Title: Laboratory - Pre-Analytical Capillary Blood Collection - Guideline

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I. Purpose Statement

a. Blood specimens obtained by skin puncture are especially important in pediatrics, because small but adequate amounts of blood for laboratory testing can be obtained with this technique.
b. It can be advantageous to obtain skin puncture blood specimens from some adult patients.
c. Skin puncture blood is a mixture of undetermined proportions of blood from arterioles, venules, capillaries, and interstitial and intracellular fluids.

II. Definitions

a. Specimen requirements
    1. Acceptable Specimen:
        i. Specimens will meet requirements of individual tests**.**
    2. Specimen handling
        i. Specimens will meet handling requirements of individual tests and must adhere to the Specimen Labeling procedure.
    3. Unacceptable Specimens:
        i. Specimens will be rejected according to individual testing and Laboratory procedure “Criteria for Specimen Rejection.
b. Equipment, Reagents, and Materials
    1. Gloves
    2. 70% isopropyl alcohol preps
    3. Lancets single use, auto-disabling:
        i. Fingerstick – 1.8 mm depth
        ii. Preemie heelstick – 0.85 mm depth, 1.75 mm length
        iii. Infant heelstick - 1.0 mm depth, 2.5 mm length
    4. Gauze
    5. Sharps disposal container
    6. Pediatric heel warmers

7. Capillary Collections Containers (bullets): Store tubes at 4-25°C (39-77°F), unless otherwise noted on the package label. Do not use after their expiration date.

c. Procedural notes
    1. Order of Draw
        i. Purple top (EDTA) collected first to ensure adequate volume and accurate test results
        ii. Green top (Lithium heparin)
        iii. Mint green top (Lithium heparin with Gel)
        iv. Grey top (Sodium Fluoride, EDTA)
        v. Gold top (Clot activator and Gel)
        vi. Red top (No additive)
        vii. NOTE: Blue (sodium citrated) samples for coagulation studies are never obtained by skin puncture.
    2. Appropriate Sites for Patients
        i. Infants less than one year old, heel punctures are generally performed.
        ii. NOTE: If the child is walking prior to age one, the skin on the heel may be too thick or calloused, necessitation the use of a finger for blood collection.
        iii. With older children and adults, fingersticks are generally performed.
        iv. Adult patients that are severely burned, extremely obese, with thrombotic tendencies, geriatric or patients in whom superficial veins are either not accessible or are very fragile, and samples for point-of-care testing may be appropriate candidates for fingersticks.
    3. Inappropriate sites or Patients
        i. Fingers of a newborns or infants less than one year old. The distance from skin surface to bone in the thickest portion of the last segment of each finger of newborns varies from 1.2 to 2.2 mm. With available lancets, the bone could easily be injured. In newborns, local infection and gangrene are potential complications of finger punctures, therefore they should not be performed.
        ii. Swollen sites or previously punctured sites, because accumulated tissue fluid may contaminate the blood specimen should be avoided.

iii. Fingers on the side of affected by mastectomy. Note: In cases of a bilateral mastectomy, please consult with the ordering physician or patient's medical personnel for appropriate blood collection sites.
iv. Earlobes of infants less than one year old.
v. The posterior curvature of the heel is not appropriate.
vi. The central area of an infant's foot (area of the arch). Punctures to this area may result in injury to nerve, tendons, and cartilage. The arch area offers no advantage over puncturing the heel and must not be used.
vii. Adult patients that are dehydrated are not fingerstick candidates. This may be assessed by lack of elasticity of the skin.
viii. Adult patients that have poor peripheral circulation from other causes (e.g. peripheral edema), may be impossible to obtain a representative blood specimen, especially by skin puncture.

III. Content

a. Select Capillary Collection Containers
    1. Select capillary collection containers (bullet) appropriate for required specimen. Specimen collection container guidelines for individual test are in the on-line "Pathology Test Catalog."
    2. Make sure a capillary specimen is an acceptable specimen before obtaining.
    3. Note any special requirements or restrictions for the test(s) ordered.
b. Wash hands
    1. Wash hands or use alcohol based sanitizer according to Hospital Infection Control Manual prior to and after each venipuncture.
    2. GLOVES MUST BE WORN WHEN PREFORMING SKIN PUNCTURES
c. Prepare equipment
    1. Select appropriate lancet and assemble supplies.
d. Select Site
    1. Fingerstick
        i. The palmar surface of the finger's distal phalanx and not at the side or tip of the finger should be selected as the puncture site. The tissue on the side and tip of the finger is about half as thick as the tissue in the center of the finger so the side and tip should be avoided.

ii. The puncture should occur across the fingerprints, not parallel to them.

iii. Fingerstick's should be performed on the patient's non-dominant hand. The middle finger and ring finger are the preferred sites, because the thumb has a pulse and the index finger may be more sensitive or callused. The fifth finger must not be punctured, because the tissue depth is insufficient to prevent bone injury.

iv. See procedural notes for inappropriate sites.

