Standardization of Blood Culture Collection for Patients Receiving In-Center Hemodialysis

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Submitted by:
The American Society of Nephrology (ASN)
1401 H Street NW
Suite 900
Washington, DC 20005

Project Director: Susan A. Stark
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This document was developed by a workgroup of the American Society of Nephrology’s Nephrologists Transforming Dialysis Safety in response to requests from healthcare professionals engaged in outpatient hemodialysis care. The document seeks to provide an accessible summary of information from published guidelines, reports and studies. Sample protocols for obtaining blood cultures and communication tools are provided. Collectively the information is intended to provide a reference for dialysis facilities as they develop facility-specific procedures, policies and protocols.

1. Facilities that perform hemodialysis should have written guidance documents outlining when blood cultures should be obtained and how they should be performed.

Nurses, patient care technicians and others who work in dialysis facilities face a difficult task of managing the complex conditions affecting their patients while simultaneously focusing on reducing the risk of infection. Therefore, resources should be provided to support infection prevention and detection efforts. Resources include guidance documents and/or links to specific protocols including those to identify when blood cultures should be obtained and step-by-step instructions on how to obtain them. Blood culture policies will help reduce the collection of falsely positive (i.e. contaminated) blood cultures and subsequent over use of antimicrobials.

2. Personnel who obtain blood cultures should be educated about recommended practices and their competency with those practices should be assessed periodically (upon hire prior to the provision of care, annually, and when policies/protocols or supplies/equipment change).

Measuring and validating competency can help ensure the delivery of safe, evidence-based, high-quality care for patients. Verification of competency is done through the use of knowledge-based testing and direct observation. If direct observation is not included as part of a competency assessment, an alternative method to ensure that healthcare personnel possess essential knowledge, skills, and abilities should be used. Demonstration of competency is essential to optimize performance of a procedure, and measuring performance at intervals is critical to ensure that procedures continue to be performed in the recommended manner.

3. Facilities should develop a list of indications for blood culture collection. Indications for blood culture collection may include fever and/or chills, redness and/or purulence at the vascular access site or one or more of the following signs: hypotension or hemodynamic instability, tachycardia, and/or altered mental status, unexplained by another cause.

The signs and symptoms of bloodstream infection in patients with hemodialysis catheters are similar to those observed in patients with other central venous catheters. The absence of local signs and symptoms at the catheter site do not
preclude infection, nor does the absence of fever. Because patients on hemodialysis have a lower basal body temperature than patients with normal kidney function, it has been suggested that fever be defined as a temperature of 37.5°C or greater.\textsuperscript{3,5} Even with the lower threshold, patients on hemodialysis with catheter-related bloodstream infection (CRBSI) may present with symptoms and signs other than fever, such as rigors, altered mental status, or unexplained hypotension.\textsuperscript{6} The same signs and symptoms should prompt evaluation for bloodstream infections in patients with permanent vascular access types specifically arteriovenous fistulas and grafts.

4. **To optimize recovery of microorganisms, blood cultures should be obtained before antibiotics are administered.**

Evidence suggests that blood cultures are not universally obtained prior to empiric treatment for BSIs in outpatient hemodialysis facilities.\textsuperscript{7}

Because the signs and symptoms of suspected CRBSI and other vascular access infections in hemodialysis patients are non-specific, it is important to obtain blood cultures prior to delivery of antibiotics to accurately determine the presence or absence of bacteremia.\textsuperscript{4,9} Empiric treatment in the absence of positive blood cultures may result in unnecessary exposure to antibiotics and increase the risk for colonization with multi-drug resistant organisms. When bacteremia is present, identifying the causative organism and performing antimicrobial susceptibility testing facilitates use of the most effective, least toxic agents for treatment and guides duration of treatment. Administering antimicrobials prior to blood cultures may inhibit bacterial growth and may result in falsely negative blood cultures.\textsuperscript{9}

Although obtaining blood cultures prior to antibiotic treatment optimizes culture yield, several studies have suggested that blood cultures obtained after antibiotics are given may still yield an organism, even if the antimicrobial agent is active against that organism.\textsuperscript{10,11} Use of blood culture bottles that contain resins or charcoal may enhance recovery of organisms in this setting.\textsuperscript{10,12} Therefore, although not optimal, blood cultures are still indicated in patients on antimicrobials, as long as it is recognized that a negative culture in this setting does not rule out a bloodstream infection.\textsuperscript{10,13}

Drawing multiple blood culture sets also helps with interpretation of positive blood cultures as it may be difficult to distinguish contamination from infection if only one set is drawn.\textsuperscript{14,39,40}

5. **Obtaining blood culture sets from two sites facilitates accurate diagnosis of bacteremia.** For patients who receive dialysis by way of a central venous catheter, sites can include the catheter hub(s), the hemodialysis circuit (the tubing connected to the catheter hub) and a peripheral vein. For patients who receive dialysis by way of an arteriovenous fistula/graft, the venous fistula needle may serve as one of the two sites for blood cultures. When symptoms arise during dialysis and peripheral venipuncture is not feasible, a practical
approach is to obtain two blood culture sets from the hemodialysis circuit separated in time by at least several minutes, although evidence in support of this approach is limited.

