

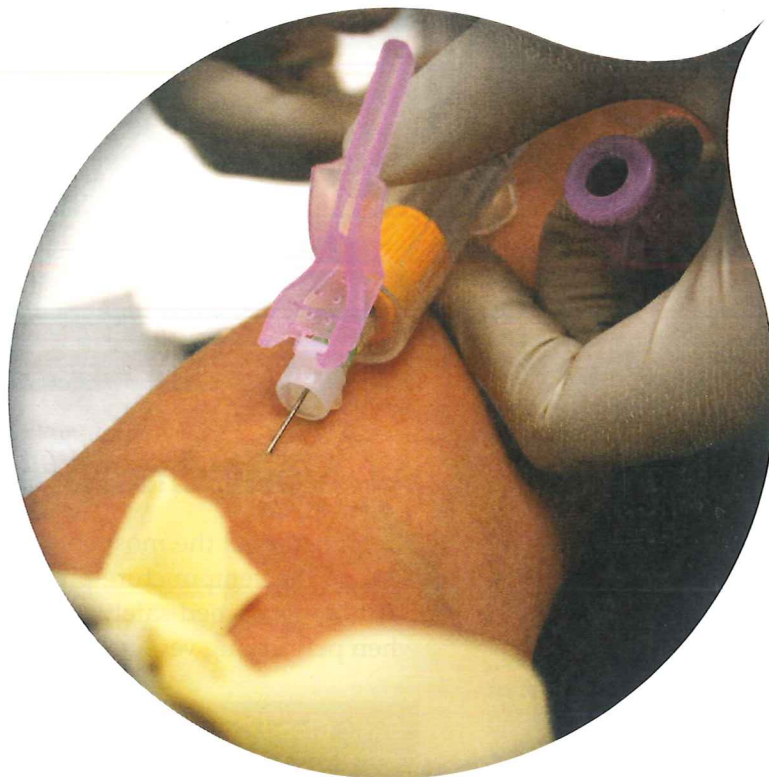
9

Venipuncture

essential terms

antecubital fossa
anticoagulant
aseptic
collapsed vein
concentric circles
ecchymosis
edematous
exsanguination
hematoma

hemoconcentration
iatrogenic anemia
lymphostasis
palpate
petechiae
sclerosis
syncope
venous reflux



ftwitty/Getty Images

Learning Outcomes

- 9.1** Perform a competent/effective venipuncture.
- 9.2** Describe special procedures needed for venipuncture on difficult-to-draw veins.
- 9.3** Describe signs and symptoms of venipuncture complications.

Related NAACLS Competencies

- 5.1** Demonstrate knowledge of collection equipment, various types of additives used, special precautions necessary, and substances that can interfere in clinical analysis of blood constituents.
- 5.6** List and select the types of equipment needed to collect blood by venipuncture and capillary (dermal) puncture.
- 5.7** Identify special precautions necessary during blood collections by venipuncture and capillary (dermal) puncture.
- 6.1** Follow standard operating procedures to collect specimens.
- 6.2** Identify potential sites for venipuncture and capillary (dermal) puncture.
- 6.3** Differentiate between sterile and antiseptic techniques.
- 6.4** Describe and demonstrate the steps in the preparation of a puncture site.

6.5 List the effects of tourniquet, hand squeezing, and heating pads on specimens collected by venipuncture and capillary (dermal) puncture.

6.6 Recognize proper needle insertion and withdrawal techniques, including direction, angle, depth, and aspiration, for venipuncture.

6.8 Describe the limitations and precautions of alternate collection sites for venipuncture and capillary (dermal) puncture.

6.9 Explain the causes of phlebotomy complications.

6.10 Describe signs and symptoms of physical problems that may occur during blood collection.

6.11 List the steps necessary to perform a venipuncture and a capillary (dermal) puncture in order.

6.12 Demonstrate a successful venipuncture following standard operating procedures.

9.11 Demonstrate basic understanding of age specific or psycho-social considerations involved in the performance of phlebotomy procedures on various age groups of patients.

Introduction

Routine and difficult venipunctures are essential tasks for the phlebotomist. This chapter outlines the procedures for routine and difficult venipunctures as well as the complications that may occur during these procedures.

9.1 Venipuncture

Venipuncture is the most common technique for obtaining blood specimens. The routine venipuncture procedure consists of a series of detailed steps that must be performed safely and accurately. Follow the steps in Learn How 9-1 when performing venipuncture.

Learn How 9-1

Basic Blood Collection

1. Greet and properly identify the patient (chapter *Patient and Specimen Requirements*).
2. Select and assemble the appropriate equipment (chapter *Blood Collection Equipment*).
3. Use aseptic technique and standard precautions during venipuncture and blood specimen collection (chapter *Infection Control*).
4. Provide proper post-puncture patient care.
5. Adhere to specimen labeling requirements (chapter *Patient and Specimen Requirements*).
6. Correctly handle and transport specimens (chapter *Blood Specimen Handling*).

Assembling the Venipuncture Equipment

After you greet and properly identify the patient but before beginning a venipuncture, you must gather and assemble the equipment and supplies you need for the procedure (see Figure 9-1). As outlined in the chapter *Blood Collection Equipment*, a routine venipuncture requires the following items:

- Gloves
- Tourniquet
- Alcohol prep pads
- Gauze pads
- Needle
- Evacuated tube holder or syringe



Figure 9-1 Assemble the equipment for venipuncture.
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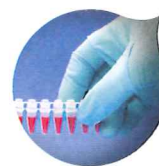
- Appropriate evacuated tubes
- Needle disposal (sharps) container
- Adhesive bandage or tape
- Permanent marker or pen
- Computerized or requisition label

Place the phlebotomy cart or tray next to the patient's bed, exam table, or phlebotomy chair and line up the venipuncture equipment needed for the procedure. Because many different manufacturers make venipuncture equipment, check to see if the tube adapter and needle are compatible. Sometimes needles and tube adapters that are made by different companies are not interchangeable. Using holders and needles from different manufacturers may cause the needle to fall out of the holder. After confirming their compatibility, attach the needle to the tube adapter. Make sure that the needle is screwed all the way up to the tube adapter and that the assembly is secure.

Do not remove the needle cap at this time. Place the first tube to be collected loosely into the tube holder/adapter. Push the tube up to the adapter guideline or indentation in the tube adapter, but *do not* push the tube all the way onto the needle because this will result in a loss of vacuum in the tube (see Figure 9-2). Always check the directions for the equipment you are using and follow your facility's guidelines and standard operating procedures.

Keep the Needle Sterile

The needle must not touch anything. If you touch or lay the unsheathed needle down for any reason, it becomes contaminated and a new needle must be used in its place. In addition, you must ensure that the needle safety label was not broken and that the expiration date on the label has not passed. Never use needles that have uncertain sterility.



**Safety &
Infection
Control**

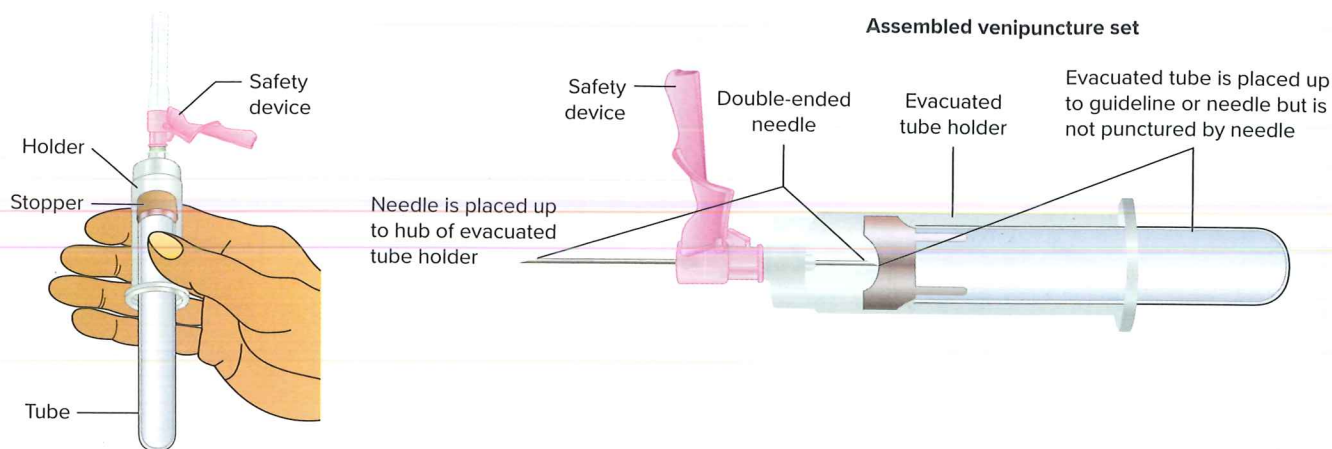


Figure 9-2 Complete venipuncture assembly.

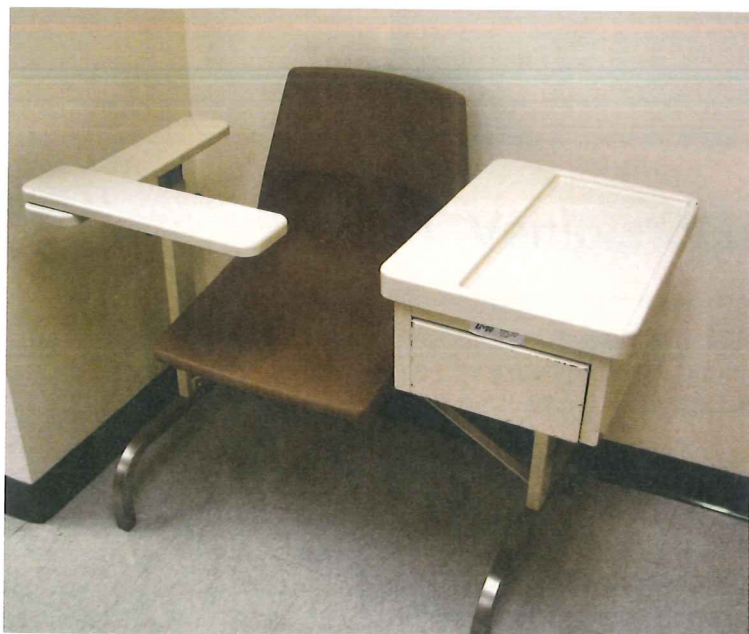


Figure 9-3 The arm supports on this outpatient phlebotomy chair are designed for the comfort and correct positioning of the patient during outpatient phlebotomy procedures.

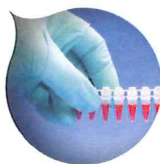
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Patient Positioning

The patient's position is another critical factor for a successful venipuncture. The patient should be either lying down or reclining backward (known as recumbent position) or sitting in a special phlebotomy chair designed for outpatients. Most phlebotomy chairs have a movable arm support that helps in positioning the patient's arm and helps prevent the patient from falling out (see Figure 9-3). When the patient is seated, the arm needs to be supported and should extend downward in a straight line from the shoulder to the wrist. The arm should not be bent at the elbow. When chairs with safety features are not available, the specimen must be collected with the patient in a recumbent position. For example, an in-home collection should be done with the patient in bed, on a couch, or in a reclining chair. Never attempt a phlebotomy procedure on a patient who is standing. This is not only uncomfortable for the patient but also dangerous if they should become dizzy or faint and be injured in a fall.

