

Blood collection (Phlebotomy)

It is usually involve taking of blood from body and it comes in many different forms. **Phlebotomy** is a common term in blood sampling for laboratory analysis.

four popular methods of blood collection are: 1-Capillary Sampling 2-Venipuncture Sampling 3- Heelstick Procedure (infants) 4-Arterial Sampling.



1-Capillary or peripheral blood:

This method used to draw a small amount of blood in special micro tubes usually from the end of a finger (capillary tubes), only a few test can be performed.

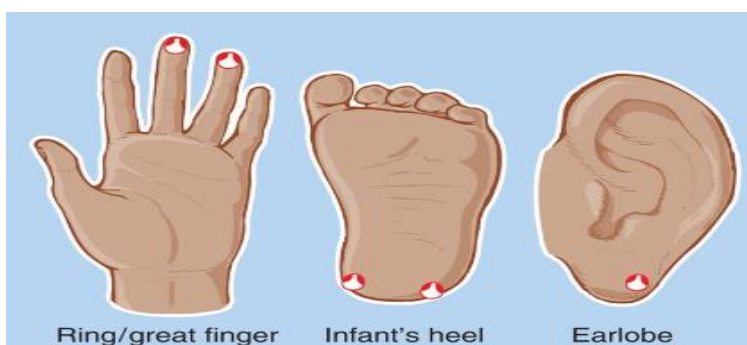
Material: 1. Lancet 2. Capillary tubes 3. Alcohol (**ethanol 70%**) 4. Cotton

Procedure:

1. Sterilize the area by alcohol and allow to dry.
2. Deep quick stab the area by disposable blood lancet, the puncture should be about 3 mm
3. Wipe off the first drop of Blood and a little pressure is applied
4. Never press out Blood
5. Take the Blood
6. Apply slight pressure over the area (**Do not use excessive pressure because the blood may become diluted with tissue fluid**).

Sites for capillary puncture: -

- 1.Finger pulp 2. Heel pulp or great toe (in infant) 3. Ear lobe



2-Venipuncture blood sampling:

A venous sample of blood must be obtained when you need a large volume of blood for laboratory analysis.

Preparation for blood collection:

1. Read the request of the patient. 2. prepare equipment for blood sampling (Tourniquet, Alcohol, Cotton, Adhesive strip, Sterile Disposable syringes) 3. Prepare the suitable tubes for each test.

Positioning the patient and choosing the vein:

- 1- The patient should sit comfortable in a chair or sit up in bed.
- 2- In order to avoid problems with hemoconcentration and hemodilution, the patient should be seated for 15 to 20 minutes before the blood is drawn.
- 3- Avoid arm with burn area, hematoma, scarring, recently injected or withdrawn syringe (tissue fluid accumulation alters test results).
- 4- Apply tourniquet to distend the vein (tourniquet obstructs the venous return so it helps to distend the vein).

Note/ as a rule, the tourniquet should not be placed too tightly or left on the patient for more than 2 min.

What are the effects if it left for more than 2 min?

Prolonged application of the tourniquet results in partial stasis of blood which leads to hemoconcentration that increase concentration of serum enzymes, potassium, proteins, and protein bound substances as calcium.

Vein-puncture:

- 1- Check the syringe
- 2- The plunger must be pushed firmly to the bottom of the cylinder to prevent injection of air into the vein, this can be fatal.
- 3- Use 70% alcohol as disinfectant the site in concentric circle and let it to dry for 30–60 sec to avoid hemolysis and burning sensation.
- 4- Enter by the needle at 45-degree angle (under the skin and then into the vein), When the needle enters the vein there is sudden loss of resistance and blood come in the head of needle.



5- Remove the tourniquet once the needle has been inserted.

