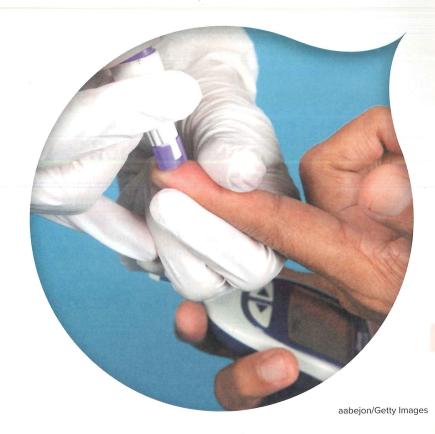
Sel

Dermal (Capillary) Puncture

calcaneus
interstitial fluid
osteomyelitis
palmar
plantar



Learning Outcomes

- 10.1 Explain why dermal (capillary) puncture is used instead of routine venipuncture for some patients.
- 10.2 Select an appropriate site for dermal (capillary) puncture and identify the equipment needed.
- 10.3 Carry out the procedure for performing a dermal (capillary) puncture.
- 10.4 Apply the procedure for collecting a dermal (capillary) specimen.

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.
- **6.7** Describe and perform correct procedure for capillary (dermal) collection methods.
- **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.
- **6.13** Demonstrate a successful capillary (dermal) puncture 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

Dermal puncture, also known as capillary puncture, is frequently used when collecting blood from infants and children as well as when an alternative to venipuncture is necessary for difficult draws on adults. This chapter outlines reasons why dermal (capillary) puncture is used, the equipment needed, and the techniques for performing it.

10.1 The Dermal (Capillary) Puncture

Venipuncture is more difficult in infants and children than in adults. Because of a child's smaller size, it is difficult to locate a vein that is large enough to withstand the vacuum present in evacuated collection tubes without collapsing. Furthermore, children usually do not remain still for the length of time this procedure requires. Dermal (capillary) puncture is therefore the preferred blood collection technique for infants and very small children.

Dermal (capillary) puncture may also be used as an alternate method of blood collection for adult patients with whom venipuncture procedures are too difficult. For example patients who are obese or have thin skin are often candidates for dermal (capillary) puncture. Be certain to check the policy at your facility as well as the laboratory tests ordered. Blood for some laboratory tests, such as coagulation tests, may not be collected using dermal (capillary) puncture. See Table 10-1 for a comparison of blood collection methods.

A dermal (capillary) puncture specimen is obtained from the capillaries. Recall the capillaries join the smallest veins (venules) and the smallest arteries (arterioles). The specimen obtained during dermal (capillary) puncture is a mixture of venous blood, arterial blood, and **interstitial fluid** (fluid between cells and tissues). When capillary blood is drawn it must be noted for the testing personnel. Capillary blood is higher in glucose and lower in electrolytes (sodium, potassium, chloride and calcium), total protein, and bilirubin making normal values (reference ranges) different.

Even with these differences, developing technology in laboratory instrumentation allows tests to be performed on capillary blood. The most notable exceptions are blood cultures and erythrocyte sedimentation rate (ESR) because both of these tests require a relatively large amount of blood. An ESR is the measurement of the erythrocyte settling rate.

One drawback of a dermal (capillary) puncture for the laboratory is the small amount of blood collected. This small quantity usually leaves an insufficient sample if the test requires a large amount of blood or needs to be repeated.

TABLE 10-1 Comparison of Collection Methods

Method	When to Use	Pros	Cons		
Evacuated Routine collection tube Whenever possible		Fast Relatively safe Best specimen quality Large collection amount possible	May not work with small veins, fragile veins, difficult draws, small children, hand veins		
Butterfly assembly with syringe	Small veins Fragile veins Difficult draw Small children	Least likely to collapse vein Less painful for patient Least likely to pass through small veins	Syringe not as safe: tube transfer Specimen may be hemolyzed Expense Increased risk of needlestick		
Dermal (capillary) puncture	Infants and children Patients with thin skin Patients who veins are being preserved for chemo or IV therapy Severely burned or scarred patients Obese patients Patients with fragile, superficial or difficult to access veins Patients with IV therapy in both arms Point-of-care testing Procedure requiring capillary specimen only Patients with thrombotic (clotting) tendencies Patients whose test requires only a small amount of blood and have multiple unsuccessful venipuncture	Easy to perform Good to use when tests require only a small amount of specimen	Not good for dehydrated patient Not good for patient with poor circulation Cannot collect for certain tests, such as blood cultures, ESRs, and coagulation tests		

- 1. For what types of patients is dermal (capillary) puncture often the preferred method?
- 2. What components make up blood specimens obtained by dermal (capillary) puncture?



