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.[1] 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/HICPAC) *Guidelines for the Prevention of Intravascular Catheter-Related Infections, 2011*.[2]

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 B. Secondary Bloodstream Infection (BSI) Guide and Surveillance Definitions, PNEU,UTI, SSI chapters).

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:

    - Arterial catheters
    - Arteriovenous fistula
    - Arteriovenous graft
    - Extracorporeal membrane oxygenation (ECMO)
    - Hemodialysis reliable outflow (HERO) dialysis catheters
    - Intra-aortic balloon pump (IABP) devices

- Non-accessed central line (not accessed nor inserted during the hospitalization)
- Peripheral IV or Midlines
- Ventricular Assist Device (VAD)

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, the first day of access as an in-patient is considered Day1. "Access" is defined as line placement, insertion of needle into the port, infusion or withdrawal through the line. Such lines continue to be eligible for a CLABSI once they are accessed until they are either discontinued (i.e. removed from body) or the day after patient discharge (as per the Transfer Rule). Note that simply "de-accessing" a port (e.g., removal of port needle but port remains in body) does not result in the patient's removal from CLABSI surveillance nor from including the central line in central line day counts.

Table 1. Determination for including implanted central line (port) in denominator count & CLABSI surveillance

Patient has an implanted central line (port), with no other central line present, and is admitted as an inpatient in your facility, see table for scenarios and determinations:

Implanted device scenario	Determination
Port is never accessed during admission	Do not count central line denominator days and any BSI is not reported as a CLABSI.
Port is accessed on Hospital day 3 and never de-accessed	Hospital day 3 is considered central line "day 1" and line is counted in central line denominator days until the day it is removed (taken out of patient) or the day of patient discharge, whichever comes first. CLABSI surveillance continues through the day after port removal or patient discharge whichever comes first.
Port is accessed on hospital day 3 and de-accessed on hospital day 10	Hospital day 3 is considered central line "day 1" and line is counted in central line denominator until the day it is removed (taken out of patient) or the day of patient discharge, whichever comes first. CLABSI surveillance and central line day count do NOT stop on hospital day 10 (i.e. when the port needle is removed/de-accessed). CLABSI surveillance continues through the day after port removal or patient discharge whichever comes first.
Port is accessed on hospital day 3 and port is removed on hospital day 10	Hospital day 3 is considered central line "day 1" and line is counted in central line denominator days through hospital day 10, and included in CLABSI surveillance through hospital day 11.

Figure 1: Associating Implanted 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	Implanted line not accessed	Implanted line not accessed	**Implanted line accessed (CL Day 1)**	**Implanted line accessed (CL Day 2)**	**Implanted line de-accessed (CL Day 3)**	**Implanted line (CL Day 4)**	**Implanted line (CL Day 5)**
Patient B	Implanted line not accessed	Implanted line not accessed	**Implanted line accessed (CL Day 1)**	**Implanted line accessed (CL Day 2)**	**Implanted line removed (CL Day3)**	No implanted line	No implanted line

Table 2: Examples of determining a CLABSI versus BSI that is not central-line associated

Scenario	CLABSI versus BSI
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 is a BSI 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).
Patient is admitted June 1 with a port in place. No other central line is present. On June 3 the port is accessed. On June 15th patient spikes a fever of 38.3°C and the patient's blood is collected for culture. The culture is subsequently positive for E.coli. LCBI 1 definition is met and the BSI is not found to be secondary to another site-specific infection.	This is a CLABSI because on the date of event the patient had a central line (port) in place and it had been accessed >2 days prior to the date of event.

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 2 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.
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 injection 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 injection 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 2: 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 (CL Day 3)**	**Central line (CL Day 4)**	**Central Line removed (CL Day 5)**	**Central Line Replaced (CL Day 6)**	**Central Line (CL Day 7)**	**Central Line removed (CL Day 8)**	No Central Line
Patient B	**Central Line (CL Day 3)**	**Central Line (CL Day 4)**	**Central Line removed (CL Day 5)**	No Central Line for one calendar day	**Central Line replaced (CL Day 1)**	Central Line **(CL Day 2)**	Central Line **(CL 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 during the infection window period (see Exception to Location of Attribution below). OR/PACU Observation unit/dialysis unit /ERs cannot be considered a location of attribution for BSI.