When bacteremia is suspected, obtaining two sets of paired aerobic and anaerobic cultures will optimize recovery of microorganisms and aide in distinguishing between true bacteremia and contamination. A blood culture set usually includes two bottles, one for aerobic culture and one for anaerobic culture, drawn from a single venipuncture or catheter access.\textsuperscript{14}

Blood culture volume is the single most important variable in the recovery of pathogens from patients with bloodstream infections.\textsuperscript{9} Collecting more than one blood culture set will increase the blood volume that is cultured and improves detection.\textsuperscript{39,40}

The most rigorous definition for CRBSI requires a positive blood culture from a peripheral vein with concordant microbial growth from the catheter tip or a catheter-drawn culture.\textsuperscript{4} The recommendation stems from data that suggest that contamination rates among blood samples obtained through catheters are much higher than those obtained through a peripheral vein.\textsuperscript{4,15-17} Catheter hubs commonly become colonized with bacteria and a positive culture drawn through the hub may reflect this colonization rather than true bacteremia.

For many patients on chronic hemodialysis, peripheral veins may have been exhausted due to prior venipuncture or by creation of arteriovenous fistulae or grafts. Even when veins are available, it is often recommended that peripheral venipuncture be avoided to preserve these vessels for creation of future dialysis access.\textsuperscript{3,19} Data from a feasibility study conducted at a hospital-based dialysis unit revealed that peripheral vein cultures were successfully obtained in only 56\% of patients over the time period of the study.\textsuperscript{19} Data from this study suggests that paired cultures from the venous catheter hub and the hemodialysis circuit are the most sensitive, specific and accurate for diagnosis of CRBSIs.\textsuperscript{19} Guidelines published by the Infectious Diseases Society of America (IDSA) suggest that when CRBSI is suspected in a patient on hemodialysis blood cultures can be obtained from the hemodialysis circuit when other options such as peripheral veins aren’t available.\textsuperscript{4}

When patients develop symptoms prior to initiation of hemodialysis, blood cultures may be obtained from the catheter hub(s) at the time of dialysis initiation, and from the hemodialysis circuit after dialysis is initiated. In the previously referenced hospital-based study, patients who developed symptoms after dialysis initiation had their treatment transiently discontinued (generally for $\leq$ 1 minute) to obtain cultures from the catheter hubs.\textsuperscript{19} When discontinuation of dialysis is not feasible or desirable, an alternative approach that has been utilized in published studies is to obtain two separate culture sets from the hemodialysis circuit.\textsuperscript{6} When this approach is employed, the cultures are obtained sequentially over a short time
interval (minutes). Although obtaining two cultures from the dialysis circuit has been suggested as a practical approach, there have been no studies to document the sensitivity and specificity of this approach in the diagnosis of CRBSI. Drawing a large volume of blood in a single access and dividing among multiple sets of blood cultures is not recommended.

6. To optimize recovery of microorganisms, 20 to 30 mL of blood should be obtained for each culture set performed on adult or adult-sized patients, dividing the blood equally between aerobic and anaerobic cultures, i.e. 10-15 mL for each bottle. Follow manufacturer’s instructions for maximum fill volume for blood culture bottles. The recommended volume of blood for pediatric blood cultures is based on weight (see table in the Blood Culture Collection Procedure document).

Because the concentrations of organisms in the blood during a blood stream infection is low, obtaining an adequate volume of blood is necessary to ensure detection. While 8-10 mL is standard for each culture, studies have suggested increased culture yields by increasing the volume per draw to 20-30 mL (one draw is equivalent to one culture set consisting of an aerobic and anaerobic culture) whenever clinically feasible. When manufacturers of blood culture bottles specify maximum fill volumes (i.e. 10 mL per bottle), these should not be exceeded. If a lesser volume of blood is obtained, it may still be cultured but the sensitivity of the test may be decreased, resulting in falsely-negative cultures.

7. To minimize contamination, the culture site should be disinfected prior to obtaining blood.

Before peripheral venipuncture, skin should be prepared with an alcohol-containing product (alcohol, tincture of iodine, or alcoholic chlorhexidine) and the disinfectant should be allowed to dry.

Catheter hubs or bloodline access ports should be disinfected with greater than 0.5% chlorhexidine with alcohol, 70% alcohol, or 10% povidone-iodine and the disinfectant should be allowed to dry. If a cap or needleless connector is in place, remove cap or connector and draw through the open hub after disinfection or draw from a newly placed, sterile needleless access device after scrubbing the hub.

