ALERT
Don appropriate personal protective equipment (PPE) based on the patient’s signs and symptoms and indications for isolation precautions.

If unable to obtain blood cultures in a timely fashion, do not delay antibiotics.

If unable to collect a specimen after two attempts, seek another qualified health care team member to attempt venipuncture.3

At the completion of the procedure, ensure that all choking hazards (e.g., syringe caps, port caps, adhesive bandages, bits of tape, twist-off caps from saline bullets) are removed from the patient’s linens and placed in the appropriate receptacle.

OVERVIEW
Blood tests are among the most commonly used diagnostic aids in the care and evaluation of children. Blood tests can yield valuable information about the patient’s nutrition, hematologic, metabolic, immune, and biochemical status.

Blood culture specimens are obtained by venipuncture, which involves inserting a hollow-bore needle into the opening (lumen) of a vein. Specimens can be obtained with a winged infusion set (butterfly needle) or a standard needle attached to a syringe. Additionally, specimens may be obtained from central lines or arterial lines using sterile technique and following the organization’s practice.

Because veins are the major sources of blood for laboratory testing and routes for IV fluid or blood replacement, the nurse must be skilled in venipuncture to avoid injury to veins. When performing venipuncture on a pediatric patient, the nurse should explore a variety of sites for venous access, including the scalp, antecubital fossa, saphenous, hand, and foot veins. The nurse must have a good understanding of the anatomy, physiology, and physics related to venipuncture.

The procedure is painful, and for many children, just the appearance of a needle is frightening. Using interventions such as distraction, sucrose, topical analgesia, positioning, music, and family involvement significantly decreases a child's anxiety regarding needlesticks.1,2 Several topical agents are available to provide analgesia for venipuncture, including creams and vapocoolant sprays.

In infants younger than 3 months of age, sucrose in water has been shown to work as well as lidocaine-prilocaine.7 Oral sucrose is thought to stimulate the release of endorphins that work on opiate receptors.7

For blood cultures, which aid in detecting bacteria in the blood, at least two blood specimens should be drawn from two different sites. Contamination with the patient’s skin flora that is introduced during specimen collection may cause false-positive results.
Blood Specimen Collection: Blood Cultures (Pediatric) - CE

Proper skin preparation can reduce the rate of blood culture contamination. There are conflicting study results regarding the efficacy of one antiseptic over another. When using an antiseptic, the nurse must consider the time needed for it to have its maximum effect and carefully follow the directions for its use. If only one culture produces bacteria, the assumption is that the bacteria are contaminants, rather than infectious agents.

Pediatric culture bottles are usually used for pediatric patients, and the recommended volumes for cultures are usually printed on the bottle by the manufacturer. For pediatric patients, organizations’ practices vary regarding the number of blood cultures that must be drawn and the amount of blood that needs to be obtained. Anaerobic blood cultures may not be ordered on all pediatric patients.

Cultures should be performed before antibiotic therapy begins because the antibiotic may interrupt the organism’s growth in the laboratory. If the patient is receiving antibiotics, the laboratory should be notified about which ones are being used.

A toddler or preschool-age child may fear that loss of their blood is a threat to his or her life, so the nurse should use developmentally appropriate language to explain that blood is continually being made. An adhesive bandage gives a toddler or preschool-age child assurance that blood will not leak out through the puncture site.

EDUCATION

- Provide individualized, developmentally appropriate education to the family and patient based on the desire for knowledge, readiness to learn, and overall neurologic and psychosocial state.
- Explain the procedure for obtaining blood cultures to the patient and family. Describe the purpose of the tests and explain how the tourniquet, skin cleansing, and needlestick may feel.
- Explain the risks related to the procedure, including pain, multiple venipuncture attempts, bruising, and hematoma.
- Explain that the patient may experience pain or anxiety during the procedure.
- Explain how the family can assist and support the patient.
- Instruct the patient or the family that pressure will be applied to the venipuncture site briefly. For a patient with a bleeding disorder or who is receiving anticoagulant therapy, explain that pressure will be applied until hemostasis is achieved.
- Instruct the patient or the family to notify the nurse or practitioner if persistent or recurrent bleeding or an expanding hematoma develops at the venipuncture site.
- Explain how the patient can assist with the procedure by remaining still (if appropriate).
- Encourage questions and answer them as they arise.
ASSESSMENT AND PREPARATION

Assessment
1. Perform hand hygiene and don PPE as indicated for needed isolation precautions.
2. Introduce yourself to the patient and family.
3. Verify the correct patient using two identifiers.
4. Determine the patient’s developmental level and ability to interact.
5. Assess the history of similar procedures, the patient’s ability to tolerate the procedure, and the use of effective coping strategies.

a. Determine whether the patient has benefitted from the use of topical analgesia in the past.
b. Consider using a topical or local anesthetic.

