Bloodstream Infection Event (Central Line-Associated Bloodstream Infection and Non-central Line Associated Bloodstream Infection)

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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:** CLABSI surveillance after patient discharge from a facility is not required. However, if discovered, any CLABSI with a date of event (DOE) on the day of or the day after discharge is attributed to the discharging location and should be communicated to that facility to encourage appropriate NHSN reporting of CLABSIs. (See Transfer Rule, Chapter 2). Do not collect or report additional central line days after discharge.

Key Terms and Abbreviations

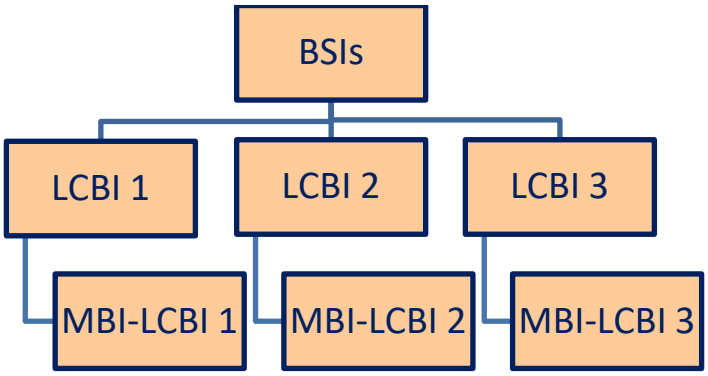
Refer to the NHSN Patient Safety Manual, Chapter *2 Identifying Healthcare Associated Infections in NHSN* and Chapter 16 *NHSN Key Terms* for definitions of the following universal concepts for conducting HAI surveillance.

I. Date of event (DOE)
II. Healthcare associated infection (HAI)
III. Infection window period (IWP)
IV. Present on admission (POA)
V. Repeat infection timeframe (RIT)
VI. Secondary BSI attribution period (SBAP)
VII. Location of Attribution (LOA)
VIII. Transfer rule

Definitions Specific to BSI / CLABSI Surveillance:

Primary bloodstream infection (BSI): A Laboratory Confirmed Bloodstream Infection (LCBI) that is not secondary to an infection at another body site (see Appendix B. Secondary BSI Guide and CDC/NHSN Surveillance Definitions for Specific Types of Infection [Ch-17], UTI [Ch-7], Pneumonia (Ch-6), and SSI (Ch-9).

LCBI Hierarchy; Types of LCBIs (see Table 1 and Table 2):



Secondary BSI: A BSI that is thought to be seeded from a site-specific infection at another body site (see Appendix B. Secondary BSI Guide and CDC/NHSN Surveillance Definitions for Specific Types of Infection [Ch-17], UTI [Ch-7], Pneumonia (Ch-6), and SSI (Ch-9).

Secondary BSI Attribution Period (SBAP): the period in which a blood specimen must be collected for a secondary BSI to be attributed to a primary site of infection. This period includes the Infection Window Period (IWP) combined with the Repeat Infection Timeframe (RIT). It is 14-17 days in length depending upon the date of event (see Ch. 2 page 2-13).

Infusion: The administration of any solution through the lumen of a catheter into a blood vessel. Infusions include continuous infusion (for example, nutritional fluids or medications), intermittent infusion (for example, IV flush), IV antimicrobial administration, and blood transfusion or hemodialysis treatment.

Access: The performance of any of the following activities during the current inpatient admission:

- Line placement
- Use of (entering the line with a needle or needless device) any central line for:
  - Infusion
  - Withdrawal of blood
- Use for hemodynamic monitoring.

Notes:

1. If a patient is admitted to a *an inpatient* location with a central line (CL) already in place, and it is the patient's only CL, the day of ***first access*** in an inpatient location begins the central line day count (CL Day 1) for making central line-associated determinations. Note: simply "de-accessing" any type of central line (for example, removal of port needle but port remains in body) does not remove the patient from CLABSI surveillance nor from device day counts for reporting denominator summary data.

2. An inpatient location, for making determinations about central line access, includes but is not limited to, any department or unit within the facility that provides service to inpatients [for example, inpatient Dialysis, Operating Room (OR), Interventional Radiology, Gastroenterology Lab (GI), Cardiac Catheterization lab (CC), wards, ICUs, etc.].

3. Include any inpatient receiving dialysis in CLABSI surveillance conducted in the patient's assigned inpatient location, regardless of whether or not the patient only has one CL and dialysis staff are the only providers to access it during dialysis treatment.

   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

   Because CLABSI events cannot be attributed to a non-bedded location, such events must be attributed to the inpatient location housing the patient.

Central line (CL): An intravascular catheter that terminates at or close to the heart, **OR** in one of the great vessels that is used for infusion, withdrawal of blood, or hemodynamic monitoring. Consider the following great vessels when making determinations about CLABSI events and counting CL device days:

- 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 type of device nor the insertion site are used to determine if a device is considered a central line for NHSN reporting purposes.
2. At times, a CL may migrate from its original central location after confirmation of proper placement. NHSN does not require ongoing verification of proper line placement. Therefore, once a line has been designated a CL **it continues to be a CL**, regardless of migration, until removed from the body or patient discharge, whichever comes first. CL days are included for any CLABSI surveillance conducted in that location.

3. An introducer is an intravascular catheter, and depending on the location of the tip and its use, may be considered a CL.
4. A non-lumened intravascular catheter that terminates at or close to the heart or in a great vessel that is not used for infusion, withdrawal of blood or hemodynamic monitoring is not considered a CL for NHSN reporting purposes (for example, non-lumened pacemaker wires. Please note: there are some pacemaker wires that do have lumens, which may be considered a central line).

Types of Central Lines for NHSN reporting purposes:

1. Permanent central line: Includes:
    a. Tunneled catheters, including tunneled dialysis catheters
    b. Implanted catheters (including ports)
2. Temporary central line: A non-tunneled, non-implanted catheter
3. Umbilical catheter**:** A vascular catheter inserted through the umbilical artery or vein in a neonate. All umbilical catheters are central lines.

Eligible Central Line: A CL that has been in place for **more than two consecutive calendar days** (on or after CL day 3), following the *first access* of the central line, in an inpatient location, during the current admission. Such lines are eligible for CLABSI events and remain eligible for CLABSI events until the day after removal from the body or patient discharge, whichever comes first. See Table 4 for examples

Central line-associated BSI (CLABSI): A laboratory confirmed bloodstream infection where an eligible BSI organism is identified and an **eligible central line** is present on the LCBI DOE or the day before.