Available evidence supports skin antisepsis before venipuncture, but does not allow for a definitive recommendation for a preferred antiseptic. IDSA guidelines recommend the use of alcohol, tincture of iodine [an alcohol-containing product], or alcoholic chlorhexidine for skin antisepsis before blood culture. The efficacy of alcohol as an antiseptic is well-established and alcohol may reduce the drying time of other agents. In one randomized trial comparing 10% povidone iodine aqueous solution, 2% iodine tincture, and 2% chlorhexidine gluconate in 70% isopropyl alcohol for skin antisepsis before blood culture, the choice of antiseptic
agent did not impact contamination rates.\textsuperscript{27} The use of pre-packaged “antisepsis kits” have potential advantages, including ease of use and standardization of practice.\textsuperscript{28}

When accessing a catheter hub, the 2011 CDC/Healthcare Infection Control Practices Advisory Committee (HICPAC) Guidelines for the Prevention of Intravascular Catheter-Related Infections, recommend the catheter hub be disinfected with an appropriate antiseptic (greater than 0.5% chlorhexidine with alcohol, 70% alcohol, or 10% povidone-iodine\textsuperscript{29}). There is not enough evidence to recommend one antiseptic over the others.

Generally, antiseptics should be allowed to dry for maximal effect. Cultures should be obtained through the disinfected catheter hub or a newly placed, sterile needleless access device.\textsuperscript{22,30} Drawing through an existing needleless access device results in unacceptably high contamination rates.\textsuperscript{31,32} One hospital reduced contamination rates of cultures drawn through central catheters coincident with the use of a multifaceted intervention that included the use of a checklist, a standardized blood culture collection kit and removal of needleless connectors and “scrubbing the hub” before obtaining blood specimens.\textsuperscript{33}

8. To minimize the risk for contamination, tops of blood culture bottles should be disinfected with 70% alcohol and allowed to dry prior to inoculation.

   The plastic cover on the blood culture bottle should be removed immediately prior to inoculation of the sample to reduce contamination. The septum of the blood culture bottle is clean but not sterile.\textsuperscript{31} Cleaning the septum prior to inoculation reduces the potential for falsely positive blood cultures that could lead to inappropriate antibiotic treatment.

9. To minimize the risk for needle stick injuries, do not routinely change venipuncture needles before inoculation of blood culture bottles.

   While a metanalysis of eight randomized and observational studies suggested a small decrease in contamination rates when the venipuncture needles are changed before inoculating blood cultures,\textsuperscript{34} the benefit of this practice is outweighed by the increased risk of needle stick injuries and should be avoided.

10. To optimize recovery of organisms, blood cultures should not be refrigerated or frozen. Delays in transportation to the laboratory may reduce recovery and result in falsely negative blood culture, delaying appropriate treatment. Time requirements vary by lab, and transportation processes should take local systems into consideration.

   Blood cultures should never be refrigerated as this may kill some organisms and
reduce the yield of culture. 9,14,35

A delay between blood culture collection and incubation in a continuous-monitoring blood culture instrument may reduce the recovery of microorganisms and result in falsely negative cultures.35 Under experimental conditions, the number of falsely negative blood cultures increases with holding time as does the time to recovery and reporting of clinically significant organisms.36 While expert guidance suggests that bottles are ideally incubated within two hours, this is often not feasible when blood must be transported to an off-site laboratory.37 The date and time of blood culture collection should be clearly documented on the bottles (and lab paperwork as applicable) and when there is a delay in processing, the manufacturer’s recommendations should be followed. Some blood culture processing systems allow for holding up to 48 hours at room temperature before additional procedures are required. Facilities could consider tracking the average time and individual data points between blood culture collection and incubation and comparing to recommended standards. The yield of blood cultures processed in an on-site lab vs those transported to a remote, centralized lab has not been studied in hemodialysis patients and represents a research gap.

11. Tracking blood culture contamination rates is an important component of infection prevention efforts.

False positive blood cultures are associated with unintended patient harm including additional testing, the administration of unnecessary antibiotics, and possibly additional financial expense to the patient.

According to the College of American Pathologists (CAP), a blood culture is considered contaminated if a common commensal is identified in only one culture of a series of specimens in a 24-hour period. Common commensals include:

- Coagulase-negative Staphylococcus species
- Propionibacterium acnes
- Micrococcus species
- Alpha-hemolytic viridans group streptococci
- Corynebacterium species (diphtheroids)
- Bacillus species

Because commensal organisms may be true pathogens in patients with hemodialysis catheters, interpretation of any positive blood culture requires careful analysis of clinical and laboratory information, including the number and source of positive cultures.14 An evaluation for bacteremia in a patient with a hemodialysis catheter should always include more than one blood culture set (see recommendation five). A full list of commensals can be found at https://www.cdc.gov/nhsn/xls/master-organism-com-commensals-lists.xlsx.

CAP has established a blood-culture contamination rate of 3% as a threshold for
corrective action (rate = number of contaminated cultures/total number of cultures).

The leading cause of contamination in blood samples is improper site preparation to eliminate skin flora, a process well within the control of the person drawing the blood sample.\(^{38}\)

All contaminated samples should be entered into a tracking tool and reviewed as part of the facility’s Quality Assessment Performance Improvement (QAPI) program. A threshold for corrective action should be established and a plan developed for any variation above that threshold.