Inpatient collections are usually done with the patient in bed. The supine position, with the patient lying on the back, face upward, is the most common for phlebotomy. The patient's arm should be extended in a straight line from the shoulder and not bent. A rolled towel or pillow can be used to support the arm and aid in positioning it in a downward fashion. Hyperextending the elbow slightly can help the phlebotomist locate a vein.

Safety & Infection Control



Hospital Bedrails

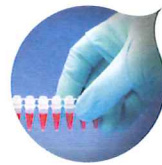
Bedrails are a major concern when performing venipuncture in a hospital situation. If you lower the bedrail for a procedure, you must raise it before leaving the room. Leaving a bedrail down increases the risk of a patient falling out of bed.

Areas Not Designed for Blood Collection

In most cases, you will be drawing blood in outpatient and inpatient facilities that are designed for blood collection, and the necessary materials will be at hand. In some cases, phlebotomists are asked to draw blood in a location not typically used for blood collection, such as a person's home. Organization is key to safety in these environments. Consider using the 1-2-3-2-1 method to ensure that you have everything you need for the procedure:

- 1—pair of gloves
- 2—tourniquet and alcohol swab
- 3—needle, holder, and tubes (in the order to be drawn)
- 2—gauze/cotton swab and bandage
- 1—sharps container

Making sure you have each of these pieces of equipment in this order will ensure that you are prepared. Also, be certain to have additional tubes and needles available and close by in case you need them during the procedure. A bottle of hand sanitizer would also be useful in case handwashing facilities are not readily available.



Safety & Infection Control

Applying the Tourniquet

Applying a tourniquet around the arm makes the veins more visible and will help you decide which vein to use. Application of a tourniquet makes it easier to feel, or **palpate**, the vein for possible venipuncture. When a tourniquet is applied, the flow of venous blood is slowed, which increases pressure in the veins, making them more visible and palpable (noticeable by touch).

A tourniquet is applied to the arm 3 to 4 inches above the venipuncture site, which is usually inside the elbow in the antecubital fossa (the area around the crease of the elbow). The tourniquet should not pinch the patient's skin, but it should feel slightly tight. It should not be so tight that the arm goes numb or turns colors. To maintain the best possible comfort level for the patient, avoid twisting the tourniquet. A twisted tourniquet will pinch and feel as if it is digging into the patient's arm, causing unnecessary discomfort and pain. Thus, the tourniquet should be kept flat against the arm (see Figure 9-4). If a patient has delicate or sensitive skin, place the tourniquet over a sleeve. If a patient with fragile skin is wearing a shirt without sleeves, place a hand towel or washcloth over the skin; then place the tourniquet over the towel to reduce the risk of tearing the skin or creating any damage to the patient's arm. Proper application of the tourniquet—as described in Learn How 9-2—will help ensure success and prevent complications during venipuncture. Left-handed phlebotomists may prefer to switch the “left and right” positions in this sequence.

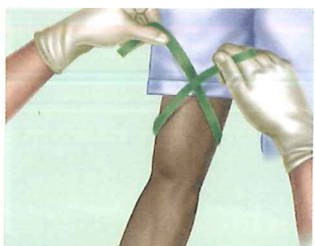


Figure 9-4 Tourniquet on arm.
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Learn How 9-2

Tourniquet Application

1. Position the tourniquet under the arm while grasping the ends above the arm and venipuncture area.
2. Cross the left end over the right end and apply a small amount of tension to the tourniquet by pulling on each half of the tourniquet.
3. Grasp both ends of the tourniquet close to the patient's arm between the thumb and forefinger of the left hand.
4. Using the right middle finger or index finger, tuck the left end under the right end. The loose end of the tourniquet will be pointing toward the shoulder and the loop will be pointing toward the hand (see Figure 9-5).
5. When tugged after the venipuncture procedure, the loose end will easily release the tourniquet from the arm.



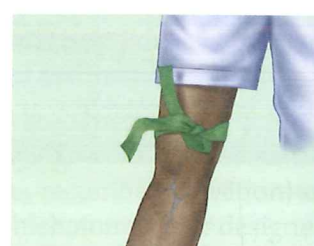
(a) Position the tourniquet under the arm while grasping the ends above the arm and venipuncture area. The tourniquet should be 3 to 4 inches above the site.



(b) Cross the left end over the right end and apply a small amount of tension to the tourniquet.



(c) Using the right middle finger or index finger, tuck the left end under the right end.



(d) A loose end of the tourniquet will be pointing toward the shoulder and the loop will be pointed toward the hand.

Figure 9-5 Follow these steps for proper tourniquet application.



Figure 9-6 The antecubital area of the arm is the most common site to perform venipuncture.
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Selecting the Venipuncture Site

The most common area to perform a venipuncture is the inside of the elbow, or **antecubital fossa** area of the arm (see Figure 9-6). This is the area on the inside bend of the elbow where the median cubital, cephalic, and basilic veins lie close to the surface of the arm (refer to the chapter *The Cardiovascular System*). Locate the median cubital vein, which is usually the largest and best-anchored vein, near the center of the antecubital area. This vein is usually preferred for venipuncture. If the median cubital vein is not readily palpable, next look for the cephalic vein. As a last resort, look for the basilic vein. The basilic vein is least desirable due to its close proximity to nerves. Always examine the antecubital area first because the easiest veins to collect from are located in this area of the arm. Patients generally

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have more prominent veins on their dominant arm. For example, if the patient is left handed, look for a vein in the left arm first. You should check and palpate both arms before deciding on the venipuncture site.

To help you locate veins, position the arm at a downward angle, using the force of gravity as an aid in making the veins more prominent. In addition, instruct the patient to make a fist, but *not* to pump the fist because this can cause **hemoconcentration** (temporary increase in cells and chemicals in the blood). If you find it necessary to increase the vein size to make the venipuncture easier, apply heat by using a moist compress at or near body temperature (98.6°F [37°C]) for 3 to 5 minutes (Figure 9-7). A tissue warmer may also be used for warming a venipuncture site because it reaches a temperature of 104°F (40°C) when activated. Warming the venipuncture site will dilate the veins and increase the blood flow. However, this technique should be used only when necessary.



Figure 9-7 Warming the site is the preferred way to increase blood flow and make the venipuncture easier. Sandra Mesrine/McGraw-Hill Education

Keeping the Arm Still

If the patient moves during the venipuncture procedure, the needle can “tear” the vein and muscle, causing pain and damage to the venipuncture site. If a patient moves during phlebotomy, the phlebotomist could miss the venipuncture site and fail to collect the blood specimen. While you are selecting the venipuncture site, explain to the patient the importance of holding the arm very still, but do not alarm the patient by telling him or her too many details. Tell the patient that holding the arm still will reduce the discomfort of the venipuncture. If the patient has anxiety over having blood drawn, help them relax by focusing the conversation on calming topics and get assistance to hold the arm if necessary.



**Communicate
& Connect**

Palpating the antecubital area will help you determine the vein's size, depth, and direction. Palpate the vein using the tip of your index finger. Select a vein that is large and does not roll from side to side or move easily. The larger the vein, the easier the blood collection. It is common to feel for the bulge of the vein, but try feeling for the valley instead of the bulge. Try closing your eyes if you have trouble feeling a vein, as this will enhance your sense of touch. An appropriate vein for venipuncture will bounce and have resilience to it. A vein that exhibits **sclerosis**, or feels hard and cordlike (i.e., lacks resilience), should be avoided. A vein that feels hard tends to roll easily and should not be used for venipuncture. In addition, paralyzed limbs and sites with shunts and fistulas should be avoided. Sometimes a blood pressure cuff is used to help locate an appropriate site for venipuncture in people with veins that are difficult to palpate. When using a blood pressure cuff, the cuff should be inflated to a pressure between the patient's systolic and diastolic pressures. Do not leave the cuff inflated for more than 1 minute.

Carefully select the vein to be used for venipuncture. Try to mentally visualize the location of this vein and note the position of the vein in reference to hair, skin creases, scars, or a mole. Once a vein has been selected, release the tourniquet to lessen the chance of causing hemoconcentration in the venipuncture area during the cleansing procedure. Mentally visualizing the vein will help you locate the vein after releasing the tourniquet. You must clean the

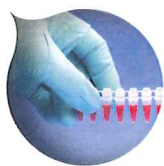
skin before venipuncture, and having a landmark will help you locate the selected site again. An experienced phlebotomist, who is able to identify the venipuncture site quickly and easily, may choose to apply the tourniquet, clean the area, and perform the venipuncture all in one step. This is done only if the venipuncture site is dry before the blood is collected and the tourniquet stays on the arm less than 1 minute. Meeting these two conditions is difficult, especially for the new phlebotomist.

As you may recall from the chapter *The Cardiovascular System*, arteries should never be selected for a routine venipuncture procedure. Because arteries are usually located much deeper than veins, you probably will not encounter them. However, you need to be aware of the differences between an artery and a vein. Arteries are more elastic and have thicker walls than veins. In addition, arteries will pulsate when palpated.

Tendons can also be mistaken for veins, although tendons do not have the elastic feel of veins and are hard and stringy to the touch. To differentiate between a vein and a tendon, have the patient rotate his or her wrist. The tendon will move with the muscle movement, but the vein should still be in nearly the same place and remain easy to feel.

If you cannot find a suitable vein in the antecubital area of either arm, remove the tourniquet and check the dorsal side of the wrist or hand for acceptable venipuncture sites (refer to the chapter *The Cardiovascular System*). Dorsal veins in the back of the hand may be used only if necessary. Veins on the anterior side of the wrist and hand are never used for venipuncture because of their close proximity to nerves and the risk of causing nerve damage. Veins of the lower the extremities such as ankle veins are not used for venipuncture by the phlebotomist.

Safety & Infection Control



Special Considerations When Selecting a Venipuncture Site

The venipuncture site should be free of lesions, abrasions, infections, and scar tissue. Never select an arm that is **edematous**, or swollen. Because of the fluid buildup in the tissue, the vein will not be prominent. If you apply a tourniquet, it will not be effective in showing the vein and it will leave an indentation on the arm. If the patient has an IV in place, perform the venipuncture procedure on the other arm. Venipuncture should never be performed above the IV site. If a specimen is collected above an IV, the fluid given through the IV will affect the laboratory results. If absolutely no other site is available, drawing a blood sample below an IV site is done under certain conditions as regulated by facility policy. The responsible health care professional should turn off the IV for at least 2 minutes before the draw and turn on the IV after it is completed. The tourniquet is placed between the IV site and the intended venipuncture site.

The arm on the side of a mastectomy (breast removal) should not be used without written permission from the physician because of the potential harm to the patient due to lymphostasis. **Lymphostasis**, or lack of fluid drainage in the lymphatic system, commonly occurs in patients who have had lymph nodes removed, such as during a mastectomy. Avoid the arm of a patient affected by a stroke because the patient may not be able to detect nerve injury, pain, or infection. Do not forcibly straighten the arm in the case an arm of a patient affected by a stroke must be used or for any other reason.

Special Considerations for Children

Just as adults can become anxious during a phlebotomy procedure, so can children—perhaps even more so. When greeting the child, phlebotomists can squat down to the child's height to reduce any intimidation the child is feeling. Never lie to children. If they ask if the procedure will hurt, respond that it will hurt a little but can hurt less if they hold absolutely still.

A good practice is to ask the child's caregiver to help with the procedure. Sometimes the parent has brought a small toy that the child can hold. This will help take the child's mind off the procedure and make the phlebotomy process easier for you. Depending upon the child's size, the parent may hold the child. If needed, special restraining chairs and arm boards are available to help immobilize children. If your facility routinely collects specimens from children, it is a good idea to have special bandages or stickers available as rewards for good helpers. Being honest and direct with the child is best; however, the child should be allowed to view the needle for as short a period as possible to help reduce anxiety.



