

## ***FAQ Sheet: How and Why to Make the Diagnosis of Blood Stream Infections (BSI):***

1. Q: Why do we need a policy on blood cultures?

A: A policy on blood cultures (BCs) will ensure our patients safety for the following reasons. When a bacterial or yeast blood stream infection is suspected, the volume of blood obtained to confirm the diagnosis is the single most important variable in recovering microorganisms from patients with BSIs. Multiple studies have shown that in adults, the volume of blood needed to make an accurate diagnosis is approximately 40 to 60 mls per septic episode. Adult standards cannot routinely be applied to children since they vary in sizes. Therefore, the amount of blood obtained per septic episode is based on body weight. It is important to provide evidence based standard guidelines to caregivers who are responsible for obtaining specimens for diagnosis of BSI to:

1. Minimize the occurrence of false negative and false positive results
2. Implement antibiotic therapy when appropriate
3. Provide the best antibiotic choice based on identification/susceptibility of the organism
4. Accurately identify central line associated infections
5. Reduce unnecessary pain and suffering
6. Provide decreased length and cost of hospital stay

Children are different than adults. Blood culture policies vary between hospitals and policies which are appropriate for adults may not be appropriate for children. We train nursing and medical students as well as residents including those in family practice and surgical specialties. They may come to our institution with differing guidelines and expectations. A policy specifically for children admitted to our hospital will be used to educate our health care providers and trainees.

2. Q: Why is such a large volume of blood needed?

A: This is not a large amount of blood. The amount of blood required is approximately 1% of the child's body weight. If adequate blood is not obtained, it may result in additional blood cultures needing to be drawn resulting in more venipunctures. For additional information, see the answer to Question 1.

3. Q: Does the volume of blood obtained for cultures represent a risk to patients that may necessitate transfusion?

A: This is a patient safety issue and the Laboratory has a policy in place to protect our patients called the Twenty-Four Hour Maximum Blood Draw Guideline. It was put into place many years ago. The policy is routinely followed by the laboratory on all patients. It allows a limited volume of blood to be drawn, based on patient weight, per 24- hour period. In the event that the number of tests requested exceeds the volume of blood that is permitted to be drawn, the physician is notified and laboratory staff works with them to prioritize testing (i.e. which tests need to be done first and which can wait until the following day or days). This occurs far more often with test requests other than blood cultures. The amount of blood needed for a Blood culture order falls well within the maximum draw policy guidelines.

4. Q: What data support the need for “standardized” blood cultures?

A: We are using the Clinical and Laboratory Standards Institute (CLSI) guidelines; Principles and Procedures for Blood Cultures; Approved guideline which is based on over 200 medical references. The CLSI is an international, interdisciplinary, non profit, standard developing and educational organization that promotes the development and use of voluntary consensus standards and guidelines within the healthcare community. Members include medical professional organizations, public health, industry and hospitals. The guidelines are written by leading physicians and scientists on the subject. Our policy also reflects a thorough review from other nationally prominent Children’s hospitals who have long experience with standardizing blood culture procedures and blood volumes.

5. Q: What is our contamination rate? Is this really a problem? How does this help determine antibiotic choices?

A: Our blood culture contamination rate varies from month to month. In most months it is over 3% in at least one area of the hospital. The national goal for blood culture contamination is less than 3%. This is determined using national standards for blood culture contamination data analysis. Although this is a realistic goal, it would be of great benefit to our patients if we could reduce our contamination still further. Two studies performed in adults showed that false positive blood cultures resulted in increased length of stay, additional lab testing, more blood draws for the patient and unnecessary antibiotic use. In one study each false positive blood culture added 4 to 6 thousand dollars to the cost of the patient’s stay. In addition, inappropriate use of antibiotics has been shown to result in the development of multidrug resistant bacteria such as MRSA

6. Q: Why do we need 2 sets of blood cultures instead of one? Why are two sites needed for patients with no lines? Doesn’t this negatively impact patient care?

A: The skin is covered with bacteria which are considered normal flora. These bacteria are present on the surface of the skin and several layers down into the epidermis. Cleaning (decontamination) of the skin removes the majority of these bacteria prior to obtaining the specimen; however in some cases not all the bacteria are removed successfully, resulting in a blood culture which is positive for the growth of bacteria consistent with skin flora. Since “skin flora” (such as coagulase negative staphylococci) can also cause a true bacteremia, it is essential to distinguish between the two results to be able to properly categorize the bacteria present as a false positive or true positive result. Studies have shown that when two separate sets of blood cultures are obtained and only one is positive for normal skin flora, there is a high likelihood that it is a contaminant and does not need to be treated. Clinicians can use this additional information to assist them in making decisions about whether antibiotic use is necessary. Central line caps can also become contaminated with bacteria and require decontamination prior to drawing blood for cultures. When the patient has a central line it is recommended that one culture be drawn from the central line and one culture be drawn from the periphery. This will assist the healthcare team to determine whether there is a central line infection and it may help us to avoid unnecessary removal and replacement of the catheter.