10.2 Preparing for a Dermal (Capillary) **Puncture**

The steps to prepare for a dermal (capillary) puncture procedure are the same as those used in venipuncture. Follow the steps in Learn How 10-1. The main differences between venipuncture and dermal (capillary) puncture are the site selection and the equipment required (see Figure 10-1).

Dermal (Capillary) Puncture Preparation

- 1. Acquire and examine the requisition slip.
- 2. Greet and identify the patient.
- 3. Explain the procedure.
- 4. Verify any dietary restrictions.
- 5. Wash your hands.
- 6. Put on gloves.

Selecting the Site for Dermal (Capillary) Puncture

The skin should be warm, pink, and free from scars, cuts, rashes, or bruises. Sites to consider for dermal (capillary) puncture are the distal regions of the middle finger (third finger) and ring finger (fourth finger) in children and adults and the medial or lateral regions of the plantar surface of the heel in infants. The blue-shaded areas in Figure 10-2 show the proper and most common sites for dermal (capillary) puncture blood collection. In rare cases, with the approval of the licensed practitioner, it may be necessary to perform a dermal (capillary) puncture on a patient's great toe. For example, a great toe may be the only accessible and appropriate site for a patient with burns that cover a large percentage of the body. Only the great toe may be used, other toes are too thin and could result in injury.

For a finger puncture, do not use the thumb (first finger) or pointer finger (second finger); they are poor choices because the area is often too thick and callused. Also do not use the pinkie (fifth finger) because the bones are closer to the surface, increasing the risk of bone puncture. Always puncture across the grain (across the lines) of the fingerprint lines. Do not use the end or tip of the finger.

In infants of less than 1 year who are not walking, the heel is the recommended puncture site. Never perform a dermal (capillary) puncture on an infant who has begun to walk because of the potential for pain and infection at the site. Examine the infant's heel and choose the lateral surface for dermal (capillary) puncture. Do not use the arch of the foot, the back of the heel, or the plantar area (bottom surface, or sole) of the foot. If an infant has several



Figure 10-1 Equipment for dermal (capillary) puncture includes (A) tissue warmer, (B) gauze, (C) alcohol prep pads, (D) lancets, and (E) microcollection containers. Sandra Mesrine/McGraw-Hill Education

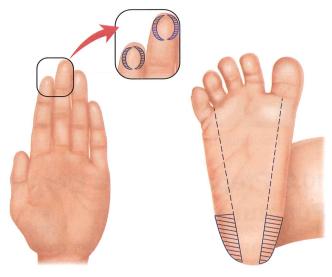


Figure 10-2 The dark areas (in blue) indicate correct sites for finger and infant heel dermal (capillary) puncture.

old puncture sites, attempt to find an unused area. The site chosen for puncture should be well away from the area of the **calcaneus**, or heel bone. If the calcaneus is punctured, it can cause **osteomyelitis**, an infection of the bone. In premature infants, the calcaneus is less than 2.0 mm below the surface of the skin and a lancet length of less than 2.0 mm should be used.

For children and adults, the preferred site for dermal (capillary) puncture is the **palmar** (palm side) surface of the finger. Usually, the ring or middle finger of the nondominant hand is chosen. The dermal (capillary) puncture site of choice is the side of the fingertip.

Selecting Age-Appropriate Dermal (Capillary) Puncture Sites

For blood collection on neonates (newborns), always use the heel. Their tiny fingers are much too small for maintaining a safe distance from the bone during puncture. Heelsticks may continue to be used until the young child begins to walk. Remember never to puncture through a previous puncture site. When performing fingerstick blood collections on children and adults, remember that the third and fourth fingers are the most appropriate to use because they are the least likely to cause pain and discomfort afterward.

Life Span
Considerations

Sites should be selected carefully. Table 10-2 summarizes the recommended dermal (capillary) puncture sites and site limitations.

Prewarming the selected site is beneficial. The warming will increase the blood flow to the capillaries sevenfold resulting in specimens being more quickly obtained with less tissue compression producing more accurate results.

Assembling the Dermal (Capillary) Puncture Equipment

Before performing a dermal (capillary) puncture, you must gather the equipment and supplies needed for the procedure. The equipment needed for dermal (capillary) puncture is the same as that used for venipuncture, with the exception of the puncture device and the collection containers. As described in the chapter *Blood Collection Equipment*, you will need the following:

- Requisition slip
- Gloves

TABLE 10-2 Dermal (Capillary) Puncture Site Selection Summary

Recommended '	Require Physician's Permission	To Be Avoided	Must Not Be Used
Heel; medial and lateral plantar surfaces	Limb on a side of a mastectomy	Extensive scarring, healed burns	Infected Sites
Central fleshy area of third and fourth fingers		Inflamed sites	Fifth (smallest) finger
Across fingerprint lines		Edematous sites	
		Previous puncture sites	
		Earlobes	
		Thumb	

- · Alcohol prep pad
- Gauze
- Adhesive bandage or tape
- Sharps container
- Computer label
- Permanent marker or pen
- Safety dermal (capillary) puncture device or lancet
- Microspecimen containers

Microspecimen containers vary in size and shape. Some collection devices have a strawlike apparatus attached to the end. Capillary action—the force that causes fluids to rise into tubes with small diameters—helps these devices fill with a pulling action. These strawlike tubes are typically held horizontally during collection.