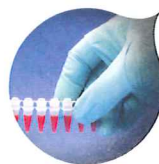
Life Span Considerations

A winged infusion set or butterfly with pediatric tubes may be used for dorsal venipuncture. Hand veins are delicate and small, so the smaller vacuum tubes, such as those for pediatric use, may be best for this procedure. The air in the tubing of the butterfly set can decrease the amount of blood obtained, so a smaller needle and adapter are preferred over the butterfly set.

Veins in the hand tend to move, or "roll." To avoid this, ask the patient to help by positioning the hand downward to hold the vein taut. Then place the thumb of the nonsticking hand about 1 to 2 inches below the insertion site. Apply pressure on the vein and pull slightly downward.

Standard Precautions

As emphasized in the *Infection Control* chapter, phlebotomists must be aware that any patient may be a carrier of an infectious disease. Always adhere to standard precautions when collecting blood by venipuncture, dermal (capillary) puncture, or venous access devices. Your attention to detail can prevent the transfer of an infectious disease from patient to patient or from the patient to yourself.



Safety & Infection Control

Special Geriatric Considerations

The process of aging presents physical problems in patients that can be challenging for the phlebotomist. Patients who have physical conditions such as arthritis and diseases that cause tremors require the phlebotomist to take extra time. Because the skin of an elderly person is thinner, the venipuncture can be more difficult. The phlebotomist must hold the skin down taut, so that the vein does not move or roll. Also, as people age, the muscles become smaller, so the angle of venipuncture should be shallower during needle insertion. Because aging patients may bruise more easily, it is best to apply pressure quickly and for a longer period of time after removing the needle.



Life Span Considerations



Figure 9-8 When cleaning the venipuncture site, use an alcohol prep pad with firm pressure and vigorous back-and-forth friction.
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Cleansing the Venipuncture Site

After you identify the venipuncture site, release the tourniquet and clean the site using an **aseptic** technique (a procedure for minimizing contamination by pathogens). Cleaning the venipuncture site with an antiseptic (alcohol pad) helps prevent microbial contamination of the specimen and the patient's venipuncture site. However, it will not sterilize or remove all the microorganisms from the site. *Sterile* puncture is discussed in the *Special Phlebotomy Procedures* chapter.

For routine venipuncture, the recommended antiseptic is 70% isopropyl alcohol—the kind used in alcohol pads. Cleanse the site using vigorous back-and-forth friction. To remove surface dirt, you must apply sufficient pressure. If the site is especially dirty, repeat the procedure (with a new alcohol pad) to ensure that the site is thoroughly clean. Allow the alcohol to dry completely. The drying action of the alcohol dries out the cells of bacteria. Never blow on the site or fan it to hasten the drying process.

Law & Ethics



Use of Alcohol

If the venipuncture is attempted before the alcohol dries, it can result in a burning sensation for the patient when the needle enters the skin. The patient may perceive this as an injury incurred by the procedure. In addition, if alcohol enters the needle and becomes mixed with the specimen, the specimen will be hemolyzed and the laboratory results will be affected. In this case the patient will be subjected to another blood collection unnecessarily.

Performing the Venipuncture

Verifying the Venipuncture Site

After reapplying the tourniquet, have the patient make a fist again to help you visualize the vein. Using your dominant hand, pick up the venipuncture assembly with your thumb on the top of the tube adapter and your fingers underneath. Remove the needle cover and visually inspect the needle tip. Look for obstructions, imperfections, or barbs along the needle shaft and needle tip. If you notice abnormalities, you must replace the needle with a new sterile needle. While inspecting the needle, note the bevel area (slanted opening at the tip of the needle) and position the bevel up. Positioning the needle bevel upward will make it easier to insert the needle into the skin and will cause less pain to the patient. In addition, if you position the bevel down, skin cells at the puncture site can enter the needle, thus increasing the chance of contamination of the specimen. Hold the adapter assembly so that the needle is at a 15- to 30-degree angle to the vein. Use an angle closer to 15 degrees for veins lying close to the surface.

Inserting the Needle

Use the thumb of your nondominant hand (the one not holding the assembly) to pull the skin taut 1 to 2 inches below the needle insertion site while gently

grasping the patient's arm. Holding the patient's arm will help anchor the arm and the vein. Pulling the skin taut will also help anchor the vein, keeping it from rolling or moving during insertion of the needle. For a successful venipuncture, line up the needle with the vein, so that the needle and the vein are parallel (see Figure 9-9). Make sure the bevel of the needle is facing upward, while pointing in the same direction as the vein. To avoid startling the patient, warn the patient when the puncture is about to occur. Reminding the patient to remain very still and saying something like "You may feel a pinch now" will allow the patient to get ready.

Using one smooth motion, insert the needle into the skin at a 15- to 30-degree angle (see Figure 9-10). You will feel a decrease in resistance or a slight "pop" when the needle enters the vein. Fully engage the evacuated tube by pushing on the tube while holding the assembly still, causing the needle to puncture the tube's stopper. The first sign of a successful venipuncture is blood in the evacuated tube, after the tube is completely inserted.

If the Venipuncture Is Not Successful

In some cases, the venipuncture is not successful. However, failure to obtain a blood specimen can be remedied by various techniques. It is important to note that insufficient vacuum in the tube can cause blood collection failure. Because there is no way to check tube vacuum before a venipuncture, always keep an extra tube close at hand. If the needle position appears correct, a loss of tube vacuum is the most likely reason for the failure of blood to appear in the tube. Replace the defective tube with another tube.

Number of Attempts

Each healthcare facility has its own policy regarding the number of times a phlebotomist may attempt to get a blood specimen. Generally, two is the maximum number of times venipuncture should be attempted. If you are unsuccessful after two tries, you need to ask for assistance. Repeated, unnecessary needlesticks can cause damage to the patient. You can be held personally liable if you fail to follow your institution's policies and patient injury occurs as a result.

In some cases, problematic needle positions can cause the venipuncture to be unsuccessful. The needle may be against the wall of the vein, stopping the blood from flowing. In this case, you can try gently rotating the needle. If the needle has penetrated too far and has gone completely through the vein and

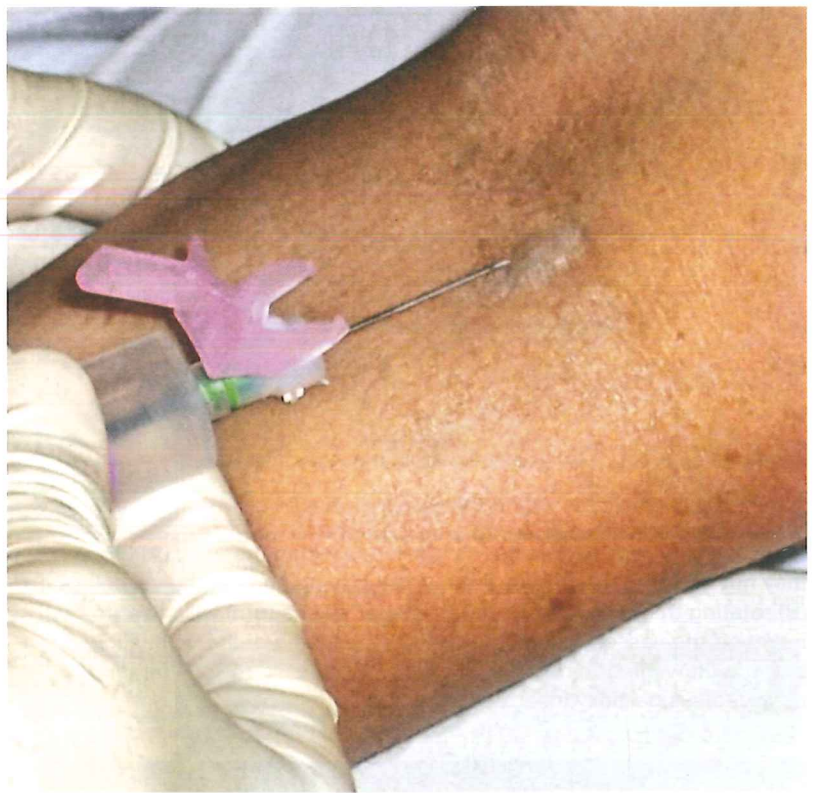


Figure 9-9 Align the needle with the chosen vein. Make sure the bevel is facing up.
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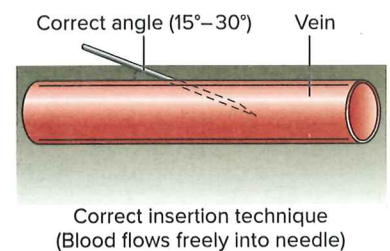


Figure 9-10 Insert the needle at a 15- to 30-degree angle.



Law & Ethics

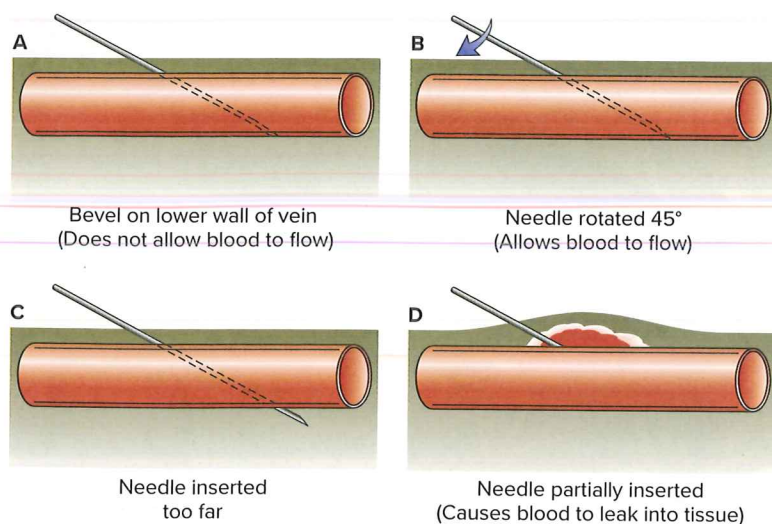


Figure 9-11 Problematic needle positions within the vein: (A) blood may not flow into the needle if the bevel is lying against the vessel wall; (B) rotating the needle 45 degrees (a quarter of a turn) will move the bevel off the vessel wall so it is open to the lumen of the vein, allowing blood to flow into the needle; (C) the needle is inserted too far; and (D) the needle is partially inserted, causing a hematoma.

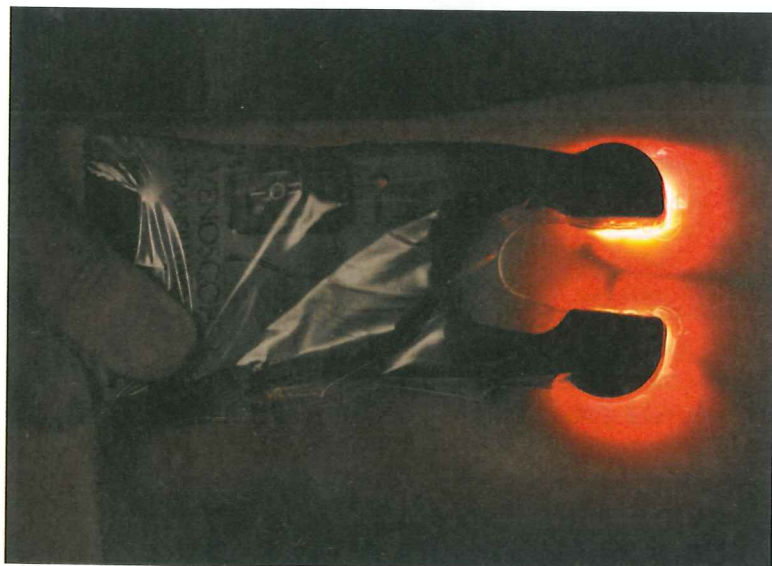


Figure 9-12 A venoscope uses a high-intensity light to make the veins of the arm easier to locate.