Central line days: the number of days a central line has been accessed to determine if a LCBI is a CLABSI

Denominator device days: the count of central lines on an inpatient unit that is recorded in the monthly denominator summary data

Eligible BSI Organism: Any organism that is eligible for use to meet LCBI or MBI-LCBI criteria. In other words, an organism that is not an excluded pathogen for use in meeting LCBI or MBI-LCBI criteria. These organisms may or may not be included on the NHSN organism list. Please contact NHSN for guidance regarding organisms that are not included on the NHSN organism list

Devices Not Considered CLs for NHSN Reporting Purposes:

- Arterial catheters
- Arteriovenous fistula
- Arteriovenous graft

- Atrial catheters (also known as transthoracic intra-cardiac catheters, those catheters inserted directly into the right or left atrium via the heart wall)
- Extracorporeal membrane oxygenation (ECMO)
- Hemodialysis reliable outflow (HERO) dialysis catheter
- Intra-aortic balloon pump (IABP) devices
- Peripheral IV or Midlines
- Ventricular Assist Device (VAD)

Table 1: Laboratory-Confirmed Bloodstream Infection Criteria:
Must meet **one** of the following LCBI criteria:

Criterion	*Comments and reporting instructions that follow the site-specific criteria provide further explanation and are integral to the correct application of the criteria.* Once an LCBI determination is made, proceed to the MBI-LCBI definitions and determine if the corresponding MBI-LCBI criteria are also met (for example, after meeting LCBI 2, investigate for potential MBI-LCBI 2)
LCBI 1 If LCBI 1 criteria is met, consider MBI-LCBI 1	Patient of any age has a recognized bacterial or fungal pathogen not included on the NHSN common commensal list, identified from one or more blood specimens obtained by a culture or non-culture based microbiologic testing methods **AND** Organism(s) identified in blood is not related to an infection at another site (See Appendix B: Secondary BSI Guide). **Notes:** 1. If a patient meets both LCBI 1 and LCBI 2 criteria, report LCBI 1 with the recognized pathogen entered as pathogen #1 and the common commensal as pathogen #2. 2. No additional elements (in other words, no sign or symptom such as fever) are needed to meet LCBI 1 criteria; therefore, the LCBI 1 DOE will always be the collection date of the first positive blood specimen used to set the BSI IWP.

LCBI 2

If LCBI 2 criteria is met, consider MBI-LCBI 2

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

AND

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

AND

The same NHSN common commensal is identified by a culture or non-culture based microbiologic testing method, from two or more blood specimens collected on separate occasions (see Blood Specimen Collection).

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.

Notes:

1. Criterion elements must occur within the 7-day IWP (as defined in Chapter 2) which includes the collection date of the positive blood specimen, the 3 calendar days before and the 3 calendar days after.
2. The two matching common commensal specimens represent a single element for use in meeting LCBI 2 criteria and the collection date of the *first* specimen is used to determine the BSI IWP.
3. At least one element (specifically, a sign or symptom of fever, chills or hypotension) is required to meet LCBI 2 criteria; the LCBI 2 DOE will always be the date the ***first*** element occurs for the first time during the BSI IWP, whether that be a sign or symptom or the positive blood specimen.

	6/1	Fever > 38.0 °C	**LCBI 2 DOE = 6/1**
	6/2	No LCBI element	
	6/3	No LCBI element	
Single element	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 element	
	6/7	No LCBI element	

LCBI 3

If LCBI 3 criteria is met, consider MBI-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 in blood is not related to an infection at another site (See Appendix B: Secondary BSI Guide).

AND

The same NHSN common commensal is identified by a culture or non-culture based microbiologic testing method, from two or more blood specimens collected on separate occasions (see Blood Specimen Collection).

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.

Notes:

1. Criterion elements must occur within the 7-day IWP (as defined in Chapter 2) which includes the collection date of the positive blood specimen, the 3 calendar days before and the 3 calendar days after.
2. The two matching common commensal specimens represent a single element for use in meeting LCBI 2 criteria and the date of the *first* is used to determine the BSI IWP.
3. At least one element (specifically, a sign or symptom of fever, hypothermia, apnea or bradycardia) is required to meet LCBI 3 criteria; the LCBI 3 DOE will always be the date the ***first*** element occurs for the first time during the BSI IWP whether that be a sign or symptom or the positive blood specimen.

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

Table 2: Mucosal Barrier Injury Laboratory-Confirmed Bloodstream Infection (MBI-LCBI)
Must meet **one** of the following MBI-LCBI criteria

An MBI-LCBI is a subset of the LCBI criteria; therefore, a BSI event must fully meet an LCBI criterion before evaluating for the corresponding MBI-LCBI criteria.

The MBI-LCBI DOE will always be the date the prerequisite LCBI criteria was met. Abnormal ANC and WBC values reflect risk factors for acquiring an MBI-LCBI, not symptoms of infection and therefore are not used in DOE determinations.

MBI-LCBI 1	MBI-LCBI 2	MBI-LCBI 3
Patient of **any age** fully meets LCBI 1 criteria	Patient of **any age** fully meets LCBI 2 criteria	Patient **≤1 year of age** fully meets LCBI 3 criteria
with at least **one** blood specimen	with at least **two** blood specimens	
identified by culture or non-culture based microbiologic testing method		
with **ONLY intestinal organisms** from the NHSN MBI organism list*	with **ONLY Viridans Group *Streptococcus*** or ***Rothia spp.*** 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 the 7 calendar days before the date the positive blood specimen was collected.
2. Is neutropenic, defined as at least two separate days with ANC[†] and/or WBC values <500 cells/mm^3 collected within a 7-day time period which includes the collection date of the positive blood specimen, the 3 calendar days before and the 3 calendar days after (See Table 6).

Note:

1. If a patient meets both MBI-LCBI 1 and MBI-LCBI 2 criteria (specifically has Viridans Group *Streptococcus* or *Rothia* spp. plus only other MBI organisms in the blood specimen), report organisms as MBI-LCBI 1 with the recognized pathogen as pathogen #1 and the common commensal as pathogen #2.
2. Any combination of ANC and/or WBC values can be used to meet neutropenic criteria provided they are collected on separate days within the 7-day period that includes the date of the positive blood specimen, the 3 calendar days before and the 3 calendar days after.

3. When a blood specimen positive for an organism not included on the NHSN MBI organism list is collected during the BSI RIT of an MBI-LCBI, the initial MBI-LCBI event is edited to an LCBI and the identified non-MBI organism is added.

*A partial list of MBI-LCBI organisms is provided in Appendix A.
See MBI organism tab on the NHSN organism list for the full list of MBI organisms.

†**Formula for calculating ANC if not provided by your laboratory:**

- The ANC is not always reported directly in the chart
- The WBC in the chart is usually reported in terms of thousand cell/mm^3

ANC = Absolute Segs + Absolute Bands

OR

ANC = WBC x %Segs + %Bands / 100

Example:
WBC: 2 k/mm^3 Segs: 20% Bands: 20% ANC = 2000 x (20+20)/100 = 800 cells/mm^3

Reporting Instructions:

Central Line data field should be marked "Yes" if Extracorporeal life support, (ECMO) and ventricular assist device (VAD) are present:

A BSI meeting LCBI criteria with an eligible central line where extracorporeal life support, (ECMO) and ventricular assist device (VAD) are present for more than 2 days on the BSI DOE, and is still in place on the DOE or the day before, will be considered an LCBI but not a CLABSI for NHSN reporting purposes. Starting in 2019, report such events, marking the "Central Line" risk factor field "Yes" as well as the ECMO or VAD field **(See Table 3).**

Central Line data field should be marked "No" regardless the presence of a CL:

See Table 3 for a Summary of CLABSI Exclusion and Reporting Requirements for 2019.

