HMSB SKILL #3
VENIPUNCTURE FOR BLOOD COLLECTING

Resource: Instructor Guide, Medical Laboratory (Advanced) Training Dept., NSHS, Bethesda, MD

I. Tube Choice

A. Anticoagulants

1. If serum is the specimen of choice, an anticoagulant is not necessary. Serum is usually the specimen used for Chemistry tests and Serology tests. The collection tubes could be the following:

   a. Red Top Tube: contains nothing.
   b. Serum Separator Tubes:
      1. The stopper may be mottled red/black. The tube contains a silica gel that separates the clot from the serum after centrifugation.
      2. A red tube but contains a plastic body at the bottom of the tube, which separates the serum from the clot after centrifugation.

2. If whole blood or plasma is the desired specimen of choice, then an anticoagulant is needed in the specimen collection tube. Anticoagulants are chemicals which inhibit the coagulation process. This may be done in several ways i.e. binding a coagulation factor so that it is not available for the process or temporarily inactivating a coagulation factor.

3. Test procedures require specific anticoagulants for specimen collection because the chemicals of the anticoagulant may interfere with the test procedure.

4. The following specimen collection tubes/anticoagulants are used for most hematology tests:

B. Lavender/Purple Top Tube:

1. Contains the disodium or dipotassium salt of ethylenediaminetetraacetic acid (EDTA).
2. It is the most widely used for whole blood specimens in hematology.
3. EDTA prevents coagulation by chelating (binding) the calcium in the blood which is necessary for coagulation.
4. A chelating agent will bind with metals. In the Chemical Periodic Table, calcium is in the Metallic group.
5. EDTA is an optimal anticoagulant for hematology because it preserves the morphology of blood cells on blood smears. Other anticoagulants can cause artifacts, which can be misleading to the technician reading blood smears.
6. The blood/anticoagulant ratio is important. Excess EDTA can cause the cells to shrink therefore falsely affecting test results. Excess EDTA can also affect the cellular

morphology on blood smears. For optimal test results, testing should be performed within two hours after collection.

C. Blue Top Tube:

1. Contains sodium citrate.
2. Choice of anticoagulant for coagulation studies.
3. It prevents coagulation by binding the calcium of the blood in a soluble complex.
4. It is ideal for coagulation studies because it maintains the stability of the coagulation factors, most notably Factors V and VIII.
5. It also contains the functional abilities of platelets when testing for platelet function.
6. The blood/anticoagulant ratio is CRITICAL. There must be a ratio of 9 parts whole blood to 1 part sodium citrate. A short draw specimen will not be accepted by the laboratory for testing. The specimen must be recollected.

D. Green Top Tube:

1. Contains heparin, which binds thrombin, which is necessary for coagulation.
2. Heparin can cause WBC and platelet clumping and is not optimal for most hematology procedures.
3. Heparinized plasma is only used for special hematology procedures.

E. Gray Top Tube:

1. Contains sodium fluoride which binds calcium and inhibits glycolysis.
2. Used for glucose levels.

II. Venipuncture Method

A. Venipuncture by Vacutainer Method

1. Principle: Vacuum in the collection tube.

2. Patient preparation:

a. The MOST IMPORTANT STEP is to accurately identify the patient. Failure to do this has extreme consequences, such as death, wrong diagnosis, or having to redraw the specimen. Patient identification should be done by comparing the laboratory chit with the name and SSN of the patient's arm band if they are on the ward. If they are outpatients, they should verbally state their complete name or present an ID card.
b. During venipuncture, the patient should never be standing. Always have the patient sitting or lying down before performing phlebotomy.

c. The next step is choosing the vein so that you can determine what kind of equipment is necessary. Preservation of a patient's vein is extremely important. Veins may be needed by other hospital/clinic staff for IVs medications, and other special procedures.
d. Select the vein by first applying the tourniquet. The tourniquet should be stretched to obtain the correct amount of tension. The tourniquet should be applied 2 -3 inches above the elbow. After tourniquet application, ask the patient to make a tight fist. Palpate any visible veins in the area of the cephalic or basilic veins. When palpating a vein, the vein should bounce back after light pressure. Arteries are much deeper, have a pulse, and will feel more resistant than veins.
e. If a vein cannot be located by touch, the following techniques can be used:

    1. Force blood into the veins by massaging the arm from the wrist to the elbow.
    2. Tap sharply on the vein site with the index and third finger to cause the vein to dilate.
    3. Apply a warm, moist cloth to the vein site.
    4. Allow the arm to hang in a vertical position so that the veins will fill to capacity with blood.

f. If the vein is of normal size and integrity, the vacutainer method is the optimal choice. If the vein is very small or fragile, or is located in the hands or wrist, a syringe, butterfly needle, or pediatric vacutainer may be needed. Also, a capillary stick may be appropriate if it would satisfy the test requested.
g. After you have selected the vein, release the tourniquet and assemble your equipment.

