



## **Bloodstream Infection Event (Central Line-Associated Bloodstream Infection and Non-central line-associated Bloodstream Infection)**

**Introduction:** Although a 46% decrease in CLABSIs has occurred in hospitals across the U.S. from 2008-2013, an estimated 30,100 central line-associated bloodstream infections (CLABSI) still occur in intensive care units and wards of U.S. acute care facilities each year.<sup>1</sup> CLABSIs are serious infections typically causing a prolongation of hospital stay and increased cost and risk of mortality.

CLABSI can be prevented through proper insertion techniques and 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 may occur in any inpatient location where denominator data can be collected, which can 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 and instructions for mapping can be found in the [CDC Locations and Descriptions](#) chapter.

**Note:** Surveillance for CLABSIs after the patient is discharged from the facility is not required. However, if discovered, any CLABSIs with a date of event on the day of discharge or the next day is attributable to the discharging location and should be included in any CLABSIs reported to NHSN for that location (see [Transfer Rule](#)). No additional associated central line days are reported.

### **Definitions:**

**Present on Admission (POA):** Infections that are POA, as defined in [Chapter 2](#), are not considered HAIs and therefore are never reported to NHSN.

**Healthcare-associated infections (HAI):** All NHSN site specific infections must first meet the HAI definition as defined in [Chapter 2](#) before a site specific infection (e.g., CLABSI) can be reported to NHSN.

**Primary bloodstream infections (BSI):** Laboratory-confirmed bloodstream infections (LCBI) that are not secondary to an infection at another body site (see Appendix 1. [Secondary Bloodstream Infection \(BSI\) Guide](#) and [Surveillance Definitions](#) chapter).

**Date of event (DOE):** The BSI date of event is the date when the FIRST element used to meet the laboratory-confirmed bloodstream infection (LCBI) criterion occurs for the first time within the 7-day infection window period. (See definition of Infection Window Period in [Chapter 2](#)). Synonym: infection date.



**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
- 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 the great vessels or in or near the heart, and be used for one of the purposes outlined above, to qualify as a central line.
2. At times an intravascular line may migrate from its original great vessel location. Subsequent to the original confirmation, NHSN does not require ongoing confirmation that a line resides in a great vessel. Therefore, once a line is identified to be a central line for NHSN purposes, it is considered a central line until discontinuation, regardless of migration, and associated central line days are included in any CLABSI surveillance being performed in that location.
3. An introducer is considered an intravascular catheter, and depending on the location of its tip and use, may be a central line.
4. Pacemaker wires and other non-lumened 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
  - Intra-aortic balloon pump (IABP) devices.
  - Hemodialysis reliable outflow (HeRO) dialysis catheters
  - Impella heart devices

**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, IV antimicrobial administration, or blood 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, non-implanted catheter.

Permanent central line: Includes

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

Central line-associated BSI (CLABSI): A laboratory-confirmed bloodstream infection (LCBI) where central line (CL) or umbilical catheter (UC) was in place for >2 calendar days on the date of event, with day of device placement being Day 1,

**AND**

the line was also in place on the date of event or the day before. If a CL or UC was in place for >2 calendar days and then removed, the date of event of the LCBI must be the day of discontinuation or the next day to be a CLABSI. If the patient is admitted or transferred into a facility with an implanted central line (port) in place, and that is the patient's only central line, day of first access in an inpatient location is considered Day 1. "Access" is defined as line placement, infusion or withdrawal through the line. Such lines continue to be eligible for CLABSI once they are accessed until they are either discontinued or the day after patient discharge (as per the Transfer Rule). Note that the "de-access" of a port does not result in the patient's removal from CLABSI surveillance.

#### **Examples of Determining a CLABSI versus BSI that is not central-line associated**

- Patient has a central line inserted on June 1. On June 3, the central line is still in place and the patient's blood is collected for culture. The culture is positive for *S. aureus*. This is a CLABSI because the central line was in place for >2 calendar days (June 1, 2, and 3), and still in place, on the date of event (June 3).
- Patient has a central line inserted on June 1. On June 3, the central line is removed and on June 4 the patient's blood is collected for culture. The culture is positive for *S. aureus*. This is a CLABSI because the central line was in place for >2 calendar days (June 1, 2, and 3), and was in place the day before the date of event (June 4).
- Patient has a central line inserted on June 1. On June 3, the central line is removed. On June 5 patient spikes a fever of 38.3°C and the patient's blood is collected for culture. The culture is positive for *S. aureus*. This meets LCBI Criterion 1 but it is not a CLABSI because the Date of Event (June 5) did not occur on the day the central line was discontinued (June 3) nor the next day (June 4).



**Notes:**

1. **Central lines that are removed and reinserted:** If, after central line removal, the patient is without a central line for at least one full calendar day (NOT to be read as 24 hours), then the central line day count to determine eligibility for a CLABSI, will start anew. If instead, a new central line is inserted before a full calendar day without a central line has passed, the central line day count, to determine eligibility for a CLABSI, will continue uninterrupted. See Figure 1 below.
2. Bloodstream infections will not be reported if they occur within the Repeat Infection Timeframe (RIT) of a previously identified BSI. See Repeat Infection Timeframe guidance in [Chapter 2](#), Identifying HAIs.
3. **Note that only primary BSIs create a BSI RIT. Secondary BSIs do not create a BSI RIT.**
4. A positive blood specimen meeting LCBI criteria, that is accompanied by **documentation** of observed or suspected patient accession into vascular access lines, within the BSI infection window period, will be considered an LCBI, but not CLABSI for NHSN reporting purposes. A BSI RIT will be created. If reporting the BSI to NHSN, answer “No” to the risk factor event field “Central line?” If a facility is reporting CLABSIs electronically to NHSN via Clinical Document Architecture (CDA), no CLABSI should be reported for this event, since this BSI is not considered associated to the central line. If blood specimens meeting LCBI criteria with a date of event outside of the BSI RIT occur, they must be investigated as a part of any BSI surveillance. Documentation of observed or suspected patient accession into vascular access lines, within the BSI infection window period, will again be necessary in order to determine that the LCBI is not central-line associated for this reason.

Figure 1: Associating Central Line (CL) Use to BSI

	March 31 (Hospital day 3)	April 1	April 2	April 3	April 4	April 5	April 6
Patient A	Central Line Day 3	Central Line Day 4	Central Line removed (CL Day 5)	Central Line replaced (CL Day 6)	Central Line Day 7	Central Line removed Day 8	No Central Line
Patient B	Central Line Day 3	Central Line Day 4	Central Line removed (CL Day 5)	No Central Line	Central Line Replaced (CL Day 1)	Central Line Day 2	Central Line Day 3

**Rationale:** NHSN surveillance for infection is not aimed at a specific device. Instead surveillance is aimed at identifying risk to the patient that is the result of device use in general.



1. In the examples above, Patient A is eligible for a CLABSI beginning on March 31, through April 6, since a CL was in place for some portion of each calendar day until April 6. A BSI with date of event on April 6 would be a CLABSI since the CL had been in > 2 days and was removed the day before the date of event.
2. Patient B is eligible for a CLABSI on March 31 (CL Day 3) through April 3. The catheter had been in place > 2 days and an HAI occurring on the day of device discontinuation or the following calendar day is considered a device-associated infection. The patient is not eligible again for a CLABSI until April 6, when the second central line had been in place for greater than 2 days. (Note: NHSN will not require the BSI to be attributed to a specific central line when reporting.)