Safety dermal (capillary) puncture devices have a blade or puncture point that retracts after the device is used, preventing needlesticks. These devices are frequently spring-loaded to control the depth and to ensure that the blade retracts after use.

Devices are chosen according to the age and size of the patient. Many devices can be set to different depths, depending on the patient. Table 10-3 shows typical depths for patients of various ages.

Note that the actual depth of the puncture is slightly more than the lancet or device blade length, because the pressure used to perform the puncture compresses the skin slightly. Therefore, devices are usually set at 2.2 mm for children over 8 years and adults. Slightly longer depths may be needed for obese patients.

Law & Ethics

Heel Puncture Depth

Improper technique during dermal (capillary) puncture can cause bone infection. This is especially true in infants. It can be considered malpractice if the calcaneus is punctured by mistake, creating a site for bacterial infection. This infection can lead to further infection of the surrounding bone, cartilage, and bone marrow. Thus, puncture depth should never be greater than 2 mm and should never be performed at the center of the heel, where the calcaneus is most likely to be punctured.

TABLE 10-3 Typical Dermal (Capillary) Puncture Depths

Patient Age	Puncture Site	Puncture Depth
Premature neonate	Heel	0.85 mm
Full-term neonate	Heel	<2.0 mm
Child 6 months to 8 years	Finger	1.5 mm
Child over 8 years	Finger	2.4 mm
Adult	Finger	2.4 mm

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10.3 Performing a Dermal (Capillary) Puncture

When a dermal (capillary) puncture is performed, a cut is made into the layers of the dermal (skin) surface. The finger should be held in such a way that the skin is stretched tightly. For a finger dermal (capillary) puncture, the cut is made across the fingerprint lines. Cutting across or perpendicular to the fingerprint delivers the best possible blood flow and droplet formation for a dermal (capillary) puncture (see Figure 10-3). If the cut is made between the fingerprint lines (parallel to the fingerprints), the blood flow is lower, and the blood tends to flow down the fingerprint instead of forming drops.

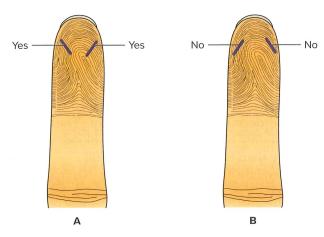


Figure 10-3 For a correct dermal (capillary) puncture, (A) cut across the fingerprint; (B) do not cut in the same direction as the fingerprint.

Finger Puncture for Pediatric Patients

The heel is the preferred site for dermal (capillary) puncture for neonates and infants under 6 months and 22 pounds. The second or third finger is used for dermal (capillary) puncture on older and heavier pediatric patients and adults. When a pediatric patient needs a finger puncture, the child must be immobilized. This can be done by having the parent sit on the phlebotomy chair with the child on their lap and do the following:

- Cross the parent's legs over the child's legs.
- Secure the arm that will not be punctured by extending the parent's arm across the child's chest and tucking it under the parent's own arm.
- Grasp the elbow of the child's dermal (capillary) puncture arm and hold it securely.
- Use the parent's other arm to grasp the child's wrist, holding it palm down.

Life Span
Considerations

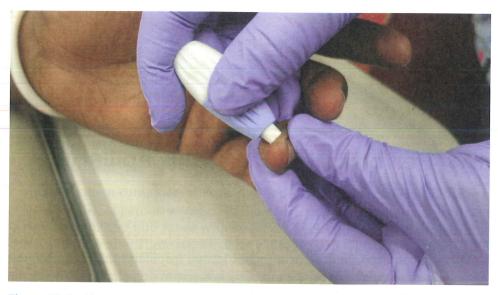


Figure 10-4 Hold the finger downward and apply pressure to puncture the site. Be sure the puncture is made across the fingerprint lines.

Clean the finger with an alcohol pad and allow the finger to air dry thoroughly. It is very important to allow the site to dry prior to collecting the dermal (capillary) puncture specimen. This will prevent hemolysis of the blood due to contact with the alcohol and will aid in killing any bacteria present. Apply slight pressure; then puncture the site with the proper safety device (see Figure 10-4).

