



## Central Line-Associated Bloodstream Infection (CLABSI) Event

**Introduction:** An estimated 41,000 central line-associated bloodstream infections (CLABSI) occur in U.S. hospitals each year.<sup>1</sup> These infections are usually serious infections typically causing a prolongation of hospital stay and increased cost and risk of mortality.

CLABSI can be prevented through proper management of the central line. These techniques are addressed in the CDC's Healthcare Infection Control Practices Advisory Committee (CDC/HIPAC) *Guidelines for the Prevention of Intravascular Catheter-Related Infections, 2011*.<sup>2</sup>

**Settings:** Surveillance will occur in any inpatient location where denominator data can be collected, which may include critical/intensive care units (ICU), specialty care areas (SCA), neonatal units including neonatal intensive care units (NICUs), step down units, wards, and long term care units. A complete listing of inpatient locations can be found in [Chapter 15](#).

NOTE: Surveillance for CLABSIs after the patient is discharged from the facility is not required. However, if discovered, any CLABSIs occurring within 48 hours of discharge should be reported to NHSN. No additional central line days are reported.

**Requirements:** Surveillance for CLABSI in at least one inpatient location in the healthcare institution for at least one calendar month as indicated in the *Patient Safety Monthly Reporting Plan* (CDC 57.106).

**Definitions:** As for all infections reported to NHSN, infections associated with complications or extensions of infections already present on admission, unless a change in pathogen or symptoms strongly suggests the acquisition of a new infection, are not considered healthcare associated. Therefore, infections that become apparent within the first few days of admission must be carefully reviewed to determine whether they should be considered healthcare associated.

Primary bloodstream infections (BSI) are laboratory-confirmed bloodstream infections (LCBI) that are not secondary to a community-acquired infection or an HAI meeting CDC/NHSN criteria at another body site (see criteria in [Chapter 17](#) and Appendix 1. Secondary Bloodstream Infection Guide). Report BSIs that are central line associated (i.e., a central line or umbilical catheter was in place at the time of, or within 48 hours before, onset of the event).

NOTE: There is no minimum period of time that the central line must be in place in order for the BSI to be considered central line associated.



Location of attribution: The inpatient location where the patient was assigned on the date of the BSI event, which is further defined as the date when the first clinical evidence appeared or the date the specimen used to meet the BSI criteria was collected, whichever came first.

**EXAMPLE:** Patient, who had no clinical signs or symptoms of sepsis upon arrival to the Emergency Department, has a central line inserted there before being admitted to the MICU. Within 24 hours of admission to the MICU, patient meets criteria for BSI. This is reported to NHSN as a CLABSI for the MICU because the Emergency Department is not an inpatient location and no denominator data are collected there.

**EXCEPTION:**

*Transfer Rule:* If a CLABSI develops within 48 hours of transfer from one inpatient location to another in the same facility, or a new facility, the infection is attributed to the transferring location. This is called the Transfer Rule and examples are shown below:

- Patient with a central line in place in the SICU is transferred to the surgical ward. Thirty six (36) hours later, the patient meets the criteria for BSI. This is reported to NHSN as a CLABSI for the SICU.
- Patient is transferred to the medical ward from the MSICU after having the central line removed. Within 24 hours, patient meets criteria for a BSI. This is reported to NHSN as a CLABSI for the MSICU.
- Patient with a central line in place is transferred from the medical ward to the coronary care ICU (CCU). After 4 days in the CCU, the patient meets the criteria for a BSI. This is reported to NHSN as a CLABSI for the CCU.
- Patient on the urology ward of Hospital A had the central line removed and is discharged home a few hours later. The IP from Hospital B calls the next day to report that this patient has been admitted to Hospital B with a BSI. This CLABSI should be reported to NHSN for, and by, Hospital A and attributed to the urology ward. No additional catheter days are reported.

Central line: An intravascular catheter that terminates at or close to the heart or in one of the great vessels which is used for infusion, withdrawal of blood, or hemodynamic monitoring. The following are considered great vessels for the purpose of reporting central-line BSI and counting central-line days in the NHSN system: Aorta, pulmonary artery, superior vena cava, inferior vena cava, brachiocephalic veins, internal jugular veins, subclavian veins, external iliac veins, common iliac veins, femoral veins, and in neonates, the umbilical artery/vein.