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exiting on the other side, repositioning the needle by pulling back slightly may work. When no blood flows, try advancing the needle slightly farther into the vein because the needle may not have penetrated the vein wall (Figure 9-11). Applying the tourniquet too tightly can also stop blood flow, so try releasing the tourniquet slightly. In the case where the vein seems to have collapsed, you may try releasing the vacuum pressure by removing the tube or syringe pressure and waiting for the vein to fill then reapply the vacuum.

Never probe the site with the needle. This is extremely painful to the patient and may cause tissue or nerve damage. In addition, probing may result in a hemolyzed specimen. Probing is much different than repositioning the needle. During probing, the needle is moved back and forth or side to side in an effort to hit a vein. It is better to try another site rather than probe.

You may want to use an instrument, such as a venoscope, to visualize the vein (see Figure 9-12). The battery-operated venoscope uses LED (light-emitting diode) lights to illuminate the subcutaneous tissue. The veins are darker than the surrounding tissue because they absorb the light, making them easier to see.

Collecting the Specimen

It is important to hold the venipuncture assembly steady during the entire tube-filling procedure (see Figure 9-13). Grasp the flange (short wings) of the tube holder with your index and middle fingers. Use your thumb to push the tube to the end of the adapter. If the needle is properly positioned in the vein, blood will flow freely into the evacuated tube. During the filling process, keep the needle as motionless as possible. Release the tourniquet once collection has started to

minimize hemoconcentration unless you are concerned about the vein collapsing. A tourniquet should not be left on the patient during specimen collection for longer than 1 minute. If blood flow stops once you release the tourniquet, you may reapply the tourniquet and leave it on for three or four tubes (approximately 1 minute). The reapplying of a tourniquet is difficult without help. If you are using an elastic strip, you would need both hands to reapply it.

Collection tubes are filled according to the order of draw outlined in the *Blood Collection Equipment* chapter. Continue filling the evacuated tube until the blood flow stops inside the tube. Blood flow will stop once the vacuum is gone from inside the evacuated tube. The amount of vacuum inside each tube has been calibrated so that a consistent amount of blood is drawn into each evacuated tube.

Overfilling an evacuated tube is not possible unless the stopper is removed and blood is added. Never remove a tube cap to fill a tube or force blood through the cap with a syringe assembly. Always use a syringe transfer device. Underfilling an evacuated tube is possible if it is removed from the assembly before it is completely filled. Recall that many collection tubes contain additives needed for specific tests. When an evacuated tube is full, the proper dilution or mixture of additive to blood has been achieved. Overfilling and underfilling change the ratio of blood to anticoagulant required not only to keep the blood anticoagulated but also to maintain the ratio required for laboratory tests.

To change tubes during collection, brace your thumb against the flange of the holder and use a pulling motion while removing the tube (see Figure 9-14). Next, place the new tube into the holder and gently push the tube all the way into the holder and onto the needle. Take care not to move the needle forward or pull the needle out of the patient's arm during tube changes. Fill all necessary tubes for the tests requested. Mix them immediately the number of times recommended by the manufacturer, usually as determined by the additives inside each tube and the type of container (vacuum or micro-collection). Some tubes may require a quick mix while filling another tube. Most tubes with additives need to be gently inverted 3 to 10 times (see Figure 9-15).

Removing the Needle

Release the tourniquet at this point, if you did not do so during tube filling. Remove the last tube from the holder and, with your other hand, fold the gauze in half or in quarters; then gently place it directly over the area where the needle enters the skin. Do not apply pressure on the gauze or skin because this will cause pain to the patient before and during needle removal. Using one smooth motion and maintaining a 15- to 30-degree angle, withdraw the needle from the patient's arm. Engage the safety mechanism as the needle is withdrawn. Exact timing for engaging the safety mechanism depends on the manufacturer's recommendations (see Figure 9-16).

Immediately apply gentle pressure to the site for 3 to 5 minutes, or until bleeding stops. The arm should remain straight (not bent at the elbow) to prevent ecchymosis and hematoma formation. **Ecchymosis** is bruising or discoloration caused by blood seeping beneath the skin, and it can spread over a large area. A **hematoma** is a bloody mass that forms when blood seeping beneath the skin remains localized to the immediate area.

Be sure to instruct the patient not to disturb the platelet plug that is forming at the venipuncture site. It is common for a patient to want to bend the arm after needle removal, but tell the patient not to bend the arm upward. Bending the arm may cause bruising. The patient should not touch, blot, or wipe the venipuncture site. Have the patient gently press on the gauze while you are labeling the specimens. Ensure that bleeding has stopped before leaving the patient.



Figure 9-13 Hold the assembly steady while collecting the blood. Do not leave the tourniquet on for more than 1 minute.

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Figure 9-14 Hold the needle steady while removing and replacing tubes during the blood collection.

Total Care Programming, Inc.

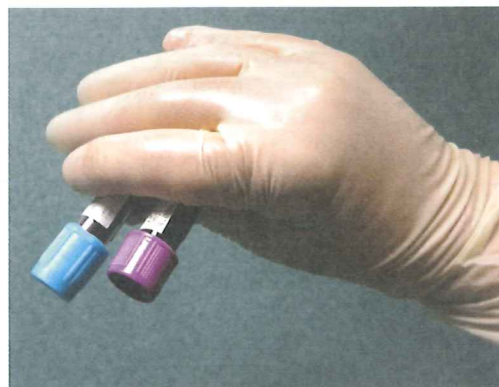
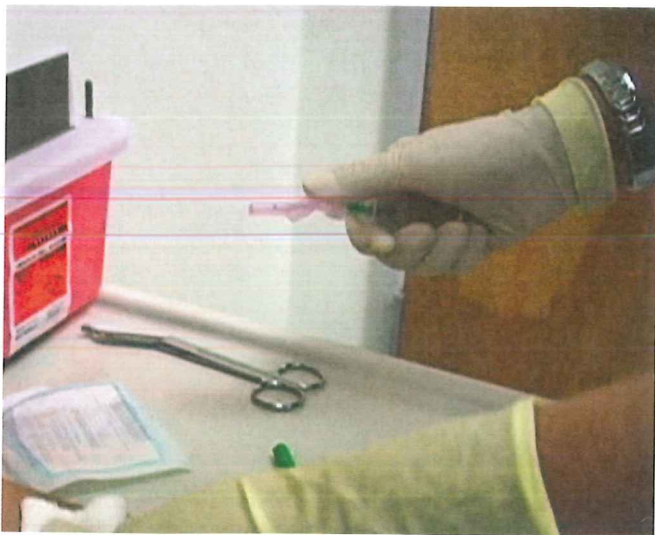


Figure 9-15 When necessary, mix the specimen by inversion.

Lillian Mundt



A



B

Figure 9-16 While holding pressure to the puncture site, engage the needle safety mechanism immediately using the manufacturer's instructions. For example, use (A) your thumb or (B) the edge of a table.

A: Total Care Programming, Inc.; B: Lillian Mundt



Figure 9-17 Have the patient apply firm pressure to the venipuncture site.
Total Care Programming, Inc.

If pressure is not applied to the venipuncture site after removing the needle, a hematoma may form. If the tourniquet is left on and the needle is removed, blood will be forced out of the hole the needle left into the surrounding tissue and into the layer of skin, resulting in a hematoma. Some patients may be on **anticoagulants** (substances that slow the process of clotting, erroneously referred to as blood thinners) and will bleed for a longer time than other patients. Do not leave the patient if bleeding has not stopped; and do not let outpatients leave if the puncture site is still bleeding.

After the Venipuncture

A few more steps are needed to complete the phlebotomy procedure. Your first responsibility is to the patient. You may ask the patient to hold pressure on the gauze while you are completing the final tasks. Make sure the patient is comfortable with holding pressure on the venipuncture site and do not let the patient bend the elbow (see Figure 9-17). If the patient is unable to hold pressure, you should do so until the bleeding stops. Then dispose of the needle and label the specimen. After all tubes are labeled, check to see if the bleeding has stopped. If it has, apply a bandage to the venipuncture site. Finally, document the specimen collection and deliver the specimen to the appropriate laboratory section.

Disposing of the Equipment

The current Needlestick Prevention Act requires that the needle and adapter be disposed of as one unit. Do not unscrew the needle from the adapter to discard it. Keep your opposite hand and arm back and away from the contaminated needle and drop the needle and adapter assembly into the sharps container (Figure 9-18). Never place your hand inside the sharps container.

Sharps containers should be made of a puncture-resistant material and display the biohazard symbol. Pay close attention when disposing of sharp materials. Never overfill the sharps container. Once the sharps container is two-thirds to three-fourths full, seal the lid tightly and place the container in

an appropriate biohazard box for disposal, or follow the specific policy at your facility. Remember to check the sharps container before the blood collection procedure so that you are not left with a contaminated needle and no place to discard it. The sooner a contaminated needle enters the sharps container, the less chance of an accidental needlestick.

Labeling the Specimen

As discussed in the chapter *Patient and Specimen Requirements*, all specimens must be labeled properly before leaving the patient's room or blood collection area or before allowing an outpatient to leave. Properly labeled collection tubes include the patient's full name, medical record number, date, time of collection, and your initials or employee ID code (see Figure 9-19).



Figure 9-19 Properly labeled collection tubes include the patient's full name, medical record number, date, the time of collection, and your initials or employee ID code.

Applying the Bandage

First check the patient's arm to verify that bleeding has stopped. At a minimum, bleeding usually stops after 3 minutes. This is approximately the time it takes to properly label the specimen tubes and dispose of the used needle. Discard the gauze pad and apply a new gauze pad by folding it in half or quarters, placing it on the site, and applying an adhesive bandage or paper tape over the folded gauze. The patient can remove the bandage after 15 minutes. If the patient is allergic to bandages or tape, the patient may apply pressure for a while longer, and paper tape may be placed over the gauze. Other options include wrapping roller gauze completely around the arm or applying a Coban® (elastic) dressing (see Figure 9-20); however, some facilities do not use Coban® on acute (inpatient) collections.

If the patient is elderly and the skin tends to tear when tape or bandages are applied, hold pressure a little longer to ensure that bleeding has stopped. To prevent injury, do not use tape on anyone with thin or fragile skin. Notify the patient's healthcare provider, so they can recheck the venipuncture site. Pressure to the venipuncture site should never be removed until bleeding has stopped—not just on the surface but at the vein level. Bleeding may no longer be present on the skin, but this does not mean that a clot has completely formed in the vein. Once a clot has formed, no bandage is needed. A bandage is recommended in most cases, but keep in mind that small bandages are not recommended for small children, who may choke on or swallow them.