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 3:

- 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 3: 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 in Unit A for inpatient care 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 LCBIs. 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 3: Laboratory-Confirmed Bloodstream Infection Criteria

Criterion	**Laboratory-Confirmed Bloodstream Infection (LCBI)** *Comments and reporting instructions that follow the site-specific criteria provide further explanation and are integral to the correct application of the criteria.* Must meet ***one*** of the following criteria:
LCBI 1	Patient of any age has a recognized pathogen identified (i.e., an organism which is not on the NHSN common commensal list) from one or more blood specimens by a culture or non-culture based microbiologic testing method (excluding organisms identified by testing on sera) **AND** Organism(s) identified in blood is not related to an infection at another site (See Appendix B: Secondary BSI Guide) NOTE: If a patient meets LCBI 1 and LCBI 2 criteria, report as LCBI 1 with pathogen listed as pathogen #1 and common commensal reported as pathogen #2.

LCBI 2

Patient of any age has at least one of the following signs or symptoms: fever (>38.0°C), chills, or hypotension

AND

Organism(s) identified from blood is not related to an infection at another site (See Appendix B: Secondary BSI Guide)

AND

the same NHSN common commensal is identified from two or more blood specimens drawn on separate occasions (see Comment 4 below), by a culture or non-culture based microbiologic testing method. Common Commensal organisms include, but not are not limited to, diphtheroids (*Corynebacterium* spp. not *C. diphtheria*), *Bacillus* spp. (not *B. anthracis)*, *Propionibacterium* spp., coagulase-negative staphylococci (including *S. epidermidis),* viridans group streptococci, *Aerococcus* spp. *Micrococcus* spp, and *Rhodococcus* spp. For a full list of Common Commensals see the Common Commensal tab of the NHSN organisms list.

Criterion elements must occur within the Infection Window Period (see Chapter 2), 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.)

Note: The matching common commensals represent a single element; therefore, the collection date of the ***first*** common commensal is the date of the first diagnostic test used to determine the Infection Window Period (IWP).

6/1	Fever > 38.0 °C	**Date of LCBI -2 Event = 6/1**
6/2	No LCBI elements	
6/3	No LCBI elements	
6/4	*S. epidermidis*(1 of 2)	**Date of 1st diagnostic test = 6/4**
6/5	*S. epidermidis*(2 of 2)	
6/6	No LCBI elements	
6/7	No LCBI elements	

LCBI 3

Patient ≤ 1 year of age has at least ***one*** of the following signs or symptoms: fever (>38.0°C), hypothermia (<36.0°C), apnea, or bradycardia

AND

Organism(s) identified from blood is not related to an infection at another site (See Appendix B Secondary BSI Guide)

AND

the same NHSN common commensal is identified from two or more blood specimens drawn on separate occasions (see Comment 4 below), by a culture or non-culture based microbiologic testing method. Common Commensal organisms include, but not are not limited to, diphtheroids (*Corynebacterium* spp. not *C. diphtheria*), *Bacillus* spp. (not *B. anthracis)*, *Propionibacterium* spp., coagulase-negative staphylococci (including *S. epidermidis),* viridans group streptococci, *Aerococcus* spp. *Micrococcus* spp, and *Rhodococcus* spp. For a full list of Common Commensals see the Common Commensal tab of the NHSN organisms list.

Note: The matching common commensals represent a single element; therefore, the collection date of the ***first*** common commensal is the date of the first diagnostic test used to determine the Infection Window Period (IWP).

6/1	No LCBI elements	
6/2	No LCBI elements	
6/3	Apnea documented	**Date of LCBI -3 Event = 6/3**
6/4	*S. epidermidis*(1 of 2)	**Date of 1st diagnostic test = 6/4**
6/5	*S. epidermidis*(2 of 2)	
6/6	No LCBI elements	
6/7	No LCBI elements	