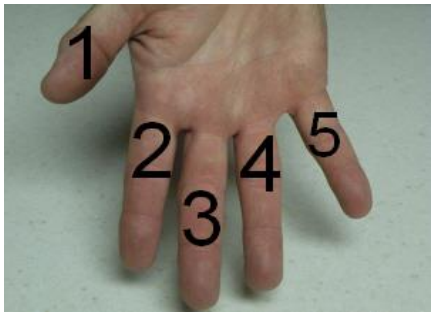
v. 

Figure 1

2. Heel Stick

i. In infants less than one year old, punctures to the lateral or medial plantar surface of the heel are generally performed. When puncturing an infant's heel, the site must be on the plantar surface medial to a line drawn posteriorly from the middle of the great toe to the heel, or lateral to a line drawn posteriorly from between the fourth and fifth toes to the heel. In almost all infants, the heel bone is not located beneath these areas. See procedural notes for inappropriate site.

ii.

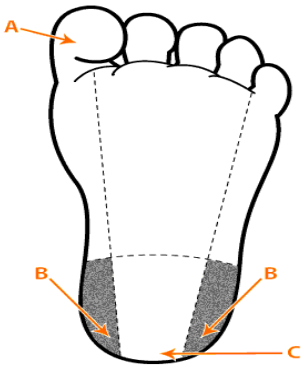
iii. 

Figure 2

iv. Puncture must be no deeper than 2.0 mm. Appropriate lancets are provided for this purpose in both infant and premie sizes.

v. Excessive crying may adversely affect the concentration of some constituents (leukocyte count and capillary blood gases). If the

specimen is collected while the patient is crying, it may be helpful to note such in the collection comments.

e. Cleanse the Site
    1. The site must be cleansed with a 70% aqueous solution of isopropanol (alcohol wipes).
    2. Allow alcohol to air dry, so the antiseptic action of the alcohol can take effect. Residual alcohol causes rapid hemolysis and can have adverse effects on test results and may cause discomfort to the patient. Errors in blood glucose determination caused by contamination with isopropanol have also been reported. Do not touch the site or allow the site to be touched after cleansing. If it is contaminated after cleansing, re-apply alcohol and allow to dry.
    3. Neonates < 26 weeks of gestation cannot have their skin cleansed with alcohol. Check with the nurse for cleansing guidelines.

f. Puncture the Skin
    1. Heel Stick
        i. Use a single use disposable lancet to puncture the skin. Do Not use a lancet with a depth of more than 2.0mm. Read the product insert of the device in stock before using for the first time. Use preemie heelstick lancets for any babies that were born prior to 26 weeks gestation or (>1 kg and <1.5 kg. lbs.
        ii. Remove Quikheel lancet device for packaging.
        iii. Hold the patients heel firmly to prevent sudden movement. With gloved hand, place the Quikheel Lancet against the site with the Quikheel logo facing you, your thumb on the logo and your middle finger on the back contour. Place the blade slot area securely against the heel perpendicular to the surface of the heel and at a 90° angle to the length of the foot. See Figure.
        iv. Using you index finger, firmly and completely depress the trigger. See Figure.
        v. After triggering, remove the lancet and discard in sharps container.
    2. Fingerstick
        i. Use a single use disposable lancet to puncture the skin. Choice of lancet will depend on volume and tests ordered. Read the product insert of the device in stock before using for the first time.

ii. Only use 1.8 mm lancets for this type collection. DO NOT USE HEELSTICK LANCETS FOR FINGERSTICKS.
iii. Remove lancet from packaging.
iv. Hold the patient's finger firmly to prevent sudden movement.
v. Position device on the patient's skin.
vi. Notify the patient of the imminent puncture.
vii. Activate the release mechanism.
viii. Remove the device from the skin and discard it into an appropriate sharps container.

g. First–Drop Elimination
    1. After the puncture, the first drop of blood should be wiped away with a gauze pad, since the first drop is most likely to contain excess tissue fluid.