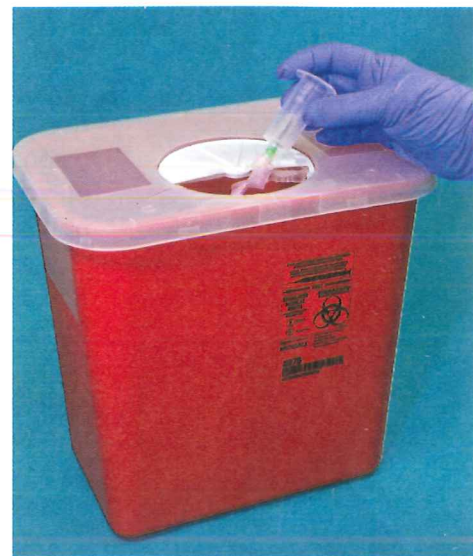


Figure 9-18 Carefully dispose of the needle and adapter in the sharps container. Sandra Mesrine/McGraw-Hill Education



Figure 9-20 Apply a bandage to the site to avoid disturbing the platelet plug and causing further bleeding. Total Care Programming, Inc.

Next, properly put away and dispose of all other supplies and equipment used in the venipuncture procedure. Place the unused evacuated tubes back in their proper places. Dispose of used alcohol pads, dirty gauze, trash from the needle assembly, and adhesive bandages in the trash receptacle. Remove and dispose of gloves in the biohazard trash receptacle or regular trash, depending on your facility's policy, and wash your hands. Thank the patient and leave the phlebotomy area as it was before the procedure.

If an inpatient specimen was collected, replace the bedrail in the same position as it was before the procedure. Move any other items you may have moved for the venipuncture procedure back into their original place. Dispose of non-sharp, noncontaminated items in the patient's trash can, but any tubes or glass slides must be disposed of properly in the laboratory. Thank the patient and, if the door was closed when you entered, close the door when you exit. Use the competency checklist *Routine Venipuncture (Evacuated Tube System)* at the end of this chapter to review and practice the procedure.

Checkpoint Questions 9.1

1. If the median cubital vein is not accessible on either of the patient's arms, which veins might you consider as alternative sites for venipuncture?
2. Under what circumstances should you avoid using adhesive bandages or tape to bandage a patient's arm?
3. What is the difference between repositioning a needle and probing?
4. What is the maximum length of time a tourniquet should be left on the patient's arm?
5. Describe the correct method for cleansing the venipuncture site.

9.2 Difficult Blood Draws

Although routine venipuncture using evacuated tubes and tube holder is the most commonly used procedure for obtaining blood specimens, situations will arise that require the use of alternate blood collection methods. Patients may have very small or difficult-to-access veins or have a condition that causes uncontrollable tremors or shaking. Or the patients may be children who have a difficult time keeping still. Blood collection in these situations often requires the use of a butterfly needle and either an evacuated tube adapter or a syringe.

Butterfly Needle Set

The butterfly needle set, or winged infusion set, is generally less painful to patients. However, the use of the butterfly needle set results in more accidental needlesticks and poses a greater risk of hemolysis. Thus, the butterfly needle set should be chosen only when a standard venipuncture cannot be performed. Figure 9-21 shows one type of butterfly assembly. Butterfly needle sizes range from 21 to 25 gauge in diameter and $\frac{1}{2}$ to $\frac{3}{4}$ inch in length. Butterfly needles may be used with either evacuated tubes or syringes.

When performing venipuncture using a butterfly assembly, the needle is inserted bevel up and held by bending the wings together or "wings up." When the needle is inserted into the vein, a small amount of blood flows into the needle hub. Known as a "flash," this indicates that the needle is in the

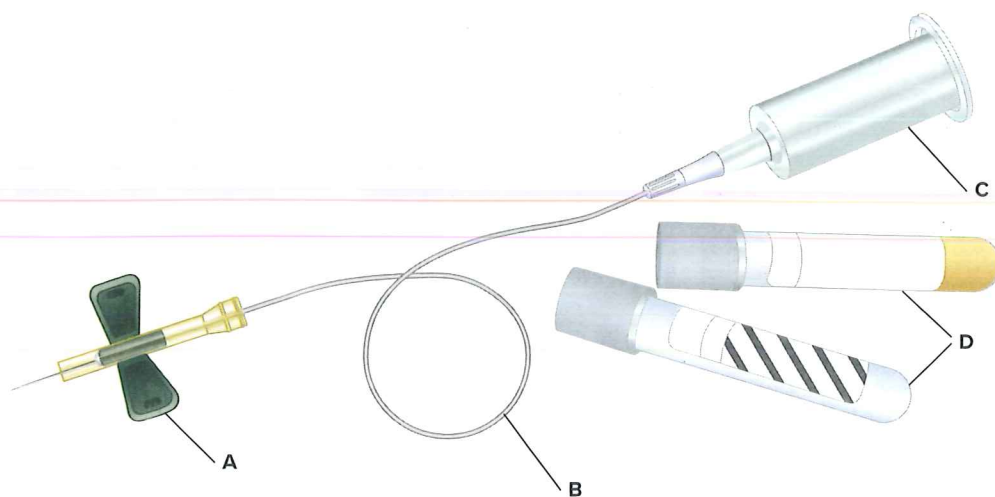


Figure 9-21 This butterfly assembly includes (A) a safety needle with butterfly wings, (B) connecting tubing, (C) an evacuated tube holder, and (D) evacuated tubes.

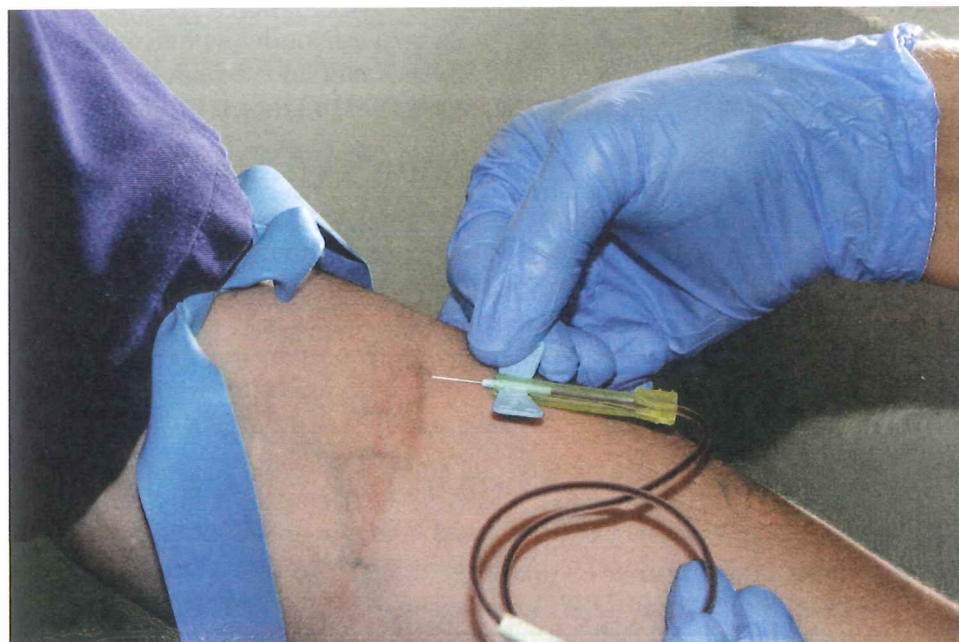


Figure 9-22 Venipuncture using butterfly assembly.
InkaOne/Alamy Stock Photo

vein. Figure 9-22 shows a blood collection using the butterfly assembly with an evacuated tube. The butterfly needle must stay secured to the patient while filling the tubes.

While evacuated tubes are most commonly used with butterfly needles, a syringe is more appropriate in certain situations. Infants, children, and some adults have small veins that require using a butterfly needle set with a syringe. If a small amount (less than 10 mL) of specimen is needed, a safety needle attached directly to a syringe may be used. When a butterfly is used with evacuated tubes, a small or delicate vein can collapse, stopping the specimen collection process (this is referred to as a **collapsed vein**). A syringe does not have a vacuum, so the phlebotomist can control the amount of pressure applied to small or delicate veins. A luer adapter attaches the butterfly needle set to the syringe (see Figure 9-23).

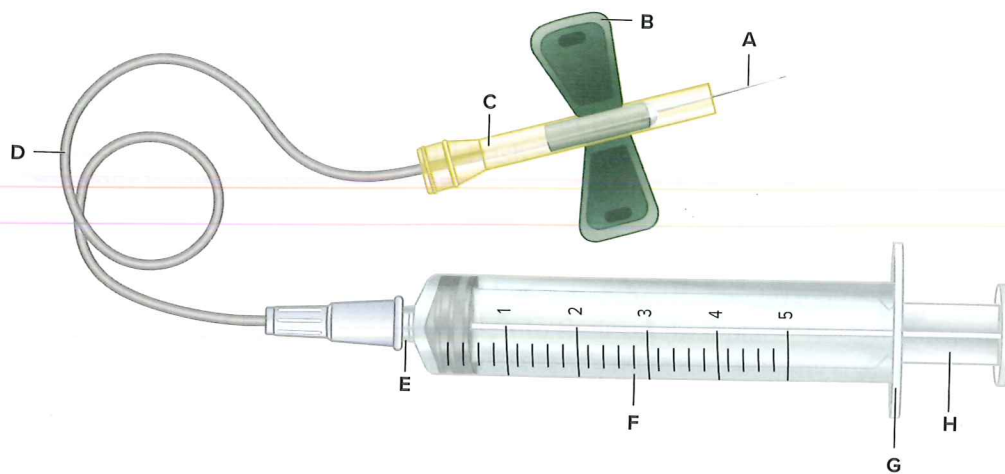


Figure 9-23 This butterfly assembly includes (A) a needle with (B) butterfly wings, (C) a slide-type safety device, (D) connecting tubing, and a syringe with (E) luer-lock hub, (F) barrel with markings in cubic centimeters (ccs) or milliliters (mLs), (G) a flange for ease of gripping, and (H) a plunger to create suction. After successful entry into the vein, the plunger is pulled back until the desired amount of blood is obtained; it is never pulled completely out while drawing blood.

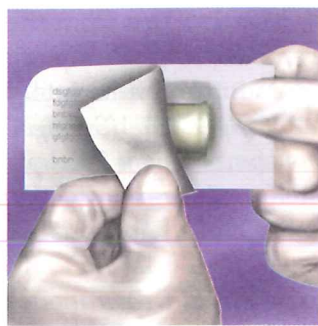
Performing the Venipuncture

When performing a venipuncture using a syringe attached to a needle or butterfly needle set, follow the general steps for routine venipuncture. However, you should be aware of some differences. Equipment setup includes selecting the evacuated tubes needed for specimen transfer from a syringe. Place the evacuated tubes into the collection rack in the correct order of transfer. Collection tubes are filled from the syringe using a transfer device, as described later in this chapter. Put all other necessary venipuncture equipment within arm's reach before starting the procedure.

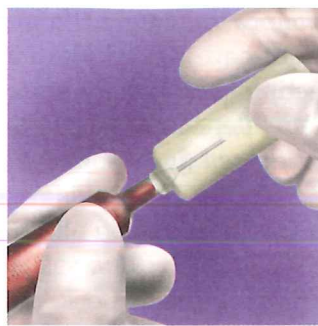
Next, remove the syringe from the sterile packaging and push the plunger in and out to ensure free and smooth movement during the venipuncture procedure. Note that failure to do this almost always results in the inability to perform a draw. Before beginning, make sure the plunger is pushed completely in. While maintaining aseptic conditions, attach the syringe to a safety needle or butterfly setup. Make sure the plunger is pushed all the way in and perform the venipuncture procedure as described earlier in this chapter. Never push the plunger in while in a vein. Hold the syringe in the same manner as you would hold the tube holder. The first sign of a successful venipuncture is blood in the hub, or clear area, at the base of the needle. Carefully pull the plunger back, so that you do not accidentally withdraw the needle from the arm. The barrel of the syringe will fill with blood as you pull the plunger out. Make sure that the correct volume is drawn with a syringe in order to fill all the tubes needed. Complete the syringe collection in the same manner as routine venipuncture.