Criterion	**Mucosal Barrier Injury Laboratory-Confirmed Bloodstream Infection (MBI-LCBI)** ***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.*** Must meet ***one*** of the following criteria:
MBI-LCBI 1	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 ONLY intestinal organisms from the MBI-LCBI organisms list. A partial list of MBI-LCBI organisms is provided in Appendix A See MBI organism tab on the NHSN organisms list for the full list of MBI-LCBI organisms NOTE: If a patient meets MBI-LCBI 1 and MBI LCBI 2 criteria, report organisms as MBI-LCBI 1. **And patient meets at least *one* of the following:** 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: a. Grade III or IV gastrointestinal graft versus host disease [GI GVHD] b. ≥1 liter diarrhea in a 24-hour period (or ≥20 mL/kg in a 24-hour period for patients <18 years of age) with onset on or within 7 calendar days before the date the positive blood specimen was collected. 2. Is neutropenic, defined as at least two separate days with values of absolute neutrophil count (ANC) or total white blood cell count (WBC) <500 cells/mm^3 within a 7-day time period which includes the date the positive blood specimen was collected (Day 1), the 3 calendar days before *and* the 3 calendar days after (See Table 5 for example).

MBI-LCBI 2	Patient of any age meets criterion 2 for LCBI with at least two blood specimens identified by a culture or non-culture based microbiologic testing method, with only viridans group streptococci but no other organisms. **And patient meets at least *one* of the following:** 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: a. Grade III or IV gastrointestinal graft versus host disease [GI GVHD] b. ≥1 liter diarrhea in a 24-hour period (or ≥20 mL/kg in a 24-hour period for patients <18 years of age) with onset on or within 7 calendar days before the date the first positive blood specimen was collected. 2. Is neutropenic, defined as at least two separate days with values of absolute neutrophil count (ANC) or total white blood cell count (WBC) <500 cells/mm^3 within a seven-day time period which includes the date the positive blood specimen was collected (Day 1), the 3 calendar days before *and* the 3 calendar days after (See Table 5 for example).
MBI-LCBI 3	Patient ≤1 year of age meets criterion 3 for LCBI with at least two blood specimens identified by a culture or non-culture based microbiologic testing method, with only viridans group streptococci but no other organisms. **And patient meets at least *one* of the following:** 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: a. Grade III or IV gastrointestinal graft versus host disease [GI GVHD] b. ≥20 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. 2. Is neutropenic, defined as at least two separate days with values of absolute neutrophil count (ANC) or total white blood cell count (WBC) <500 cells/mm^3 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 *and* the 3 calendar days after. (See Table 5 for example)

Comments	1. A positive blood specimen meeting LCBI criteria, that is accompanied by **documentation** of observed or suspected patient injection 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 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 injection 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. 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 www.cdc.gov/nhsn/XLS/master-organism-Com-Commensals-Lists.xlsx) for the list of common commensals). Exceptions: a. *Campylobacter* spp., *C. difficile,* Enterohemorrhagic *E.coli*, Enteropathogenic *E. coli*, *Salmonella* sp., *Shigella* spp., *Listeria* spp., *and Yersinia* 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. b. Organisms belonging to the following genera cannot be used to meet any NHSN definition: *Blastomyces, Histoplasma, Coccidioides, Paracoccidioides, Cryptococcus and Pneumocystis.* These organisms are typically causes of community-associated infections and are rarely known to cause healthcare-associated infections, and therefore are excluded. c. CLABSIs will not be reported for a blood specimen identifying Group B *Streptococcus* during the first 6 days of life. A BSI RIT will be set, but no central line association will be made.

	3. 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 Table 4 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, solely due to laboratory practice. Report the organism to the genus/species level only once, and if antibiogram data are available, report the results from the most resistant panel. 4. 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, would be expected to undergo separate decontaminations and are therefore considered drawn on "separate occasions". 5. Specimen Collection Considerations: Although blood specimens drawn through central lines can have a higher rate of contamination than blood specimens collected through peripheral venipuncture [3, 4] . All positive blood specimens, regardless of the sites from which they were collected or the purposes for which they are drawn, must be included when conducting in-plan CLABSI surveillance (e.g., weekly blood cultures performed in hematology and oncology locations). 6. In MBI-LCBI 1, 2 and 3, "No other organisms" means there is no identification of a non-MBI-LCBI pathogens (e.g., *S.*

	aureus) 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. 7.
Reporting Instructions	1. Report organisms identified from blood as BSI–LCBI when no other site of infection is evident (see Appendix B Secondary Bloodstream Infection [BSI] Guide). Note: VASC infections with positive blood specimens should be reported as BSI-LCBI (see Reporting Instruction 2 below for exception). 2. 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 an organism(s) is identified from pus collected from the insertion site of the other vascular access site, during the LCBI infection window period, and that organism matches at least one 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: • Arterial catheters • Arteriovenous fistula • Arteriovenous graft • Extracorporeal membrane oxygenation (ECMO) • Hemodialysis reliable outflow (HERO) dialysis catheters • Intra-aortic balloon pump (IABP) devices • Non-accessed central line (not accessed nor inserted during the hospitalization) • Peripheral IV or Midlines • Ventricular Assist Device (VAD) 3. 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.