a. Patient Injection: A BSI meeting LCBI criteria that is accompanied by documentation of observed or suspected patient injection into the vascular access line, within the BSI IWP, will be considered an LCBI but not a CLABSI for NHSN reporting purposes. This exclusion is very specific to "INJECTION". Manipulating or tampering with the line (such as biting, picking at, sucking on, etc.) DOES NOT meet the intent of this exclusion. The documentation must state specifically that the patient was "observed injecting…" or "suspected of injecting…" the device. Insinuations or descriptive events that suggest such behavior DO NOT meet the intent of this exclusion. If entering into NHSN, answer "No" to the risk factor

field "Central line" Device days should be included in summary denominator counts. A subsequent positive blood specimen collected after the BSI RIT must be investigated and meet the exclusion criteria again in a new BSI IWP in order to determine it is not central line associated.

b. Also added to the protocol are reporting instructions for marking the "central line" data field "No" if during the current admission, there is either a diagnosis of Epidermolysis bullosa (EB) or documentation of known or suspected Munchausen Syndrome by Proxy (MSBP), also known as factitious disorder imposed on another. If a CL has been in place for more than 2 days on a BSI DOE, these events are considered LCBIs but are NOT considered central line associated. Optional fields for EB and MSBP are added to the BSI event form for use in 2019 and also will become required fields in 2020.

c. Occasionally, a patient with both a central line and another vascular access device will have pus at the other access site. If there is pus at the site of one of the following vascular access devices and a specimen collected from that site has at least one matching organism to an organism identified in blood enter "No" in the risk factor field for central line on the NHSN BSI event form if reporting. Device days however, should be included in the summary denominator count. Vascular access devices included in this exception are limited to:
- Arterial catheters
- Arteriovenous fistulae
- Arteriovenous grafts
- Atrial catheters (also known as transthoracic intra-cardiac catheters, those catheters inserted directly into the right or left atrium via the heart wall)
- Hemodialysis reliable outflow (HERO) dialysis catheters
- Intra-aortic balloon pump (IABP) devices
- Non-accessed CL (those neither inserted nor used during current admission)
- Peripheral IV or Midlines

d. Group B *Streptococcus* identified from blood, with a date of event during the first 6 days of life, will not be reported as a CLABSI. A BSI RIT will be set but no central line association is made. If reported to NHSN, the data field "Central Line" should be marked "No".

Note: Meeting LCBI criteria in all of the situations noted above result in setting a BSI RIT and any associated device days should be included in counts for denominator summary data.

Table 3: CLABSI Exclusions and Reporting of these events in 2019 :

CLABSI Exclusions	Exclusion Field Marked Yes or No	Central Line Field Marked Yes or No	Exclusion Reporting Requirement in 2019
Extracorporeal membrane oxygenation (ECMO)	-	-	-
• ECMO present >2 days on BSI DOE and in place on the DOE or the day before	**Y**	**Y**	**Required**
• NOT present > 2 days on BSI DOE, or NOT present on DOE or day before	**N**	**Y**	**Required**
Ventricular assist device (VAD)	-	-	-
• VAD present >2 days on BSI DOE and in place on the DOE or the day before	**Y**	**Y**	**Required**
• NOT present > 2 days on BSI DOE, or NOT present on DOE or day before	**N**	**Y**	**Required**
Epidermolysis Bullosa (EB)	**Y**	**N**	**Optional**
Munchausen's syndrome by proxy (MSBP)	**Y**	**N**	**Optional**
Patient self-injection	**Y**	**N**	**Optional**
Pus at vascular site	**Y**	**N**	**Optional**
Group B Streptococcus BSI- 1st 6 days of life	**Y**	**N**	**Optional**

A CLABSI determination includes a LCBI with an eligible organism and an eligible CL present on the DOE or day before. Therefore, Table 3 implies there is an ***eligible CL*** in place in all of the following scenarios.

Reporting Instructions:

1. The "Any hemodialysis question" grouped with the others for consistency, is not new. Continued useto identify trends related to dialysis is optional but does not affect central line association.

2. Do not report a BSI that has a DOE that occurs within a BSI RIT. However, add additional organisms identified that are eligible for BSI events to the initial BSI event. See RIT guidance in Chapter 2, Identifying Healthcare associated Infections or Chapter 16, Key Terms.

3. Only primary BSIs create a 14-day BSI RIT:
   Primary BSI example: Patient has a positive blood specimen identifying *S. aureus* on hospital day 6, which is not secondary to another site-specific source of infection. A subsequent positive blood specimen is collected on hospital day 12 that identifies *Pseudomonas aeruginosa*. Because this occurs in the BSI RIT, no new BSI event is identified or reported and *Pseudomonas* is added to the initial BSI event.

4. Secondary BSIs do not create a 14-day BSI RIT:

   Secondary BSI example: A SUTI with *Enterococcus faecalis* is identified and *E. faecalis* is also collected from a blood specimen on hospital day 11 within the SUTI secondary BSI attribution period. This BSI is secondary to the SUTI. Only a SUTI RIT is set, not a BSI RIT. On hospital day 15 (also within the SUTI RIT and secondary BSI attribution period), a blood culture which grows *Staphylococcus aureus* is collected. Because the blood growing *S. aureus* does not have at least one pathogen that matches the urine culture used to meet the SUTI criterion the BSI cannot be attributed as secondary to the SUTI. There is no BSI RIT in effect, therefore the BSI will need to be investigated as a new BSI event and either assigned as a secondary BSI to another primary site of infection or determined to be a primary BSI.

   Note: The secondary BSI attribution period of a primary source of infection is not a "catch all" for subsequent BSIs.

5. There is no expectation that positive blood specimens collected during the present on admission (POA) timeframe be investigated. If identified, they are not reported to NHSN. However, if a subsequent positive blood specimen is collected within 14 days of a positive blood specimen collected during the POA timeframe, it is imperative that a determination be made for the original blood specimen in order to make the correct determination about the subsequent blood specimen.
   Example 1: A patient has a positive blood specimen with *E. coli* that is POA 6/1. On 6/10, a subsequent positive blood specimen with *K. pneumonia* is collected. The 6/1 blood specimen is investigated and if determined to be a primary BSI, it sets a 14-day BSI RIT (6/1-6/14). Therefore, the 6/10 specimen is not a new BSI event and *K. pneumonia* is added to the POA BSI event if reported.

Example 2: A patient has a positive blood specimen that identifies *S. aureus* present on admission 6/1. On 6/10, a subsequent positive blood specimen with *K. pneumonia* is collected. To make the correct determination about the second blood specimen, the initial POA BSI event must be investigated to determine if it is primary or secondary to another site. In reviewing the chart, a right elbow culture from 5/31, also positive for *S. aureus*, plus the symptoms needed to meet JNT criteria 3c were documented making the 6/1 BSI secondary to JNT. The POA primary JNT infection creates a 14-day JNT RIT (6/1-6/14), during which no new JNT infections are reported. Because the subsequent blood specimen does not contain at least one matching pathogen to the specimen used to meet the JNT criteria, the positive blood with *K. pneumonia* cannot be attributed to the original JNT event and must be investigated as a primary or secondary BSI.

Purulent phlebitis confirmed with a positive semi quantitative culture of a catheter tip, but with either a negative or no blood culture is considered a CVS-VASC, not an LCBI, SST-SKIN, or an SST-ST infection.

Blood Specimen Collection

1. In LCBI criteria 2 and 3, the phrase "two or more blood specimens drawn on separate occasions" means:
    a. blood from at least two separate blood draws was collected on the same or consecutive calendar days, and
    b. two separate site preparations (decontamination steps) were performed during specimen collection.