<table>
<thead>
<tr>
<th>Table 1 Local, Topical, and Oral Analgesics</th>
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</thead>
<tbody>
<tr>
<td><strong>Type of pain reliever</strong></td>
</tr>
<tr>
<td>Lidocaine and prilocaine</td>
</tr>
<tr>
<td>4% liposomal lidocaine</td>
</tr>
<tr>
<td>Lidocaine and tetracaine</td>
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<tr>
<td>Pentafluoropropane and tetrafluoroethane</td>
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<tr>
<td>Buffered Lidocaine</td>
</tr>
<tr>
<td>Oral sucrose</td>
</tr>
<tr>
<td><strong>How applied</strong></td>
</tr>
<tr>
<td>Topical anesthetic cream</td>
</tr>
<tr>
<td>Topical anesthetic cream</td>
</tr>
<tr>
<td>Analgesic patch</td>
</tr>
<tr>
<td>Vapocoolant spray</td>
</tr>
<tr>
<td>Needle-free (e.g., J-tip) injection system</td>
</tr>
<tr>
<td>Oral solution</td>
</tr>
<tr>
<td><strong>Time needed before the procedure</strong></td>
</tr>
<tr>
<td>60 min</td>
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<tr>
<td>1–3 min</td>
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<tr>
<td>20–30 min</td>
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<tr>
<td>&lt;1 min</td>
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<tr>
<td>1 minute</td>
</tr>
<tr>
<td>2 min</td>
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<tr>
<td><strong>Recommended age</strong></td>
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<tr>
<td>Term birth and up</td>
</tr>
<tr>
<td>3 years old and older</td>
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<tr>
<td>3 years old and older</td>
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<tr>
<td>3 years old and older</td>
</tr>
<tr>
<td>Birth and up</td>
</tr>
<tr>
<td>&gt;32 weeks corrected gestational age</td>
</tr>
<tr>
<td><strong>Considerations</strong></td>
</tr>
<tr>
<td>Causes vasoconstriction</td>
</tr>
<tr>
<td>Removing the transparent dressing causes pain</td>
</tr>
<tr>
<td>Use of more than two applications at different sites is not recommended</td>
</tr>
<tr>
<td>Warming patch may burn</td>
</tr>
<tr>
<td>In a younger child, cold may be perceived as pain</td>
</tr>
<tr>
<td>Single use unit</td>
</tr>
<tr>
<td>Use with a pacifier</td>
</tr>
<tr>
<td>May be repeated every 2 min with a maximum of three doses</td>
</tr>
</tbody>
</table>

6. Assess the patient for conditions that can be aggravated or disrupted by venipuncture, such as anticoagulant therapy, low platelet count, and bleeding disorders.
7. Determine the patient’s history of injury and infection; assess the patient for contraindicated venipuncture sites because of an IV line, a hematoma, a Blalock-Taussig or a hemodialysis shunt, or renal grafts and fistulas in the extremities.
8. Determine if the child has current peripheral or central access.
9. Review the child’s medication history.
10. Assess the patient’s hydration and perfusion status.
11. Determine the family’s desire to be present during the procedure.
12. Determine the patient’s desire for the family to be present during the procedure.
13. Determine the patient’s ability to cooperate during the procedure.

**Preparation**

1. If time permits, engage a patient life specialist to prepare the patient and assist with distraction during the procedure.
2. Obtain the patient’s weight in kilograms.
3. Verify the practitioner’s order.
4. Identify the minimum blood volumes required for specimen collection.

    Rationale: Drawing minimum volumes decreases the incidence of iatrogenic anemia.

5. Collect and assemble the equipment and supplies for the procedure (e.g., a winged infusion set [butterfly needle attached to a small-volume syringe] or a standard needle attached to a syringe).
6. If using a topical anesthetic cream, don gloves and apply it to the area as ordered and per the manufacturer’s instructions. Cover the cream with a transparent semipermeable dressing or apply a topical anesthetic patch.

    Rationale: Onset of action of these agents requires application before the procedure begins.