NOTES:

1. Neither the insertion site nor the type of device may be used to determine if a line qualifies as a central line. The device must terminate in one of these vessels or in or near the heart to qualify as a central line.
2. An introducer is considered an intravascular catheter, and depending on the location of its tip, may be a central line.
3. A Hemodialysis Reliable Outflow dialysis catheter (HERO), that is located in one of the great vessels and used for purposes outlined above, is considered a central line.
4. Pacemaker wires and other nonlumened devices inserted into central blood vessels or the heart are not considered central lines, because fluids are not infused, pushed, nor withdrawn through such devices.
5. The following devices are not considered central lines: extracorporeal membrane oxygenation (ECMO), femoral arterial catheters and intraaortic balloon pump (IABP) devices. If you have a question about whether a device qualifies as a central line, please email us at [NHSN@cdc.gov](mailto:NHSN@cdc.gov).

**Infusion:** The introduction of a solution through a blood vessel via a catheter lumen. This may include continuous infusions such as nutritional fluids or medications, or it may include intermittent infusions such as flushes or IV antimicrobial administration, or blood, in the case of transfusion or hemodialysis.

**Umbilical catheter:** A central vascular device inserted through the umbilical artery or vein in a neonate.

**Temporary central line:** A non-tunneled catheter.

**Permanent central line:** Includes

- Tunneled catheters, including certain dialysis catheters
- Implanted catheters (including ports)

**Laboratory-confirmed bloodstream infection (LCBI):** Must meet one of the following criteria:

**Criterion 1:** Patient has a recognized pathogen cultured from one or more blood cultures  
**and**  
organism cultured from blood is not related to an infection at another site. (See Notes 1 and 2 below and Appendix 1. Secondary Bloodstream Infection Guide.)

**Criterion 2:** Patient has at least one of the following signs or symptoms: fever (>38°C), chills, or hypotension  
**and**  
signs and symptoms and positive laboratory results are not related to an infection at another site (See Appendix 1. Secondary Bloodstream Infection Guide.)  
**and**



common commensal (i.e., diphtheroids [*Corynebacterium* spp. not *C. diphtheriae*], *Bacillus* spp. [not *B. anthracis*], *Propionibacterium* spp., coagulase-negative staphylococci [including *S. epidermidis*], viridans group streptococci, *Aerococcus* spp., and *Micrococcus* spp.) is cultured from two or more blood cultures drawn on separate occasions.

Criterion 3: Patient  $\leq$  1 year of age has at least one of the following signs or symptoms: fever ( $>38^{\circ}\text{C}$  core) hypothermia ( $<36^{\circ}\text{C}$  core), apnea, or bradycardia  
and  
signs and symptoms and positive laboratory results are not related to an infection at another site (See Appendix 1. Secondary Bloodstream Infection Guide.)  
and

common skin commensal (i.e., diphtheroids [*Corynebacterium* spp. not *C. diphtheriae*], *Bacillus* spp. [not *B. anthracis*], *Propionibacterium* spp., coagulase-negative staphylococci [including *S. epidermidis*], viridans group streptococci, *Aerococcus* spp., *Micrococcus* spp.) is cultured from two or more blood cultures drawn on separate occasions. (See Notes 3, 4 and 5 below.)

#### NOTES:

1. In criterion 1, the phrase “one or more blood cultures” means that at least one bottle from a blood draw is reported by the laboratory as having grown organisms (i.e., is a positive blood culture).
2. In criterion 1, the term “recognized pathogen” does not include organisms considered common commensals (see criteria 2 and 3 for a list of common commensals). A few of the recognized pathogens are *S. aureus*, *Enterococcus* spp., *E. coli*, *Pseudomonas* spp., *Klebsiella* spp., *Candida* spp., etc.
3. In criteria 2 and 3, the phrase “two or more blood cultures drawn on separate occasions” means 1) that blood from at least two blood draws were collected within two days of each other (e.g., blood draws on Monday and Tuesday or Monday and Wednesday would be acceptable for blood cultures drawn on separate occasions, but blood draws on Monday and Thursday would be too far apart in time to meet this criterion), and 2) that at least one bottle from each blood draw is reported by the laboratory as having grown the same common commensal (i.e., is a positive blood culture). (See Note 4 for determining sameness of organisms.)
  - a. For example, an adult patient has blood drawn at 8 a.m. and again at 8:15 a.m. of the same day. Blood from each blood draw is inoculated into two bottles and incubated (four bottles total). If one bottle from each blood draw set is positive for coagulase-negative staphylococci, this part of the criterion is met.
  - b. For example, a neonate has blood drawn for culture on Tuesday and again on Saturday and both grow the same common commensal. Because the time between these blood cultures exceeds the two-day period for blood draws stipulated in criteria 2 and 3, this part of the criteria is not met.



- c. A blood culture may consist of a single bottle for a pediatric blood draw due to volume constraints. Therefore, to meet this part of the criterion, each bottle from two or more draws would have to be culture-positive for the same commensal.
- 4. If the common commensal is identified to the species level from one culture, and a companion culture is identified with only a descriptive name (e.g., to the genus level), then it is assumed that the organisms are the same. The organism identified to the species level should be reported as the infecting pathogen along with its antibiogram if available (see Table 1 below).