References


Attachment 1-Example Blood Culture Specimen Collection (in Adults) During Hemodialysis using the Catheter, Circuit, or Fistula Needle

Procedure

**Objective**: Optimal blood culture specimen collection in the outpatient hemodialysis facility.

I. **Assess for signs of blood-stream infection prior to initiation of dialysis and obtain culture orders if signs and symptoms of bloodstream infection present.** Indications for blood culture collection may include fever and/or chills, redness and/or purulence at the catheter site or one or more of the following symptoms: hypotension or hemodynamic instability, tachycardia, altered mental status, unexplained by another cause.

1. If a blood-stream infection is suspected, use SBAR process to notify the provider of the concern.

2. Obtain order for blood cultures if a standing order does not exist.

3. Provider should order at least 2 sets of paired (aerobic and anaerobic) blood cultures. Whenever possible, the culture sets should be obtained from two different sites. Sites can include the catheter hub(s), the venous needle for an AVF/AVG, the hemodialysis circuit (the tubing connected to the vascular access) and a peripheral vein.

   a. If a peripheral blood culture is not contraindicated and supplies and trained personnel are available in the facility, follow the procedure for a peripheral blood culture specimen collection (see Attachment 2).

   b. If a peripheral culture is contraindicated and/or cannot be obtained, proceed as follows (see Recommendation 5, Recommendations and Rationale document):

      i. For patients who have not yet initiated dialysis, obtain 1 set from the hemodialysis circuit and 1 set from the access (catheter or fistula/graft).

      ii. When symptoms arise during dialysis, the patient may be temporarily
disconnected for the blood draw from the catheter, if clinically appropriate. Alternatively, a commonly used option is to obtain two blood culture sets from the hemodialysis circuit.

4. If clinically appropriate, avoid administering antibiotics until the blood cultures have been drawn.

II. It is optimal to assign 2 staff members who have proven skills and have passed a competency check for the procedure. If this is not possible, the staff person drawing the blood should be skill competency validated and the second person should observe the first person using the competency checklist as described below:
   1. First person performs the blood draw.
   2. Second person observes using a checklist.
   3. Observer is empowered to stop the procedure (for example, if contamination or deviations from the checklist).
   4. Completed checklists used per facility discretion for quality improvement/QAPI.

III. Gather Materials
   - Procedure for blood culture collection (site-specific)
   - Clean exam gloves and alcohol hand sanitizer
   - PPE: face shield, or eye goggles plus mask, and gowns for all staff involved in the procedure
   - 1 - clean or sterile barrier to place under disconnected catheter limbs, if applicable
   - Antiseptic for skin: an alcohol-containing product (70% alcohol, tincture of iodine, or alcoholic chlorhexidine)
   - Disinfectant for catheter hubs or bloodline access ports: Per the Centers for Disease Control and Prevention appropriate antiseptics may include greater than 0.5% chlorhexidine with alcohol, 70% alcohol, or 10% povidone-iodine
   - 70% sterile alcohol prep pads to clean tops of culture bottles
   - Blood culture bottles: 2-sets of paired blood culture bottles (1-aerobic bottle and 1-anaerobic bottle per set)
• 2 - 20 ml syringes
• 2 - blood transfer devices
• 1 - sterile needleless connector
• 1 - recirculating device

IV. Drawing blood cultures from the hemodialysis catheter hub
1. Identify the patient according to facility policy and explain the procedure to the patient.
2. Prepare the blood culture bottles for the procedure:
   a. Inspect bottles for defects and expiration date. Do not uncap.
   b. Place patient labels on blood culture bottles.
3. Don PPE, perform hand hygiene, don fresh gloves
4. If the patient is already on dialysis and will be disconnected for the blood culture draw, recirculate blood using facility policy. Place a clean or sterile (depending on facility policy) barrier under the central venous catheter limbs.
5. Prepare 1 set of blood culture bottles.
   a. Uncap blood culture bottles.
   b. With friction, scrub the rubber septum with a 70% alcohol swab or prep pad. Let dry.
   c. Use a separate swab prep pad for each bottle.
   d. Do not touch septum.
   e. Remove gloves and perform hand hygiene.
6. Don new gloves.
7. Prepare the catheter for drawing blood.
   a. If there is no needleless connector: scrub the hub with any of the following: greater than 0.5% chlorhexidine with alcohol, 70% alcohol, or 10% povidone-iodine. Let dry, OR
   b. If there is a needleless connector on the venous catheter hub
      i. Remove the needleless connector and scrub the hub with any of the following: greater than 0.5% chlorhexidine with alcohol, 70% alcohol, or 10% povidone-iodine. Let dry.
      ii. Attach a new, sterile needleless connector to the venous limb hub.
8. For **ADULTS**, attach a 20 ml syringe to the needleless connector or catheter hub and withdraw 20 ml blood. If the blood culture is for a **PEDIATRIC** patient draw the appropriate volume as stated in the table located in **Attachment 2**.