Location of attribution: The inpatient location where the patient was assigned on the date of the LCBI event, which is further defined as the date when the first element used to meet the LCBI criterion occurred (see [Exception](#) to Location of Attribution below).

#### **Exception to Location of Attribution:**

*Transfer Rule:* If the date of event for a CLABSI is the day of transfer or discharge, or the next day, the infection is attributed to the transferring location. Receiving facilities should share information about such HAIs with the transferring facility to enable reporting. This is called the Transfer Rule and examples are shown below and in [Figure 2](#):

- Patient with a central line in place in the SICU is transferred to the surgical ward. The day after transfer is the date of event for an LCBI. This is reported to NHSN as a CLABSI for the SICU.
- Patient with a central line in place is transferred from the medical ward to the coronary care ICU (CCU). An LCBI date of event is on day four in the CCU. The central line is still in place. This is reported to NHSN as a CLABSI for the CCU because the date of event was not the date of transfer from the medical ward, or the next day.
- After a two-week hospital stay, a patient in the urology ward of Hospital A has his only 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 and meets LCBI criteria. This CLABSI should be reported to NHSN for, and by, Hospital A and attributed to the urology ward because the date of event was the day after transfer.



Figure 2: Example of Multiple Transfers within the Transfer Rule Time-Frame

	3/22	3/23	3/24
Locations in which patient was housed	Unit A	Unit A Unit B Unit C	Unit C Unit D This is also the date of event for a CLABSI. CLABSI is attributed to Unit A since Unit A was the first location in which the patient was housed the day before the date of event.

**Inpatient Dialysis:**

Inpatients receiving dialysis are included in any CLABSI surveillance in the location in which they are housed, regardless of whether or not the central line is the only central line and only accessed for dialysis. This also applies to patients in Long-Term Acute Care (LTAC) facilities within Acute Care Facilities when dialysis is received from the Acute Care Facility staff.

**Examples:** *CLABSIs in the following examples will be attributed to Unit A*

- Patient on Unit A receives onsite dialysis by contracted dialysis staff
- Dialysis staff travels to Unit A to provide dialysis to Unit A patient
- Patient resides on Unit A for inpatient care, but is transported to dialysis unit within the facility for dialysis. Since CLABSIs cannot be attributed to non-bedded locations, such an event must be attributed to the inpatient location housing the patient.

Facilities may choose to capture information about the presence of a dialysis catheter in patients with LCBI. The BSI collection form includes an optional data field “Any hemodialysis catheter present,” which may be marked yes or no, and used internally by facility to identify association of dialysis to LCBI.



Table 1: Laboratory-Confirmed Bloodstream Infection Criteria

<b>Criterion</b>	<b>Laboratory-Confirmed Bloodstream Infection (LCBI)</b> <i>Comments and reporting instructions that follow the site-specific criteria provide further explanation and are integral to the correct application of the criteria.</i>  Must meet <b><i>one</i></b> of the following criteria:
<b>LCBI 1</b>	Patient has a recognized pathogen identified from one or more blood specimens by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment (e.g., not Active Surveillance Culture/Testing (ASC/AST)).  <b>AND</b>  Organism(s) identified in blood is not related to an infection at another site.(See <a href="#">Appendix 1 Secondary BSI Guide</a> )



<p><b>LCBI 2</b></p>	<p>Patient has at least one of the following signs or symptoms: fever (&gt;38.0°C), chills, or hypotension</p> <p><b>AND</b></p> <p>Organism(s) identified from blood is not related to an infection at another site (See <a href="#">Appendix 1 Secondary BSI Guide</a>)</p> <p><b>AND</b></p> <p>the same common commensal (i.e., diphtheroids [<i>Corynebacterium</i> spp. not <i>C. diphtheriae</i>], <i>Bacillus</i> spp. [not <i>B. anthracis</i>], <i>Propionibacterium</i> spp., coagulase-negative staphylococci [including <i>S. epidermidis</i>], viridans group streptococci, <i>Aerococcus</i> spp., and <i>Micrococcus</i> spp.) is identified from two or more blood specimens drawn on separate occasions (see comment <a href="#">5</a> below), by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment (e.g., not Active Surveillance Culture/Testing (ASC/AST). Criterion elements must occur within the Infection Window Period (see <a href="#">Chapter 2</a>), the 7-day time period which includes the collection date of the positive blood, the 3 calendar days before and the 3 calendar days after. (See complete list of common commensals by selecting the common commensal tab at the bottom of the Excel worksheet at <a href="http://www.cdc.gov/nhsn/XLS/master-organism-Com-Commensals-Lists.xlsx">http://www.cdc.gov/nhsn/XLS/master-organism-Com-Commensals-Lists.xlsx</a>)</p> <p><b>Note:</b> The matching common commensals represent a single element; therefore, the collection date of the <b>first</b> common commensal is the date of the element used to determine the Date of Event.</p> <table border="1" data-bbox="527 1333 1412 1438"> <tr> <td>6/1/2014</td> <td>6/2/2014</td> <td>6/3/2014</td> <td>6/4/2014</td> <td rowspan="2">Date of LCBI Event = 6/1/2014</td> </tr> <tr> <td><i>S. epidermidis</i> (1 of 2)</td> <td><i>S. epidermidis</i> (2 of 2)</td> <td>No LCBI elements</td> <td>Fever &gt; 38.0 °C</td> </tr> </table>	6/1/2014	6/2/2014	6/3/2014	6/4/2014	Date of LCBI Event = 6/1/2014	<i>S. epidermidis</i> (1 of 2)	<i>S. epidermidis</i> (2 of 2)	No LCBI elements	Fever > 38.0 °C
6/1/2014	6/2/2014	6/3/2014	6/4/2014	Date of LCBI Event = 6/1/2014						
<i>S. epidermidis</i> (1 of 2)	<i>S. epidermidis</i> (2 of 2)	No LCBI elements	Fever > 38.0 °C							





<b>LCBI 3</b>	<p>Patient <math>\leq</math> 1 year of age has at least <b><u>one</u></b> of the following signs or symptoms: fever (<math>&gt;38.0^{\circ}\text{C}</math>), hypothermia (<math>&lt;36.0^{\circ}\text{C}</math>), apnea, or bradycardia</p> <p style="text-align: center;"><b>AND</b></p> <p>Organism(s) identified from blood is not related to an infection at another site (See <a href="#">Appendix 1 Secondary BSI Guide</a>)</p> <p style="text-align: center;"><b>AND</b></p> <p>the same common commensal (i.e., diphtheroids [<i>Corynebacterium</i> spp. not <i>C. diphtheriae</i>], <i>Bacillus</i> spp. [not <i>B. anthracis</i>], <i>Propionibacterium</i> spp., coagulase-negative staphylococci [including <i>S. epidermidis</i>], viridans group streptococci, <i>Aerococcus</i> spp., and <i>Micrococcus</i> spp.) is identified from two or more blood specimens drawn on separate occasions (see comment <a href="#">5</a> below), by a culture or non-culture based microbiologic testing method which is performed for purposes of clinical diagnosis or treatment (e.g., not Active Surveillance Culture/Testing (ASC/AST). Criterion elements must occur within the Infection Window Period, the 7-day time period which includes the collection date of the positive blood, the 3 calendar days before and the 3 calendar days after. (See complete list of common commensals by selecting the common commensal tab at the bottom of the Excel worksheet at <a href="http://www.cdc.gov/nhsn/XLS/master-organism-Com-Commensals-Lists.xlsx">http://www.cdc.gov/nhsn/XLS/master-organism-Com-Commensals-Lists.xlsx</a>)</p> <p><b>Note:</b> The matching common commensals represent a single element; therefore, the collection date of the <b><u>first</u></b> common commensal is the date of the element used to determine the Date of Event.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="padding: 2px;">6/1/2014</td> <td style="padding: 2px;">6/2/2014</td> <td style="padding: 2px;">6/3/2014</td> <td style="padding: 2px;">6/4/2014</td> <td rowspan="2" style="padding: 2px;">Date of LCBI Event = 6/1/2014</td> </tr> <tr> <td style="padding: 2px;"><i>S. epidermidis</i> (1 of 2)</td> <td style="padding: 2px;"><i>S. epidermidis</i> (2 of 2)</td> <td style="padding: 2px;">No LCBI elements</td> <td style="padding: 2px;">apnea documented</td> </tr> </table>	6/1/2014	6/2/2014	6/3/2014	6/4/2014	Date of LCBI Event = 6/1/2014	<i>S. epidermidis</i> (1 of 2)	<i>S. epidermidis</i> (2 of 2)	No LCBI elements	apnea documented
6/1/2014	6/2/2014	6/3/2014	6/4/2014	Date of LCBI Event = 6/1/2014						
<i>S. epidermidis</i> (1 of 2)	<i>S. epidermidis</i> (2 of 2)	No LCBI elements	apnea documented							