3. Preferred and Alternate Venipuncture Sites

a. The three main sites of venipuncture are the median cephalic, median basilic, and cephalic veins.

    1. The median cephalic is the vein of choice because it is generally well anchored and does not roll when punctured.
    2. The median basilic, located at the inner portion of the arm tends to roll in many patients.
    3. The cephalic is located on the outer portion of the arm where the skin tends to be a little tougher.

b. If the above venipuncture sites are not available, an alternate site must be located. Alternative sites include the veins of the forearm, hands, and the outside of the wrists. Never draw blood from the inside of the wrists.

c. The veins of the legs and feet **are not** an alternative site for phlebotomy. Particularly with bed ridden patients or the elderly who may have circulation problems. Physicians, who have received the proper training, use these sites, when no other sites are available.

4. Assembling Equipment

   a. After selecting the vein, the equipment should be assembled near and within close reach of the patient.
   b. When assembling your materials, mentally go through the venipuncture procedure so you won't forget anything.
   c. Always anticipate problems such as a tube which has lost its vacuum, dropping a sterile gauze, and other problems, so have extra equipment handy just in case.
   d. Insert the shorter part of the needle into the vacutainer needle holder. The shorter end of the needle is covered with a rubber sleeve to prevent blood leakage in between insertion of additional tubes.
   e. Insert the first tube to the line on the vacutainer. Do not puncture the tube with the shorter end of the needle or you will lose the vacuum of the tube. Each tube contains a vacuum, which is responsible for drawing the appropriate amount of blood into the tube. Without the vacuum, the venipuncture will be unsuccessful.

5. Steps of the Procedure:

   a. After you have prepared and assembled your equipment, reapply the tourniquet. If necessary, ask the patient to make a tight fist.
   b. Cleanse the puncture site with 70% alcohol or an alcohol prep pad. Allow the area to dry completely so as not to sting the patient when the needle is inserted. You can expedite the alcohol drying by fanning the area with your hand above the site, or wiping the area with a STERILE gauze pad. Do not blow on the area or you will introduce your oral bacteria on the puncture site. Do not wipe the area with a non-sterile gauze pad or you will introduce bacteria on the puncture site. Also do not touch the puncture area with your finger, unless you cleanse your finger with 70% alcohol.
   c. Uncap the needle and hold it bevel side up along with the vacutainer assembly. Holding the patient's skin taut (remember not to touch the sterile site), insert the needle with the opposite hand. The needle should be pointed in the same direction as the vein and should be less than a 15-degree angle with the arm. Increasing the angle would be awkward for the phlebotomist and cause more discomfort to the patient.

d. As soon as the needle is in the vein, push the tube as far as it will go without moving the vacutainer assemble. If the vacutainer is moved forward there is more chance of the needle going through the vein which will cause a hematoma (blood leakage into the tissue). If a hematoma occurs, stop the venipuncture immediately.

e. Order of specimen draw (National Committee on Clinical Laboratory Standards, 1998):

   1. If several collection tubes are being drawn, collect the culture tubes (yellow) or vials first to decrease the possibility of bacterial contamination.
   2. Non-additive tubes (red top) are second in case any tissue fluid, additive, or collection problems occur that may give erroneous results.
   3. Citrate tubes (light blue)
   4. Gel separator tubes and clot activator (speckled top) tubes.
   5. Heparin tubes (green).
   6. EDTA tubes (lavender)
   7. Other additive.

f. The tourniquet should not stay on the patient for longer than one minute or hemoconcentration may occur. Hemoconcentration (an increased concentration of blood in the area) can yield false test results.
g. Release the tourniquet as soon as the last tube of blood is filled. Never remove the needle before releasing the tourniquet. Failure to do so will cause blood to spurt out and can cause a hematoma.
h. After the tourniquet is released, apply a sterile gauze pad to the puncture site and quickly and smoothly withdraw the needle from the patient's arm.
i. Have the patient apply pressure to the site of puncture for several minutes until the bleeding has stopped. Apply a Band-Aid tautly to maintain pressure on the site. The patient may also keep his arm raised in a vertical position for several minutes to decrease pressure in the blood tube.