Do not use spring-loaded devices designed for glucose monitoring when performing a routine dermal (capillary) puncture. These lancets produce a smaller puncture and only two or three drops of blood. Most microcollection containers need more than two or three drops to fill.

Use the device correctly. Check the directions. No matter which device or site (finger or heel) you use, dermal (capillary) puncture will cause pain. It is better to make the first puncture deep enough, using the proper technique, than to have to puncture a second time to obtain sufficient blood. Use Learn How 10-2 and the competency checklists Dermal (Capillary) Puncture on Finger and Dermal (Capillary) Puncture on Heel at the end of the chapter to review and practice the procedure.

Learn How 10-2

Performing a Dermal (Capillary) Puncture

- 1. Assemble the equipment, considering the patient and puncture depth.
- 2. Clean the site with an alcohol pad and allow the site to dry thoroughly.
- 3. Hold the finger (or heel) with the skin stretched tightly.
- 4. Use the lancet or puncture device according to the manufacturer's directions to create the puncture.



- 1. Why should you position the lancet or dermal (capillary) puncture device so that the blade cuts across the fingerprint lines?
- 2. Why should you avoid using puncture devices designed for glucose monitoring for routine dermal (capillary) puncture?

10.4 Collecting the Dermal (Capillary) Specimen

At the puncture site, a drop of capillary blood forms. Before collecting any blood in the microcollection container, wipe away the first drop of blood. This drop contains interstitial fluid and damaged tissue cells, which will contaminate the blood specimen. After the next drop has formed, touch the open end (collection tube or scoop) of the microcollection container to the drop of blood. The microcollection container will fill by gravity or capillary action, depending on the size of the collection area (see Figure 10-5). Capillary tubes are typically collected horizontally using capillary action and require very little blood. However, more than 0.5 mL of capillary blood can be collected by dermal (capillary) puncture if the puncture is performed properly.

Correct dermal (capillary) puncture collection involves allowing free-flowing drops to enter the collection device. The blood flows onto the tip and then down the walls of the microcollection container. Do not massage or apply pressure moving toward the puncture site. This process, known as "milking," does not enhance blood flow. It can, however, contaminate the specimen with interstitial fluid, causing hemolysis or clotting. Also, do not scrape the collection container against the skin because this may cause the blood to either hemolyze or clot before it can be mixed with the anticoagulant in the microcollection container. The resulting clotted specimen is unsuitable for testing. Instead, gently squeeze and release the site periodically, allowing for capillary refill, until an adequate amount of blood is obtained. Keep the site below the level of the heart to increase blood flow.

Recall that some microcollection containers have an anticoagulant additive. After each drop enters the container, gently tap the container on a hard surface to mix the blood with the anticoagulant. Tapping should cause the blood to flow down the side or wall. Most microcollection containers have a fill line. It is critical to collect to the fill line, especially if the container has an anticoagulant. Do not underfill or overfill the container. After the container is correctly filled, apply the cap to the container and mix by inverting the container according to the manufacturer's instructions.

Order of Draw

As you may recall from the *Blood Collection Equipment* chapter, microcollection tubes must be drawn in a specific order to avoid contaminating the specimens. Fill the tubes in the following order:

- EDTA (lavender or pink)
- Heparin (green or light green)

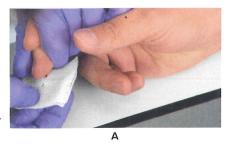






Figure 10-5 For a dermal (capillary) puncture, (A) wipe away the first drop of blood to avoid contaminating the specimen with tissue fluid, (B) position the finger so that drops of blood form freely and fall away from the puncture site, and (C) collect each drop in a microcollection container and gently tap the container after each drop to ensure mixing with the anticoagulant (if present).

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Figure 10-6 Blood microcollection containers with markings for acceptable minimum and maximum fill levels.

- Sodium fluoride (gray)
- Nonadditive (red) or serum separator (gold)

Complications of Dermal (Capillary) Puncture

Care must be taken when performing dermal (capillary) punctures because several complications may occur as a result of improper technique. It is important *not* to puncture through a previous site. Using the same site on the heel of an infant or the finger on a child or adult may cause the site to become infected if microorganisms are present in the scar tissue from the previous puncture. Care must also be taken to ensure that the puncture is not so deep that it punctures the bone. Puncturing the bone may cause osteochondritis (inflammation of bone and cartilage) or osteomyelitis (inflammation of bone marrow and adjacent bone).

Minimum and Maximum Blood Volumes

Phlebotomists must be aware of the minimum amount of blood required for each laboratory test, which may require asking the testing laboratory for specific volumes. This is very important when collecting blood from infants and small children because phlebotomists must not only be certain that enough blood is collected but also ensure that the blood collection for these patients does not exceed the maximum allowed for the day or over time. 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.