<b>Criterion</b>	<b>Mucosal Barrier Injury Laboratory-Confirmed Bloodstream Infection (MBI-LCBI)</b>  <i>For MBI-LCBIs, ANC/WBC levels should not be used to set the IWP or to identify the date of event. MBI-LCBIs are subsets of LCBIs and therefore the date of the LCBI would be the date of the MBI-LCBI event.</i>  Must meet <b><u>one</u></b> of the following criteria:
<b>MBI-LCBI 1</b>	Patient of any age meets criterion 1 for LCBI with at least one blood specimen identified by a culture or non-culture based microbiologic testing method, with any of the following intestinal organisms ( <u>but no other organisms</u> ). ( <a href="#">See Comment #8</a> ): <i>Bacteroides</i> spp., <i>Candida</i> spp., <i>Clostridium</i> spp., <i>Enterococcus</i> spp., <i>Fusobacterium</i> spp., <i>Peptostreptococcus</i> spp., <i>Prevotella</i> spp., <i>Veillonella</i> spp., or Enterobacteriaceae*  <b>And patient meets at least <u>one</u> of the following:</b> <ol style="list-style-type: none"><li>1. Is an allogeneic hematopoietic stem cell transplant recipient within the past year with one of the following documented during same hospitalization as positive blood specimen:<ol style="list-style-type: none"><li>a. Grade III or IV gastrointestinal graft versus host disease [GI GVHD]</li><li>b. <math>\geq 1</math> liter diarrhea in a 24-hour period (or <math>\geq 20</math> mL/kg in a 24-hour period for patients <math>&lt; 18</math> years of age) with onset on or within 7 calendar days before the date the positive blood specimen was collected.</li></ol></li><li>2. Is neutropenic, defined as at least two separate days with values of absolute neutrophil count (ANC) or total white blood cell count (WBC) <math>&lt; 500</math> cells/mm<sup>3</sup> within a 7-day time period which includes the date the positive blood specimen was collected (Day 1), the 3 calendar days before <i>and</i> the 3 calendar days after (See <a href="#">Table 4</a> for example).</li></ol> *See <a href="#">Table 3</a> for partial list of eligible Enterobacteriaceae genera.
<b>MBI-LCBI 2</b>	Patient of any age meets criterion 2 for LCBI with at least one blood specimen identified by a culture or non-culture based microbiologic testing method, with only viridans group streptococci and <u>no other organisms</u> .  <b>And patient meets at least <u>one</u> of the following:</b>



	<ol style="list-style-type: none"> <li>1. Is an allogeneic hematopoietic stem cell transplant recipient within the past year with one of the following documented during same hospitalization as positive blood specimen:             <ol style="list-style-type: none"> <li>a. Grade III or IV gastrointestinal graft versus host disease [GI GVHD]</li> <li>b. <math>\geq 1</math> liter diarrhea in a 24-hour period (or <math>\geq 20</math> mL/kg in a 24-hour period for patients <math>&lt; 18</math> years of age) with onset on or within 7 calendar days before the date the first positive blood specimen was collected.</li> </ol> </li> <li>2. Is neutropenic, defined as at least two separate days with values of absolute neutrophil count (ANC) or total white blood cell count (WBC) <math>&lt; 500</math> cells/mm<sup>3</sup> within a seven-day time period which includes the date the positive blood specimen was collected (Day 1), the 3 calendar days before <i>and</i> the 3 calendar days after (See <a href="#">Table 4</a> for example).</li> </ol>
<p><b>MBI-LCBI 3</b></p>	<p>Patient <math>\leq 1</math> year of age meets criterion 3 for LCBI with at least one blood specimen are identified by a culture or non-culture based microbiologic testing method, with only viridans group streptococci <u>and no other organisms.</u></p> <p><b>And patient meets at least <i>one</i> of the following:</b></p> <ol style="list-style-type: none"> <li>1. Is an allogeneic hematopoietic stem cell transplant recipient within the past year with one of the following documented during same hospitalization as positive blood specimen:             <ol style="list-style-type: none"> <li>a. Grade III or IV gastrointestinal graft versus host disease [GI GVHD]</li> <li>b. <math>\geq 20</math> mL/kg diarrhea in a 24-hour period with onset on or within 7 calendar days before the date the first positive blood specimen is collected.</li> </ol> </li> <li>2. Is neutropenic, defined as at least two separate days with values of absolute neutrophil count (ANC) or total white blood cell count (WBC) <math>&lt; 500</math> cells/mm<sup>3</sup> on or within a seven-day time period which includes the date the positive blood specimen was collected (Day 1), the 3 calendar days before <i>and</i> the 3 calendar days after. (See <a href="#">Table 4</a> for example)</li> </ol>
<p><b>Comments</b></p>	<ol style="list-style-type: none"> <li>1. A positive blood specimen meeting LCBI criteria, that is accompanied by <b><u>documentation</u></b> of observed or suspected patient accession into vascular access lines, within the BSI infection window period, will be considered an LCBI, but not CLABSI for NHSN reporting purposes. A BSI RIT will be created. If reporting the BSI to NHSN, answer “No” to the</li> </ol>