7. Q: What if patients and parents do not want the child to have a venipuncture when they have a line?
- A: It is our job to explain to parents why we need to obtain a peripheral blood culture. The explanation should include why this test will provide the most accurate diagnosis and best treatment for their child. In order to facilitate this, a parent teaching sheet on blood cultures will be available to give to parents and children as needed.
8. Q: Why is an anaerobic blood culture bottle necessary?
- A: A blood culture consists of an anaerobic bottle (orange top) and an aerobic bottle (green top). Each bottle holds a maximum of 10 mls. In order to obtain the volume required in larger children and adolescents, both bottles may need to be used. In addition, the aerobic bottle will not allow the growth of anaerobes. If 2 aerobic bottles are used, we would miss any anaerobes present. In contrast, the anaerobic bottle will do a good job supporting the growth of most aerobic organisms with the exception of *Pseudomonas* species and yeast. When the bottles are paired, we get the volume needed to make the diagnosis and the best chance to isolate the organism causing the BSI, be it aerobe, anaerobe or yeast.
9. Q: Will the lab reject lower volumes of blood for culture if the required volume is not obtained?
- A: No. The lab has never rejected blood cultures due to insufficient volume. However, at least 1% of the patient's total body volume must be obtained in order to assist the lab in accurately diagnosing BSI. If adequate blood is not obtained, it may result in additional blood cultures needing to be drawn resulting in more venipunctures, increased costs, possible delayed diagnosis of BSI, and decreased patient satisfaction. Quality assurance monitors will keep track of how we are doing and help us improve our performance when necessary.
10. Q: What precautions need to be taken while drawing cultures to avoid contamination?
- A: It is very important to follow the guidelines to clean the skin or catheter hub prior to obtaining the blood culture (See Q3). Wearing a mask prevents contamination of the site with oral flora. Also, when blood is needed for multiple tests, it is best to inoculate the blood culture bottles first. The bottle tops should be wiped with an alcohol wipe prior to inoculation to remove bacteria, mold spores and other environmental contaminants. Please follow the full procedure found in lab and nursing manuals.
11. Q: What if a venipuncture is unsuccessful?
- A: No procedure is 100% successful so if peripheral blood cannot be obtained, the second blood culture can be obtained from another line or another lumen if present. If another line or lumen is not present, then a repeat BC from the same line may be obtained using a separate line access procedure.

12. Q: How many attempts at venipuncture are reasonable?

A: Procedures for the Collection of Diagnostic Blood Specimens by Venipuncture; Approved Standard-Sixth Addition (CLSI HS-A6, Vol. 27 No.26) states: “that is it not advisable to attempt a venipuncture more than twice. If possible, have another person attempt to draw the specimen, or notify the physician”. It is also recommended that clinicians caring for the patient attempt to coordinate their requests for lab tests in order limit the number of venipunctures the child may have to undergo.

The laboratory personnel will make two venipuncture attempts to obtain blood for any laboratory test requiring blood. If not otherwise instructed beforehand, they will then call the clinical care provider and request permission to continue with additional attempts to obtain blood. This conversation will provide the clinical care team an opportunity to choose the source of the second blood culture set.

13. Q: How can I help reduce the number of venipunctures my patient has to undergo?

A: Communication between members of the healthcare team (laboratory, nursing and physicians) is essential to providing excellent patient care. Understanding test order priority will help you be part of the solution. Please review the following laboratory definitions and review daily laboratory orders to group them into as few blood draws as possible.

1. **Blood culture orders are always STAT orders** and require an immediate blood draw. Please use this opportunity to review pending lab test requests and if additional testing has been ordered ask the question; can it be obtained at the same time? If the answer is yes, you have saved this child an additional blood draw later in the day.
2. **Routine blood draws** occur once in the AM and once in the PM. It is strongly recommended that requests for lab tests be ordered as ROUTINE whenever possible to prevent additional venipunctures during the day or night. “Routine” orders allow the lab personnel to group lab test requests and draw the patient only once. This will prevent unnecessary pain and emotional distress for the children, parents and healthcare providers as well as the laboratory personnel who are tasked with obtaining the specimen.
3. **Timed critical blood draws** are ordered when a specific time to draw is indicated (do not order these tests as STAT) such as drug levels or blood glucose and the test needs to be run immediately. Please use this opportunity to review other lab test requests to assess whether there are additional test requests pending which can be grouped with this draw.
4. **Draw now, run routine orders** are tests which must be drawn at a specific time but do not need to do be done immediately in the lab (this allows the laboratory personnel to batch the testing and may save time and cost). Please use this opportunity to review other lab test requests to assess whether there are additional test requests pending which can be grouped with this draw.