    This will reduce misidentification of contaminated blood specimens as LCBIs. For example, aseptic technique indicates that separate site decontaminations would be performed for blood specimens drawn from different sites (in other words; different venipunctures, a combination of venipuncture and lumen withdrawal, or different lumens of the same central line), or at different times. Specimens collected in this manner would therefore be considered "separate occasions".
2. Specimen Collection Considerations: Blood specimens drawn through central lines can have a higher rate of contamination than blood specimens collected through peripheral venipuncture. [3, 4] However, all positive blood specimens, regardless of the site from which they are drawn or the purpose for which they are collected, must be included when conducting in-plan CLABSI surveillance (for example, weekly blood cultures performed in hematology and oncology locations).
3. Catheter tip cultures cannot be used in place of blood specimens for meeting LCBI criteria.
4. In MBI-LCBI 1, 2 and 3, "No other organisms" means there is no identification of a non-MBI-LCBI pathogen (such as *S. aureus*) or 2 matching common commensals (such as coagulase-negative *staphylococci*) collected from the blood on separate occasions that would otherwise meet LCBI criteria. If this occurs, the infection does not meet MBI-LCBI criteria.

5. When a blood specimen positive for an organism not included on the NHSN MBI organism list is collected during the BSI RIT of an MBI-LCBI, the initial MBI-LCBI event is edited to an LCBI and the identified non-MBI organism is added.

Table 4: Examples of Associating the Use of Central Lines to BSI Events (CLABSI): This table provides examples that illustrate:

- Device association as determined by the presence of an eligible CL on the BSI DOE or the day before.
- The goal of NHSN HAI surveillance is to identify risks to the patient that are the result of device use in general; therefore, NHSN will not require a BSI to be associated with a specific device when more than one line is present.

Date	31-Mar	1-Apr	2-Apr	3-Apr	4-Apr	5-Apr	6-Apr
Patient A: Port Status	Port in	Port in	Port in	Port in	Port in	Port in	Port in
Accessed	No	No	**Yes**	Yes	**Yes De-accessed***	No	No
Eligible for CLABSI event	No	No	No	No	**Yes-eligible CL**	Yes-eligible CL	Yes-eligible CL
			CL Day 1	CL Day 2	CL Day 3	CL Day 4	CL Day 5

Patient A becomes eligible for a CLABSI on 4/4 because an accessed port had been in place for some portion of > 2 consecutive calendar days making it an eligible CL on 4/4 (CL day 3). The port remains eligible for a CLABSI until it is removed or the patient is discharged, whichever comes first.

Date	31-Mar	1-Apr	2-Apr	3-Apr	4-Apr	5-Apr	6-Apr
Patient B: CL Status	CL in	CL in	CL in	CL in	**CL in / CL out**	No device	No device
Accessed	No	No	**Yes**	Yes	**Removed**	-	-
Eligible for CLABSI event	No	No	No	No	**Yes-eligible CL**	Yes-eligible CL	No
	-	-	**CL Day 1**	CL Day 2	CL Day 3	-	-

Patient B, eligible for a CLABSI on 4/4 (CL Day 3) through 4/5. An accessed CL had been in place > 2 consecutive calendar days making it an eligible CL on 4/4 (CL day 3). A BSI DOE on the day of or the day after device removal or patient discharge is considered device-associated (CLABSI).

Date	31-Mar	1-Apr	2-Apr	3-Apr	4-Apr	5-Apr	6-Apr
Patient C: CL Status	CL in	CL in	**CL in/ CL out**	CL in	CL in	**CL in/ CL out**	No device
Accessed	Yes	Yes	**Removed**	**Placed**	Yes	**Removed**	-
Eligible for CLABSI event	**Yes** **CL Day 3**	Yes CL Day 4	Yes CL Day 5	Yes CL Day 6	Yes CL Day 7	Yes CL Day 8	Yes -

Patient C, was admitted to an inpatient location on 3/29 with a central line in place. Patient C becomes eligible for a CLABSI on 3/31 (CL Day 3) through 4/6 because an accessed CL had been in place > 2 consecutive calendar days. A BSI DOE occurring on the day of or the day after device removal or patient discharge is considered a device-associated infection (CLABSI). The patient remains eligible for a CLABSI event through 4/6 because a full calendar day **did not pass** without a CL in place, therefore, device counts continue uninterrupted.

Date	31-Mar	1-Apr	2-Apr	3-Apr	4-Apr	5-Apr	6-Apr
Patient D: CL Status	**CL in**	CL in	**CL in/ CL out**	No device	**CL in**	CL in	**CL in**
Accessed	Yes	Yes	**Removed**	-	**Placed**	Yes	Yes
Eligible for CLABSI event	**Yes-eligible CL** **CL Day 3**	Yes-eligible CL CL Day 4	Yes-eligible CL CL Day 5	Yes-eligible CL	**No** **CL Day 1**	No CL Day 2	**Yes-eligible CL** CL Day 3

Patient D, was admitted to an inpatient location on 3/29 with a central line in place. Patient D becomes eligible for a CLABSI 3/31 (CL Day 3) through 4/3. An accessed CL had been in place > 2 consecutive calendar days, however, a full calendar day passed (4/3) with no CL in place, therefore, device day counts start over at CL day 1 when a new line is placed. After 4/3, the patient will not be eligible for a CLABSI event again until 4/6 when the new CL becomes an eligible CL (CL day 3).

Date	31-Mar	1-Apr	2-Apr	3-Apr	4-Apr	5-Apr	6-Apr
Patient E: CL Status	**No device**	**CL in**	CL in	CL in	CL in	CL in	CL in
Accessed	-	**Placed**	Yes	Yes	Yes	Yes	Yes
Eligible for CLABSI event	- -	No **CL Day 1**	No CL Day 2	**Yes-eligible CL** CL Day 3	Yes-eligible CL CL Day 4	Yes-eligible CL CL Day 5	Yes-eligible CL CL Day 6

Patient E, eligible for a CLABSI on 4/3 (CL Day 3) through 4/6 because line placement is considered first access which begins device day counts regardless of whether the line is being actively used or not and an accessed CL had been in place > 2 consecutive calendar days.

BOLD = change in status

- The procedure for de-accessing a port involves ensuring patency of the line prior to removal of the needle which involves blood withdrawal, an IV flush and injection of an anticoagulant.

Pathogen Exclusions and Reporting Considerations:

1. The term "recognized pathogen" in LCBI 1 criteria refers to any organism that is not included on the NHSN common commensal list (see NHSN Master Organism List for the complete list of common commensals used for NHSN reporting purposes). Exceptions:
   a. Organisms that are parasites and viruses are excluded as LCBI pathogens.
   b. Organisms belonging to the following genera are excluded as LCBI pathogens: *Campylobacter, Salmonella, Shigella, Listeria, Vibrio and Yersinia as well as C. difficile,* Enterohemorrhagic *E.coli, and* Enteropathogenic *E. coli*. These organisms are eligible for use in secondary BSI determinations but will not be reported as the sole pathogen in a primary BSI.
   c. Organisms belonging to the following genera cannot be used to meet any NHSN definition: *Blastomyces, Histoplasma, Coccidioides, Paracoccidioides, Cryptococcus, and Pneumocystis.* These organisms are excluded because they typically cause community-associated infections and are rarely known to cause healthcare-associated infections.