Most blood microcollection containers display markings for acceptable minimum and maximum fill levels (see Figure 10-6). The amounts vary by manufacturer and type of additive present. In the example in Figure 10-6, the PST tube (light green) shows that the acceptable amounts of blood for this tube are from 400 to 600 microliters, while the EDTA tube (lavender) shows an acceptable fill range of 250 to 500 microliters. Filling between these two marks and mixing adequately will ensure that a quality specimen is collected. Do not exceed the maximum fill amount because overfilling may cause the specimen to clot or alter test results.

Some facilities require anyone collecting blood specimens from infants to record the amount withdrawn in the patient's health record or on a special document maintained at the nursing unit. Hospital neonatal units may have guidelines established for the maximum amount of blood that can be collected from infants and who is responsible for monitoring these volumes. See Table 10-4

TABLE 10-4 Example Guidelines for Maximum Blood Collection Volumes*

Body Weight (kg)	Body Weight (lb)	Maximum Allowable Volume (mL) in One Blood Draw (2.5% of Total Blood Volume)	Total Maximum Allowable Volume (mL) Drawn Over 30 Days
1	2.2	2.5	5
2	4.4	5	10
3	6.3	6	12
4	8.8	8	16
5	11	10	20
6	13.2	12	24
7	15.4	14	28
8	17.6	16	32
9	19.8	18	36
10	22	20	40

*Based on blood volumes of 100 mL/kg for preterm infants and 80 mL/kg for term infants. Always follow the guidelines for your facility.

for an example of maximum blood volume guidelines. Always abide by the protocols of your facility. Paying careful attention to the amount collected from infants and children will reduce the occurrence of iatrogenic anemia and exsanguination in these patients. Recall that iatrogenic anemia is a result of drawing too much blood for hospital tests or other medical procedures. If the amount of blood removed for testing exceeds 10% of the patient's total blood volume, it could become life-threatening and is known as exsanguination. These conditions can easily occur in patients of smaller size, children, and infants.

Just the Right Amount

Pay very close attention to blood volumes in microcollection containers to ensure the collection of a quality specimen by dermal (capillary) puncture. An underfilled container may contain too much anticoagulant for the amount of blood collected, which alters the anticoagulant to blood ratio and affects test results. An overfilled container does not have enough anticoagulant for the volume of blood collected. This may result in either microclot formation or general clotting of the specimen. Both situations will result in the need to recollect the specimen. If daily maximum blood collection levels have been reached, testing and treatment will be delayed. To avoid overfilling and underfilling microcollection containers, fill the containers to between the minimum and maximum volume markings found on the container. See Figure 10-6.

Safety & Infection Control

After the Dermal (Capillary) Puncture

After you complete the dermal (capillary) puncture, mix the specimens (if necessary). Dispose of the contaminated safety lancet in the sharps container. Label the microcontainers, observe any specimen handling instructions, and place in a transport bag if needed. Check the site of puncture and apply a bandage, when appropriate. Do not apply bandages to the fingers of small children because children have a tendency to put their fingers in their mouth and run the risk of swallowing or choking on the bandage. In addition, infants have delicate skin that can tear when adhesive bandages are removed. For these patients, either hold gauze on the puncture site until the bleeding stops, or have a parent do this. Ensure that the bleeding has stopped before leaving the patient or allowing outpatients to leave. Learn How 10-3 summarizes the steps for collecting a dermal (capillary) specimen.

Collect and dispose of your supplies appropriately. Clean the area. Provide for safety, then thank and dismiss the patient, if appropriate. Remove your gloves and transport the specimen to the laboratory.

- 1. Why is it important to wipe away the first drop of blood from a dermal (capillary) puncture?
- 2. An adult patient objects to having a dermal (capillary) puncture because their job involves typing on a keyboard all day. What might you say to reassure this patient?
- 3. What physical principles are involved in the proper collection of blood into microcollection containers?



Learn How 10-3

Collecting the Dermal (Capillary) Specimen

- 1. After performing the dermal (capillary) puncture, wipe away the first drop of blood.
- 2. If using capillary tubes, hold the tube horizontally and touch the end of the tube to the next drop of blood to fill the tube by capillary action.
- 3. If using microcollection containers, follow the correct order of draw. Allow freeflowing drops of blood to enter the collection device, without milking the finger.
- 4. If the microcollection container includes an anticoagulant additive, tap the container gently on a hard surface after each drop to mix the blood with the additive.
- 5. Collect blood to the fill line on the container. Collect a capillary tube to 2/3 to 3/4 full. Do not overfill or underfill.
- 6. Cap the microcollection container or seal the capillary tube.
- 7. If the container contains an additive, mix by inverting the container according to the manufacturer's directions. Seal the capillary tube ends.
- 8. Dispose of the puncture device in the sharps container.
- 9. Label the microcontainers.
- 10. Check the puncture site and apply a bandage if appropriate.