	<p>event field “Central line?” If a facility is reporting CLABSIs electronically to NHSN via Clinical Document Architecture (CDA), no CLABSI should be reported for this event, since this BSI is not considered associated to the central line. If blood cultures collected after the BSI RIT are again positive, they must be investigated as a part of any BSI surveillance. Documentation of observed or suspected patient accession into vascular access lines, within the BSI infection window period, will again be necessary in order to determine that the LCBI is not central-line associated.</p> <p>2. In LCBI criterion 1, the term “recognized pathogen” includes any organism not included on the common commensal list (see criteria 2 and 3 or Supporting Material section at <a href="http://www.cdc.gov/nhsn/XLS/master-organism-Commensals-Lists.xlsx">http://www.cdc.gov/nhsn/XLS/master-organism-Commensals-Lists.xlsx</a>) for the list of common commensals). Exceptions:</p> <ul style="list-style-type: none"><li>a. <i>Salmonella</i> spp. are excluded as pathogens for LCBI. These organisms may be secondary BSIs but will not be reported as the sole pathogen in a primary BSI.</li><li>b. Organisms belonging to the following genera cannot be used to meet any NHSN definition: <i>Blastomyces</i>, <i>Histoplasma</i>, <i>Coccidioides</i>, <i>Paracoccidioides</i>, <i>Cryptococcus</i> and <i>Pneumocystis</i>. These organisms are typically causes of community-associated infections and are rarely known to cause healthcare-associated infections, and therefore are excluded.</li></ul> <p>3. LCBI criteria 1 and 2 and MCI-LCBI criteria 1 and 2 may be used for patients of any age, including those patients <math>\leq 1</math> year of age.</p> <p>4. In LCBI criteria 2 and 3, if the pathogen or common commensal is identified to the species level from one blood specimen, and a companion blood specimen is identified with only a descriptive name, which is complementary to the companion culture (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 organism along with its antibiogram if available (see <a href="#">Table 2</a> below). Only genus and species identification should be used to determine the sameness of organisms (i.e., matching 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,</p>
--	---



	<p>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.</p> <ol style="list-style-type: none"><li>5. In LCBI criteria 2 and 3, the phrase “two or more blood specimens drawn on separate occasions” means, 1) that blood from at least two separate blood draws were collected on the same or consecutive calendar days, and 2) were collected in a manner which suggests that two separate blood draw site preparations were performed. This will reduce misidentification of contaminated blood specimens as LCBI. For example, blood specimens drawn from different sites (e.g., different venipunctures, a combination of venipuncture and lumen withdrawal, or different lumens of the same central line), or at different times, should undergo separate decontaminations and are therefore considered drawn on “separate occasions”.</li><li>6. For pediatric patients, due to volume constraints, a blood specimen may consist of a single bottle. Therefore, to meet this part of the criterion, each bottle from two, single bottle blood draws would have to be positive for the same common commensal.</li><li>7. Specimen Collection Considerations: Although blood specimens drawn through central lines can have a higher rate of contamination than blood specimens collected through peripheral venipuncture <sup>3,4</sup> all positive blood specimens, regardless of the sites from which they were collected, must be included when conducting in-plan CLABSI surveillance.</li><li>8. In MBI-LCBI 1, 2 and 3, “No other organisms” means there is no identification of a non-MBI-LCBI pathogens (e.g., <i>S. aureus</i>) or 2 matching common commensals (e.g., coagulase-negative staphylococci) collected from blood on separate occasions that would otherwise meet LCBI criteria. If this occurs, the infection should not be classified as MBI-LCBI.</li></ol>
<b>Reporting Instructions</b>	<ol style="list-style-type: none"><li>1. Report organisms identified from blood as BSI–LCBI when no other site of infection is evident (see <a href="#">Appendix 1</a>. Secondary Bloodstream Infection [BSI] Guide). Note: VASC infections with positive blood specimens should be reported as BSI-LCBI (see Reporting Instruction 5 below for exception).</li><li>2. When another blood specimen is collected during the RIT of an identified MBI-LCBI, which is positive for an organism excluded from MBI-LCBI criteria, the MBI-LCBI event is edited to become an LCBI and the organism is added.</li></ol>



3. Catheter tip cultures are not used to determine whether a patient has a primary BSI.
4. 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 an LCBI, SST-SKIN, or an SST-ST infection.
5. Occasionally, a patient with both a central line and another vascular access device develops a primary bloodstream infection (LCBI) that can clearly be attributed to the other vascular access site. If both pus at the insertion site and a culture of that pus, collected during the LCBI infection window period, has at least one matching organism to the blood specimen, the LCBI will not be considered associated with the central line. In this situation, enter “No” for the filed “Central Line?” in the NHSN application. You should, however, include the patient’s central line days in the summary denominator count. Vascular access devices included in this exception are limited to:
  - a. Peripheral IV
  - b. Arteriovenous fistula
  - c. Arteriovenous graft
  - d. Non-accessed central line (not accessed nor inserted during the hospitalization)



Table 2: Examples of How to Report Speciated and Unspeciated Organisms Identified from Blood Specimens

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

Table 3: Partial List of Criterion 1 MBI-LCBI Eligible Enterobacteriaceae Genera

<i>Citrobacter</i>
<i>Enterobacter</i>
<i>Escherichia</i>
<i>Klebsiella</i>
<i>Proteus</i>
<i>Providencia</i>
<i>Salmonella</i>
<i>Serratia</i>
<i>Shigella</i>
<i>Yersina</i>

**Note:** See complete list of MBI Pathogens by selecting the MBI Organisms tab at the bottom of the Excel worksheet at <http://www.cdc.gov/nhsn/XLS/master-organism-Commensals-Lists.xlsx>



Table 4: Examples Illustrating the MBI-LCBI Criteria for Neutropenia



		Day -7	Day -6	Day -5	Day -4	Day -3	Day -2	Day -1	Day 1*	Day 2	Day 3	Day 4
Pt. A	WBC	100	800	400	300	ND	ND	320	400 + BC* w/ <i>Candida</i> spp. x1	ND	550	600
Pt. B	ANC	ND	410	130	ND	ND	120	110	ND +BC* w/ viridans strep x2 and fever >38°C	110	300	320
Pt. C	WBC	100	800	400	300	ND	ND	ND	600 + BC* w/ <i>Candida</i> spp. x1	230	ND	400

ND = not done; \*Day the blood specimen that was positive was collected

Patient A meets MBI-LCBI criterion 1, sub-criterion 2: Positive blood specimen with intestinal organism (*Candida* spp.) and neutropenia (2 separate days of WBC <500 cells/mm<sup>3</sup> occurring on the date the positive blood specimen was collected [Day 1] or during the 3 days before or the 3 days after that date). In this case, the Day 1 value = 400, and Day -1 value = 320.

Patient B meets MBI-LCBI criterion 2, sub-criterion 2: At least two positive blood specimens with viridans group streptococci (in this case, two positive), and fever >38°C and neutropenia (two separate days of ANC <500 cells/mm<sup>3</sup> occurring on the date the positive blood specimen was collected [Day 1] or during the 3 days before or the 3 days after that date). In this case, the Day -1 value = 110 and Day -2 value = 120.

**Note:** any two of Days -2,-1, 2, 3, and 4 could be used to meet this requirement since WBC or ANC under 500 were present on those days.

Patient C meets MBI-LCBI criterion 1, sub-criterion 2: Positive blood specimen with intestinal organism (*Candida* spp.) and neutropenia (2 separate days of WBC <500 cells/mm<sup>3</sup> occurring on the date the positive blood specimen was collected [Day 1] or during the 3 days before or the 3 days after that date). In this case, Day 2 value =230 and Day 4value = 400)).