7. Discard supplies, remove gloves (if worn), and perform hand hygiene.

**PROCEDURE**

1. Perform hand hygiene and don appropriate PPE based on the patient’s signs and symptoms and indications for isolation precautions.
2. Verify the correct patient using two identifiers.
3. Explain the procedure to the patient and family and ensure that the patient agrees to treatment.
4. Provide privacy for the patient or use a designated treatment area.
5. Ensure adequate lighting. Consider using a transilluminator or vein-finding ultrasound.
6. If a topical anesthetic was used, ensure that it is on the skin for the appropriate amount of time per the manufacturer’s recommendations. Don gloves and remove the topical
anesthetic from the skin completely after the allotted time. If a topical anesthetic was not used, consider using oral sucrose in infants younger than 6 months old.  
7. Discard supplies, remove gloves (if worn), and perform hand hygiene.  
8. Identify an appropriate venipuncture site.  

a. Use veins in the hand, forearm, or the antecubital fossa.  
b. Consider using the veins of the scalp for an the infant or the veins of the foot (if not walking) for infants and toddlers. Use these sites only if other sites are not available.  
c. Avoid using veins in the right arm after procedures treating congenital cardiac defects that may have decreased blood flow to the subclavian artery.  
d. If the patient can participate in activities of daily living or sucks a thumb, avoid the dominant or preferred hand.  

9. Ensure that the site is warm and well perfused. Consider applying an organization-approved hot pack or warm compress to help dilate the blood vessels.  

   Rationale: Obtaining a sample from a cool extremity may be difficult because of vasoconstriction.  

10. Perform hand hygiene and don gloves and appropriate PPE based on the patient’s signs and symptoms and indications for isolation precautions.  
11. Disinfect bottle tops with 70% isopropyl alcohol (i.e., alcohol pad).  
12. With the help of another health care team member or a family member, position the patient based on his or her age and developmental level. Use active and passive distraction techniques for pain reduction, as developmentally appropriate.  
a. Have the health care team member or family member hold the patient and position the extremity.  

   Rationale: Holding the patient ensures the position is maintained and the site is not contaminated.  

b. For an infant receiving a venipuncture in the foot, have the health care team member or family member hold the infant against his or her body on the edge of the table.  

   Do not offer a bottle to an infant during the procedure because choking may occur.  

13. If unable to observe or palpate a vein, apply a tourniquet a few inches above one of the selected venipuncture sites.  

   If possible, avoid using a tourniquet to reduce the risk of injury to the vascular endothelium. If a tourniquet is required, limit the time of use to less than 1 minute to reduce the risk of hemolysis and inaccurate laboratory results.
a. Encircle the extremity and pull one end of the tourniquet tightly over the other, looping one end under the other.
b. Apply the tourniquet so that it can be removed by pulling the end with a single motion.

Do not keep the tourniquet on the child longer than needed. Make sure that the tourniquet does not impede arterial flow.

14. Palpate the venipuncture site.

a. If the vein cannot be palpated and the tourniquet is in place longer than 1 minute, remove it and either assess another vein site or wait 1 minute before reapplying it.
b. If the vein cannot be palpated or viewed easily, remove the tourniquet and apply a warm compress over the extremity for 5 to 10 minutes.

Rationale: Heat causes local dilation and makes the vein more visible.

15. Obtain blood cultures.

a. Clean the skin with alcohol, then allow the skin to dry completely.
b. Prepare the insertion site with greater than 0.5% chlorhexidine in alcohol solution, using a back-and-forth motion for a minimum of 30 seconds, and allow to dry completely.

Use chlorhexidine cautiously because it may cause skin irritation and chemical burns in infants less than 2 months old or infants with compromised skin integrity (premature infants).

16. If using a butterfly needle, hold it by the wings. Enter the vein at a slight angle from the arm with the bevel facing upward just distal to the exact site selected for vein penetration and look for blood return.

Rationale: This technique allows controlled entry into the vein after the skin has been pierced. Entering the skin distal to the vein prevents unanticipated vein puncture, which may result in inadequate blood specimen retrieval and the development of a hematoma.

17. Collect the required volume of blood per the organization’s practice.
18. Release the tourniquet (if applied) before removing the needle.
19. Apply a clean gauze pad over the puncture site without applying pressure and quickly but carefully withdraw the needle from the vein, activating the safety lock mechanism.