**Table 1. Examples of how to report speciated and unspeciated common commensals**

Culture Report	Companion Culture Report	Report as...
<i>S. epidermidis</i>	Coagulase-negative staphylococci	<i>S. epidermidis</i>
<i>Bacillus</i> spp. (not <i>anthracis</i> )	<i>B. cereus</i>	<i>B. cereus</i>
<i>S. salivarius</i>	<i>Strep viridans</i>	<i>S. salivarius</i>

- 5. Only genus and species identification should be utilized to determine the sameness of organisms. No additional comparative methods should be used (e.g., morphology or antibiograms) because laboratory testing capabilities and protocols may vary between facilities. This will reduce reporting variability, solely due to laboratory practice, between facilities reporting LCBIs meeting criterion 2. Report the organism to the genus/species level only once, and if antibiogram data are available, report the results from the most resistant panel.
- 6. LCBI criteria 1 and 2 may be used for patients of any age, including patients  $\leq 1$  year of age.
- 7. Specimen Collection Considerations:  
Ideally, blood specimens for culture should be obtained from two to four blood draws from separate venipuncture sites (e.g., right and left antecubital veins), not through a vascular catheter. These blood draws should be performed simultaneously or over a short period of time (i.e., within a few hours).<sup>3,4</sup> If your facility does not currently obtain specimens using this technique, you must still report BSIs using the criteria and notes above, but you should work with appropriate personnel to facilitate better specimen collection practices for blood cultures.

**REPORTING INSTRUCTIONS:**

- Report organisms cultured from blood as BSI – LCBI when no other site of infection is evident.



- When there is a positive blood culture and clinical signs or symptoms of localized infection at a vascular access site, but no other infection can be found, the infection is considered a primary BSI.
- Purulent phlebitis confirmed with a positive semiquantitative culture of a catheter tip, but with either negative or no blood culture is considered a CVS-VASC, not a BSI or an SST-SKIN or ST infection.
- Occasionally a patient with both peripheral and central IV lines develops a primary bloodstream infection (LCBI) that can clearly be attributed to the peripheral line (e.g., pus at the insertion site and matching pathogen from pus and blood). In this situation, enter “Central Line = No” in the NHSN application. You should, however, include the patient’s central line days in the summary denominator count.

**Numerator Data:** The *Primary Bloodstream Infection (BSI)* form (CDC 57.108) is used to collect and report each CLABSI that is identified during the month selected for surveillance. The *Instructions for Completion of Primary Bloodstream Infection Form* (Tables of Instructions, Tables 2 and 2a.) contains brief instructions for collection and entry of each data element on the form. The Primary BSI form includes patient demographic information and whether a central line was present, and, if so, the type of central line the patient had if appropriate to the location; these data will be used to calculate line-specific infection rates. Additional data include the specific criteria met for identifying the primary BSI, whether the patient died, the organisms isolated from blood cultures, and the organisms’ antimicrobial susceptibilities.

#### REPORTING INSTRUCTION:

- If no CLABSIs are identified during the month of surveillance, the Report No Events box must be checked on the appropriate denominator summary screen, e.g., Denominators for Intensive Care Unit (ICU)/Other locations (Not NICU or SCA), etc.

**Denominator Data:** Device days and patient days are used for denominators (see [Chapter 16](#), Key Terms). Device-day denominator data that are collected differ according to the location of the patients being monitored; however, they should be collected at the same time each day. When denominator data are available from electronic databases, these sources may be used as long as the counts are not substantially different (+/- 5%) from manually-collected counts, validated for a minimum of 3 months.

For locations other than specialty care areas (SCAs) and NICUs, the number of patients with one or more central lines of any type is collected daily, at the same time each day, during the month and recorded on the *Denominators for Intensive Care Unit (ICU)/Other Locations (Not NICU or Specialty Care Area (SCA))* (CDC 57.118). Only the totals for the month are entered into NHSN. When denominator data are available from electronic sources (e.g., central line days from electronic charting), these sources may be used as long as the counts are not substantially different (+/- 5%) from manually-collected counts, validated for a minimum of 3 months.



For specialty care areas, the number of patients with one or more central lines is dichotomized into those with permanent central lines and those with temporary central lines on the *Denominators for Specialty Care Area* (CDC 57.117) form. Each is collected daily, at the same time each day. Only the total for the month are entered into NHSN. This distinction in lines is made because permanent lines are commonly used in patients frequenting these areas and may have lower rates of associated infection than central lines inserted for temporary use. If a patient has both a temporary and a permanent central line, count the day only as a temporary line day. The *Instructions for Completion of Denominators for Intensive Care Unit (ICU)/Other Locations Form* (Tables of Instructions, Table 6) and *Instructions for Completion of Denominators for Specialty Care Areas (SCA) Form* (Tables of Instructions, Table 7) contain brief instructions for collection and entry of each data element on the forms.