**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. All LCBI and MBI-LCBI that are identified as central-line associated must be included. MBI-LCBI will be excluded from the numerator for CMS reporting pending implementation of a new baseline risk-adjustment, expected late 2016. The [Instructions for Completion of Primary Bloodstream Infection \(BSI\) form](#) 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, organisms identified from blood specimens, 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. Device-day denominator data that are collected differ according to the location of the patients being monitored. The following methods can be used for the collection of denominator data:

<b>Denominator Data Collection Method</b>	<b>Details</b>
<b>Manual, Daily</b> (i.e., collected at the same time every day of the month)	<p>Denominator data are collected at the same time, every day, per location.</p> <p>For locations other than specialty care areas/oncology (SCA/ONC) 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 <a href="#">Denominators for Intensive Care Unit (ICU)/Other Locations (Not NICU or SCA/ONC) form (CDC 57.118)</a>. Only the totals for the month are entered into NHSN.</p> <p>For specialty care areas/oncology, 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 <a href="#">Denominators for Specialty Care Area (SCA)/Oncology (ONC) form (CDC 57.117)</a>. Each is collected daily, at the same time each day. Only the totals for the month are entered into NHSN. This distinction in lines is made because permanent lines are commonly used</p>



Denominator Data Collection Method	Details
	<p>in patients frequenting these areas and may be associated with lower rates of BSI 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 <a href="#">Instructions for Completion of Denominators for Intensive Care Unit (ICU)/Other Locations (Not NICU and SCA/ONC)</a> and <a href="#">Instructions for Completion of Denominators for Specialty Care Areas (SCA)/Oncology (ONC)</a> contain brief instructions for collection and entry of each data element on the forms.</p> <p>In NICUs, the number of patients with one or more central lines is stratified by <u>birth weight</u> in five categories since risk of BSI varies by birth weight. These data are collected on the <a href="#">Denominators for Neonatal Intensive Care Unit (NICU) form (CDC 57.116)</a>.</p> <p><b>Note:</b> The weight of the infant at the time of BSI is <u>not</u> 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 a CLABSI develops, record the birth weight of 1006 grams on the BSI form. The <a href="#">Instructions for Completion of Denominators for Neonatal Intensive Care Unit (NICU)</a> form contains brief instructions for collection and entry of each data element on the forms.</p>
<p><b>Manual, sampled once/week</b> (i.e., collected at the same time on the same designated day, once per week)</p>	<p>For locations other than specialty care areas/oncology (SCA/ONC) and NICUs (e.g., ICUs, step-down units, wards), the denominator sampling method can be used.</p> <p>To reduce staff time spent collecting surveillance data, once weekly sampling of denominator data to generate estimated central line days, may be used as an alternative to daily collection in non-oncology ICUs and wards. The number of patients in the location (patient-days) and the number of patients with one or more central lines of any type (central line days) is collected on a designated day each week (e.g., every Tuesday), at the same time during the month.</p> <p>Evaluations of this method have repeatedly shown that use of Saturday or Sunday generate the least accurate estimates of denominator data, therefore, these days should not be</p>



Denominator Data Collection Method	Details
	<p>selected as the designated day.<sup>6-8</sup> If the day designated for the collection of sampled data is missed, collect the data on the next available day instead.</p> <p>The following must be collected and entered into NHSN:</p> <ol style="list-style-type: none"> <li>1. The monthly total for patient-days, based on collection daily</li> <li>2. The sampled total for patient-days</li> <li>3. The sampled total central line-days</li> </ol> <p>When these data are entered, the NHSN application will calculate an estimate of central line-days.</p> <p><b>Notes:</b></p> <ul style="list-style-type: none"> <li>• To ensure the accuracy of estimated denominator data obtained by sampling, only ICU and ward location types with an average of 75 or more central line-days per month are eligible to use this method. A review of each location’s central line denominator data for the past twelve months in NHSN will help determine which locations are eligible.</li> <li>• The accuracy of estimated denominator data generated by sampling can be heavily influenced by incorrect or missing data. Careful implementation of data collection following the guidance in this protocol is essential to avoid erroneous fluctuations in rates or SIRs.</li> </ul>
<b>Electronic</b>	<p>For <u>any</u> location, 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, once a day counts, pre-validated for a minimum of three months.</p> <p>The validation of electronic counts should be performed for each location separately.</p>

**Data Analyses:** The Standardized Infection Ratio (SIR)<sup>9</sup> is calculated by dividing the number of observed infections by the number of predicted infections. The number of predicted infections is calculated using CLABSI rates from a standard population during a baseline time period, which represents a standard population’s CLABSI experience.<sup>10, 11</sup>



**Note:** The SIR will be calculated only if the number of predicted CLABSIs (numExp) is  $\geq 1$  to help enforce a minimum precision criterion.

**Note:** In the NHSN application, “predicted” is referred to as “expected”.

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

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 can obtain one CLABSI SIR adjusting for all locations reported. Similarly, you can obtain one CLABSI SIR for all ICUs in your facility.

**Note:** Only those locations for which baseline data have been published will be included in the SIR calculations. For acute care hospitals, the baseline time period is 2006-2008; for long term acute care hospitals, the baseline time period is 2013.<sup>10,11</sup>

The CLABSI rate per 1000 central line days is calculated by dividing the number of CLABSIs 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, oncology units, and other locations in the institution. Separate rates and ratios will also be calculated for different types of catheters in specialty care areas/oncology locations and for birth weight categories in NICUs.

Descriptive analysis output options of numerator and denominator data, such as line listings, frequency tables, and bar and pie charts are available in the NHSN application. CLABSI SIRs, rates, and run charts are also available. Guides on using NHSN analysis features are available from: <http://www.cdc.gov/nhsn/PS-Analysis-resources/reference-guides.html>.



## REFERENCES

- <sup>1</sup>CDC National and State Healthcare-Associated Infections Progress Report, published March 2014, available at <http://www.cdc.gov/HAI/pdfs/progress-report/hai-progress-report.pdf>
- <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". *Clinical Infectious Diseases* 52 (a): (2011): 1087-99.
- <sup>3</sup> Clinical and Laboratory Standards Institute (CLSI). *Principles and Procedures for Blood Cultures; Approved Guideline*. CLSI document M47-A. Wayne, PA: Clinical and Laboratory Standards Institute; 2007.
- <sup>4</sup>Baron, EJ., Weinstein, MP., Dunne, WM., Yagupsky, P., Welch, DF., Wilson, DM. *Blood Cultures; Approved Guideline*. Washington, DC: ASM Press; 2005.
- <sup>5</sup> Lee, A., Mirrett, S., Reller, LB., Weinstein, MP. "Detection of Bloodstream Infections In Adults: How Many Blood Cultures are Needed?" *Journal of Clinical Microbiology*, Nov; 45(11): (2007): 3546-8.
- <sup>6</sup> Klevens, RM., et al. "Sampling for Collection of Central Line Day Denominators in Surveillance for Healthcare-associated Bloodstream Infections". *Infection Control Hospital Epidemiology*. 27: (2006):338-42.
- <sup>7</sup> Thompson, ND., et al." Evaluating the Accuracy of Sampling to Estimate Central Line-Days: Simplification of NHSN Surveillance Methods". *Infection Control Hospital Epidemiology*. 34(3): (2013): 221-228.
- <sup>8</sup> See, I., et al. ID Week 2012 (Abstract #1284): Evaluation of Sampling Denominator Data to Estimate Urinary Catheter- and Ventilator-Days for the NHSN. San Diego, California. October 19, 2012.
- <sup>9</sup> Your guide to the Standardized Infection Ratio (SIR). October 2010. [http://www.cdc.gov/nhsn/PDFs/Newsletters/NHSN\\_NL\\_OCT\\_2010SE\\_final.pdf](http://www.cdc.gov/nhsn/PDFs/Newsletters/NHSN_NL_OCT_2010SE_final.pdf)
- <sup>10</sup> Edwards et al. (2009). National Healthcare Safety Network (NHSN) report: Data summary for 2006 through 2008, issued December 2009. Available at: <http://www.cdc.gov/nhsn/PDFs/dataStat/2009NHSNReport.PDF>
- <sup>11</sup>Dudeck, MA., et al. National Healthcare Safety Network (NHSN) Report, Data Summary for 2013, Device-associated Module. *American Journal of Infection Control*. 43(3): (2015): 206-221.