Chapter Summary

Learning Outcome	Key Concepts/Examples	Related NAACLS Competency
10.1 Explain why dermal (capillary) puncture is used instead of routine	Although routine venipuncture is usually the preferred method for obtaining blood specimens, dermal (capillary) puncture may be performed on the following patients:	5.1, 6.8
venipuncture for some patients.	Infants and young children	
outients.	 Adults whose veins are difficult to find or are unsuitable; these patients may include those who are obese, elderly, or severely burned 	
10.2 Select an appropriate site for dermal (capillary) puncture and identify the equipment needed.	Skin at the site of a dermal (capillary) puncture should be warm, pink, and free from scars, cuts, rashes, or bruises. For children and adults, dermal (capillary) puncture sites include the distal regions of the middle finger (third finger) and ring finger (fourth finger). For infants, the medial or lateral regions of the plantar surface of the heel are used. The equipment for dermal (capillary) puncture is the same as that for venipuncture, except dermal (capillary) puncture requires a safety dermal (capillary) puncture device and microspecimen containers as well.	5.1, 5.6, 6.2, 6.4
10.3 Carry out the procedure for performing a dermal (capillary) puncture.	Clean the finger with an alcohol pad and allow the finger to air dry thoroughly before performing the dermal (capillary) puncture. Apply slight pressure and then use the dermal (capillary) puncture device to puncture the skin so that the cut crosses the fingerprint lines. Be aware of the minimum volume required for testing and the maximum allowed blood collection volume.	5.7, 6.13
10.4 Apply the procedure for collecting a dermal (capillary) specimen.	The general steps for performing a dermal (capillary) puncture and collecting a specimen are summarized in Learn How 10-1, 10-2, and 10-3 in the chapter and in the competency checklists at the end of the chapter.	5.7, 6.1, 6.5, 6.7 6.11, 6.13

Chapter Review

A: Labeling

Label the blood collection equipment pictured in the following image.



Sandra Mesrine/McGraw-Hill Education

- 1. [LO 10.2] _____
- **2.** [LO 10.2] _____
- 3. [LO 10.2] _____
- 4. [LO 10.2] _____
- 5. [LO 10.2]

B: Matching

Match each term with its definition.

- _____6. [LO 10.2] calcaneus
- 7. [LO 10.2] edema
- _____8. [LO 10.1] interstitial fluid
- 9. [LO 10.2] osteomyelitis
- ____10. [LO 10.2] palmar
- ___11. [LO 10.2] plantar

- a. infection of the bone
- b. heel bone
- c. bottom surface
- d. caused by a buildup of fluids
- e. fluid between cells and tissues
- f. palm side or surface

C: Fill in the Blank

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

- **12.** [LO 10.1] New and developing technology in laboratory instrumentation allows some tests to be performed on blood obtained from _______, instead of the traditional venous blood.
- 13. [LO 10.2] The preferred sites for dermal (capillary) puncture in an infant are the medial or lateral regions of the ______ surface of the infant's heel.

D: Sequencing

Place the steps for performing a routine dermal (capillary) puncture in the correct order (from 1 to 14).

- 18. [LO 10.3] _____ Apply pressure to the puncture site.
- 19. [LO 10.3] _____ Cleanse the capillary puncture site.
- **20.** [LO 10.4] _____ Collect blood samples into microcollection containers.
- **21.** [LO 10.3] _____ Check the requisition.
- **22.** [LO 10.3] _____ Cover puncture wound with gauze.
- **23.** [LO 10.3] _____ Engage the safety lancet device.
- **24.** [LO 10.3] _____ Explain the procedure to the patient.
- **25.** [LO 10.3] _____ Firmly hold the finger or foot.
- **26.** [LO 10.3] _____ Identify the patient.
- **27.** [LO 10.3] _____ Introduce yourself.
- **28.** [LO 10.4] _____ Label the tubes.
- **29.** [LO 10.3] _____ Select an appropriate site.
- **30.** [LO 10.3] _____ Thank the patient.
- 31. [LO 10.3] _____ Wash hands and put on gloves.
- **32.** [LO 10.3] _____ Select appropriate equipment.
- **33.** [LO 10.3] _____ Wipe away the first drop.

E: Case Studies/Critical Thinking

- **34.** [LO 10.2] When asked to collect blood from an infant in the special care nursery, you notice that there are several lancet scars on both heels. What site will you choose and why?
- 35. [LO 10.3] While performing a dermal (capillary) puncture on a finger, you are having difficulty forming a good drop of blood. Instead, the blood seems to be running along the fingerprint and going everywhere except into the collection tube. What caused this to happen and what should you have done?