9. Attach the blood transfer device to the syringe of blood.

10. Fill each blood culture bottle with blood, following the manufacturer’s instructions for maximum fill volume for that specific brand of blood culture bottles.
   
   a. Fill the aerobic blood culture bottle first.

   b. Avoid introducing air into the anaerobic blood culture bottle.

11. If dialysis was interrupted for blood drawn, discontinue recirculation, re-establishing the blood through the circuit, according to facility policy.

12. Label bottles with source of specimen, time of collection, and initials of the individual who drew the specimen as per facility policy.

13. Dispose of syringes/needles in sharps container per unit policy.

14. Remove gloves and PPE; perform hand hygiene.

### VI. Drawing blood cultures from the arterial blood line of the hemodialysis circuit

1. Don PPE, perform hand hygiene, don fresh gloves.

2. Prepare 1 set of Blood Culture Bottles.
   
   a. Uncap blood culture bottles.

   b. With friction, scrub the rubber septum with a 70% alcohol swab prep pad. Let dry.

   c. Use a separate swab prep pad for each bottle.

   d. Do not touch septum.

   e. Remove gloves and perform hand hygiene.

3. Don new gloves.

4. Disinfect the sampling port on the arterial blood line with greater than 0.5% chlorhexidine with alcohol, 70% alcohol, or 10% povidone-iodine; scrub and allow to dry.

5. For **ADULTS**, attach 20 ml syringe to the port and withdraw 20 ml of blood. If
the blood culture is for a PEDIATRIC patient draw the appropriate volume as stated in the table located in Attachment 3.

6. Attach a blood transfer device to the filled syringe and fill each blood culture bottle with blood, following the manufacturer’s instructions for maximum fill volume for that specific brand of blood culture bottles.
   a. Fill the aerobic blood culture bottle first.
   b. Avoid introducing air into the anaerobic blood culture bottle.

7. Dispose of syringes in sharps containers, remove gloves and PPE; perform hand hygiene.

8. Label bottles with source of specimen, time of collection, and initials as per facility policy.

VII. Drawing blood cultures from venous fistula needle at the initiation of dialysis

1. Don PPE, perform hand hygiene, don fresh gloves.

2. Attach 30 ml syringe to the sterile fistula needle tubing hub, using caution not to contaminate the connection.

3. Prepare 1 set of Blood Culture Bottles.
   a. Uncap blood culture bottles.
   b. With friction, scrub the rubber septum with a 70% alcohol swab prep pad. Let dry.
   c. Use a separate swab prep pad for each bottle.
   d. Do not touch septum.
   e. Remove gloves and perform hand hygiene.

4. Don new gloves.

5. Select the venous cannulation site, disinfect the site with an alcohol-containing product (alcohol, tincture of iodine, or alcoholic chlorhexidine) and cannulate the site per facility protocol.

6. Withdraw 20 ml of blood and remove the 20 ml syringe; replace with a syringe containing saline/heparin flush per individual facility protocol.

7. Flush venous needle tubing to avoid clotting of the venous fistula needle.

8. Attach a blood transfer device to the blood-filled syringe.
9. Fill each blood culture bottle with blood, following the manufacturer’s instructions for maximum fill volume for that specific brand of blood culture bottles.
   a. Fill the aerobic blood culture bottle first.
   b. Avoid introducing air into the anaerobic blood culture bottle.
10. Label the blood culture bottles with source of specimen, time of collection, and initials as per facility policy.
11. Initiate dialysis per facility procedures.
12. Dispose of syringes in sharps container, remove gloves and PPE, perform hand hygiene.

VIII. Keep filled blood culture bottles at room temperature; transport to the laboratory as soon as possible, according to facility procedures.

References:


https://www.idsociety.org/Guidelines/Patient_Care/IDSA_Practice_Guidelines/Laboratory_Diagnosis_of_Infectious_Disease/
Attachment 2-Example Instructions Peripheral Blood Culture Collection

Supplies:
- Peripheral blood collection kit containing:
  - 1 set of blood culture bottles (aerobic and anaerobic)
  - Needle
  - Alcohol prep pads
  - 2 x 2 gauze sponge
  - Antiseptic for skin: an alcohol-containing product (alcohol, tincture of iodine, or alcoholic chlorhexidine)¹ ²
  - Tourniquet
- Other supplies:
  - Personal protective equipment (PPE), including: face shield, or eye goggles plus mask, and gowns for all staff involved in the procedure
  - Patient labels and requisition
  - 20 mL syringe (adults)
  - Povidone iodine, if chlorhexidine contraindicated
  - Transfer device/adapter

1. Identify the patient according to facility policy and explain the procedure to the patient.
2. Place tourniquet, find a suitable venipuncture site, and then release tourniquet.
   a. Prepare the blood culture bottles for the procedure:
      - Inspect bottles for defects and expiration date. Do not uncap.
      - Place patient labels on blood culture bottles.
3. Don PPE, perform hand hygiene, don fresh gloves
4. Prepare 1 set of Blood Culture Bottles.
   a. Uncap blood culture bottles.
   b. With friction, scrub the rubber septum with a 70% alcohol swab prep pad. Let dry.
   c. Use a separate swab prep pad for each bottle.
   d. Do not touch septum.
   e. Remove gloves and perform hand hygiene.
5. Don clean gloves.
7. Before peripheral venipuncture, skin should be prepared with an alcohol-containing product (alcohol, tincture of iodine, or alcoholic chlorhexidine; dependent on patient
allergies) and the antiseptic should be allowed to dry. If using alcoholic chlorhexidine, the site should be disinfected for 30 seconds for maximal effect.