Transferring the Specimen to Tubes

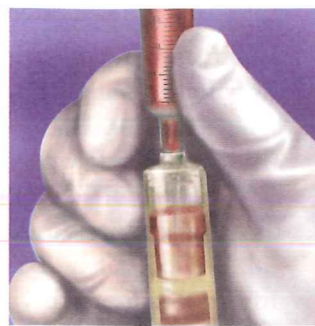
Immediately after removing the needle from the patient's arm, transfer the blood collected in the syringe to evacuated tubes using a blood transfer safety device (see Figure 9-24). Evacuated tubes are filled from the syringe in the same order of draw as outlined in the chapter *Blood Collection Equipment*. When using a blood transfer device, first you must remove the needle from the syringe. Before doing so, make sure the safety mechanism is engaged, so that the needle is not exposed. Attach the device to the syringe and then insert the



1. Peel off backing from transfer device.



2. Insert syringe tip into hub and rotate syringe clockwise to secure.



3. Hold the syringe facing down and push the evacuated tube into the holder. Do not depress the plunger of the syringe.



4. After removing the evacuated tube, discard the tube holder and syringe in an approved sharps container.

Figure 9-24 Using a syringe transfer device.

evacuated blood collection tube into the transfer device. Allow the blood to transfer using the vacuum in the tube. Do not depress the plunger, as this may result in hemolysis. Hemolysis can affect the results of several laboratory tests (see Table 9-1). When the tubes are filled, mix them according to the manufacturer's recommendation and dispose of the transfer device and syringe in the appropriate sharps container. Use the competency checklist *Transferring Specimens to Tubes* at the end of the chapter to review and practice the procedure.

Using a Butterfly Needle Set with Evacuated Tubes

A butterfly needle set can be used with an evacuated tube adapter. Evacuated tube adapters come in two sizes, one for regular-size tubes and one for pediatric-size tubes. A butterfly needle set has tubing that attaches the needle to the evacuated tube adapter area. Tubes are pushed into the adapter in the same manner as in routine venipuncture. A discard tube must be used when drawing a citrate tube (light blue top) to pull the air out of the tubing, allowing the blood collection tube to fill to the line.

Disposing of a Syringe and Butterfly Needle Set

Extra care should be taken when disposing of the entire butterfly needle set in the sharps container. When the needle is removed from the arm, the needle tends to hang from the butterfly assembly tubing, exposing both the phlebotomist and the patient to a potential needlestick injury. A safety device should always be present and engaged as soon as possible after blood collection. Be certain to use the safety device, employing it immediately on withdrawal

TABLE 9-1 Laboratory Tests Affected by Hemolysis

Severely Affected	Considerably Affected	Barely Affected
APTT—activated partial thromboplastin time	ALT—alanine aminotransferase	Acid phosphatase
AST—aspartate aminotransferase	ANA—antinuclear antibodies	Albumin
CBC—complete blood count	Fe—iron	Ca—calcium
K—potassium	Folate	Mg—magnesium
LD—lactate dehydrogenase	TSH—thyroid stimulating hormone	P—phosphorus
PT—prothrombin time	Vitamin B ₁₂	TP—total protein

from the vein, and, in some cases, before the needle is withdrawn from the patient. Some safety devices have a hard plastic cover that snaps into place after withdrawing the needle. Other safety devices retract the needle into a special holder. Use the competency checklists *Routine Venipuncture (Syringe)*, *Venipuncture Using a Butterfly and Syringe*, and *Venipuncture Using a Butterfly and Evacuated Tube Adapter* at the end of this chapter to review and practice these procedures.

Checkpoint Questions 9.2

1. Under what conditions would you consider drawing a patient's blood using a butterfly needle set?
2. When transferring blood from a syringe to evacuated tubes, in what order should you fill the tubes?
3. What two problems may occur if the plunger on a syringe is pulled back too hard or fast while collecting blood using a butterfly set and syringe?

9.3 Venipuncture Complications

Most venipuncture procedures are completed without complication. However, some are not. Complications include events involving the patient and situations that affect the quality of the specimen collected.

Patient Complications

Phlebotomists must be aware of various patient reactions to and complications of the venipuncture procedure. Being prepared to handle complications will help you provide the best customer service, if and when complications occur. Patient complications include fainting, nausea, vomiting, seizures, post-procedure bleeding, formation of petechiae or hematomas, accidental arterial puncture, infection or injury, additive reflux, and choking. Documentation of patient complications is essential for patient follow-up and assurance of quality healthcare delivery. Documentation may need to be recorded at the nurses' station or in the patient's EHR, the laboratory computer, the phlebotomy department log books, variance forms, and risk management forms. Always follow the requirements of your facility for documentation of patient complications. Quality assurance is discussed in more detail in the chapter *Quality Essentials*.

Allergic Reactions

Recall from the chapter *Safety and Preparedness* that some patients have allergies to latex and/or alcohol. Using only nonlatex equipment will help patients avoid such reactions. If the phlebotomist knows that the patient has an allergy to alcohol, they should use an alternate antiseptic. Rarely is a patient allergic to many types of antiseptics. In that case, use warm water on a gauze pad to cleanse the puncture site.

Syncope

During phlebotomy, **syncope** (fainting) can occur. The signs to look for in the patient are heavy perspiration, pale skin, and shallow or fast breathing. Following this, the patient experiences drooping eyelids, rapid and weak pulse, and finally unconsciousness. If the patient does have a syncopal episode, immediately remove the tourniquet and needle and activate the safety device while calling for help. Apply pressure to the venipuncture site. Do not attempt

to handle this situation alone and do not leave the patient. Position yourself in front of the phlebotomy chair or next to the bedside to block the patient from falling or sliding out of the chair or bed. If possible, lay the patient flat or lower their head. If the patient is sitting, lower the patient's head and arms by placing both the head and arms between the patient's knees. Loosen tight clothing. Do not use an ammonia inhalant. If a sink is near the patient, wipe the patient's forehead and back of the neck with a cold compress. Some patients who faint also experience nausea and vomiting. Be prepared to provide the patient with a basin, trash can, or other container. Stay with the patient until appropriate personnel are notified of the incident.

Seizures

In rare cases, seizures or convulsions occur during venipuncture or when a patient faints. Immediately remove the tourniquet and needle, activate the safety device and call for help. Protect the patient from injury by supporting the head if they collapse and moving sharp objects and furniture away from the patient. Lay the patient on the floor if possible. Do not attempt to restrain the patient during the seizure. Stay with the patient and remain calm speaking to the patient during and after the seizure until they have recovered or additional trained personnel have arrived.

Petechiae

Petechiae, or small, nonraised red spots on the skin due to a minute hemorrhage, can result if a tourniquet is left on too long. Petechiae may be seen in normal patients and in patients with coagulation disorders. The presence of these small purple or red spots leaves the patient with a negative, lasting impression of the phlebotomy procedure. Any form of temporary or permanent disfigurement must be avoided, so be sure to remove the tourniquet in a timely manner and keep pressure on the venipuncture site as long as necessary to stop the bleeding.

Bleeding

A patient may say that the bleeding has stopped, leave the phlebotomy area, and remove the arm gauze but return a few moments later with blood dripping down the arm. In this case, the following has occurred: the venipuncture wound appeared to be closed and the bleeding stopped, but movement of the arm caused it to open back up. This will not happen if proper procedures are followed. You must check the puncture site to determine if bleeding has stopped before leaving the patient or allowing outpatients to leave. Advise the patient to apply additional pressure for several minutes before taking off the bandage or gauze. In addition, caution the patient not to use the venipuncture arm to push off with, open doors, or lift heavy objects, such as a purse.

Syncope

After the initial steps of introducing yourself, identifying the patient, and obtaining consent to the procedure, it is a good idea to ask the patient about past experiences with having blood drawn. The patient may convey the tendency to faint during blood-drawing procedures. If fainting is a concern for an outpatient, have them lie down on a hospital bed or an exam table during blood collection.



**Communicate
& Connect**

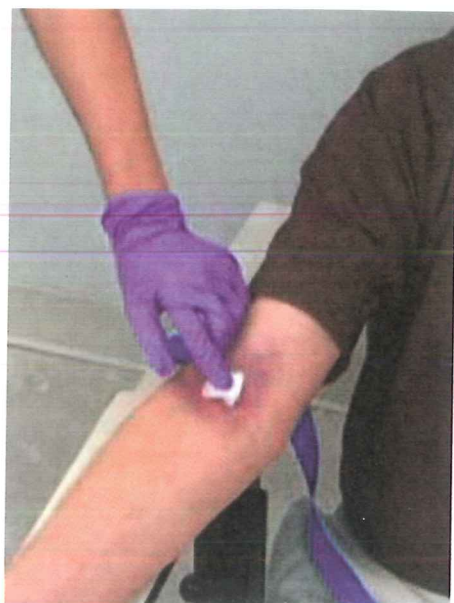


Figure 9-25 Hematomas form underneath the skin if the needle is not inserted completely into the vein or if the needle slips out.

McGraw-Hill Education/Take One Digital Media, photographer

Hematoma

A hematoma, or mass of blood caused by leakage of blood into the tissues, will occur if the tourniquet is left on the arm too long after the needle has been taken out (see Figure 9-25). The tourniquet should be removed before the needle. A hematoma will occur if the needle has gone through the vein or if the bevel of the needle is not inserted fully into the vein. If you notice the formation of a hematoma, release the tourniquet, pull the needle out, and apply firm pressure at the site. If the patient complains of discomfort, apply ice to the hematoma.

Iatrogenic Anemia and Exsanguination

Patients who have repeated blood collections may develop an anemic condition in response to the removal of a large amount of blood over time. This phlebotomy-induced condition is known as **iatrogenic anemia**. If the amount of blood removed for testing exceeds 1% to 5% of total blood volume over a 24-hour period, or 10% over 8 weeks, it could become life-threatening. This later condition is called **exsanguination** and can easily occur in patients of smaller size, children, and infants.

Infection

Puncture site infections are rare, but they do occur. Be careful to ensure the sterility of all the equipment you use. Do not remove the cap from the needle until you are ready to insert the needle into the vein. Never remove a needle cap or lancet cover and then set the needle or device on the bed or other surface. Do not touch the puncture site once it has been cleansed. If a bandage has been applied, ask the patient to leave it in place until there is no chance of reopening the wound, usually 24 hours. Never perform a venipuncture or dermal (capillary) puncture through a previously used site. It may be difficult because of possible scar formation, and microorganisms may be present in scar tissue and can be introduced deeper into the puncture site.

Injury

Injury to the patient can occur if a venipuncture site is poorly selected. A vein that feels very tight and stringy may not be a vein but, rather, a tendon. Nerves lie close to blood vessels. If you insert the needle too deeply, you may intersect a nerve. Probing after an unsuccessful venipuncture may also cause nerve or tendon damage. Observe the patient during phlebotomy, if you hit a nerve, they may jerk the arm or describe a shocking pain. When this occurs, immediately stop the procedure and remove the needle. Instruct the patient to elevate their arm and use ice and light pressure on the site. When nerve injury has occurred, it should be reported to the health care provider and documented according to facility policy.