## **Appendix 1: Secondary Bloodstream Infection (BSI) Guide (*not applicable to Ventilator-associated Events [VAE]*)**

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. LCBI criteria include the caveat that the organism(s) identified from the blood cannot be related to infection at another site (i.e., must be a primary BSI). One must be sure that there is no other CDC/NHSN defined primary site-specific infection that may have seeded the bloodstream secondarily; otherwise the bloodstream infection may be misclassified as a primary BSI and erroneously associated with the use of a central line, i.e., called a CLABSI. For locations performing in-plan VAE surveillance, refer to [Figure 4](#) in this appendix, as well as the VAE chapter for specific guidance on assigning a secondary BSI to a VAE.

### **Secondary BSI Scenarios**

For purposes of NHSN, in order for a bloodstream infection to be determined secondary to another site of infection the following requirements must be met: ‡

**The patient must meet one of the NHSN site-specific definitions (CDC/NHSN Surveillance Definitions for Specific Types of Infections, UTI, PNEU or SSI),  
AND**

**Either “1” or “2” below must also be true:**

1. An organism identified from the site specific infection is used as an element to meet the site-specific infection criterion, AND the blood specimen contains at least one matching organism to that site specific specimen, and is collected during the secondary BSI attribution period.

**OR**

2. The positive blood specimen is an element used to meet the site-specific infection criterion, and is collected during the site specific infection’s infection window period

#### **‡Exception:**

Necrotizing enterocolitis (NEC) criteria include neither a site-specific specimen nor organism identified from blood specimen, however an exception for assigning a BSI secondary to NEC is provided.

A BSI is considered secondary to NEC if the patient meets one of the two NEC criteria AND an organism identified from blood specimen collected during the secondary BSI attribution period is an LCBI pathogen, or the same common commensal is identified from two or more blood specimens drawn on separate occasions on the same or consecutive days.



Below are examples with guidance on how to distinguish between the primary or secondary nature of a BSI. The definition of “matching organisms” and important notes and reporting instructions are also provided.

See [Figure 3](#): Secondary BSI Guide for algorithmic display of the following instructions.

**Scenario 1: An organism identified from the site-specific infection is used as an element to meet the site-specific infection criterion, AND the blood specimen contains at least one matching organism to that site specific specimen. The positive blood specimen must be collected during the site-specific infection’s secondary BSI attribution period.**

- a. **Example:** Patient meets NHSN criteria for a symptomatic urinary tract infection (suprapubic tenderness and  $>10^5$  CFU/ml of *E. coli*) and blood specimen collected during the SUTI secondary BSI attribution period is positive for *E. coli*. This is a SUTI with a secondary BSI and the reported organism is *E. coli*.
- b. **Example:** Patient meets NHSN criteria for a symptomatic urinary tract infection (suprapubic tenderness and  $>10^5$  CFU/ml of *E. coli*) and blood specimen collected during the SUTI secondary BSI attribution period grows *E. coli* and *P. aeruginosa*. This is a SUTI with a secondary BSI and the reported organisms are *E. coli* and *P. aeruginosa*, since both site and blood specimens are positive for at least one matching pathogen.
- c. **Example:** Patient meets NHSN criteria for a symptomatic urinary tract infection (suprapubic tenderness and  $>10^5$  CFU/ml of *E. coli*) and a single blood specimen collected during the SUTI secondary BSI attribution period *E. coli* and *S. epidermidis*. This is a SUTI with a secondary BSI and the reported organism is only *E. coli*, since the single common commensal *S. epidermidis* positive blood specimen by itself does not meet BSI criteria.

**Scenario 2: The positive blood culture is an element used to meet the site-specific infection criterion, and is collected during the site specific infection’s infection window period.** (For your convenience, a list of infection criteria that include positive blood culture as an element are included in [Table 5](#) below).

- a. **Example:** Patient becomes febrile and complains of nausea and abdominal pain. CT scan done that day shows fluid collection suggestive of infection. Blood specimen collected that day results in identification of *Bacteroides fragilis*. Because the patient meets IAB criterion 3b, using the identification of an organisms from the blood specimen as an element (fever, nausea or abdominal pain, positive blood specimen and CT scan showing infection in abdominal cavity), the BSI is considered secondary to IAB.
- b. **Example:** Patient is febrile, has a new onset of cough and has positive chest imaging test indicating the presence of an infiltrate. Blood specimens collected identify *Pseudomonas aeruginosa*. Because the patient can meet



PNU2 definition by using identification of organisms from blood specimen as one of the elements of the infection criterion (i.e., infiltrate on chest imaging test, fever, new onset of cough and organism identified from blood specimen), the BSI is considered secondary to PNEU.

**NOTE: In scenarios where an NHSN infection definition can be met using more than one criterion of the infection definition, it is possible that identification of organism from blood and site-specific specimens may not match and a BSI may still be considered as a secondary BSI. Consider the following:**

- d. **Example:** During the SSI surveillance period, a postoperative patient becomes febrile and complains of nausea and abdominal pain. CT scan done that day shows fluid collection suggestive of infection. Culture results show *Escherichia coli* from the T-tube drainage specimen and the blood specimen grows *Bacteroides fragilis*. Although the organisms in the blood culture and site-specific culture do not match for at least one organism, the blood culture is considered secondary to IAB. This is because the patient meets organ/space SSI IAB criterion 3b, using the identification of organism in blood specimen as an element (fever, nausea or abdominal pain, organisms identified from blood specimen and CT scan showing infection in abdominal cavity). This patient also meets IAB criterion 3a using the positive site culture plus fever, and nausea or abdominal pain even though the organism involved is different from that used for IAB criterion 3b. In this case, the BSI is considered secondary to the organ/space SSI IAB and both organisms would be listed as IAB infection pathogens.
- e. **Example:** Patient is febrile, has a new onset of cough and has positive chest imaging test indicating the presence of an infiltrate. Blood and bronchoalveolar lavage (BAL) specimens are collected. Results identify *Klebsiella pneumoniae*  $> 10^4$  CFU/ml from the BAL and *Pseudomonas aeruginosa* from the blood. Although the organisms in the blood specimen and site-specific specimen do not match for at least one organism, because the patient can meet PNU2 definition using either the identification of organism from blood specimen or BAL specimen as one of the elements of the infection criterion (i.e. infiltrate on chest imaging test, fever, new onset of cough and organism identified from blood specimen or identified from BAL specimen), the blood is considered a secondary BSI to PNEU and both organisms would be listed as PNEU pathogens.





**If there is no matching organism identified from blood and site-specific specimen which is used to meet the site-specific infection definition, nor is an organism identified from blood specimen used to meet the site-specific infection criterion, secondary BSI attribution cannot be assigned.**

- a. **Example:** Patient has pustules on their abdomen with tenderness and swelling. Purulent material is obtained from the pustules and is positive for *Streptococcus* Group B. A blood specimen collected the same day identifies methicillin resistant *Staphylococcus aureus*. Because the organisms from the site and blood specimens do not match, and there is no site-specific criterion for SKIN that includes organisms identified from blood specimen, both a site-specific infection, SKIN (criteria 1 and 2a) and a primary BSI would be reported.
  