	4. Catheter tip cultures are not used to determine whether a patient has a primary BSI. 5. 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

Table 4: Examples of How to Report Speciated and Unspeciated Organisms Identified from Blood Specimens

Culture Report	**Companion Culture Report**	**Report as…**
Coagulase-positive staphylococci	*S. aureus*	*S. aureus*
S. epidermidis	Coagulase-negative staphylococci	*S. epidermidis*
Enterococcus spp.	*E. faecium*	*E. faecium*
Bacillus spp. (not *anthracis*)	*B. cereus*	*B. cereus*
S. salivarius	Strep viridans	*S. salivarius*

Table 5: 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/ *Candida* 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/ *Candida* 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^3 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^3 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^3 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. For CLABSI surveillance, all LCBI and MBI-LCBI that are identified as central-line associated must be included. The 2015 rebaseline for CLABSI will exclude MBI-LCBIs from the numerator that is being reported to CMS. 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:

Denominator Data Collection Method	**Details**
Manual, Daily (i.e., collected at the same time every day of the month)	Denominator data are collected at the same time, every day, per location. 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 *Denominators for Intensive Care Unit (ICU)/Other Locations (Not NICU or SCA/ONC)* form (CDC 57.118). Only the totals for the month are entered into NHSN. 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 *Denominators for Specialty Care Area (SCA)/Oncology (ONC)* form (CDC 57.117). Each is collected daily, at the same time each day. Only the totals for the month are entered into NHSN. This distinction in

Denominator Data Collection Method	Details
	lines is made because permanent lines are commonly used 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 Instructions for Completion of Denominators for Intensive Care Unit (ICU)/Other Locations (Not NICU and SCA/ONC) and Instructions for Completion of Denominators for Specialty Care Areas (SCA)/Oncology (ONC) contain brief instructions for collection and entry of each data element on the forms. In NICUs, the number of patients with one or more central lines is stratified by birth weight in five categories since risk of BSI varies by birth weight. These data are collected on the *Denominators for Neonatal Intensive Care Unit (NICU)* form (CDC 57.116). **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 a CLABSI develops, record the birth weight of 1006 grams on the BSI form. The Instructions for Completion of Denominators for Neonatal Intensive Care Unit (NICU) form contains brief instructions for collection and entry of each data element on the forms.
Manual, sampled once/week (i.e., collected at the same time on the same designated day, once per week)	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. 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.

Denominator Data Collection Method	Details
	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 selected as the designated day.[6-8] If the day designated for the collection of sampled data is missed, collect the data on the next available day instead. The following must be collected and entered into NHSN: 1. The monthly total for patient-days, based on collection daily 2. The sampled total for patient-days 3. The sampled total central line-days When these data are entered, the NHSN application will calculate an estimate of central line-days. **Notes:** • 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. • 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.
Electronic	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. The validation of electronic counts should be performed for each location separately.

Data Analyses: The standardized infection ratio (SIR) is calculated by dividing the number of observed events by the number of predicted events. The number of predicted events is calculated using probabilities estimated from negative binomial models constructed from 2015 NHSN data, which represents a standard population. Beginning with 2015 data, SIRs are calculated for CLABSI (excluding MBI-LCBI events), and, for acute care hospitals, MBI.

Note: The SIR will be calculated only if the number of predicted events (numPred) is ≥1 to help enforce a minimum precision criterion.

While SIRs 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.

The SUR, or Standardized Utilization Ratio, is a risk adjusted summarized measure for device use. Similar to the SIRs, the SUR can be calculated for single locations as well as be summarized across multiple locations.

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: www.cdc.gov/nhsn/PS-Analysis-resources/reference-guides.html.