8. Remove gloves, perform hand hygiene and don clean gloves.
9. Re-apply tourniquet. Do not touch puncture site after cleaning.
10. Collection: for ADULTS, perform venipuncture and collect 20 mL of blood (10 mL for each bottle). If less than 20 mL is obtained, divide volume in half for each culture bottle. In the case of PEDIATRIC patients, refer to the volume recommendations in Attachment 3.
11. Release tourniquet; remove the needle from the patient's arm, hold site with light pressure; apply bandage.
12. Remove needle from the syringe and attach the needleless adapter. Holding the syringe plunger for control of draw, press and hold adapter down over the top of the aerobic bottle. Fill blood culture bottle with blood, following the manufacturer’s instructions for maximum fill volume for that specific brand of blood culture bottles.
13. Remove adapter and syringe from aerobic bottle and fill anaerobic bottle with remaining blood. Do not inject air into the anaerobic bottle. Gently invert bottles to mix contents.
14. Label bottles with source of specimen, time of collection, and initials of the individual who drew the specimen as per facility policy.
15. Indicate on requisition that blood was drawn from a peripheral site. Process cultures per facility procedures.
16. Dispose of syringe in sharps container, remove gloves and PPE, perform hand hygiene.

References

Attachment 3-Pediatric Blood Culture Volume Recommendations

Table 3. Recommended Volumes of Blood for Culture in Pediatric Patients (Blood Culture Set May Use Only 1 Bottle)

<table>
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<th>Weight of Patient, kg</th>
<th>Total Patient Blood Volume, mL</th>
<th>Recommended Volume of Blood for Culture, mL</th>
<th>Total Volume for Culture, mL</th>
<th>% of Total Blood Volume</th>
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<td>4</td>
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<td>100–200</td>
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<td>2</td>
<td>4</td>
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<td>20–30</td>
<td>20–30</td>
<td>40–60</td>
</tr>
</tbody>
</table>

When 10 mL of blood or less is collected, it should be inoculated into a single aerobic blood culture bottle.

Reference

A Guide to Utilization of the Microbiology Laboratory for Diagnosis of Infectious Diseases: 2018 Update by the Infectious Diseases Society of America and the American Society for Microbiology. Table 3.
Attachment 4-Example Competency Evaluation for Personnel Obtaining Blood Cultures

Competence encompasses knowledge, skills, abilities, and traits. It is gained in the healthcare professions through pre-service education, in-service training, and work experience. Competence is a major determinant of provider performance as represented by conformance with various clinical, non-clinical, and interpersonal standards. Measuring competence is essential for determining the ability and readiness of health workers to provide quality services. Although competence is a precursor to doing the job right, measuring performance periodically is also crucial to determine whether providers are using their competence on the job. A provider can have the knowledge and skill, but use it poorly because of individual factors (abilities, traits, goals, values, inertia, etc.) or external factors (unavailability of drugs, equipment, organizational support, etc.).

I. Purpose:

To establish and maintain a mechanism to evaluate and demonstrate competency in test performance for each person who obtains a blood culture within the outpatient hemodialysis facility. This means that a designated person should critically observe the individual being checked to determine that procedural methods and protocols are followed correctly, proper technique is used in the performance of activity, and safety guidelines are followed.

II. Interval:

It is recommended that newly hired personnel or a current staff member who is learning a procedure for the first time should demonstrate competency in accordance with the following schedule:

1. Initial training and competency should be documented.
2. Repeat for identified problems such as false positive blood cultures.
3. Repeat annually thereafter.

III. Materials:

See Blood Culture Procedure for materials needed.

IV. Evaluation:

A. The evaluator, will directly observe the entire procedure with special emphasis on the following:
   1. Test performance according to written protocols.
   2. Assessment of problem solving skills.
   3. Adherence to appropriate safety guidelines.

B. The evaluator should be someone who is trained in the procedure and has demonstrated competency.
V. Results:

Individual Competency Evaluation Worksheet

1. Make as many copies of the Individual Competency Worksheet as needed so that each person has their own evaluation form.

2. Record the name of the individual and site location on each form.

3. The evaluator will observe the person performing the blood culture procedure.

4. For each procedure evaluated, each of the criteria listed on the Competency Worksheet will be scored as “pass” or “fail”. Acceptable performance requires a “pass” score in all of the criteria.

5. The evaluator will note the date, individual criteria, an overall scored of either pass or fail and comments regarding the procedure observed.