- **36.** [LO 10.3] Several EDTA microcollection containers from different infants were found to have microclots in them. The CBC on these specimens is not reliable and the specimens must be recollected. What may have caused these specimens to clot? How can this situation be avoided? What harm could it cause the patients?
- 37. [LO 10.4] You have been asked to collect more blood on an infant who has had blood collected multiple times every day for several days. What precautions should be taken in this situation?

F: Exam Prep

Choose the best answer for each question.

- **38.** [LO 10.3] To produce a rounded drop of blood, finger punctures should be made
 - a. before the alcohol is dry.
 - **b.** across the fingerprint.
 - c. along or on the fingerprint.
 - d. on the index finger.
- **39.** [LO 10.2] What is the effect of warming the site prior to dermal (capillary) puncture?
 - a. It may cause hemolysis in the specimen.
 - **b.** It increases blood flow to the area.
 - c. It makes the puncture less painful.
 - d. It causes hemoconcentration.
- **40.** [LO 10.4] During a fingerstick collection, excessive milking can cause
 - a. irritation at the site.
 - b. excessive bleeding.
 - **c.** contamination of the specimen with tissue fluid.
 - d. introduction of an infection.
- **41.** [LO 10.3] According to guidelines, the depth of a heelstick lancet should be no more than
 - a. 1 mm.
 - b. 1.8 mm.
 - c. 2 mm.
 - d. 2.4 mm.
- **42.** [LO 10.4] Why should the first drop of blood be wiped during a dermal (capillary) puncture?
 - a. To remove any interstitial fluid contamination
 - b. To limit the amount of blood released
 - c. To increase the amount of blood released
 - **d.** To decrease the possibility of bloodborne pathogen transmission

- **43.** [LO 10.4] A fingerstick specimen was found to be clotted. What might have caused this specimen to be clotted? (*Choose all that apply.*)
 - a. Not waiting for the alcohol to dry
 - b. Scraping the blood off the finger
 - c. Mixing the specimen after each drop
 - d. Aggressively squeezing the finger
- **44.** [LO 10.1] Which of the following patients is the most likely candidate for a dermal (capillary) puncture to obtain blood for laboratory testing?
 - a. 30-year-old pregnant woman
 - b. 2-week-old infant with pneumonia
 - c. 17-year-old boy with influenza
 - d. 46-year-old man with asthma
- **45.** [LO 10.1] For which blood tests is dermal (capillary) puncture *not* recommended? (*Choose all that apply.*)
 - a. Erythrocyte sedimentation rate
 - b. Potassium level
 - c. Blood culture
 - d. Complete blood count
- **46.** [LO 10.1] Which of the following is an advantage of dermal (capillary) puncture, relative to other blood specimen collection methods?
 - **a.** It allows a large amount of blood to be drawn.
 - b. It provides the best specimen quality.
 - **c.** It requires transferring the blood to microspecimen containers.
 - d. It is easy to perform.

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- **47.** [LO 10.2] Why should a dermal (capillary) puncture *not* be performed on the heel of a 2-year-old toddler?
 - **a.** If the site becomes infected, osteomyelitis may result.
 - b. Walking on the puncture site may cause pain.
 - **c.** The skin around the plantar surface of the foot may be calloused.
 - d. Osteomyelitis may occur if the puncture site becomes dirty.
- **48.** [LO 10.2] Why do phlebotomists avoid using the fingers of a newborn for dermal (capillary) puncture?
 - **a.** The potential for pain is greater in the fingers than in the heel.
 - **b.** A greater volume of blood can be obtained from the infant's heel.
 - **c.** The fingers are too small for maintaining a safe distance from bone.
 - **d.** The fingerprint is not yet well enough developed to cut across.
- **49.** [LO 10.2] Which of the following areas of the heel are recommended for dermal (capillary) puncture? (Choose all that apply.)
 - a. Back of heel
 - b. Medial plantar surface
 - c. Lateral plantar surface
 - d. Arch of foot
- **50.** [LO 10.3] Which of the following describes the proper way to hold a finger for a dermal (capillary) puncture?
 - **a.** Stretch the skin tightly across the surface to be punctured.
 - **b.** Pinch the area to be punctured to elevate it above the rest of the finger.
 - **c.** Allow the skin to rest naturally, without touching it.
 - **d.** Hold the finger firmly above the level of the heart.
- **51.** [LO 10.3] Why is a dermal (capillary) puncture performed so that the cut runs across the fingerprint lines?
 - a. To prevent hemolysis
 - b. To prevent the puncture from piercing too deep
 - **c.** To direct the blood along the lines of the fingerprint
 - d. To deliver the best possible blood flow