2. Business rules written into the pathogen fields of the NHSN application prevent entry of a common commensal as pathogen #1 when attempting to report both a recognized pathogen and commensal identified in an LCBI 1 or MBI-LCBI 1. In order to save the event successfully, enter the recognized pathogen first as pathogen # 1 and the common commensal as pathogen #2.
3. For LCBI criteria 2 and 3, if the common commensal is identified to the species level for one blood specimen, and a companion blood specimen is identified with only a descriptive name, which is complementary to the companion culture (in other words, to the genus level), then it is assumed the organisms are the same. An organism identified to the species level should be reported along with the antibiogram, if available (see Table 5). Colony morphology, biotype, and antibiogram comparisons should not be used to determine the 'sameness' of organisms because laboratory testing capabilities and protocols vary between facilities. To reduce reporting variabilities due to differences in laboratory practice only genus and species identification should be used and they should only be reported once. If antibiograms are available and the sensitivities differ for the same organisms in separate specimens, always report the more resistant panel (see Table 5).
4. A common commensal identified in a single blood specimen is considered a contaminant. It will not be used to meet LCBI 2 or 3 criteria nor will it prevent a case from meeting MBI-LCBI criteria when the organism requirements call for "only" a specific organism or type of organism (for example, "only intestinal organisms from the MBI list").

Table 5: Reporting 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*

Note: When identification to the species level is not provided, the genus of the organism will be reported to NHSN. When identification to the genus level is not provided, report the organism as available on the NHSN all organism list (for example, Gram-positive bacilli).

Table 6: 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* x 1 *Candida* spp.**	**ND**	**550**	**600**
Pt. B	**ANC**	**ND**	**410**	**130**	**ND**	**ND**	**120**	**110**	**ND +BC* x 2 viridans strep plus fever >38°C**	**110**	**300**	**320**
Pt. C	**WBC**	**100**	**800**	**400**	**300**	**ND**	**ND**	**ND**	**600 + BC* x 1 *Candida* spp.**	**230**	**ND**	**400**

*ND = not done; *Collection date of positive blood specimen; Highlight = ANC/WBC < 500 cells/mm^3; red font = ANC/WBC value used to meet neutropenic criteria*

Rationale for Table 6:

Patient A meets MBI-LCBI 1 criteria with neutropenia: Positive blood specimen with intestinal organism (*Candida* spp.) and neutropenia*****. In this case, the WBC values on Day 1 = 400, and Day -1 = 320 are used.

Patient B meets MBI-LCBI 2 criteria with neutropenia: At least two positive blood specimens with *viridans group streptococci*, fever >38°C and neutropenia*. In this case, the ANC values on day -1 = 110 and Day -2 = 120 are used.

Note: Any two of Days -2, -1, 2, 3, and 4 could be used to meet this requirement since WBC and/or ANC values of <500cells/mm^3 were present on those days.

Patient C meets MBI-LCBI 1 criteria with neutropenia: Positive blood specimen with intestinal organism (*Candida* spp.) and neutropenia*. In this case, WBC values on Day 2 = 230 and Day 4 = 400 are used.

*Neutropenia is defined as: 2 separate days of ANC or WBC <500 cells/mm^3 occurring on the collection date of the positive blood specimen (Day 1) or during the 3 days before or the 3 days after Day

Monthly Summary Data

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 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:
During the month of surveillance, if no CLABSI events are identified, the "Report No Events" box must be checked on the appropriate denominator summary screen, (for example, Denominators for Intensive Care Unit [ICU]/other locations [not NICU or SCA], etc.

Denominator Data: Device days and patient days are used for denominator reporting. Device-day denominator data that are collected differ according to the patient location. The following methods can be used for the collection of denominator data:

Table 7: Examples of Denominator Day counts for Device Days
This table provides examples that illustrate:

- Denominator device day counts for a central line present on an inpatient location at the time of the device day count.

Date	31-Mar	1-Apr	2-Apr	3-Apr	4-Apr	5-Apr	6-Apr
Patient A:	Inpatient Location ICU CL inserted	ICU CL in	ICU CL in	ICU CL in	ICU CL in	ICU CL in	ICU CL in
Denominator Day Counts for Device Days	Day 1*	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Patient A has a CL inserted in the ICU. Because the CL was inserted in an inpatient location, Day 1 will begin the denominator day count for device days. Patient A will have 7 denominator device days for 3/31-4/6.							

Date	31-Mar	1-Apr	2-Apr	3-Apr	4-Apr	5-Apr	6-Apr
Patient B:	ED CL in place at time of admission	Patient admitted to inpatient location ICU CL in	ICU CL in	ICU CL in	ICU CL in	Inpatient Location CL in	Inpatient Location CL in
Denominator Device Day Count	-	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6

Patient B, has a central at the time of admission. Because Patient B is admitted to the emergency department on 3/31, the denominator device day count will not begin until the patient is transferred to the inpatient location on 4/1. Patient B will have 6 denominator device days for 4/1-4/6.

Date	31-Mar	1-Apr	2-Apr	3-Apr	4-Apr	5-Apr	6-Apr
Patient C:	Inpatient Location ICU CL in place at time of admission	ICU CL in	ICU **CL in/ CL out**	ICU CL in	ICU CL in	**ICU** **CL in/ CL out**	ICU No device
Denominator Device Day Count	Day 1	Day 2	Day 3*	Day 4	Day 5	Day 6*	-

Patient C, has a central at the time of admission to ICU. Because Patient C is admitted to ICU on 3/31, the denominator device day count will begin on the day of admission (3/31). Because there is no device on 4/6, the denominator device day count will end on 4/5. Patient C will have 6 denominator device days for 3/31-4/5.

Date	31-Mar	1-Apr	2-Apr	3-Apr	4-Apr	5-Apr	6-Apr
Patient D:	Inpatient Location ICU **No device**	Inpatient Location ICU **CL inserted**	ICU CL in	ICU CL in	ICU CL in	ICU CL in	ICU CL in
Denominator Device Day Count	-	Day 1*	Day 2	Day 3	Day 4	Day 5	Day 6

Patient D, does not have a central line in place at the time of admission to ICU. Because there is no central line in place on admission, the denominator device day count will not begin until the central line is placed in the inpatient location on 4/1. Patient D will have 6 denominator device days for 4/1-4/6.

Date	31-Mar	1-Apr	2-Apr	3-Apr	4-Apr	5-Apr	6-Apr
Patient E:	Inpatient Location ICU **Patient admitted with non-accessed port**	Inpatient Location ICU Port not accessed	ICU Port not accessed	ICU Port accessed	ICU Port accessed	ICU Port accessed	ICU Port accessed
Denominator Device Day Count	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7

Patient E, has a non-accessed port at the time of admission to ICU. The denominator device day count will begin on the date the patient is admitted to ICU (3/31). Accessing the port on 4/3 does not change the denominator device day count. Patient E will have 7 denominator device days for 3/31-4/6.