6. The evaluator will review each person’s individual Competency Evaluation form, sign and date the form.

7. The Individual Competency Evaluation form will be maintained by the facility

Reference

Individual Competency Evaluation

Employee: _______________________________   Date: _____________

Emp. ID#: _________________   Evaluator Name: ____________________

Evaluator Initials: _____

- [ ] Initial Evaluation   - [ ] Interim Evaluation   - [ ] Annual Evaluation

<table>
<thead>
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<th>Criteria</th>
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**Required for ALL Sites**

- Identify the patient according to facility policy
- Explain procedure to the patient
- Assess patient for signs/symptoms of a blood stream infection (BSI)
- Two staff members present for the blood draw (one to perform the procedure and one to follow the checklist)
- Gather materials
- Two cultures obtained from different sites. Check sites used for this procedure:
  - [ ] peripheral site
  - [ ] hemodialysis catheter hub
  - [ ] arterial blood line
  - [ ] venous fistula needle
- Prepare the blood culture bottles for procedure
  - Inspect the blood culture bottles for defects and expiration date (do not uncap)
  - Place patient labels on the blood culture bottles
- Don personal protective equipment
- Perform hand hygiene
<table>
<thead>
<tr>
<th>Criteria</th>
<th>Comments</th>
<th>Initials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Don clean gloves</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>If the patient is already on dialysis and will be disconnected for the blood culture draw, recirculate blood using facility policy. Place a clean or sterile (depending on facility policy) barrier under the central venous catheter limbs.</em></td>
<td></td>
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</tr>
<tr>
<td>Prepare 1 set of blood culture bottles (2 bottles/set)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Uncap blood culture bottles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• With friction, scrub the rubber septum with a 70% alcohol swab or prep pad. Let dry.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Use a separate swab prep pad for each bottle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Do not touch septum</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Remove gloves</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perform hand hygiene</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**IF Drawing from a Peripheral Site**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Comments</th>
<th>Initials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place tourniquet, find a suitable venipuncture site, and then release the tourniquet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Don clean gloves</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assemble needle and syringe; avoid touching needle and syringe ends</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before peripheral venipuncture, prep skin with an alcohol-containing product or appropriate antiseptic depending on patient allergies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remove gloves</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perform hand hygiene</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Don clean gloves</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Re-apply tourniquet; do not touch puncture site after cleaning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Criteria</td>
<td>Comments</td>
<td>Initials</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>-----------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td><strong>For ADULTS, perform venipuncture and collect 20 mL of blood, 10 mL for each bottle (if less than 20 mL is collected, divide volume equally between the two blood culture bottles.</strong></td>
<td>Met</td>
<td>Not Met</td>
</tr>
<tr>
<td><strong>For PEDIATRIC patients, refer to the volume recommendations in Attachment 3.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Release the tourniquet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remove the needle from the patient’s arm</td>
<td></td>
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</tr>
<tr>
<td>Hold puncture site with light pressure and apply bandage once homeostasis is obtained</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remove needle from the syringe and attach the needleless adapter. Holding the syringe plunger for control of draw, press and hold adapter down over the top of the aerobic bottle. Fill blood culture bottle with blood, following the manufacturer’s instructions for maximum fill volume for that specific brand of blood culture bottles.</td>
<td>Met</td>
<td>Not Met</td>
</tr>
<tr>
<td>Remove adapter and syringe from aerobic bottle and fill anaerobic bottle with remaining blood. <strong>Do not inject air into the anaerobic bottle.</strong> Gently invert bottles to mix contents.</td>
<td>Met</td>
<td>Not Met</td>
</tr>
</tbody>
</table>

*Skip to the Final Steps*
**IF Drawing From Catheter Hub**

Prepare the catheter for drawing blood
- If there is no needleless connector: scrub the hub with any of the following: greater than 0.5% chlorhexidine with alcohol, 70% alcohol, or 10% povidone-iodine. Let dry.
- If there is a needleless connector on the venous catheter hub
  - Remove the needleless connector and scrub the hub with any of the following: greater than 0.5% chlorhexidine with alcohol, 70% alcohol, or 10% povidone-iodine. Let dry.
  - Attach a new, sterile needleless connector to the venous limb hub. Scrub the new, sterile needleless connector with any of the following: greater than 0.5% chlorhexidine with alcohol, 70% alcohol, or 10% povidone-iodine. Let dry.

**For ADULTS**, attach a 20 ml syringe to the needelless connector or catheter hub and withdraw 20 ml of blood. For a **PEDIATRIC** patient, draw the appropriate volume as stated in the table located in *Attachment 2* of the procedure.

Attach the blood transfer device to the syringe of blood.

Fill each blood culture bottle with blood, following the manufacturer’s instructions for maximum fill volume for that specific brand of blood culture bottles.
- Fill the aerobic blood culture bottle first
- Avoid introducing air into the anaerobic blood culture bottle

*If dialysis was interrupted for blood drawn,* discontinue recirculation, re-establishing the blood through the circuit, according to facility policy.
**IF Drawing from the Arterial Blood Line of the Hemodialysis Circuit**

Disinfect the sampling port on the arterial blood line with greater than 0.5% chlorhexidine with alcohol, 70% alcohol, or 10% povidone-iodine; scrub and allow to dry.