- **52.** [LO 10.4] After the skin has been punctured, the next step in collecting a capillary blood specimen is to
 - a. clean the puncture using an alcohol prep pad.
 - **b.** wipe away the first drop of blood.
 - **c.** touch the open end of the container to the blood drop.
 - d. "milk" the finger to obtain the specimen.
- **53.** [LO 10.4] If you are having trouble obtaining enough blood from a puncture site, which of the following is the *best* alternative for obtaining the proper specimen?
 - **a.** Gently squeeze and release the finger, allowing for capillary refill.
 - **b.** Perform a second dermal (capillary) puncture to obtain the rest of the blood.
 - c. "Milk" the finger to enhance the blood flow.
 - **d.** Scrape the container against the puncture site.
- **54.** [LO 10.4] If the microspecimen container has an anticoagulant, how should you mix the blood with the anticoagulant?
 - **a.** Shake the microspecimen container vigorously.
 - **b.** Invert the microspecimen container according to the manufacturer's instructions.
 - **c.** Use a micropipette to stir the blood in the container.
 - **d.** Process the microspecimen container in a centrifuge at a low speed.
- **55.** [LO 10.4] How should you dispose of the safety lancet after performing a dermal (capillary) puncture?
 - a. Wrap it in a tissue and place it in the garbage.
 - b. Place it in a biohazardous waste container.
 - c. Place it in a sharps container.
 - **d.** Send it to a medical reprocessing unit for cleaning.
- **56.** [LO 10.2] Which of the following may cause osteomyelitis?
 - a. Puncturing the middle of the pad of the finger
 - **b.** Failing to clean the site of the puncture with alcohol
 - c. Puncturing the calcaneus
 - **d.** Choosing a calloused site for the dermal puncture

- **57.** [LO 10.2] A swollen finger should not be used for dermal (capillary) puncture because
 - **a.** this would increase the amount of interstitial fluid in the specimen.
 - **b.** the site cannot be properly prepared due to the edema.
 - **c.** the fingerprint is not sufficiently visible on a swollen finger.
 - **d.** pain is greatly increased in an edematous area.



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COMPETENCY CHECKLIST: DERMAL (CAPILLARY) PUNCTURE ON FINGER

The state of the s		Practice		F	Performed	
Procedure Steps	1	2	3	Yes	No	Master
Preprocedure						
1. Examines the requisition.						
Greets the patient (and parents, if the patient is a child); introduces self.						
Identifies the patient verbally using two identi- fiers, 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. Selects the appropriate finger.						
12. Warms the finger, if necessary.						
13. Selects the dermal (capillary) puncture site.						
14. Cleanses the puncture site.						
15. Allows the site to air dry.						
Procedure						
16. Applies the lancet across the fingerprint.						
17. Uses adequate pressure when activating the lancet.						
18. Wipes away the first drop of blood.						
19. Collects the sample without scraping.						
20. Collects the sample without milking the site.						
21. Collects an appropriate amount of sample.						
22. Mixes Microtainer® or seals capillary tubes.						
23. Cleanses the site of excess blood.						
24. Places gauze over the puncture site.						
25. Applies pressure to the puncture site.						
26. Removes all items from the collection area.						
27. Disposes of the puncture device correctly.						
28. Labels the tubes correctly.						

COMPETENCY CHECKLIST: DERMAL (CAPILLARY) PUNCTURE ON HEEL

Procedure Steps	Practice 2					Performed	
Preprocedure	1	2		3	Yes	No	Maste
1. Examines the requisition.				V27-2-4			
2. Greets the parents; introduces self.							
3. Identifies the patient verbally using two identifiers, including comparing the identification with the requisition. (If nursery collection, confirms identity with nursing staff and the identification band.)							
Explains the procedure to the parents (if present).							
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 (and parents).							
11. Warms the heel, if necessary.							
12. Selects an appropriate site on the heel.							
13. Cleanses the puncture site.							
14. Allows the site to air dry.							
Procedure							
15. Avoids previously punctured sites.			. The state of				
16. Applies the lancet at the appropriate place and angle on the heel.							
17. Uses adequate pressure when activating the lancet.							
18. Wipes away the first drop of blood.							
19. Collects without scraping the site.							
20. Collects an appropriate amount of sample.							
21. Mixes Microtainer® or seals capillary tubes.							
22. Cleanses the site of excess blood.							
23. Places gauze over the puncture site.							
24. Applies pressure to the puncture site.							
25. Removes all items from the collection area.							
26. Disposes of the puncture device correctly.							
27. Labels the tubes correctly.							