In NICUs, the number of patients with central lines is stratified by birthweight in five categories since risk of BSI varies by birthweight. These data are collected on the *Denominators for Neonatal Intensive Care Unit (NICU)* (CDC 57.116) form.

NOTE: The weight of the infant at the time of BSI is not used and should not be reported. For example, if a neonate weighs 1006 grams at birth but remains in the NICU for two months and has a body weight of 1650 grams when it develops a CLABSI, record the birthweight of 1006 grams on the BSI form. The *Instructions for Completion of Denominators for Neonatal Intensive Care Unit (NICU)* form (Tables of Instructions, Table 8) contains brief instructions for collection and entry of each data element on the forms.

**Data Analyses:** The SIR is calculated by dividing the number of observed infections by the number of expected infections. The number of expected infections, in the context of statistical prediction, is calculated using CLABSI rates from a standard population during a baseline time period as reported in the NHSN Report.

**NOTE: The SIR will be calculated only if the number of expected HAIs (numExp) is  $\geq 1$ .**

$$\text{SIR} = \frac{\text{Observed (O) HAIs}}{\text{Expected (E) HAIs}}$$

While the CLABSI SIR can be calculated for single locations, the measure also allows you to summarize your data across multiple locations, adjusting for differences in the incidence of infection among the location types. For example, you will be able to obtain one CLABSI SIR adjusting for all locations reported. Similarly, you can obtain one CLABSI SIR for all specialty care areas in your facility.

The CLABSI rate per 1000 central line days is calculated by dividing the number of CLABSI by the number of central line days and multiplying the result by 1000. The



Central Line Utilization Ratio is calculated by dividing the number of central line days by the number of patient days. These calculations will be performed separately for different types of ICUs, specialty care areas, and other locations in the institution. Separate rates and ratios will also be calculated for different types of catheters in specialty care areas and for birthweight categories in NICUs.

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<sup>1</sup>CDC Vital Signs. Making healthcare safer: reducing bloodstream infections. March 2011. Available at: <http://www.cdc.gov/VitalSigns/HAI/index.html>.

<sup>2</sup> O'Grady NP, Alexander M, Burns LA, Dellinger EP, Garland J, Heard SO, Maki DG, et al. Guidelines for the prevention of intravascular catheter-related infections, 2011. *Clinical Infectious Diseases* 2011; 52 (a):1087-99.

<sup>3</sup> Clinical and Laboratory Standards Institute (CLSI). *Principles and Procedures for Blood Cultures; Approved Guideline*. CLSI document M47-A (ISBN 1-56238-641-7). Clinical and Laboratory Standards Institute, 940 West Valley Road, Suite 1400, Wayne, Pennsylvania, USA, 2007.

<sup>4</sup> Baron EJ, Weinstein MP, Dunne Jr WM, Yagupsky P, Welch DF, and Wilson DM. *Blood Cultures IV*. ASM Press: Washington, DC; 2005.



## Appendix 1. Secondary Bloodstream Infection (BSI) Guide

### What is the meaning of the statement “not related to infection at another site” in relation to a positive blood culture?

The purpose of using the CDC/NHSN infection criteria is to identify and consistently categorize infections that are healthcare-associated into major and specific infection sites or types. Several of the criteria include the caveat that signs, symptoms, and/or laboratory findings may not be related to infection at another site. When assessing positive blood cultures in particular, one must be sure that there is no other CDC-defined primary site of HAI that may have seeded the bloodstream secondarily; otherwise the bloodstream infection may be misclassified as a primary BSI or erroneously associated with the use of a central line, i.e., called a CLABSI.

If the criteria for the primary infection site require a culture, then at least one organism cultured from that site must match an organism in the blood culture. NOTE: As of 1/1/11, antibiograms of the blood and site isolates do not have to match. In these instances and others where a culture of the involved site is not required for the criteria, and no such culture is collected, it is necessary to use clinical judgment regarding the likelihood of the organisms causing a secondary bloodstream infection. The graphic below may be used to help determine the relatedness of a primary site of infection to a positive blood culture.

In addition, if the blood isolate by itself does not meet BSI criteria (e.g., only one positive blood culture of a common commensal), then that isolate may not be used to indicate the presence of a secondary BSI. For example, the patient has an HAI meeting criteria for symptomatic urinary tract infection due to *E. coli* and a single positive blood culture with *E. coli* and *S. epidermidis*, the SUTI should be reported as having a secondary bloodstream infection, but only *E. coli* should be listed as the infecting pathogen.