14. Q: Will there be unnecessary delays in giving critically ill patients antibiotics while waiting to get these blood cultures?

A: No. If delay occurs, and antibiotics are ready, contact the ordering provider, antibiotics may be started and cultures obtained when able to. File a variance report so that the matter can be investigated and process improvement developed if necessary.

15. Q: How often do blood cultures need to be obtained?
- A: In patients with signs and symptoms of sepsis, it is reasonable to draw one blood culture order (1% of patient total body volume) within a 24 hour period. It is suggested in the CLSI guideline that after blood cultures (with adequate volume) are drawn and the patient is on antibiotics blood cultures may not need to be repeated for 2 to 5 days. Since most of our blood cultures turn positive on the second day, this guideline fits with what we see in our population. In some cases, patients with bacteremia or fungemia documented by positive blood cultures can be managed safely and appropriately clinically and do not need follow up blood cultures. Two exceptions to this suggestion are infective endocarditis and Staphylococcus aureus bacteremia. In these cases, repeat blood cultures may be indicated in 2 to 4 days.
16. Q: What about surveillance blood cultures?
- A. The use of so called surveillance blood cultures has been advocated in the past as a means to allow earlier detection of sepsis in certain patient populations-such as those in intensive care, undergoing transplantation or with vascular catheters. Blood cultures obtained to predict septic episodes are of limited value and should not be performed routinely, as these cultures do not improve patient management but add substantial costs.
17. Q: Are catheter tip cultures recommended?
- A. Catheter tip cultures are recommended only if the catheter must be removed because it has been determined to be infected. In these cases it is recommended that one blood culture be obtained from the catheter and one blood culture from a peripheral site before the catheter is removed. Catheters which are being removed for other reasons do not need to be sent for culture.
18. Q: What is the procedure for obtaining catheter tip cultures?
- A:
1. Perform hand hygiene and don appropriate PPE's (sterile gloves and mask)
  2. Using aseptic technique, remove dressing and clean IV site per CVL protocol using ChloroPrep
  3. Using sterile equipment remove CVL catheter
  4. While not touching catheter tip, verify tip is intact
  5. Using sterile scissors cut catheter 5 cm (2 inches) below tip and place in sterile specimen cup
  6. Label cup with patient name, MR number, date, time and exact specimen site
19. Q: When are catheter site cultures appropriate?
- A: Catheter site cultures should only be performed if the site is infected (i.e. erythematous and has purulent drainage, if there is no drainage then cultures cannot be obtained) and if the catheter **is not** going to be removed.

20. Q: What is the appropriate method for obtaining catheter exit site cultures?

A:

1. Perform hand hygiene and don appropriate PPE's (sterile gloves and mask)
2. Using aseptic technique, remove dressing and clean IV site per CVL protocol using ChloroPrep and allow to dry, then wipe with sterile saline pad to remove ChloroPrep from around site.
3. Best practice is to use a syringe (without needle) to aspirate pus exuding from the site or apply gentle pressure to the surrounding area, being careful not to contaminate the sterile area to express pus from the site and collect in a syringe, seal with sterile cap. (Please see Q&A #6 for explanation on skin normal flora for additional explanation) If pus cannot be obtained with a syringe a swab may be used. However swabs are suboptimal collection devices because they hold a limited amount of material and bacteria cling to the tip fibers and are difficult to dislodge. Studies have shown that for every 100 bacteria absorbed onto a swab only 3 are returned to the culture plate.
4. Label syringe with patient name, MR number, date, time and exact specimen site.
5. Please DOCUMENT site condition when charting using the following characteristics if present (warmth, tenderness, redness, swelling and discharge (clear, yellow, pus etc)

21. Q: When blood is being obtained from central lines do we need to "waste" blood before inoculating the blood culture bottles?

A: No, it is not necessary to discard the initial volume of blood or flush the line with saline to eliminate residual heparin or other anticoagulants. The antimicrobial activity of heparin is effectively eliminated in the protein-rich culture media within the bottle.