - shaking the tube hard
  - drawing from a hemtoma
  - pulling on a syringe to quickly
  - probing
  - to small a needle
  - forcing the blood into another tube

Collection Techniques Affecting the Specimen

- **Partially filled tubes**:
  - Filling additive tubes until the vacuum is exhausted is important for proper ratio of anticoagulant to blood
  - **Very important for coagulation studies, under filled tubes are not acceptable**
- **Specimen Contamination:**
  - Alcohol can cause contamination, touching the site, not following order of draw

Safety Reminders

- Always use standard or universal blood precautions when drawing blood
- Always wear gloves when drawing blood
- Identify patient by asking for a name or check armband
- Do not allow tourniquet to remain on the arm for more than one minute
- Properly label tubes after the blood is in them

Summary Points

- Patient identification is the most important step in blood collection
- Wash hands and wear gloves for every patient
- Clean arm in concentric circles, let dry
- Anchor vein with the thumb and enter the vein at a 15 – 30 degree angle
- Always follow order of draw