- b. **Example:** A patient has an abscess in the soft tissue around a percutaneous endoscopic gastrostomy (PEG) tube, identified by CT scan, and there is also purulent drainage from that site. No site-specific specimen was collected, but a blood specimen is positive for *Staphylococcus aureus*. No other sites of infection are identified. Because no culture of the site was collected, and the patient therefore cannot meet ST criterion 1, and because there is no ST criterion which uses identification of organism from blood specimen as an element, this patient has a ST infection with unknown pathogen (criterion 2), and a primary BSI with the pathogen *Staphylococcus aureus* for NHSN purposes.



Table 5: Site-specific criteria that require positive blood specimens

Organisms identified from blood as an element			Organisms identified from blood with imaging test evidence of infection		
Site	Element	Page	Site	Element	Page
BURN	1	17-23	BONE	3a	17-5
IAB	2b	17-19	DISC	3a	17-5
JNT	3c	17- 6	GIT	2c	17-18
MEN	2c & 3c	17-8	IAB	3b	17-19
OREP	3a	17-22	SA	3a	17-9
PNU2	Lab finding	6-6	USI	3b & 4b	17-26
PNU3	Lab finding	6-8	ENDO	4a, 4b, 5a & 5b (specific organisms) 6e & 7e plus other criteria as listed	17-10
UMB	1b	17-25			

A **matching organism** is defined as one of the following:

1. If genus and species are identified in both specimens, they must be the same.
  - a. **Example:** A blood specimen reported as *Enterobacter cloacae* and an intraabdominal specimen of *Enterobacter cloacae* are matching organisms.
  - b. **Example:** A blood specimen reported as *Enterobacter cloacae* and an intraabdominal specimen of *Enterobacter aerogenes* are NOT matching organisms as the species are different.
  
2. If the organism is less definitively identified in one specimen than the other, the identifications must be complementary.
  - a. **Example:** A surgical wound growing *Pseudomonas* spp. and a blood specimen growing *Pseudomonas aeruginosa* are considered a match at the genus level and therefore the BSI is reported as secondary to the SSI.
  - b. **Example:** A blood specimen reported as *Candida albicans* and a culture from a decubitus reported as yeast not otherwise specified are considered to have matching organisms because the organisms are complementary, i.e. *Candida* is a type of yeast.



**Notes:**

1. Antibigrams of the blood and potential primary site isolates do not have to match.
2. If the blood specimen by itself does not meet BSI criteria (e.g., only one positive blood specimen positive for a common commensal), then that specimen may not be used to indicate the presence of a secondary BSI (see [scenario 1c](#)).

**Reporting Instructions:**

- For reporting secondary BSI for possible VAP (PVAP), [see Figure 4](#) and [Chapter 10](#).
- Do not report secondary bloodstream infection for vascular (VASC) infections, Ventilator-Associated Conditions (VAC), or Infection-related Ventilator-Associated Complications (IVAC), pneumonia 1 (PNEU 1).
- When a BSI is suspected to be secondary to a lower respiratory tract infection and the BSI cannot be determined to be secondary to VAE, the PNEU definitions are available for secondary BSI assignment (see Figure 4).
- Site-specific organism exclusions apply to secondary BSI attribution as well.

**Pathogen Assignment**

Pathogens identified from secondary BSIs, should be added to those pathogens reported for the primary infection type. The Secondary BSI data collection field should be checked yes.

A secondary BSI pathogen may be assigned to two different primary site infections (e.g., UTI and an IAB infection). In example 1 below, two primary site infections have been identified and a blood culture is collected within both the SUTI and the IAB secondary BSI attribution period. The blood culture pathogen matches both primary site infection pathogens (SUTI and IAB). Therefore the pathogen is reported for both primary sites of infection as a secondary bloodstream infection.



Example 1: Pathogen Assignment

Hospital Day	BSI	RIT	Infection Window Period	Infection Window Period		BSI
1						
2						
3						
4		1	Urine culture: >100,000 cfu/ml <i>K. pneumoniae</i>			
5		2	Fever > 38.0 C			
6		3				
7		4				
8		5		Fever >38.0 C, Abdominal pain		
9		6		CT Scan : Abdominal abscess		
10		7	Blood culture: <i>K. pneumoniae</i>	Blood culture: <i>K. pneumoniae</i>		
11		8				
12		9				
13		10				
14		11				
15		12				
16		13				
17		14				
18						
19						
20						
21						
22						
23						
			<b>SUTI &amp; Secondary BSI Date of Event = 4 Pathogen: <i>K. pneumoniae</i></b>	<b>IAB &amp; Secondary BSI Date of Event = 8 Pathogen: <i>K. pneumoniae</i></b>		

**Infection Window Period**  
(First positive diagnostic test, 3 days before and 3 days after)

**Repeat Infection Timeframe (RIT)**  
(date of event = day 1)

**Secondary BSI Attribution Period** (Infection Window Period + RIT)

**Date of Event (DOE)**  
(Date the first element occurs for the first time within the infection window period)

Pathogens excluded from specific infection definitions (e.g., yeast in UTI, or *Enterococcus* spp. for PNEU) are also excluded as pathogens for BSIs secondary to that type of infection (i.e., they cannot be added on to one of these infections as a pathogen). In example 2 below, the excluded organism must be accounted for as either 1) a primary bloodstream infection (BSI/CLABSI) or, 2) a secondary bloodstream infection attributed to another primary infection (e.g., IAB, SINU). A blood culture with yeast and *E. faecalis* is collected during the SUTI RIT. A BSI secondary to SUTI is identified. *E. faecalis* is already documented as a pathogen, but the yeast will not be reported as a secondary BSI pathogen, because yeasts are excluded as organisms in the UTI definition. Because no other primary source of infection for which the yeast BSI can be assigned as secondary is found, a primary BSI with yeast is identified.

Note: The *Enterococcus faecalis* is not reported as a pathogen for the primary BSI because if an excluded organism had not been identified, a primary BSI would not have been reported.



Example 2: Pathogen Assignment (continued)

Hospital Day	BSI	RIT	Infection Window Period	Infection Window Period	RIT
1					
2					
3		1	Dysuria		
4		2	Urine culture: > 100,000 cfu/ml <i>E. faecalis</i>		
5		3			
6		4			
7		5			
8		6			
9		7			
10		8			
11		9	Blood culture: <i>E. faecalis</i> / Yeast	Blood culture: <i>E. faecalis</i> / Yeast	1
12		10			2
13		11			3
14		12			4
15		13			5
16		14			6
17					7
18					8
19					9
20					10
21					11
22					12
23					13
24					14
25					
			UTI & Secondary BSI Date of Event = 3 Pathogen: <i>E. faecalis</i>	Primary BSI Date of Event = 11 Pathogen: Yeast	

