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MiniCollect® Skin Puncture Manual



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Foreword

Performing a skin puncture requires skill, practiced technique and a thorough understanding of how the process can have an effect on test results. When collected incorrectly, the results can be so distorted, that the physician falsely treats the patient.

Healthcare professionals with blood specimen collection responsibilities must be careful not to underestimate the finer details of the procedure that are necessary so that the laboratory test results accurately reflect the patient's physiology. All patients must be approached as if they were a member of our own family so that the care administered as a result of the specimens we draw is exactly what we would want for those we care for: appropriate, therapeutic, and that which contributes to their well-being.

When drawing from paediatric patients, the collector must have compassion for the child's anxiety. Calming fears and performing the procedure quickly and efficiently will help minimise the trauma of the procedure for our youngest patients. Because our youngest patients are often nervous about sample collection, it is imperative that we take time to reassure them the procedure will be as painless as possible. We must then take steps to deliver our promise by pre-warming skin puncture sites. This simple practice not only shortens the duration of the procedure, but also helps assure an adequate volume of blood that is not haemolysed or contaminated with tissue fluids.

The aim of this booklet is to detail the proper procedure for skin puncture collections on patients of all ages. When adhered to strictly and consistently, we perform a valuable service to the patients who come to us in need of our skill and experience. Performing the procedure as described herein is the best way to provide patients with the quality of care they deserve and to reward them for placing their trust in our abilities.



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Drawing capillary specimens is one of the more challenging demands in specimen collection. This guide will detail why capillary collections are important and how to perform them properly and safely.

Why Perform a Skin Puncture?

Obtaining blood specimens by capillary collection can be a viable alternative to venipuncture for patients in whom venous access is difficult, and when small quantities of blood are sufficient for testing. In newborns, heelsticks are the preferred collection method for small volumes of blood.

Capillary collections may be preferable over venipuncture in many cases and situations including:

- Severely burned patients
- Obese patients
- Patients with thrombotic tendencies
- Elderly patients or others in whom superficial veins are very fragile or inaccessible
- Patients performing self-testing
- Point-of-care testing
- Newborn testing
- Patients who have a paralyzing fear of needles



Capillary collections also pose fewer dangers to patients when compared to venipunctures, including a decreased risk of inducing iatrogenic anaemia through excessive blood draws.

Differences Between Skin Puncture Blood and Venipuncture Blood ^(1,2)

Capillary blood is a mixture of blood from capillaries, venules, arterioles, interstitial fluid and intercellular fluid. As such, the normal values (reference ranges) vary from those of venipuncture blood. For example:

Higher in capillary blood:

Glucose.

Lower in capillary blood:

Potassium, total protein, calcium.

When drawing specimens by capillary puncture, make a notation to that effect so that testing personnel can include the information with the test results for proper interpretation.

Safety

Human blood and all other body fluids should be treated as if they are known to be infectious for HIV, HBV, and other bloodborne pathogens. Practices that reflect standard precautions include:

- Wear gloves whenever contact with body substances, mucous membranes, or non-intact skin is possible
- Wash hands with soap and water or an appropriate disinfectant before and after patient care or if bodily fluids have been handled
- Wear gowns impermeable to liquids when clothing is likely to become soiled or contaminated with body fluids
- Wear a mask and protective eyewear or a face shield when the risk of being splashed with body fluids exists
- Place sharps in a designated disposal container as soon as possible
- Refrain from all direct patient care and the handling of patient care equipment if you have a weeping rash

When collecting capillary blood, the following additional practices are also important:

- Use only retractable puncture or incision devices
- Immediately dispose of the device after use
- Clean all blood spills immediately with a solution of 10% bleach, wearing gloves to prevent exposure
- Report all accidental needlesticks immediately
- Remove gowns that have become visibly contaminated

Supplies and Equipment

Open versus closed collection tubes

Specimen collection devices for capillary blood are either open systems or closed systems. With open systems, specimens are more likely to splatter when mixed during collection, exposing the collector to potentially infectious bloodborne pathogens. In addition, when tubes of an open system are accidentally dropped the contents are likely to spill from the tube, necessitating a recollection and cleaning up the biohazardous spill.

The benefit of using a closed system like **MiniCollect**[®] is one of safety. Because the tops of **MiniCollect**[®] tubes are closed, the specimen can be mixed during collection without concern for splatter, loss of specimen, and bloodborne exposure. Dropped specimens remain intact.