Table 6: CLABSI Measures Available in NHSN

Measure	**Calculation**	**Application**
CLABSI SIR (Excluding MBI-LCBIs)	The number of Observed CLABSIs The number of Predicted CLABSIs	Both location specific and summarized measure
MBI-LCBI SIR (ACH Only)	The number of Observed MBI-LCBIs The number of Predicted MBI-LCBIs	Both location specific and summarized measure
CLABSI Rates	The number of CLABSIs for a location x 1000 The number of Central Line Days for that location	Location specific measure only
MBI-LCBI Rates	The number MBI-LCBIs for a location x 1000 The number of Central Line Days for that location	Location specific measure only
Central Line SUR	The number of Observed Central Line Days The number of Predicted Central Line Days	Both location specific and summarized measure
DUR	The Central Line Days for a location The Patient Days for that location	Location specific measure only

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Appendix A: Partial List of Criterion 1 MBI-LCBI Eligible Enterobacteriaceae Genera

Abiotrophia	*Escherichia (E)*	*Pantoea (+E)*
Alistipes	*Eubacterium*	*Parabacteroides*
Alloscardovia	*Ewingella (E)*	*Peptostreptococcus*
Anaerobiospirillum	*Faecalibacterium*	*Pichia*
Anaerococcus	*Filifactor*	*Porphyromonas*
Anaerorhabdus	*Finegoldia*	*Prevotella*
Arcobacter	*Flavonifractor*	*Proteus (E)*
Atopobium	*Fusobacterium*	*Providencia (E)*
Averyella (+E)	*Gemella*	*Pseudoflavonifractor*
Bacteroides	*Geotrichum*	*Pseudoramibacter*
Bifidobacterium	*Granulicatella*	*Rahnella (E)*
Bilophila	*Hafnia (E)*	*Raoultella (+E)*
Blautia	*Helcococcus*	*Rothia*
Buttiauxella (E)	*Helicobacter*	*Ruminococcus*
Campylobacter	*Klebsiella (E)*	*Saccharomyces*
Candida	*Kluyvera (E)*	*Sarcina*
Capnocytophaga	*Kluyveromyces*	*Serratia (E)*
CDC Enteric Group 58 (+E)	*Lactobacillus*	*Shigella (E)*
Cedecea (E)	*Leclercia (E)*	*Slackia*
Citrobacter (E)	*Leminorella (E)*	*Streptococcus (VGS subset)*
Clostridium	*Leptotrichia*	*Tannerella*
Collinsella	*Leuconostoc*	*Tatumella (E)*
Cronobacter (+E)	*Megamonas*	*Tetragenococcus*
Dialister	*Megasphaera*	*Tissierella*
Dichelobacter	*Mitsuokella*	*Trabulsiella (E)*
Edwardsiella (E)	*Moellerella (E)*	*Veillonella*
Eggerthella	*Mogibacterium*	*Weissella*
Eggerthia	*Morganella (E)*	*Yersinia (E)*
Enterobacter (E)	*Obesumbacterium (+E)*	*Yokenella (E)*
Enterococcus	*Odoribacter*	

E = Family Enterobacteriaceae

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

Appendix B: 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 B2 in this appendix, as well as the VAE chapter for specific guidance on assigning a secondary BSI to a VAE. When conducting BSI surveillance the PNEU definitions (as well as UTI, SSI and all definitions found in Chapter 17) are available for attributing a secondary BSI for any patient in any location. For example, a ventilated patient in an adult location where VAE surveillance is being conducted can have a secondary BSI assigned to VAE or PNEU. A ventilated patient in a neonatal location where in-plan PedVAP surveillance is not an option can have a secondary BSI assigned to PNEU.

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: ‡

An NHSN site-specific definition must be met; either one of the CDC/NHSN Surveillance Definitions for Specific Types of Infections (defined in Chapter 17), or UTI, PNEU or SSI definition.

AND

One of the following scenarios must be met:

Scenario 1: At least one organism from the blood specimen matches an organism identified from the site-specific infection that is used as an element to meet the NHSN site-specific infection criterion AND the blood specimen is collected during the secondary BSI attribution period (infection window period + repeat infection timeframe).

OR

Scenario 2: An organism identified in the blood specimen is an element that is used to meet the NHSN site-specific infection criterion, and therefore is collected during the site-specific infection window period.