**Infection Window Period**  
(First positive diagnostic test, 3 days before and 3 days after)

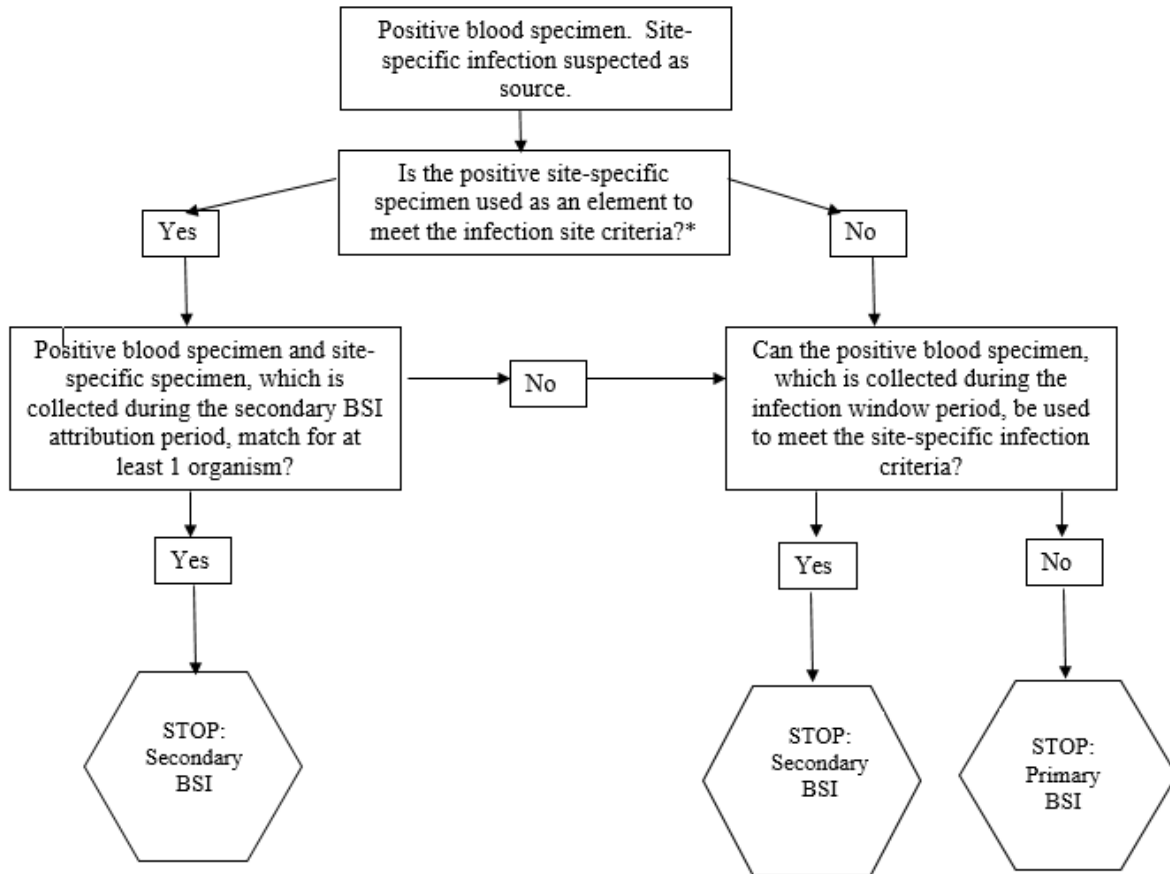
**Repeat Infection Timeframe (RIT)**  
(date of event = day 1)

**Secondary BSI Attribution Period**  
(Infection Window Period + RIT)

**Date of Event (DOE)**  
(Date the first element occurs for the first time within the infection window period)

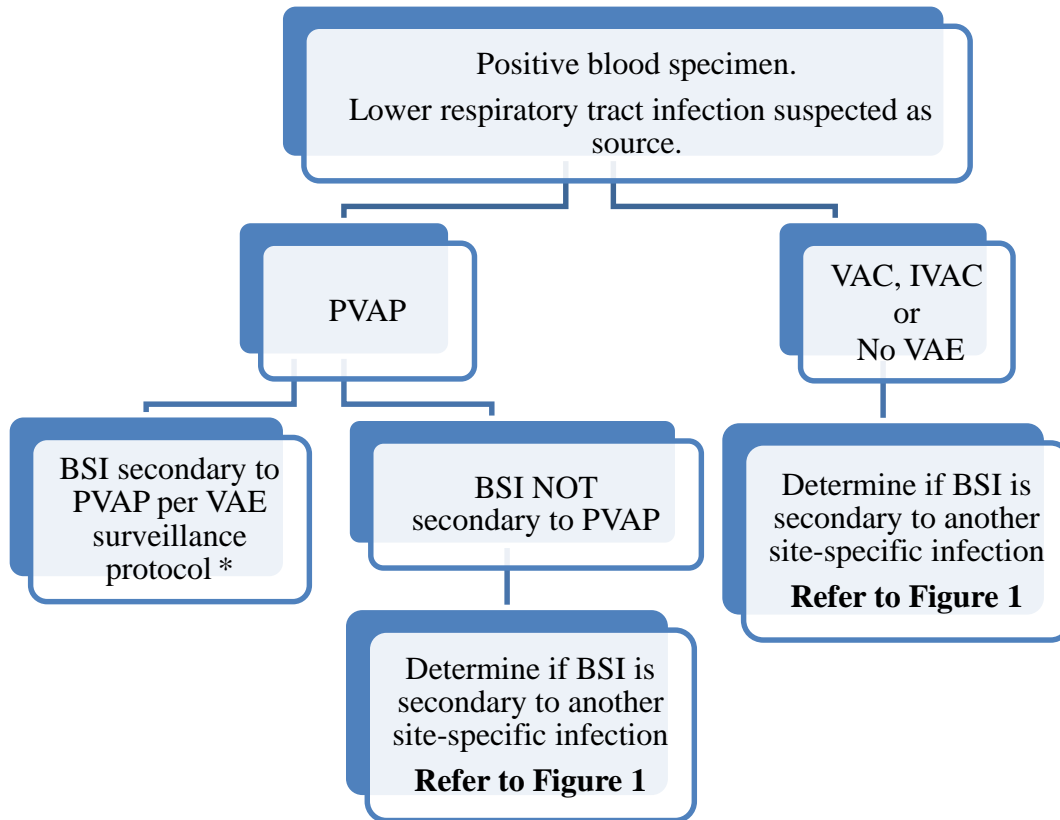


**Figure 3: Secondary BSI Guide for eligible organisms\*‡**  
(Not applicable to Ventilator-associated Events [VAE], See [Figure 4](#))



**‡Exception:** Necrotizing enterocolitis (NEC) criteria include neither a site-specific specimen nor organism identified from blood specimen, however an exception for assigning a BSI secondary to NEC is provided. A BSI is considered secondary to NEC if the patient meets one of the 2 NEC criteria AND an organism identified from blood specimen collected during the secondary BSI attribution period is an LCBI pathogen or the same common commensal is identified from 2 or more blood specimens drawn on separate occasions on the same or consecutive days.

**Figure 4: VAE Guidance for Secondary BSI Determination**



\*Secondary BSIs may be reported for possible VAP (PVAP) events, provided that at least one organism identified from the blood specimen matches an organism identified from an appropriate respiratory tract specimen (including respiratory secretions, pleural fluid and lung tissue). The respiratory tract specimen must have been collected on or after the 3rd day of mechanical ventilation and within 2 calendar days before or after the day of onset of worsening oxygenation to be considered as a criterion for meeting the PVAP definitions. In addition, the blood specimen must have been collected during the 14-day event period, where day 1 is the day of onset of worsening oxygenation.

- In cases where PVAP is met with only the histopathology criterion and no culture or non-culture based test is performed on an eligible respiratory specimen, and there is also a positive blood specimen, a secondary BSI to VAE is not reported.
- In cases where a culture or non-culture based test of respiratory secretions, pleural fluid or lung tissue is performed and does not identify an organism that matches an organism identified from blood, a secondary BSI to VAE is not reported.



**Note:** *Candida* species or yeast not otherwise specified, coagulase-negative *Staphylococcus* species, and *Enterococcus* species identified from blood cannot be deemed secondary to a PVAP, unless the organism was also identified from pleural fluid or lung tissue.