Puncture versus incision devices

There are two types of devices that penetrate capillary beds:

puncture device and incision devices. Incision devices slice through tissue where puncture devices or lancets vertically pierce the skin. Incision devices are generally less painful than lancet devices, less likely to bruise the patient or haemolyse specimens, require fewer repeat incisions, and result in shorter draw times than lancet devices.⁽³⁻⁵⁾

However, puncture devices may be more appropriate for patients who require regular sampling of small amounts of blood, as with glucose monitoring or neonatal bilirubin testing. Because puncture devices vertically pierce tissue and incision devices slice the skin, sites that are repeatedly punctured can be used more often than sites that are repeatedly incised.

Capillary blood collection devices should be constructed for single-use and have a spring-loaded, retractable sharp to prevent accidental exposure. Non-retractable puncture devices and those that require manual removal of the contaminated sharp should not be used.

Supplies for capillary collection include:

- Alcohol prep pads or other appropriate skin disinfectant
- Commercial heel warmer or warm compress
- Bandages (preferably latex-free)
- Micro-collection containers
- Non-glass microhaematocrit tubes
- Micro-haematocrit sealer (if necessary)
- Incision or puncture devices
- Sharps container
- Gauze pads
- Gloves



Performing the Procedure

1. Approaching the patient

Many patients have apprehensions about invasive procedures, even those as simple as a skin puncture. Calming their fears can be difficult. Often, anxiety is masked and impossible to predict. Therefore, each patient should be approached with compassion and attentiveness to his/her distress. For children, the fear of medical procedures is especially acute. The attitude, compassion, patience, understanding, and personality of the individual collecting the specimen play a large role in the overall success of the procedure.

Approach the patient with a great deal of patience and compassion. Many young patients are well prepared, but those who are apprehensive deserve an extra measure of patience. Because children often have misconceptions of the procedure, it is critical that the healthcare professional be perceptive of the child's expectations and level of anxiety from the first moment. Give paediatric patients a reasonable amount of time to allay their fears and accept the procedure.

Calming fears

For all paediatric patients, preparation begins when your eyes meet. Children will be able to detect compassion and tenderness in your face and body language just as you will be able to read anxiety or complacency in theirs.

How well you interpret and react to the patient's level of anxiety will heavily influence the degree of cooperation. The approach to preparing the paediatric patient for phlebotomy is age-specific.

Age: birth to 12 months

Because punctures on this age group take a great deal of expertise and advanced phlebotomy technique, they should be performed by those skilled and experienced in performing heelsticks. Studies show infants demonstrate lower pain scores when given oral glucose or sucrose prior to the collection.^(8,9)

Breastfeeding has been shown to have a similar effect.^(10,11) While all infants have a need for comforting immediately after the procedure, swaddling during the procedure was found to reduce pain responses in neonates.⁽¹²⁾

Age: 1 to 3 years

Besides compassion, good technique, and being outwardly pleasant, there is little that can be done to prepare children in this age group for a puncture. If the facility permits, parents who agree to hold, comfort, and stabilise the child can be instrumental in minimising anxiety.

Some parents prefer not to assist or witness the procedure, and should be allowed to wait outside the room while the collector performs the puncture with the assistance of a co-worker.

Gentle physical restraint is necessary because of the active nature of this age group. If possible, position the child on the lap of the parent or guardian, who can restrain the free arm of the child throughout the procedure.

Where a parent is unable to assist, the patient should lie on a bed or cot with an assistant providing gentle restraint to the free arm.

Age: 4 years to adolescent

At this age and above, communication skills allow the collector to interact on a higher level and with greater success than for younger children. Defuse the apprehensive child's fear by addressing him/her pleasantly and with compassion.

After establishing a rapport, describe the procedure using terms appropriate to the patient's age, detailing the following steps:

- Show the child the finger that will be used
- Explain that it will be cleansed
- Tell the child they will feel a poke or pinch, but avoid inflammatory terms such as "sting" or "bite"
- Show the device that you will collect the drops of blood into and how it will be used
- Tell the child you will bandage the site after you're done

On younger children in this age group, it will be necessary to immobilise the arm. The older the child, the more likely the procedure will be tolerated without incident.



In all cases, identify yourself and state your purpose. Attempt to awaken sleeping, sedated, or unconscious patients.

If the patient expresses an interest in the nature of the tests to be performed, provide an explanation in terms he/she can understand. If the patient requests information the collector is unsure of, refer the patient to the nurse or ordering physician.