Table B1: Secondary BSI Guide (table format) *In order for the NHSN Secondary BSI rule to be applied, the site specific infection definition must be met using either* ***Scenario 1*** *or* ***Scenario 2*** *below:*

	Scenario 1	OR	Scenario 2
Blood Specimen	Blood specimen must contain at least **one matching organism** of the site specific specimen		Blood specimen must be **an element of the site specific specimen**
Time Period	**And** is collected in the **secondary BSI attribution period**		**And** is collected during the site specific infection's **infection window period**
Organism identified	**And an organism identified from the site specific infection** is used as an element to meet the site specific infection criterion		**And an organism identified in the blood specimen** is an element that is used to meet the site-specific infection criterion
See appropriate site specific infection to determine if criterion are met			

Site	Criterion
ABUTI	ABUTI
BONE	1
BRST	1
CARD	1
CIRC	2 or 3
CONJ	1
DECU	1
DISC	1
EAR	1, 3, 5 or 7
EMET	1
ENDO	1
EYE	1
GE	2a
GIT	2a
IAB	1a or 3a
IC	1
JNT	1
LUNG	1
MED	1
MEN	1
ORAL	1 or 3a
OREP	1
PJI	1
PNEU	2 or 3
SA	1
SINU	1
SSI	SI or DI or OS
SKIN	2a
ST	1
UMB	1a
UR	1a or 3a
USI	1
SUTI	1a or 1b or 2
VASC	1, 3 or 5
VCUF	3

Site	Criterion
BONE	3a
BURN	1
DISC	3a
ENDO	4a, 4b, 5a or 5b (specific organisms) 6e or 7e plus other criteria as listed
GIT	2c
IAB	2b or 3b
JNT	3c
MEN	2c or 3c
OREP	3a
PNEU	2 or 3
SA	3a
UMB	1b
USI	3b or 4b

‡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 B1: 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: An organism identified from a 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. (For your convenience, a list of infection criteria that include positive blood culture as an element are included in Table B1).

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:

c. **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.

d. **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 <u>BSI attribution cannot be assigned</u>. The BSI would be primary in nature.

a. **Example:** Patient has pustules on their abdomen with tenderness and swelling. Purulent material is obtained from the pustules and is positive for *Streptococccus* 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.

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:** An intraabdominal specimen is used as an element to meet IAB definition and is growing *Enterobacter cloacae.* A blood specimen with a collection date in the IAB secondary BSI attribution period is reported to be growing *Enterobacter cloacae.* These are considered matching organisms.
    b. **Example:** An intraabdominal specimen is used as an element to meet IAB definition and is growing *Enterobacter aerogenes.* A blood specimen with a collection date in the IAB secondary BSI attribution period is reported to be growing *Enterobacter cloacae.* These are NOT considered matching organisms as the species are different.

2. If the organism is less definitively identified in one specimen than the other, the lesser identified organism must be identified to at least the genus level and at that level the organisms must be the same.
    a. **Example:** A surgical wound growing *Pseudomonas* species is used to meet deep incisional SSI criteria and a blood specimen growing *Pseudomonas aeruginosa* is collected in the SSI secondary BSI attribution period. The organisms are considered matching at the genus level and therefore the BSI is secondary to the SSI.
    b. **Example:** PCR identifying *Enterococcus faecalis* in CSF meets the MEN definition. A subsequent blood culture collected in the MEN secondary BSI attribution period is identified as *Enterococcus* species. The organisms are considered to be matching and therefore the BSI is secondary to MEN

3. There are two exceptions to the definition:

    a. Infections meeting LCBI 2 criteria with staphylococcus

    Example: A patient has a fever and a previous chest tube site is reddened, swollen and a culture is collected from the soft tissue. The chest tube site culture is reported positive for *Staphylococcus* species. SST/ST definition is met. The next day 2 blood culture sets are collected. The blood cultures are both positive for coagulase negative *Staphylococcus.* The organisms are NOT considered matching, because *Staphylococcus* species could represent a coagulase negative or a coagulase positive *Staphylococcus*. Therefore the BSI would not be considered secondary to SST/ST.

b. In cases where an organism is identified only as "yeast" or "yeast not otherwise specified", the organism can be considered a match to other yeasts, when collected during the required timeframe, whether more fully identified or not.
Example: A culture of tissue from ulcer margin of a decubiti reported positive for yeast is used as an element to meet DECU definition. A blood specimen collected in the secondary BSI attribution period of the DECU is reported as *Candida albicans*. In this example the two organisms are considered matching organisms as the organisms are complementary (i.e., *Candida* is a type of yeast and because yeasts isolated from non-sterile sites are commonly not identified to the genus or genus and species level.