Additive Reflux

Additive reflux is the flowing of blood mixed with tube additive back into the patient's vein. Additives can cause adverse reactions in the patient. To avoid additive reflux, you should always have the patient's arm and evacuated tubes in a downward position while performing venipuncture.

Choking

Any patient, and especially children, should not be drinking, eating, or chewing gum during the phlebotomy procedure. Any foreign object in the mouth during phlebotomy can cause choking.

Situations That Affect the Quality of the Specimen

Accidental Arterial Puncture

It is important for phlebotomists to be able to differentiate between veins and arteries. Recall that a vein feels bouncy and an artery feels firmer and pulsates. If an artery is punctured by mistake, the blood will appear bright red and will flow with greater force and may even pulsate into the tube. If this occurs, release the tourniquet immediately, withdraw the needle, and apply firm pressure for at least 5 minutes (longer if there is still active bleeding). Then, apply a taut gauze dressing. Instruct the patient to keep the arm relatively still for a short period to minimize the flow of blood and immediately notify a nurse or other licensed professional, who can assist you in preventing hematoma formation.

When arterial blood is given to the laboratory for testing, it must be labeled as “arterial” because the normal values for many blood test results are different for arterial and venous blood. In most cases arterial blood is not used for testing and venous blood will need to be collected.

Hemoconcentration

Hemoconcentration is a rapid increase in the ratio of blood components to plasma. Imagine berries in a jar of liquid that contains five berries per ounce of liquid. Removing some of the liquid, but none of the berries, will increase the number of berries per ounce of fluid. Hemoconcentration is similar; water can slowly leave the vein, causing the concentration of cells and chemicals to increase. Hemoconcentration can be caused if the patient vigorously pumps (rapidly opens and closes) the fist, if the phlebotomist leaves the tourniquet on for longer than 1 minute, or if the tourniquet is too tight. Hemoconcentration happens long before the patient notices it, usually in 3 to 5 minutes. Pain, pressure, or a “falling asleep” sensation of the arm can occur. Hemoconcentration should be avoided because it can cause erroneous results for some laboratory tests, such as protein levels, cell counts, and coagulation studies.

1. List seven complications that may affect the patient during phlebotomy.
2. How will you know if an artery is accidentally punctured instead of a vein?
3. How can you prevent hemoconcentration while drawing a patient's blood?



Checkpoint Questions 9.3

Chapter Summary

Learning Outcome	Key Concepts/Examples	Related NAACLS Competency
9.1 Perform a competent/effective venipuncture.	Venipuncture sites are selected based on their location and appearance and with consideration of the patient's age, the accessibility of appropriate veins, and varying patient situations. Venipuncture is typically performed in the antecubital area of the arm. Each step of the venipuncture procedure is crucial in providing the patient with a successful venipuncture experience. The steps are described in Learn How 9-1 and 9-2 and in the competency checklists at the end of the chapter.	5.1, 5.6, 5.7, 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.11, 6.12
9.2 Describe special procedures needed for venipuncture on difficult-to-draw veins.	Difficult blood draws may require selection of alternate puncture sites, equipment, and techniques. A butterfly needle set is normally a last resort when attempting blood collection; however, it may become necessary in certain circumstances.	5.1, 5.6, 5.7, 6.1, 6.6, 6.8, 6.11, 9.11
9.3 Describe signs and symptoms of venipuncture complications.	Phlebotomists must be aware of and prepared to handle possible complications of venipuncture. Some patient complications include allergic reactions, bleeding and hematoma formation, choking, syncope, pain, injury, and infection. Complications that can affect the quality of the specimen collected include accidental puncture of an artery and hemoconcentration due to prolonged tourniquet application.	6.9, 6.10

Chapter Review

A: Labeling

Label the venipuncture equipment pictured in the following image:



Total Care Programming, Inc.

1. [LO 9.1] _____
2. [LO 9.1] _____
3. [LO 9.1] _____
4. [LO 9.1] _____
5. [LO 9.1] _____
6. [LO 9.1] _____
7. [LO 9.1] _____
8. [LO 9.1] _____
9. [LO 9.1] _____
10. [LO 9.1] _____

B: Matching

Match each term with its definition.

- | | |
|------------------------------------|--|
| ___ 11. [LO 9.3] additive reflux | a. abnormal caving in of the vessel walls, stopping blood flow |
| ___ 12. [LO 9.3] collapsed vein | b. fainting |
| ___ 13. [LO 9.3] ecchymosis | c. increase in ratio of blood components to plasma |
| ___ 14. [LO 9.3] hemoconcentration | d. large bruise caused by blood under the skin |
| ___ 15. [LO 9.3] hematoma | e. mass formed by leakage of blood under the skin |
| ___ 16. [LO 9.3] petechiae | f. results in bright red blood flowing with greater force |
| ___ 17. [LO 9.3] arterial puncture | g. tiny red spots caused by minor hemorrhaging in underlying tissue |
| ___ 18. [LO 9.3] syncope | h. flow of blood mixed with tube additive back into a patient's vein |

C: Fill in the Blank

Write in the word(s) to complete the statement.

19. [LO 9.1] A(n) _____ can be used to visualize the veins during phlebotomy.
20. [LO 9.1] When performing venipuncture, the _____ of the needle should face upward.
21. [LO 9.1] The cap of the needle should not be removed until immediately before puncture to avoid _____.
22. [LO 9.2] If the vacuum in the tube is too great for the vein to handle, it may _____.
23. [LO 9.1] A tube will not fill completely if it has lost its _____.
24. [LO 9.3] If the tourniquet is not released before the needle is removed from the vein, a(n) _____ may form.

D: Sequencing

Place the steps for performing a routine venipuncture in the correct order (from 1 to 21).

25. [LO 9.1] _____ Anchor vein.
26. [LO 9.1] _____ Apply pressure to puncture site.
27. [LO 9.1] _____ Apply tourniquet.
28. [LO 9.1] _____ Cleanse venipuncture site.
29. [LO 9.1] _____ Cover venipuncture site loosely with gauze.
30. [LO 9.1] _____ Check requisition.
31. [LO 9.1] _____ Engage the first tube.
32. [LO 9.1] _____ Explain the procedure to the patient.
33. [LO 9.1] _____ Identify the patient.
34. [LO 9.1] _____ Insert needle into the patient's arm.
35. [LO 9.1] _____ Introduce yourself.
36. [LO 9.1] _____ Label tubes.
37. [LO 9.1] _____ Reapply tourniquet.
38. [LO 9.1] _____ Select tubes and prepare equipment.
39. [LO 9.1] _____ Release tourniquet first time.
40. [LO 9.1] _____ Release tourniquet second time.
41. [LO 9.1] _____ Remove needle apparatus.
42. [LO 9.1] _____ Remove tube and mix.
43. [LO 9.1] _____ Select venipuncture site.
44. [LO 9.1] _____ Thank the patient.
45. [LO 9.1] _____ Wash hands and put on gloves.

E: Case Studies/Critical Thinking

46. [LO 9.3] You encounter a patient with very small veins. You make one attempt and miss; you make another attempt and miss. What should be your next step after the second failed attempt to obtain a specimen?
47. [LO 9.3] An outpatient informs you that he has had several bad experiences with fainting during blood collection procedures. What should you do?
48. [LO 9.3] A patient tells you that it is very difficult to obtain blood from her veins. You are not able to palpate any appropriate vein in the antecubital area. What is your next step?
49. [LO 9.3] During a venipuncture procedure, the blood stops flowing into the tube. What may have happened and how can you save the draw?

F: Exam Prep

Choose the best answer for each question.

50. [LO 9.2] When is a phlebotomist allowed to perform a venipuncture on an ankle vein?
 - a. Never
 - b. When the patient has IVs in both arms
 - c. During an emergency
 - d. When all other options have been exhausted and the physician has given approval
51. [LO 9.1] The most important step in performing a venipuncture is
 - a. removing the tourniquet before taking the needle out.
 - b. drawing the correct amount of blood.
 - c. inserting the needle in the vein properly.
 - d. identifying the patient.
52. [LO 9.1] The vein most frequently used for venipuncture is the
 - a. cephalic vein.
 - b. dorsal arch vein.
 - c. median cubital vein.
 - d. saphenous vein.
53. [LO 9.2] A blood specimen in which the red blood cells are destroyed or broken apart is said to be
 - a. arterial.
 - b. hemolyzed.
 - c. clotted.
 - d. hemoconcentrated.
54. [LO 9.3] When a patient develops syncope during venipuncture, the phlebotomist should first
 - a. lower the patient's head.
 - b. remove the tourniquet and needle and call for help.
 - c. complete the venipuncture as quickly as possible.
 - d. apply an ammonia inhalant
55. [LO 9.1] Which action is appropriate when cleaning the puncture site?
 - a. Blow on the applied alcohol to hasten drying.
 - b. Do not allow the alcohol to dry prior to puncture.
 - c. Rub the alcohol pad using back-and-forth friction.
 - d. Use 70% isopropanol on the site before and after puncture.
56. [LO 9.2] What part of a butterfly needle set should be disposed of in a sharps container?
 - a. The needle
 - b. The needle and tubing
 - c. The entire butterfly needle set
 - d. The needle and safety device
57. [LO 9.1] The angle at which you enter the vein should be
 - a. bevel up at a 15- to 30-degree angle.
 - b. bevel up at a 45- to 60-degree angle.
 - c. bevel down at a 15- to 30-degree angle.
 - d. bevel down at a 45- to 60-degree angle.

58. [LO 9.2] Why is a butterfly needle set used only when a standard venipuncture cannot be performed?
- Butterfly needle sets have a tendency to cause veins to collapse.
 - Using a butterfly needle set results in more accidental needlesticks.
 - Butterfly needle sets cannot be used with patients who are shaking or have tremors.
 - Safety devices cannot be used with butterfly needle sets.
59. [LO 9.1] Advancing the stopper of a collection tube past the mark or ridge on the adapter during equipment setup will
- cause hemolysis in the specimen collected.
 - help ensure that the evacuated tube is working properly.
 - make the venipuncture less painful for the patient.
 - cause a loss of the vacuum in the tube.
60. [LO 9.3] Which of the following laboratory tests is *severely* affected by hemolyzed blood?
- Magnesium (Mg)
 - Calcium (Ca)
 - Potassium (K)
 - Phosphorus (P)
61. [LO 9.2] When using a blood transfer device to transfer blood from a syringe into evacuated tubes, what is the *first* thing you should do?
- Make sure the safety mechanism is engaged.
 - Remove the needle from the syringe.
 - Attach the blood transfer device to the syringe.
 - Insert the evacuated blood collection tube into the transfer device.
62. [LO 9.3] Another phlebotomist tells you that the patient you are about to draw tends to develop hematomas very easily. This means that
- the area around the tourniquet will show small, red spots.
 - the venipuncture site may swell and fill with blood.
 - the patient will faint and should be lying down.
 - you should not apply a bandage because the patient has allergies.
63. [LO 9.1] Which veins are appropriate for routine venipuncture? (*Choose all that apply.*)
- Cephalic vein
 - Dorsal arch vein
 - Median cubital vein
 - Metacarpal plexus veins
64. [LO 9.1] Which action is appropriate when cleaning the puncture site?
- Clean the site with antiseptic, moving back and forth over the site.
 - Start at the top of the puncture site and wipe downward.
 - Start at the bottom of the puncture site and wipe upward.
 - Rub the alcohol pad in concentric circles from inside out.
65. [LO 9.2] Which veins may a phlebotomist access during difficult venipuncture procedures? (*Choose all that apply.*)
- Ankle veins
 - Dorsal arch vein
 - Femoral vein
 - Metacarpal plexus veins
66. [LO 9.3] You are informed that a specimen you delivered to the laboratory has to be re-collected due to hemolysis. What might have caused this specimen to hemolyze? (*Choose all that apply.*)
- Not waiting for the alcohol to dry
 - Leaving the tourniquet on too long
 - Vigorously mixing the specimen
 - Removing the tourniquet while the tubes were filling
67. [LO 9.2] Which of the following is another name for a butterfly needle set?
- Evacuated tube set
 - Pediatric set
 - Blood transfer device
 - Winged infusion set
68. [LO 9.3] Reflux during a venipuncture procedure is a condition in which
- the patient is experiencing heartburn.
 - the patient is jerking his or her arm.
 - the tube additive is being pulled into the patient's vein.
 - the needle is slipping out of the vein.