***If the central line is in place at the time of the denominator device count, it is included in the daily denominator device day count.**

Table 8: Denominator Data Collection Methods

Data Collection Method	Details
Manual, Daily	Denominator data (patient days and device days) should be collected at the same time, every day, for each location performing surveillance to ensure that differing collection methods don't inadvertently result in device days being > patient days. • For locations other than specialty care areas/oncology (SCA/ONC) and NICUs, the **number of patients** with at least one central line, of any type, is collected daily, at the same time each day during the month and is 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 **Notes:** 1. Only one central line per patient is counted per calendar day regardless of the number of central lines present. 2. All central lines on inpatient units should be included in device day counts regardless of access. • For specialty care areas/oncology, the number of patients with at least one central line are separated into those with permanent central lines and those with temporary central lines. The **number of patients** with at least one central line, of either or both type(s), is collected daily, at the same time each day during the month and is recorded on the *Denominators for Specialty Care Area (SCA)/Oncology (ONC)* form (CDC 57.117). Only the totals for the month are entered into NHSN. Temporary and permanent lines are reported separately in this location because permanent lines are more commonly used in this patient population and may be associated with a lower BSI rate when compared to temporary central lines. **Notes:** 1. Only one central line per patient is counted per calendar day regardless of the number of central lines present. 2. All central lines on inpatient units should be included in device day counts regardless of access. 3. If a patient has both a temporary and a permanent central line, only report the temporary line because it is associated with a higher risk of bloodstream infection.

Data Collection Method	Details
	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 form. • In NICUs, the **number of patients** with at least one central line is stratified by birth weight in five categories because the risk of BSI varies by birth weight. These data are reported on the *Denominators for Neonatal Intensive Care Unit (NICU)* form (CDC 57.116). **Note:** 1. Report only birth weight when entering BSI denominator data. The infant's weight at the time of BSI identification is not used and should not be reported. For example, 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; enter the birth weight of 1006 grams on the BSI form. 2. All central lines on inpatient units should be included in device day counts regardless of access. 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 (collected at the same time on the same designated day, once per week)	• 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 (see Notes below). Sampling may not be used in SCA/ONC locations or NICUs. During the month, the number of patients in the location (patient-days) and the **number of patients** with at least one central line of any type (central line days) is collected on a designated day each week (for example, every Tuesday), and at the same time each day. • Evaluations of this method have repeatedly shown that use of Saturday or Sunday generate the least accurate estimates of denominator data, therefore, weekend days should not be selected as the designated

Data Collection Method	Details
	denominator data collection day.[6-8] If the designated day is missed, collect the denominator data on the next available weekday. • The following must be collected and entered into NHSN: 1. The monthly total for patient-days, collected 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:** 1. 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. 2. 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, denominator data from electronic sources (in other words, central line days from electronic charting may be used only after a validation of a minimum 3 consecutive months proves the data to be within 5% (+/-) of the manually collected once-a-day counts. Perform the validation of electronic counts separately for each location conducting CLABSI surveillance.

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 the baseline population. The CLABSI SIR reports exclude MBI-LCBI events and MBI-LCBI events have their own SIR reports. Beginning with 2019 data, CLABSI SIR reports exclude ECMO and VAD events. For more information on using the CLABSI SIR reports, please see the troubleshooting guide: https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/clabsicauti_sirtroubleshooting.pdf.

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 central lines 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: https://www.cdc.gov/nhsn/ps-analysis-resources/reference-guides.html.

Table 9:CLABSI Measures Available in NHSN

Measure	Calculation	Application
CLABSI SIR (Excluding MBI-LCBIs, ECMO, and VAD)	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 MBI-LCBI Organisms

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 NHSN Organism List

Appendix B: Secondary 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 site-specific infection types. LCBI criteria include the caveat that the organism(s) identified from the blood cannot be related to infection at another site (in other words, it 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, specifically 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 reporting, 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 definitions.

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 specimen 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.

Exception Notes:

1. *The necrotizing enterocolitis (NEC) definition does not include criteria for a matching site-specific specimen nor an organism identified from a blood specimen that can be used as an element to meet the NEC criteria, however an * exception for assigning a BSI secondary to NEC is provided.
    2. A BSI is considered secondary to NEC if the patient meets one of the two NEC criteria AND an organism identified from a blood specimen, collected during the secondary BSI attribution period, is an LCBI pathogen, or the same common commensal identified from two or more blood specimens drawn on separate occasions that are on the same or consecutive days.

2. † **The ENDO criteria have different rules** for infection window period, RIT, pathogen assignment and secondary BSI attribution period. (See ENDO criteria in Ch. 17).

- Below are examples with guidance on how to distinguish between the primary or secondary nature of a BSI. The definition of "matching organisms", 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. (For your convenience, a list of infection criteria that include a blood specimen with at least one matching pathogen to the site-specific specimen that was used as an element to meet the definition are included in Table B1).

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

a. **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 a blood specimen as an element (fever, nausea or abdominal pain, organism identified from a 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.

b. **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.

Note: If no matching organism is identified from the blood and the site-specific specimen, which is used to meet the site-specific infection definition, and the organism identified from the blood specimen cannot be used to meet the site-specific infection criteria, secondary BSI attribution cannot be assigned. 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 reporting purposes.

Table B1: Secondary BSI Guide: List of all NHSN primary site-specific definitions available for making secondary BSI determinations using Scenario 1 or Scenario 2

<table>
<tr><th>Scenario 1</th><th>Scenario 2</th></tr>
<tr><td>A positive blood specimen must contain at least one eligible matching organism to the site-specific specimen</td><td>Positive blood specimen must be an element of the site-specific definition</td></tr>
<tr><td>And the blood specimen is collected in the site-specific secondary BSI attribution period</td><td>And blood specimen is collected in the site-specific infection window period</td></tr>
<tr><td>And an eligible organism <u>identified from the site-specific specimen</u> is used as an element to meet the site-specific definition</td><td>And an eligible <u>organism</u> <u>identified in a blood specimen</u> is used as an element to meet the site-specific definition</td></tr>
<tr><td>
<table>
<tr><th>Site</th><th>Criterion</th></tr>
<tr><td>ABUTI</td><td>ABUTI</td></tr>
<tr><td>BONE</td><td>1</td></tr>
<tr><td>BRST</td><td>1</td></tr>
<tr><td>CARD</td><td>1</td></tr>
<tr><td>CIRC</td><td>2 or 3</td></tr>
<tr><td>CONJ</td><td>1</td></tr>
<tr><td>DECU</td><td>1</td></tr>
<tr><td>DISC</td><td>1</td></tr>
<tr><td>EAR</td><td>1, 3, 5 or 7,</td></tr>
<tr><td>EMET</td><td>1</td></tr>
<tr><td>ENDO</td><td>1</td></tr>
<tr><td>EYE</td><td>1</td></tr>
<tr><td>GE</td><td>2a</td></tr>
<tr><td>GIT</td><td>2a, 2b (only yeast)</td></tr>
<tr><td>IAB</td><td>1 or 3a</td></tr>
<tr><td>IC</td><td>1</td></tr>
<tr><td>JNT</td><td>1</td></tr>
<tr><td>LUNG</td><td>1</td></tr>
<tr><td>MED</td><td>1</td></tr>
<tr><td>MEN</td><td>1</td></tr>
<tr><td>ORAL</td><td>1 or 3a</td></tr>
<tr><td>OREP</td><td>1</td></tr>
<tr><td>PJI</td><td>1</td></tr>
<tr><td>PNEU</td><td>2 or 3</td></tr>
<tr><td>SA</td><td>1</td></tr>
<tr><td>SINU</td><td>1</td></tr>
<tr><td>SSI</td><td>SI, DI or OS</td></tr>
<tr><td>SKIN</td><td>2a</td></tr>
<tr><td>ST</td><td>1</td></tr>
<tr><td>UMB</td><td>1a</td></tr>
<tr><td>UR</td><td>1a or 3a</td></tr>
<tr><td>USI</td><td>1</td></tr>
<tr><td>SUTI</td><td>1a, 1b or 2</td></tr>
<tr><td>VASC only as SSI</td><td>1</td></tr>
<tr><td>VCUF</td><td>3</td></tr>
</table>
</td><td>
<table>
<tr><th>Site</th><th>Criterion</th></tr>
<tr><td>BONE</td><td>3a</td></tr>
<tr><td>BURN</td><td>1</td></tr>
<tr><td>DISC</td><td>3a</td></tr>
<tr><td>ENDO</td><td>4a, 4b, 5a or 5b (specific organisms)
6e or 7e plus other criteria as listed</td></tr>
<tr><td>GIT</td><td>1b or 2c</td></tr>
<tr><td>IAB</td><td>2b or 3b</td></tr>
<tr><td>JNT</td><td>3c</td></tr>
<tr><td>MEN</td><td>2c or 3c</td></tr>
<tr><td>OREP</td><td>3a</td></tr>
<tr><td>PNEU</td><td>2 or 3</td></tr>
<tr><td>SA</td><td>3a</td></tr>
<tr><td>UMB</td><td>1b</td></tr>
<tr><td>USI</td><td>3b or 4b</td></tr>
</table>
</td></tr>
</table>