NOTE: This exception is limited to yeast. It does not apply to identification of organisms as Gram positive cocci, Gram negative rods, etc.

Example: A culture of tissue from ulcer margin of a decubiti reported positive for Gram negative rod is used as an element to meet DECU definition. A blood specimen collected in the secondary BSI attribution period of the DECU is reported as *E.coli*. In this example the two organisms are NOT considered matching organisms.

Notes:
1. Antibiograms 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 B2 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 the BSI can be determined to be secondary to VAE or PNEU definitions. (see Figure B2).
- 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.

- If at least one BSI pathogen with a collection date in the secondary BSI attribution period matches an organism from a specimen that was used to meet a site-specific infection criterion (either a site-specific specimen or a blood specimen) the BSI is considered secondary to the event.

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 *K. pneumoniae*			
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: *K. pneumoniae*	Blood culture: *K. pneumoniae*		
11		8				
12		9				
13		10				
14		11				
15		12				
16		13				
17		14				
18						
19						
20						
21						
22						
23						
			SUTI & Secondary BSI Date of Event = 4 Pathogen: *K. pneumoniae*	**IAB & Secondary BSI Date of Event = 8 Pathogen: *K. pneumoniae***		

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 *E. faecalis*		
5		3			
6		4			
7		5			
8		6			
9		7			
10		8			
11		9	Blood culture: *E.faecalis* / Yeast	**Blood culture:** *E. faecalis* / 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: *E. faecalis***	**Primary BSI** **Date of Event = 11** **Pathogen: Yeast**	

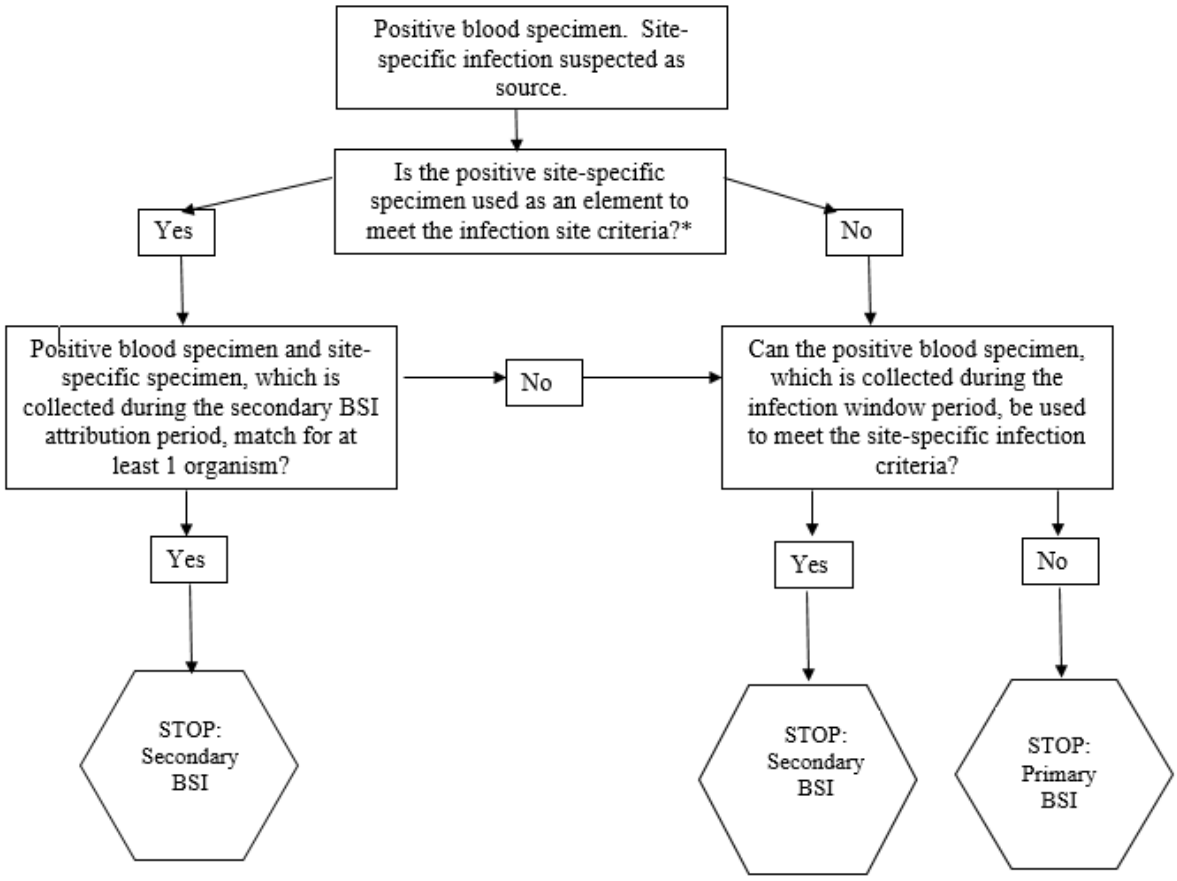
Infection Window Period
(First positive diagnostic test, 3 days before and 3 days after)