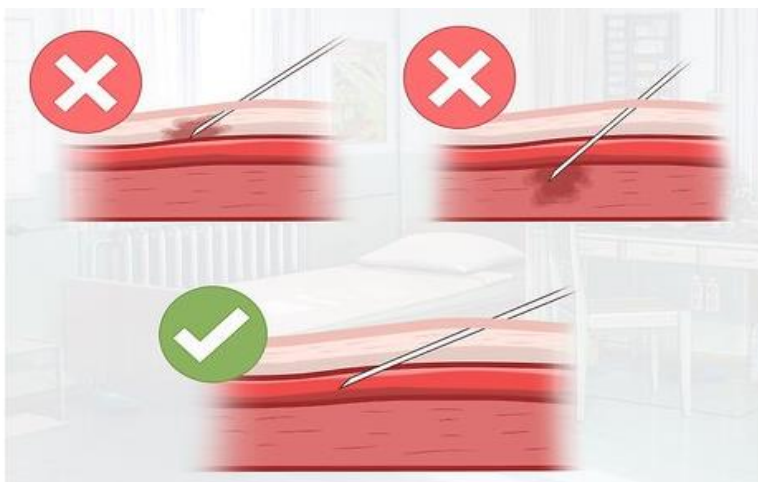
Note If the needle were removed prior to the Tourniquet being removed, blood would be forced out of the venipuncture site, resulting in hematoma.

6- Withdraw blood gradually by gently pulling upon the syringe plunger.

7- Place a sterile cotton piece over the point where the needle entered the skin.

8- Remove the syringe quickly

9- Dispose of contaminated materials and needles in special disposal containers.



3-Heelstick Procedure (infants):

The recommended location for blood collection on a newborn baby or infant is the heel.

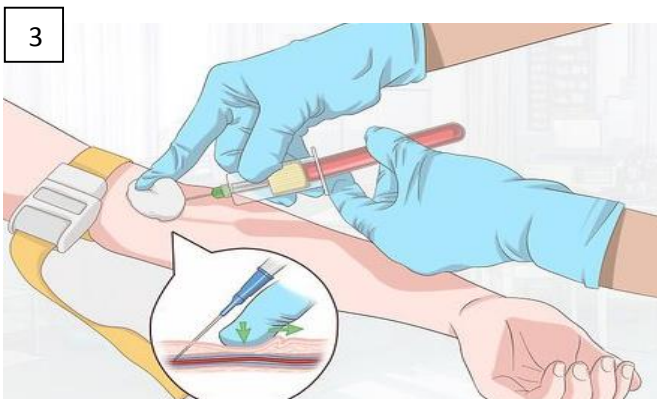
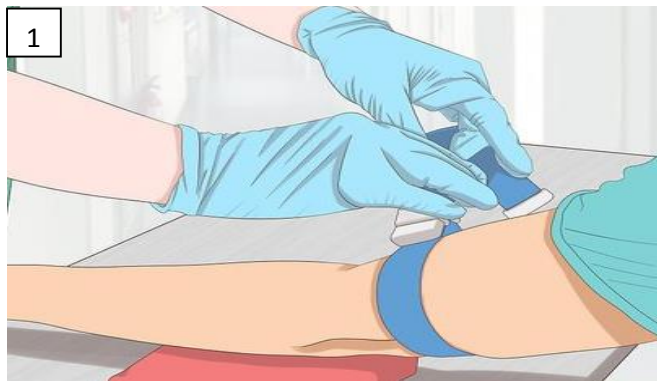
1- Prewarming the infant's heel (42° C for 3 to 5 minutes) is important to increase the flow of blood for collection.

2-Hold the baby's foot firmly to avoid sudden movement.

3-Make the cut across the heel print lines so that a drop of blood can well up and not run down along the lines.

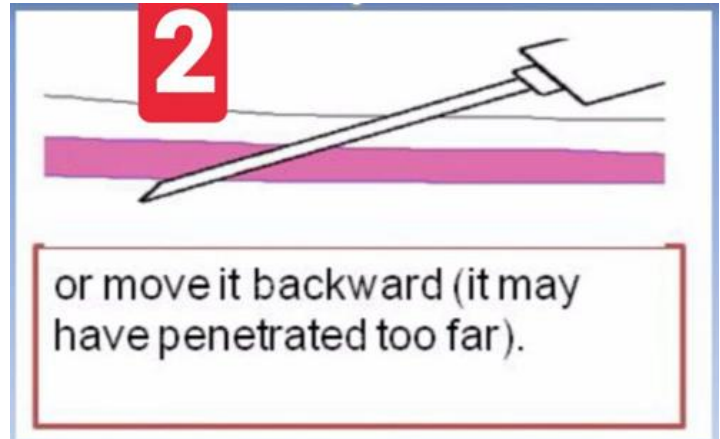
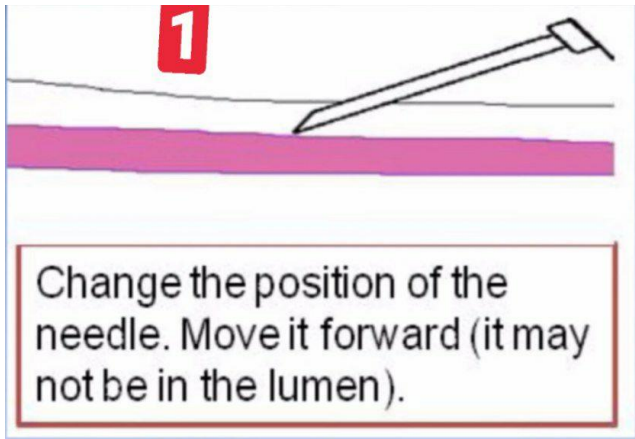