In summary, manage all patients who demonstrate anxiety with compassion and patience throughout the procedure. Before the procedure begins, use appropriate pain intervention techniques according to your facility's policy, and provide step-by-step explanation about the procedure. Once the procedure begins, distract the patient's attention away from the procedure with casual conversation.

2. Identifying the patient

Healthcare professionals with specimen collection responsibilities are often the patient's last line of defence against medical mistakes.

Failure to identify patients properly can lead to catastrophic medical errors. It is imperative that all patients are properly identified according to your facility's policy, (e.g. by using armbands or labelling directly on the tube label).



Inpatient identification

It is imperative that specimens are drawn from the intended patient. If your facility uses identification bracelets for patient identification, be aware that relying on them may not be sufficient. Studies have shown up to 16 percent of patient identification bracelets to be erroneous.⁽⁶⁾

Bracelets that are not attached to the patient should not be considered reliable. If possible, ask the patient to state his/her name and compare it with the information on the order requisition and arm bracelet (if available). Your facility may require a second identifier, such as a hospital number, to protect against cases in which two patients have the same name. Ask the patient to state his/her full name instead of responding to the name you provide. Asking patients to affirm their name as in "Are you John Smith?" may not be sufficient.

Patients who are semi-conscious or hard of hearing may simply respond in the affirmative just to be polite. Verbalising their name is essential.

If the patient is unconscious or unable to respond - as in the case for newborns and infants - ask a caregiver or family member to state the patient's name, then compare it with the requisition and arm bracelet if available. Document the name of the one who provided verbal verification. Refer to your facility's policy in all aspects of patient identification. Any discrepancy must be resolved before the specimen is collected. In situations where identification bracelets are in use (for example, long-term care facilities, isolation patients, emergency room patients, etc.), refer to your institution's policy for patient identification.

Outpatient identification

Proper outpatient identification consists of asking the patient for his/her full name at the very least. Other information may be requested, such as an address or birth date. Compare the information given with the information on the request form. Relying solely on the papers that an outpatient brings to the drawing station for identification may not be sufficient to reveal patient registration errors.

3. Placement of supplies

Healthcare personnel collecting capillary samples should have all necessary supplies and equipment within reach during the procedure. Supplies that are dropped should be replaced, even if sterility has not been compromised. Phlebotomy trays should not be placed on inpatient contact surfaces, such as bedside trays and nightstands since the tray's underside may spread a host of bacteria that can endanger the patient's health. In non-conventional settings such as in-home collections, care should be exercised to protect the patient's furnishings from real or perceived contamination. Placing collection supplies and equipment on paper towels or another barrier helps to prevent this.

4. Patient positioning

Outpatients should be seated in a phlebotomy chair or stationary chair with arms suitable for capillary puncture.

Infants and children can be held on the lap of the parent or secured in an infant carrier/car seat. Studies show positioning the child in a secure parental hug with close physical contact promotes the child's sense of control and requires fewer assistants. (13)

For inpatient collections and some outpatient situations, a bed or reclining chair is appropriate. Assure all test requirements have been met (e.g., fasting).



It has been found that children exposed to movies or cartoons were less distressed than those who were not distracted. (14,15)

5. Site selection

The site of the puncture must be carefully determined based on the patient's age, availability of acceptable sites and the tests ordered. Factors that must be considered when selecting a site for capillary collection include:

- **Bruised or traumatised sites** – Punctures to excessively bruised, previously punctured or traumatised sites should be avoided, since the specimen obtained will likely be contaminated with breakdown products present in the bloodstream.
- **Presence of oedema** – Puncture sites should be free of oedema, as excessive swelling can result in tissue fluid contamination of the specimen.
- **Prior mastectomies** – Collections from the same side of a mastectomy are not permitted without the physician's permission. The reason is two-fold:
 1. Fluid balance on the affected side is altered due to the removal of lymph nodes. Therefore, specimens collected may be compromised and misrepresent the patient's general state.
 2. Mastectomy patients are at increased risk to infection in the affected limb as well as the painful, long-lasting effects lymphoedema.

Birth to 12 months

For newborns and infants up to one year of age, the only acceptable puncture sites are the medial or lateral (inner and outer) plantar surface of either heel.



Because the thickness of the tissue on the side of an infant's heel can be as little as 2.0mm, depth of penetration should not exceed 2.0mm. Punctures to the posterior curvature or back of the heel must never be performed, since the skin in this area may be only 1.0mm thick. Punctures to the fingers of infants under 12 months of age are not acceptable due to the danger of bone penetration and the complications that can result including infection and gangrene.