Secondary BSI 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.

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 one organism is less definitively identified than the other, the lesser identified organism must be identified at least to 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 or Streptococcus*

        Example (*Staphylococcus*): A patient has a fever and a previous chest tube site is reddened, swollen and a culture is collected from the soft tissue. A culture of the chest tube site is positive for *Staphylococcus* species. SST/ST definition is met. The next day, two blood culture sets are collected. Both are 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.

Example (*Streptococcus*): A patient has a fever and a previous chest tube is red and swollen and a culture is collected from the soft tissue. The chest tube site culture is reported positive for *Streptococcus* species. SST/ST definition is met. The next day 2 blood culture sets are collected. The blood cultures are both positive for *Streptococcus*, viridans group. The organisms are NOT considered matching, because *Streptococcus* species could represent a *Streptococcus*, viridans group or non- *Streptococcus*, viridans group. 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 the ulcer margin of a decubiti reported positive for yeast is used as an element to meet the 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 (for example, only one blood specimen positive for a common commensal), that specimen may not be used to meet secondary BSI criteria (see Scenario 1c).

Pathogen Assignment

- Additional pathogens identified from secondary BSIs, should be added to the 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 sites of infection (for example, UTI and an IAB infection). In example 1 below, two primary sites of infection 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 the pathogens for both primary sites of infection (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. However, if no matching pathogen is identified, the subsequent BSI pathogen must be evaluated and deemed primary or secondary to another site-specific infection**. For example: A patient with a primary UTI with *E. coli* and a secondary BSI with *E. coli*** has a subsequent positive blood specimen with *yeast. Yeast* is an excluded pathogen for meeting UTI criteria; therefore, the subsequent blood must be evaluated as primary or secondary to another site-specific infection.

Example 1: Pathogen Assignment

Hospital Day (HD)	UTI SBAP	UTI RIT	UTI Infection Window Period	IAB Infection Window Period	IAB RIT	IAB SBAP
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 DOE = HD 4 Pathogen: *K. pneumoniae*	**IAB & Secondary BSI DOE = HD 8 Pathogen: *K. pneumoniae***		

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

Repeat Infection Timeframe (RIT)
(DOE = day 1)

Secondary BSI Attribution Period (SBAP)
(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 (for example, yeast in UTI, or Enterococcus spp. for PNEU) are also excluded as pathogens for BSIs secondary to that type of infection (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 (for example, 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 (HD)	UTI SBAP	UTI RIT	UTI Infection Window Period	BSI Infection Window Period	BSI 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 DOE = HD 3 Pathogen: *E. faecalis*	**Primary BSI DOE = HD 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 (SBAP)
(Infection Window Period + RIT)

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

Example 3: Pathogen Assignment (continued)

Hospital Day (HD)	IAB SBAP	IAB RIT	IAB Infection Window Period	IAB Infection Window Period
1	Admit		Abdominal pain & distention	
2	PICC placed			
3				
4			US guided drainage-5L purulent peritoneal fluid: *Klebsiella pneumoniae* and *E.coli*	
5				
6				
7				
8				
9				
10				Abdominal pain
11				CTS multiple liver abscesses **Blood culture:** *C. glabrata, L. casei*
12				
13				jaundice, fever
14				
15				
			IAB 1 DOE = HD 4 Pathogens: *K. pneumoniae, E. coli*	**IAB 3b & Secondary BSI DOE = HD 4 Pathogens: *C. glabrata, L casei***

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 (SBAP)
(Infection Window Period + RIT)

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

Only one infection of a specific type (or major type for BSI, UTI and pneumonia) is reported during an RIT for that type of event. However, a new event of the same specific type (or major type for BSI, UTI and pneumonia) can be identified during an RIT if all required elements occur within a new IWP and the DOE is within the RIT of the initial event. In example 3, IAB criteria 1is met on hospital day-4 using organisms identified from purulent fluid. During the IAB RIT (hospital day 4-hospital day 17), IAB criteria 3a is met (on hospital day 10) using two symptoms, positive imaging evidence of an abscess and a positive blood specimen. The positive blood specimen occurs within the IAB secondary BSI attribution period, therefore, it is considered secondary to IAB. The pathogens, in this case, do not have to match because another definition (IAB 3b) is fully met within a new IAB IWP (hospital day 8-hospital day 14). Because the DOE (hospital day 10) occurs within the RIT of the initial IAB 1, a new event is not reported. The DOE, RIT and device association are not changed but any additional organisms identified (*C. glabrata* and *L casei*) are added to the initial IAB event if reported.

Example 4: Pathogen Assignment (continued)

Hospital Day (HD)	GIT SBAP	GIT RIT	GIT Infection Window Period	GIT Infection Window Period
1	Admit		Fever & vomiting	
2	PICC placed			
3				
4			CT bowel abscess	
5				
6			**Blood culture: *Enterococcus faecalis* X2**	
7				
8				
9				
10				
11				**Blood culture:** *Candida glabrata*
12				
13				Abscess drainage: *Candida glabrata* Abdominal pain and nausea
14				
15				
			GIT-2c DOE & Secondary BSI DOE= HD 1 Pathogen: *E. faecalis*	**GIT-2a & Secondary BSI DOE = HD 1 Pathogen: *C. glabrata***