Rationale: Pressure over the needle can cause discomfort. Careful removal of the needle minimizes discomfort and vein trauma.
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20. Immediately apply pressure over the venipuncture site with gauze or an antiseptic pad until the bleeding stops. Instruct a cooperative patient or family member to hold the gauze in place and to apply direct pressure. Include the family in this step.

21. Prepare the specimen.

a. If using a butterfly needle, place a safety device on the syringe and distribute the blood volume evenly between the culture bottles. Fill (inoculate) the aerobic culture bottle first.\(^2\)

   **Rationale:** Air in the tubing will be drawn in along with the blood.

b. If using a standard needle with a syringe, distribute the blood volume evenly between the culture bottles without replacing the needle. Fill the anaerobic culture bottle first.\(^2\)

   **Rationale:** The syringe technique prevents air from entering the anaerobic bottle so the anaerobic bottle should be filled first.

   **If there is only enough blood for one bottle, the aerobic bottle should be filled.**

   **Keep the blood culture bottles upright during the procedure.**

c. Gently mix the medium and blood after inoculation.

22. In the presence of the patient, label the specimen per the organization’s practice.\(^5\)

23. Place the labeled specimen in a biohazard bag and transport the specimen to the laboratory immediately, per the organization’s practice.

24. Apply an adhesive bandage when hemostasis is achieved. If there is a risk of aspiration, remove the bandage.

25. Praise the patient for cooperating and the ability to hold still. Encourage the family to comfort the child.

26. Discard supplies, remove PPE, and perform hand hygiene.

27. Document the procedure in the patient’s record.

**MONITORING AND CARE**

1. Monitor the venipuncture site for active bleeding.

   **Rationale:** Bleeding may occur after the vein is punctured if inadequate pressure is applied, particularly in an active patient.

   **Report persistent active bleeding.**

2. Monitor perfusion distal to the puncture site.
Rationale: Inadvertent arterial puncture may affect perfusion distal to the puncture site.

Report decreased or absent perfusion distal to the puncture site.

3. Determine whether the patient remains anxious or fearful. Give stickers or other rewards for good behavior as developmentally appropriate

Rationale: The patient may require more blood tests in the future. Anxiety or concerns should be expressed and addressed.

4. Assess, treat, and reassess pain.

EXPECTED OUTCOMES
- Venipuncture is successfully performed with one attempt.
- Patient and family tolerate the procedure with minimal distress.
- Desired laboratory specimens and accurate results are obtained.
- Patient remains free from complications of venipuncture.
- Pain and anxiety are controlled adequately during the procedure.

UNEXPECTED OUTCOMES
- Inadequate blood volume is obtained; specimens cannot be processed.
- Significant hematoma or infection develops at the puncture site.
- More than one attempt is needed to obtain samples.
- Pain and anxiety are inadequately managed.
- Hemostasis is not achieved.
- Patient or family member becomes dizzy or faints during venipuncture.

DOCUMENTATION
- Date and time of venipuncture, specimens obtained, disposition of the specimens
- Number of attempts, and name and credentials of person performing the procedure
- Gauge and type of needle used to perform venipuncture
- Site of venipuncture
- Patient’s weight in kilograms
- Patient’s tolerance of procedure
- Techniques used to facilitate procedure (e.g., distraction or positioning techniques)
- Unexpected outcomes and related nursing interventions
- Education

REFERENCES
**Blood Specimen Collection: Blood Cultures (Pediatric) - CE**


**ADDITIONAL READINGS**


Elsevier Skills Levels of Evidence

- Level I - Systematic review of all relevant randomized controlled trials
- Level II - At least one well-designed randomized controlled trial
- Level III - Well-designed controlled trials without randomization
- Level IV - Well-designed case-controlled or cohort studies
- Level V - Descriptive or qualitative studies
- Level VI - Single descriptive or qualitative study
- Level VII - Authority opinion or expert committee reports

**SUPPLIES**

- Gloves and PPE, as indicated
- Topical anesthetic (if prescribed)
- Antiseptic solution: alcohol, chlorhexidine, or tincture of iodine
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- Alcohol swabs
- Standard needles for venipuncture
- Butterfly needles
- Appropriate-size syringe(s) for needed blood sample(s)
- Clean gauze pads
- Single-use disposable tourniquet, latex-free
- Adhesive bandage
- Specimen labels containing two patient identifiers
- Laboratory requisition
- Biohazard bags
- Aerobic and anaerobic culture bottles

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