One year to adult

On patients one year of age and older, skin punctures are usually performed on the fleshy pad of the third or fourth (i.e. middle or ring) finger only. The thumb should not be used due to the skin often being too thick and callous. Because it is notably more sensitive than the other fingers and may also be callous, the index finger should not be considered. Lastly, punctures to the fifth finger (pinky) should be avoided since its flesh is not sufficiently thick to guarantee that the bone will not be penetrated.

Fingersticks should be performed on the fleshy pad of the fingers rather than the sides since the flesh on the pad is twice as thick as the flesh on the sides, decreasing the risk of bone penetration.



When puncturing the finger, place the device so it will puncture across the lines of the fingerprint, not parallel with them. This technique allows the blood to form a bead as it emerges from the tissue instead of "channeling" away from the puncture site. Particular consideration must be given to the depth of the puncture in respect to the site selected. Some device manufacturers provide age-specific recommendations. Refer to the depth of the puncture recommended by the manufacturer of the lancet in use.

Capillary Collection Sites

Patient	Acceptable Sites	Sites to Avoid
Newborns and infants under 12 months of age	Medial or lateral (inner and outer) plantar surfaces of the heel	<ul style="list-style-type: none"> - Fingers of newborns and infants - Other areas of the foot including the arch and back of the heel
Older children and adults	Fleshy pads of the third or fourth finger	<ul style="list-style-type: none"> - Thumb - Index and pinky fingers - Earlobe

6. Site preparation

Pre-warming

Pre-warming the intended puncture site for 3 to 5 minutes is the single most effective way to make certain that the specimen collected will produce accurate test results. This is because warming the capillary beds increases blood flow through the area seven-fold.⁽¹⁾

Pre-warming is especially important for infants, who typically have high haematocrits. A commercial heel warmer or a warm compress may be applied to the site. Make sure the pre-warming temperature does not exceed 42 °C. The time invested in proper pre-warming will result in specimens that are more quickly obtained and require less tissue compression.

This is particularly important since excessive squeezing during collection may contaminate the specimen with tissue fluid, haemolyse red blood cells, and lead to inaccurate test results or specimen rejection.

Pre-warming may not be necessary when collecting only a single drop of blood - for example, when performing bedside glucose testing.

Cleansing the site

Cleanse the intended puncture site with 70% isopropyl alcohol or an appropriate disinfectant according to facility protocol and allow to air dry.

Blowing on the site is not recommended. For capillary lead levels, a thorough scrub of the finger and nail area with soap and water may be required.

Precautionary note:

The presence of wet alcohol during the puncture may contaminate and/or haemolyse the specimen, as well as create a stinging sensation in the patient.

Alcohol is also considered a threat to the integrity of neonatal skin because of its drying effect on tissue.⁽⁷⁾

7. Performing the puncture

Select the type and size of capillary blood collection device best suited to the intended puncture site and patient variables.

Step 1. Wash hands and put on gloves.

Step 2. Assemble supplies and equipment within reach.

Step 3. Select and pre-warm the puncture site (as applicable).

Step 4. Cleanse the site and allow to air dry.

Step 5. Open a sterile puncture or incision device within view of the patient to provide assurance the device is sterile.

Step 6. Hold the finger or heel firmly to prevent sudden movement, position the puncture device on the skin. Notify older children and adults of the imminent puncture.



Step 7. Activate the system by pushing the button. **Precautionary note:** pressing the device forcefully against the skin dangerously closes the distance between the tissue and bone and risks injury to the patient.



Step 8. Remove the puncture device and discard in a sharps container.

Step 9. Wipe away the first drop of blood to prevent tissue fluid from contaminating the specimen unless otherwise instructed. (Some point-of-care testing devices require the first drop to be tested.) If testing with a point-of-care testing device such as a glucose meter, apply the specimen to the test strip or the appropriate testing interface.



Step 10.
If using the funnel:

Touch the next drop of blood with the edge of the funnel and allow it to flow freely into the tube. Do not scoop the blood from the skin as this technique can force fluid from the tissue into the specimen, altering test results.

Remove the funnel from the site and allow another drop to form. Touch the funnel to the drop, repeating until the volume in the tube reaches the fill line. If necessary, gently squeeze the finger or heel to facilitate blood flow until the **MiniCollect®** is filled +/- 10% of the fill line. Avoid excessive squeezing as this will haemolyse the sample. If flow cannot be established by gentle squeezing, discontinue the collection and repeat the procedure in another site.