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

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

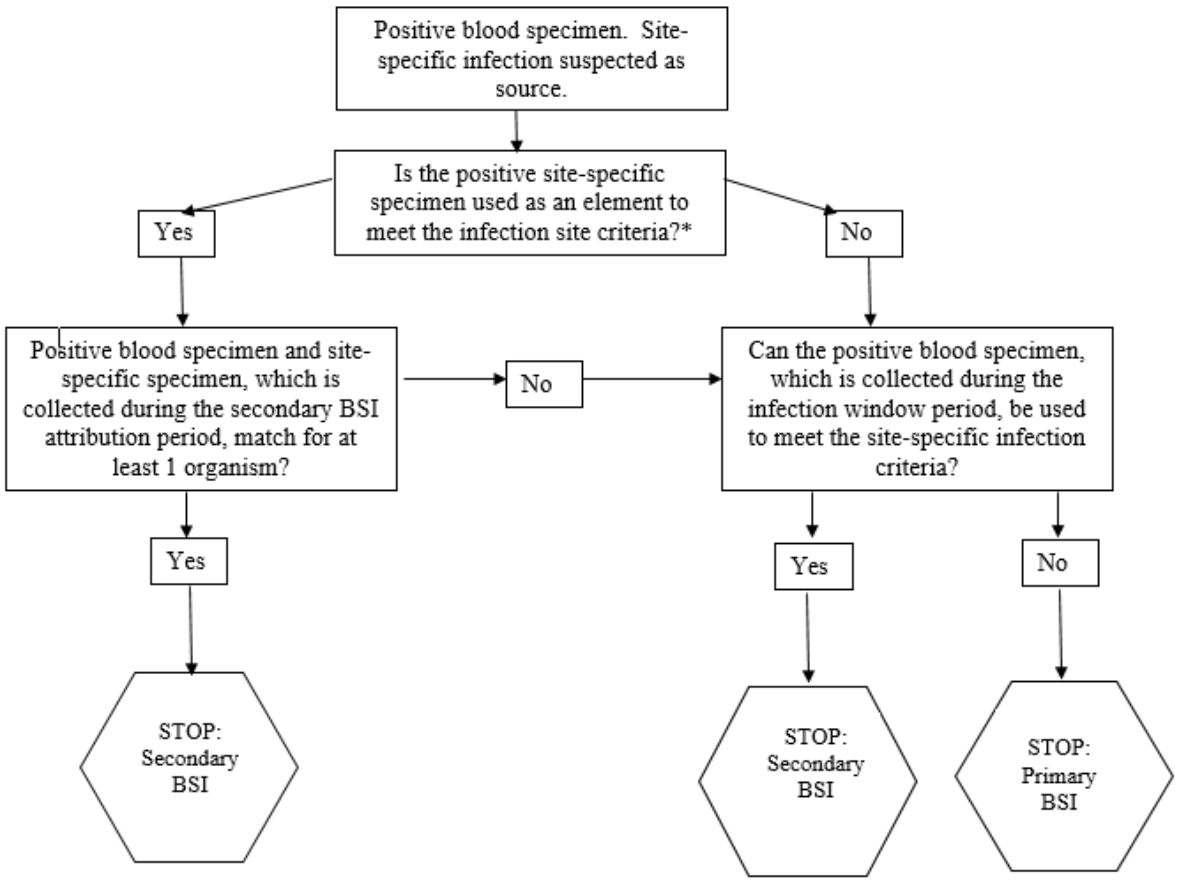
Secondary BSI Attribution Period (SBAP)
(Infection Window Period + RIT)

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

Only one infection of a specific type (or major type for BSI, UTI and pneumonia) is reported during an RIT for that type of event. However, a new event of the same specific type (or major type for BSI, UTI and pneumonia) can be identified during an RIT if all required elements occur within a new IWP and the DOE is within the RIT of the initial event. In example 4, GIT criterion 2c is met on hospital day-1 using two symptoms, positive imaging evidence of an abscess and a positive blood specimen. During the GIT RIT (hospital day 1-hospital day 14), GIT criteria 2a is met (on hospital day 11) using two symptoms and a positive abscess culture. The positive blood specimen occurs within the GIT secondary BSI attribution period and matches the organism identified from the abscess culture. Therefore, it is considered secondary to the GIT infection. The pathogens, in this case, do not have to match because another definition (GIT 2a) is fully met within a new GIT IWP (hospital day 8-hospital day 14). Because the DOE (hospital day 11) occurs within the RIT of the initial GIT 2c, a new event is not reported. The DOE, RIT and device association are not changed but any additional organism identified (*C. glabrata*) is added to the initial GIT event if reported.

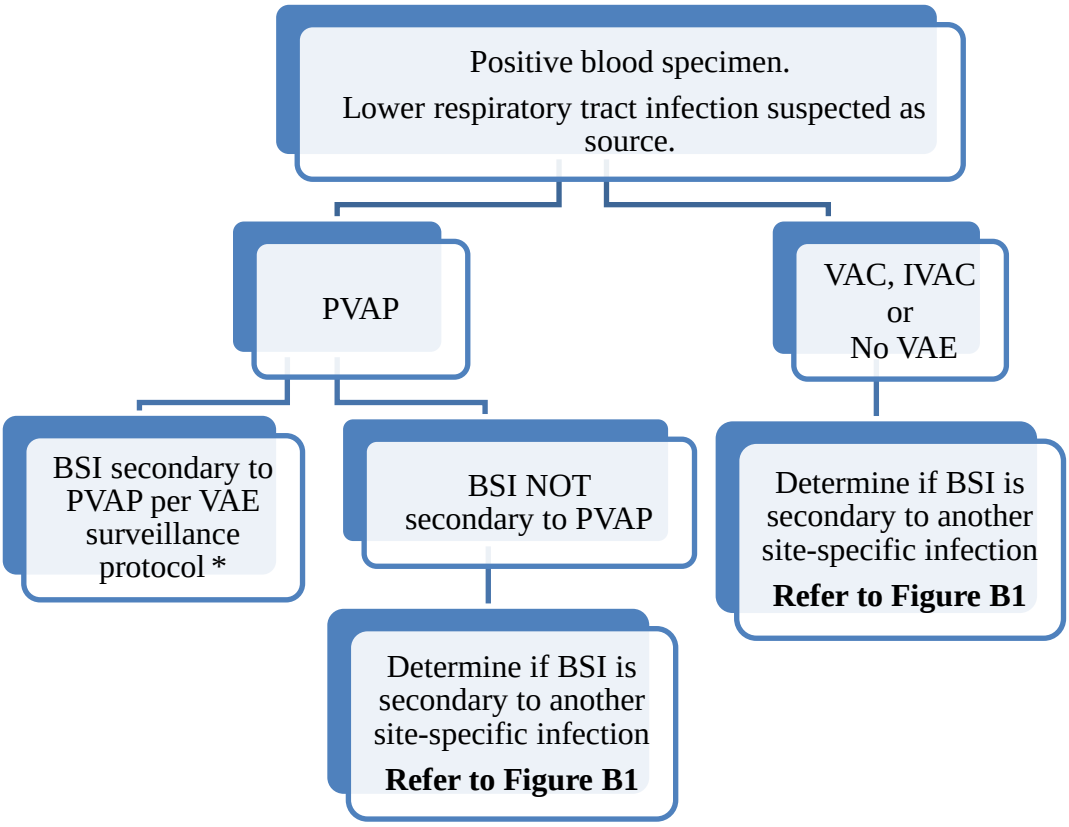
Note: This scenario is applicable to any site-specific infection definition from Chapter 17 or major infection type including BSI, UTI or pneumonia.

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



*__Exception:__ The necrotizing enterocolitis (NEC) definition does not include criteria for a matching site-specific specimen nor an organism identified from a 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 a 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 but 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.