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

Secondary BSI Attribution Period
(Infection Window Period + RIT)

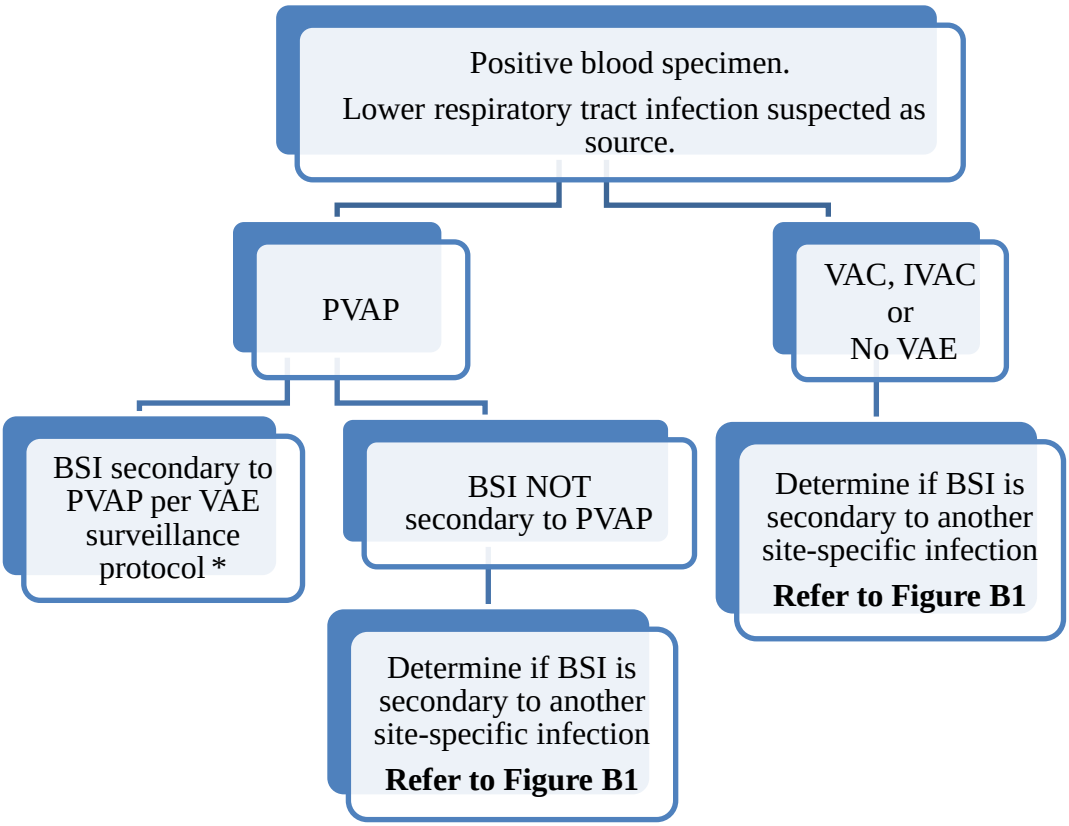
Date of Event (DOE)
(Date the first element occurs for the first time within the infection window period)

Figure B1: Secondary BSI Guide for eligible organisms*‡
(Not applicable to Ventilator-associated Events [VAE], See Figure B2)



‡**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 B2: 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.