For **ADULTS**, attach 20 ml syringe to the port and withdraw 20 ml of blood. If the blood culture is for a **PEDIATRIC** patient draw the appropriate volume as stated in the table located in **Attachment 2** of the procedure.

Attach the blood transfer device to the syringe of blood.

Fill each blood culture bottle with blood, following the manufacturer's instructions for maximum fill volume for that specific brand of blood culture bottles.
- Fill the aerobic blood culture bottle first
- Avoid introducing air into the anaerobic blood culture bottle

**Skip to the Final Steps**

**IF Drawing from the Venous Fistula Needle at the Initiation of Dialysis**

Attach 30 ml syringe to the sterile fistula needle tubing hub, using caution not to contaminate the connection.

Select the venous cannulation site, prepare the site with an alcohol-containing product (alcohol, tincture of iodine, or alcoholic chlorhexidine) and cannulate the site per facility protocol.

Withdraw 20 ml of blood and remove the 20 ml syringe; replace with a syringe containing saline/heparin flush per individual facility protocol.

Flush venous needle tubing to avoid clotting of the venous fistula needle.
Attach a blood transfer device to the blood-filled syringe.

For **ADULTS**, attach 20 ml syringe to the port and withdraw 20 ml of blood. If the blood culture is for a **PEDIATRIC** patient draw the appropriate volume as stated in the table located in *Attachment 3* of the procedure.

Initiate dialysis per facility procedures.

**Skip to the Final Steps**

### Final Steps

<table>
<thead>
<tr>
<th>Step</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Label the blood culture bottles with source of specimen, time of collection, and initials as per facility policy.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Dispose of syringes in sharps container.</td>
<td></td>
<td></td>
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<tr>
<td>Remove gloves and PPE.</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Perform hand hygiene.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Keep filled blood culture bottles at room temperature; transport to the laboratory as soon as possible according to the facility’s procedures.</td>
<td></td>
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</tr>
</tbody>
</table>
Nephrologists Transforming Dialysis Safety (NTDS)
Blood Culture Subcommittee

Why Use SBAR for Blood Culture Draw Assessment?
What is SBAR?

• SBAR is a structured method for communicating critical information that requires immediate attention and action
• SBAR improves communication, effective escalation and increased safety
• Tool use is well established in many settings including the military, aviation, and some acute medical environments
• SBAR has 4 steps:
  • Situation
  • Background
  • Assessment
  • Recommendation
Why Use SBAR?

• To reduce the barrier to effective communication across different disciplines and levels of staff

• SBAR creates a shared mental model around all patient handoffs and situations requiring escalation, or critical exchange of information (handovers)

• SBAR is memory prompt; easy to remember and encourages prior preparation for communication

• SBAR reduces the incidence of missed communications
Uses and Settings for SBAR

- **Dialysis**
  - Inpatient and outpatient
  - Conversations between disciplines
  - Urgent and non urgent communications
  - Conversations with peers
  - Escalating a concern
  - Handoffs or handovers
How Can SBAR Help Me?

• Easy to remember
• Clarifies what information needs to be communicated quickly
• Points to action

Prevents “Hinting and Hoping”
### SBAR for Suspected Infection Requiring Blood Cultures

**Prepare for SBAR Communication:**
- Assess patient, take vital signs
- Review chart; know all allergies, medications, and have recent lab results available
- Be aware of what has been going on with the patient for the last 2-3 dialysis treatments; review all treatment notes
- Review dialysis access history
- Review any recent changes in health with the patient

<table>
<thead>
<tr>
<th><strong>Situation</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Your name/facility name:</td>
</tr>
<tr>
<td>✓ Patient name/dialysis shift:</td>
</tr>
<tr>
<td>✓ The problem:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Background</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Time started on dialysis:</td>
</tr>
<tr>
<td>✓ Pertinent medical history:</td>
</tr>
</tbody>
</table>

| ✓ Brief synopsis of today's treatment: |

<table>
<thead>
<tr>
<th><strong>Assessment</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ What do you think the problem is?</td>
</tr>
<tr>
<td>✓ Pertinent therapies (currently on antibiotics, started on dialysis, etc.)</td>
</tr>
</tbody>
</table>

| ✓ Appearance of dialysis access: |
| ✓ Other areas of infection: |

<table>
<thead>
<tr>
<th><strong>Recommendation(s)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Express what you think the patient needs to address the problem:</td>
</tr>
</tbody>
</table>

| ✓ Request orders for tests, medications, etc.: |

**Before hanging up:**
- Discuss/clarify plan or goal of care. If orders are not clear or if you are uncertain if the patient problem has been addressed, discuss with the facility nurse manager/medical director.
- **Read back** all verbal orders.

**Document the assessment, notification of the physician and the outcome in the patient’s medical record.**