69. [LO 9.1] During a venipuncture, the blood stops flowing into the tube. You change tubes, and blood flows into the second tube, but then it stops again before the tube is filled. What may be causing this to happen? (*Choose all that apply.*)

- a. The tubes are expired and have partially lost vacuum.
- b. The vein collapses and expands when the tube is removed.
- c. The tube selected is a pediatric draw tube and fills only part of the way.
- d. The needle is too far into the vein.



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NAME: _____ DATE: _____

COMPETENCY CHECKLIST: ROUTINE VENIPUNCTURE (EVACUATED TUBE SYSTEM)

Procedure Steps	Practice			Performed		
	1	2	3	Yes	No	Master
Preprocedure						
1. Examines the requisition.						
2. Greet the patient; introduces self.						
3. Identifies the patient verbally using two identifiers, including comparing the identification band with the requisition for inpatients.						
4. Explains the procedure to the patient.						
5. Verifies dietary restrictions or instructions.						
6. Washes hands and puts on gloves.						
7. Selects the correct equipment and supplies.						
8. Assembles the equipment and supplies properly.						
9. Conveniently places the equipment.						
10. Reassures the patient.						
11. Positions the patient's arm comfortably.						
12. Applies the tourniquet.						
13. Identifies a vein by palpation.						
14. Selects a venipuncture site.						
15. Releases the tourniquet.						
16. Cleanses the venipuncture site.						
17. Allows the site to air dry.						
Procedure						
18. Reapplies the tourniquet.						
19. Confirms the venipuncture site visually.						
20. Anchors the vein below the puncture site.						
21. Smoothly inserts the needle at the correct angle.						
22. Inserts the needle with the bevel up.						
23. Inserts the tubes without causing pain.						
24. Allows the tubes to fill completely.						
25. Removes the tubes.						
26. Mixes the tubes by inversion (as recommended by the manufacturer).						
27. Collects the tubes in correct order.						
28. Does not move the needle between tubes.						
29. Removes the last tube from the holder.						
30. Releases the tourniquet.						

Procedure Steps	Practice			Performed		
	1	2	3	Yes	No	Master
Procedure						
31. Places gauze over the puncture site.						
32. Withdraws the needle smoothly.						
33. Activates the safety engineering control device.						
Postprocedure						
34. Applies pressure to the venipuncture site.						
35. Disposes of the needle and tube adapter in the correct container.						
36. Labels the tubes correctly (including date, time, and phlebotomist identification).						
37. Places specimen in transport bag observing any special handling instructions.						
38. Checks the venipuncture site.						
39. Applies a bandage.						
40. Thanks the patient.						
41. Disposes of used supplies appropriately.						
42. Removes gloves and washes the hands.						
43. Transports specimens to the laboratory.						
44. Documents specimen collection.						

COMMENTS: _____

SIGNED

EVALUATOR: _____

STUDENT: _____

COMPETENCY CHECKLIST: TRANSFERRING SPECIMENS TO TUBES

Procedure Steps	Practice			Performed		
	1	2	3	Yes	No	Master
Preprocedure						
1. Prepares for specimen transfer after the venipuncture preprocedure but prior to the venipuncture procedure.						
2. Selects the correct equipment and supplies (blood transfer device).						
3. Conveniently places the equipment.						
4. Performs the specimen transfer procedure immediately after removing the needle from the vein.						
Procedure						
5. Inserts the syringe into the transfer device hub.						
6. Inserts the syringe into the transfer device hub.						
7. Uses safe technique to fill the tubes.						
8. Fills the tubes in correct order.						
9. Allows the tubes to fill naturally.						
10. Mixes anticoagulated tubes by inversion.						
Postprocedure						
11. Disposes of the transfer device and syringe in the correct container.						
12. Continues with the venipuncture postprocedure.						

COMMENTS: _____

SIGNED _____

EVALUATOR: _____

STUDENT: _____

COMPETENCY CHECKLIST: ROUTINE VENIPUNCTURE (SYRINGE)

Procedure Steps	Practice			Performed		
	1	2	3	Yes	No	Master
Preprocedure						
1. Examines the requisition.						
2. Greets the patient; introduces self.						
3. Identifies the patient verbally using two identifiers, including comparing the identification band with the requisition for inpatients.						
4. Explains the procedure to the patient.						
5. Verifies dietary restrictions or instructions.						
6. Washes hands and puts on gloves.						
7. Selects the correct equipment and supplies.						
8. Assembles the equipment and supplies properly.						
9. Checks the plunger movement of the syringe.						
10. Conveniently places the equipment.						
11. Reassures the patient.						
12. Positions the patient's arm comfortably.						
13. Applies the tourniquet.						
14. Identifies a vein by palpation.						
15. Selects the venipuncture site.						
16. Releases the tourniquet.						
17. Cleanses the venipuncture site.						
18. Allows the site to air dry.						
Procedure						
19. Reapplies the tourniquet.						
20. Confirms the venipuncture site visually.						
21. Anchors the vein below the puncture site.						
22. Smoothly inserts the needle at the correct angle.						
23. Inserts the needle with the bevel up.						
24. Collects the appropriate amount of the sample.						
25. Releases the tourniquet.						
26. Places gauze over the puncture site.						
27. Withdraws the needle smoothly.						
28. Activates the safety engineering control device.						

(Continued)

Procedure Steps	Practice			Performed		
	1	2	3	Yes	No	Master
Postprocedure						
29. Applies pressure to the venipuncture site.						
30. Uses a safe technique to fill the tubes.						
31. Fills the tubes in correct order.						
32. Mixes anticoagulated tubes by inversion.						
33. Disposes of the needle and syringe in the correct container.						
34. Labels the tubes correctly (including date, time, and phlebotomist identification).						
35. Places specimen in transport bag observing any special handling instructions.						
36. Checks the venipuncture site.						
37. Applies a bandage.						
38. Thanks the patient.						
39. Disposes of used supplies appropriately.						
40. Removes gloves and washes the hands.						
41. Transports the specimens to the laboratory.						
42. Documents specimen collection.						

COMMENTS: _____

SIGNED

EVALUATOR: _____
 STUDENT: _____

COMPETENCY CHECKLIST: VENIPUNCTURE USING A BUTTERFLY AND SYRINGE

Procedure Steps	Practice			Performed		
	1	2	3	Yes	No	Master
Preprocedure						
1. Examines the requisition.						
2. Greets the patient; introduces self.						
3. Identifies the patient verbally using two identifiers, including comparing the identification band with the requisition for inpatients.						
4. Explains the procedure to the patient.						
5. Verifies dietary restrictions or instructions.						
6. Washes hands and puts on gloves.						
7. Selects the correct equipment and supplies.						
8. Assembles the equipment and supplies properly.						
9. Checks the plunger movement of the syringe.						
10. Conveniently places the equipment.						
11. Reassures the patient.						
12. Positions the patient's arm comfortably.						
13. Applies the tourniquet.						
14. Identifies a vein by palpation.						
15. Selects the venipuncture site.						
16. Releases the tourniquet.						
17. Cleanses the venipuncture site.						
18. Allows the site to air dry.						
Procedure						
19. Reapplies the tourniquet.						
20. Confirms the venipuncture site visually.						
21. Anchors the vein below the puncture site.						
22. Holds the butterfly needle with the wings upward and bevel up.						
23. Inserts the needle smoothly at the correct angle.						
24. Collects the appropriate amount of the sample.						
25. Releases the tourniquet.						
26. Places gauze over the puncture site.						
27. Withdraws the needle smoothly.						
28. Activates the safety engineering control device.						

(Continued)

Procedure Steps	Practice			Performed		
	1	2	3	Yes	No	Master
Postprocedure						
29. Applies pressure to the venipuncture site.						
30. Uses safe technique to fill tubes.						
31. Fills the tubes in correct order.						
32. Mixes anticoagulated tubes by inversion.						
33. Disposes of the needle and syringe in the correct container.						
34. Labels the tubes correctly (including date, time, and phlebotomist identification).						
35. Places specimen in transport bag observing any special handling instructions.						
36. Checks the venipuncture site.						
37. Applies a bandage.						
38. Thanks the patient.						
39. Disposes of used supplies appropriately.						
40. Removes the gloves and washes hands.						
41. Transports the specimens to the laboratory.						
42. Documents the specimen collection.						

COMMENTS: _____

SIGNED

EVALUATOR: _____

STUDENT: _____

NAME: _____ DATE: _____

COMPETENCY CHECKLIST: VENIPUNCTURE USING A BUTTERFLY AND EVACUATED TUBE ADAPTOR

Procedure Steps	Practice			Performed		
	1	2	3	Yes	No	Master
Preprocedure						
1. Examines the requisition.						
2. Greets the patient; introduces self.						
3. Identifies the patient verbally using two identifiers, including comparing the identification band with the requisition for inpatients.						
4. Explains the procedure to the patient.						
5. Verifies diet restrictions or instructions.						
6. Washes hands and puts on gloves.						
7. Selects the correct equipment and supplies.						
8. Assembles the equipment and supplies properly.						
9. Conveniently places the equipment.						
10. Reassures the patient.						
11. Positions the patient's arm comfortably.						
12. Applies a tourniquet.						
13. Identifies a vein by palpation.						
14. Selects a venipuncture site.						
15. Releases the tourniquet.						
16. Cleanses the venipuncture site.						
17. Allows the site to air dry.						
Procedure						
18. Reapplies the tourniquet.						
19. Confirms the venipuncture site visually.						
20. Anchors the vein below the puncture site.						
21. Holds the butterfly needle with wings upward and bevel up.						
22. Inserts the needle smoothly at the correct angle.						
23. Collects tubes in the correct order of draw.						
24. Mixes the tubes by inversion (as recommended by the manufacturer).						
25. Releases the tourniquet.						
26. Places gauze over the puncture site.						
27. Withdraws the needle smoothly.						
28. Activates the safety engineering control device.						

(Continued)

Procedure Steps	Practice			Performed		
	1	2	3	Yes	No	Master
Postprocedure						
29. Applies pressure to the venipuncture site.						
30. Disposes of the needle and holder in the correct container.						
31. Labels the tubes correctly (including date, time, and phlebotomist identification).						
32. Places specimen in transport bag observing any special handling instructions.						
33. Checks the venipuncture site.						
34. Applies a bandage.						
35. Thanks the patient.						
36. Disposes of used supplies appropriately.						
37. Removes gloves and washes hands.						
38. Transports specimens to the laboratory.						
39. Documents the specimen collection.						

COMMENTS: _____

SIGNED

EVALUATOR: _____

STUDENT: _____