If using the capillary tube:

Hold the **MiniCollect®** in downward position. Touch the tip of the capillary tube to the next drop. Blood will traverse the tube into the device by capillary action. When the drop has been collected, remove the tube from the site and allow another drop to form. Maintain the tube in a horizontal orientation between drops. Touch the capillary tube to the next drop and repeat the process until the **MiniCollect®** tube is filled +/- 10% of the fill line. Avoid excessive squeezing, as this will haemolyse the sample. If flow cannot be established by gentle squeezing, discontinue the collection and repeat the procedure in another site.



Tips for optimal blood flow

When properly positioned, the blood should freely flow into the tube by gravity and/or capillary action. To optimise the blood flow, position the patient's finger or heel lower than the heart. Additionally, orient the site vertically downward so that the blood doesn't trickle down the skin away from the collection site, permitting blood to flow directly into the collection tube. Such positioning results in more blood being collected into the device.

It may also be necessary to gently squeeze the fingertip or heel to increase blood flow. However, avoid excessively "milking" the heel or finger. Such compression increases the likelihood that the red cells will rupture (haemolyse), and contaminate the specimen with tissue fluid. If excessive squeezing is required because of an inadequate blood flow, the procedure should be terminated and an attempt made on another site after pre-warming.

Step 11. Fill tubes in the proper order. When more than one collection tube is necessary for testing, the Clinical and Laboratory Standards Institute recommends tubes be filled as follows:

- First: EDTA tubes (e.g. lavender-top)
- Second: Other-additive tubes
- Last: Non-additive tubes

This order is essential to prevent platelets from clumping together and compromising complete blood count (CBC) results from the EDTA tube. Other additive tubes (if necessary) should be filled after the EDTA tube to reduce the risk of clotting that could otherwise occur during specimen collection.

Step 12. Samples collected into additive tubes should be mixed periodically during collection to prevent clotting of the specimen. This can be accomplished by gently tapping the collection tube against a hard surface or by flicking the side of the tube. This technique is also useful in dispersing drops of blood that may adhere to the top of the collection device.



Minimum/Maximum Fill Requirements

MiniCollect® tubes containing additives are manufactured with exact amounts of anticoagulants to ensure that a completely filled tube will be properly anticoagulated. Fill all tubes to within 10% of the fill line.

Step 13. Once an adequate volume of blood has been obtained, cover the puncture site with clean gauze and apply direct pressure. Elevate the puncture site to reduce the flow of blood through the area. Apply pressure until bleeding has stopped. Cooperative patients may be allowed to assist.

Step 14. Mix additive tube(s) by gentle inversion 5-10 times. An inversion is defined as turning the tube fully downward, then returning it upright.



Step 15. Specimen(s) should be labelled in the presence of the patient with the patient's name, identification number, date and time of collection, and a means to identify the collector as defined by facility protocol. Pre-printed or bar-coded labels that identify the patient are acceptable alternatives to inscription. Incomplete or improper labelling places the patient at risk. Micro-collection tubes should not be pre-labelled before the sample is obtained.



Step 16. When bleeding has stopped, bandage the site. Bandaging may be optional, based on the patient's preference and your facility policy. Due to latex allergies among some patients, latex-free bandages should be available for older children and adults with known latex allergies.

Step 17. Before leaving the inpatient or dismissing an outpatient, inspect the area for supplies that might otherwise be left behind and discard them into appropriate waste receptacles. When collecting blood from infants in cribs and car seats, it is crucial to account for all items used. Items left behind may pose a choking or ingestion hazard to the infant.

Step 18. Remove gloves and wash hands.

Step 19. Thank and dismiss/leave patient.

Specimen Transport

Specimens should be transported to the testing facility in a timely manner and under appropriate conditions, as defined by the test procedure and facility protocol.

Troubleshooting

Problem: blood won't flow from puncture site.

Resolution: lower the extremity.

Resolution: terminate the puncture and repeat the procedure after prewarming the site with a commercial warmer or warm compress not to exceed 42 degrees Celsius. Do not excessively squeeze the site.

Problem: specimen clots in anticoagulant tube.

Resolution: repeat the procedure, mixing the **MiniCollect®** during collection periodically by tapping it gently on a hard surface or flicking the side of the **MiniCollect®**.

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