4- Wipe away the first drop of blood with a piece of clean, dry cotton gauze. Since newborns do not often bleed immediately. Do not use excessive pressure because the blood may become diluted with tissue fluid.



Venous blood collection steps

Some mistakes during venous blood collection:



4- Arterial Blood Collection

After arm is extended and wrist flexed about 30 degrees to stretch and fix the soft tissues over ligaments and bone.

- 1- Locate radial by assessing for pulse
- 2-Clean site and gloved fingers with 70% isopropyl alcohol
- 3-Relocate pulse with “off” hand
- 4-Holding syringe like a dart, puncture skin at a 30 – 45-degree angle, bevel up and facing the blood flow. This should be 5-10 mm from the finger over the artery.





- 5-Collect specimen
- 6-Withdraw needle and apply 5 minutes of direct pressure
- 7-Continue applying pressure until bleeding has stopped
- 8-Expel air bubbles
- 9-Mix blood in heparinized syringe
- 10-Wait 30-seconds horizontal rolling (first)

Why arterial blood was taken?

It is requiring a sample from an artery in body to:

- 1-Measure the levels of oxygen and carbon dioxide in blood (Because low blood oxygen levels (hypoxemia) can lead to many serious conditions and damage to individual organ systems, especially your brain and heart).
- 2-The test also checks the balance of acids and bases, known as the pH balance, in blood.

Arterial blood gas tests can help healthcare providers interpret conditions that affect your respiratory system, circulatory system and metabolic processes (how your body transforms the food you eat into energy), especially in emergency situations.

What is measured in an arterial blood gas test?

- 1-Oxygen content (O₂CT):** This measures the amount of oxygen in your blood.
- 2- Hemoglobin:** This measures the amount of hemoglobin, the protein responsible for carrying oxygen to your cells, in your blood.
- 3-Oxygen saturation (O₂Sat):** This measures how much hemoglobin in your blood is carrying oxygen. Hemoglobin is a protein in your red blood cells that carries oxygen from your lungs to the rest of your body.
- 4-Partial pressure of oxygen (PaO₂):** This measures the pressure of oxygen dissolved in your blood. It helps show how well oxygen moves from your lungs to your bloodstream.
- 5-Partial pressure of carbon dioxide (PaCO₂):** This measures the amount of carbon dioxide in your blood and how well carbon dioxide can move out of your body.
- 6-pH:** This measures the balance of acids and bases in your blood, known as your blood pH level. The pH of blood is usually between 7.35 and 7.45. If it's lower than that, your blood is



considered too acidic. If it's higher than that range, your blood is considered too basic (alkaline).

7-Bicarbonate (HCO_3): This is calculated using the measured values of pH and PaCO_2 to determine the amount of the basic compound made from carbon dioxide (CO_2 .)

References:

- 1-Mei, J. (2014). Dried blood spot sample collection, storage, and transportation. *Dried blood spots: Applications and techniques*, 21-31.
- 2-World Health Organization. (2010). *WHO guidelines on drawing blood: best practices in phlebotomy*. World Health Organization.
- 3-Duś-Ilnicka, I., Szczygielska, A., Kuźniarski, A., Szymczak, A., Pawlik-Sobecka, L., & Radwan-Oczko, M. (2022). SARS-CoV-2 IgG Amongst Dental Workers During the COVID-19 Pandemic. *International Dental Journal*, 72(3), 353-359.

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