h. Collection into Capillary Collection Container (bullet)
    1. See "Procedural Notes" for "Order of Draw."
    2. Free flow of blood is essential to obtain reproducible results.
    3. Blood flow is enhanced by holding the puncture site downward and gently applying intermittent pressure to the surrounding tissue. Strong repetitive pressure (milking) must be avoided to prevent tissue fluid contamination of the specimen.
    4. Drops of blood form at the puncture. When the tip of the capillary collection container (bullet) touches these drops, blood will flow freely into the bullet. Bullets may be tapped gently on a hard surface to move the blood to the bottom of the bullet.
    5. A scooping motion of dragging the container up the skin must be avoided to prevent hemolysis. If the blood begins to run away from the puncture site, wipe with gauze and fill tube with next drop.

i. Fill Capillary Tube (if appropriate)
    1. Blood for spun hematocrit may be collected into heparinized capillary tubes.
    2. At least two capillary tubes should be collected. For accurate results, the capillary tube should be ⅔ to ¾ full.
    3. As soon as the tube is filled, one end should be sealed with clay. Care should be taken not to break tube when placing it in clay. Tube must be sealed with the tube perpendicular to the sealing clay. This will ensure a flat seal and an accurate hematocrit.
    4. The capillary tubes must be placed in a correctly labeled transport container.

j. Fill Bullet.
    1. Remember to fill the bullets to the appropriate line. Under or over filling of bullets may result in clotting or erroneous test results.

k. Cap and Invert Bullets Immediately after Filling
    1. While each successive tube is filling, invert filled tubes appropriately. See procedural notes.
    2. One inversion is upside-down and return it to upright position.
    3. Do not shake. Vigorous mixing may cause foaming or hemolysis.
    4. Insufficient mixing or delayed mixing in serum tubes may result in delayed clotting and incorrect test results.
    5. In tubes with anticoagulants, inadequate mixing may result in platelet clumping, clotting and/or incorrect test results.

l. Elevate, Apply Pressure and Bandage
    1. Apply clean gauze, pressure and elevate the foot or hand until bleeding stops.
    2. BandAids should not be applied to the fingers of children under the age of two, due to possible choking hazards. It is not appropriate to apply Coban after a heelstick.

m. Wash Hands
    1. Wash hands or use alcohol based sanitizer according to Hospital Infection Control Manual before leaving the room and in between patients.

n. Capillary Blood Collection Errors Affecting Patient Test Results
    1. Not allowing sufficient time for the alcohol to air dry on the puncture site may cause possible hemolysis of the specimen.
    2. Not wiping away the first drop of blood may cause contamination of the blood specimen with tissue fluid.
    3. Not mixing a sample that is collected in a tube containing an anticoagulant after drawing the specimen can cause possible micro clot formation that would bias test results, interfere with test measurement, and possibly cause instrument downtime.
    4. Using a swollen or previously punctured site for specimen collection may contaminate the specimen with accumulated tissue fluid.
    5. Using iodine/povidine to disinfect a skin puncture site may falsely elevate potassium, phosphorous, and uric acid test results.
    6. Vigorously shaking the microcollection device after collection of the specimen may hemolyze the specimen.

7. Overfilling a microcollection device containing an anticoagulant may cause the formation of clots due to insufficient anticoagulant to blood ratio.
8. Underfilling a microcollection device containing an anticoagulant may cause an alteration in the appearance of blood cells due to excess anticoagulant.

o. Suggestion for Preparing Pediatric patients for a Blood Collection

1. It is important to make an attempt to gain the cooperation of the pediatric patient prior to a skin puncture or a venipuncture. Taking the time to explain the procedure to the child can be key to a successful outcome. A young child should have the procedure explained to him/her very close to the time of the collection. Preparing the child (and the parents) may include these steps:
   i. Introduce yourself. Be friendly and establish eye contact.
   ii. Ask whether the child has ever had a blood test before and if so, ask what that experience was like. Responses to these questions from both the parent and the child may give you some ideas on how you will need to proceed. Parents may provide useful suggestion based on their knowledge of their child's behaviors and reactions.
   iii. Place yourself at the child's eye level when you explain the procedure. Use words that are appropriate to the child's age and understanding.
   iv. If the child asks if it is going to hurt, be honest, but assure the child that it will only be a pinch and if they hold really still, it will be over very quickly. Tell the child that he or she can say "ouch" or make faces, but he /she needs to hold very still.
   v. Parents should be encouraged to be present during the blood collection to distract and to comfort their child.
   vi. At the venipuncture technicians discretion, have the child sit on the parents lap and instruct the parent to hug the child in a way that will keep the child's free arm still, unable to grab the venipuncture device.
   vii. Have a staff person, who has been trained in the correct holding procedures, immobilize the child's arm by holding the elbow on the underside and holding the child's hand.

viii. After the blood collection is completed give positive reinforcement such as letting the child know what a great job they did holding their arm still.

IV. Attachments

a. Not applicable