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

Settings:

Surveillance will occur in all inpatient locations in Kuwait Ministry of Health hospitals.

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 should be reported to KNHSS (see Transfer Rule). No additional central line days are reported.

Definitions:

Present on Admission (POA): Infections that are POA, are not considered Healthcare-associated infections (HAIs) and therefore are never reported to KNHSS.

Healthcare-associated infections (HAI): All NHSN site specific infections must first meet the HAI definition before a site specific infection (e.g., CLABSI) can be reported to KNHSS.

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

Date of event (DOE): For a BSI the date of event is the date when the **FIRST** element used to meet the laboratory-confirmed bloodstream infection (LCBI) criterion occurred. 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 KNHSS 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, KNHSS 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 KNHSS purposes, it is considered a central line until discontinuation, regardless of migration.
3. An introducer is considered an intravascular catheter, and depending on the location of its tip and use, may be a central line.
4. Pacemaker wires and other non-lumened devices inserted into central blood vessels or the heart are not considered central lines, because fluids are not infused, pushed, nor withdrawn through such devices.
5. The following devices are **not** considered central lines:
    - Extracorporeal membrane oxygenation (ECMO),
    - Femoral arterial catheters
    - Intra-aortic balloon pump (IABP) devices,
    - Hemodialysis reliable outflow (HeRO) dialysis catheters.

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:

- o Tunneled catheters, including certain dialysis catheters
- o 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

a CL or UC was 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. If the patient is admitted or transferred into a facility with an implanted central line (port) in place, and that is the patient's only central line, day of first access in an inpatient location is considered Day1. "Access" is defined as line placement, infusion or withdrawal through the line. Such lines continue to be eligible for CLABSI once they are accessed until they are either discontinued or the day after patient discharged (as per the Transfer Rule).

Note that the "de-access" of a port does not result in the patient's removal from CLABSI surveillance.

EXAMPLES of Determining a CLABSI verses BSI:

- Patient in MICU has central line inserted/accessed on June 1. On June 3, the central line is still in place and the patient has positive blood culture with *S. aureus*. This is a CLABSI because the central line was in place for >2 calendar days (June 1, 2, and 3) 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 has a positive blood culture with *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).
- A central line is placed in the facility on May 30th. On June 3, the central line is removed and on June 5 patient spikes a fever of 38.3°C. Two blood culture sets collected on June 6 are positive for *S. epidermidis*. This may be a healthcare-associated bloodstream infection 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) or the next day (June 4).

Notes:

- 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 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 will continue.(*See figure 1 below)*
- Bloodstream infections will not be reported if they occur within the Repeat Infection Timeframe of a previously identified BSI. *(See Repeat Infection Timeframe guidance in Identifying HAIs document)*.
- Patients suspected or known to have accessed their own IV lines are **not** excluded from CLABSI surveillance. A facility must protect the line as best they can. Prevention efforts may include providing a patient sitter and/or removal of the catheter as soon as is clinically possible.

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

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

Rationale: KNHSS 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.

- 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 place greater than 2 days and was removed the day before the date of event.
- 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.

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

INPATIENT DIALYSIS:

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

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

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

EXCEPTION TO LOCATION OF ATTRIBUTION:

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

- Patient with a central line in place in the SICU is transferred to the surgical ward. On the next day, the patient meets criterion for an LCBI. This is reported to KNHSS as a CLABSI for the SICU.
- Patient without a central line is transferred from the medical ward on hospital day 3 to MICU. Later that day a central line is inserted. The next day, LCBI criteria are met. This would be considered a BSI and attributed to the medical ward; however, it is not a CLABSI because the central line was not in place >2 days on the date of event.
- Patient with a central line in place is transferred from the medical ward to the coronary care ICU (CCU). After 4 days in the CCU and with the central line still in place, all elements of LCBI are met. This is reported to KNHSS as a CLABSI for the CCU.
- After a two week hospital stay, a patient on 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 KNHSS for, and by, Hospital A and attributed to the urology ward.

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

Example of multiple transfers within the transfer rule time-frame:			
	22/3	**23/3**	**24/3**
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.

Table 1. Laboratory-Confirmed Bloodstream Infection Criteria

<table>
<tr><td>Criterion</td><td>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:</td></tr>
<tr><td>LCBI 1</td><td>Patient has a recognized pathogen cultured from one or more blood cultures
and
organism cultured from blood is not related to an infection at another site.(Appendix 1 Secondary BSI Guide)</td></tr>
<tr><td>LCBI 2</td><td>Patient has at least one of the following signs or symptoms: fever (>38^{o}C), chills, or hypotension
and
organism cultured from blood is not related to an infection at another site (See Appendix 1 Secondary BSI Guide)
and
the same common commensal (i.e., diphtheroids [Corynebacterium spp. not C. diphtheriae], Bacillus spp. [not B. anthracis], Propionibacterium spp., coagulase-negative staphylococci [including S. epidermidis], viridans group streptococci, Aerococcus spp., and Micrococcus spp.) is cultured from two or more blood cultures drawn on separate occasions (see comment 3a below). Criterion elements must occur within the Infection Window Period , the seven-day time period which includes the date the positive blood culture was collected, the 3 calendar days before and the 3 calendar days after.
(See complete list of common commensals by selecting the common commensal tab at the bottom of the Excel worksheet at http://www.cdc.gov/nhsn/XLS/master-organism-Com-Commensals-Lists.xlsx)

NOTE: The matching common commensals represent a single element; therefore, the collection date of the first common commensal is the date of the element used to determine the Date of Event.
<table>
<tr><td>1/6/2014</td><td>2/6/2014</td><td>3/6/2014</td><td>4/6/2014</td><td rowspan="2">Date of LCBI Event = 1/6</td></tr>
<tr><td>S. epidermidis (1 of 2)</td><td>S. epidermidis (2 of 2)</td><td>No LCBI elements</td><td>Fever >38°C</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td>LCBI 3</td><td>Patient ≤ 1 year of age has at least <u>one</u> of the following signs or symptoms: fever (>38^{o}C), hypothermia (<36^{o}C), apnea, or bradycardia
and
organism cultured from blood is not related to an infection at another site (See Appendix 1 Secondary BSI Guide)
and
the same common commensal (i.e., diphtheroids [Corynebacterium spp. not C. diphtheriae], Bacillus spp. [not B. anthracis], Propionibacterium spp., coagulase-negative staphylococci [including S. epidermidis], viridans group streptococci, Aerococcus spp., Micrococcus spp.) is cultured from two or more blood cultures drawn on separate occasions (see comment 3a below). Criterion elements must occur within the Infection Window Period, the seven-day time period which includes the date the positive blood culture was collected, the 3 calendar days before and the 3 calendar days after.
(See complete list of common commensals by selecting the common commensal tab at the bottom of the Excel worksheet at <u>http://www.cdc.gov/nhsn/XLS/master-organism-Com-Commensals-Lists.xlsx</u>)

NOTE: The matching common commensals represent a single element; therefore, the collection date of the first common commensal is the date of the element used to determine the Date of Event.

<table>
<tr><td>1/6/2014</td><td>2/6/2014</td><td>3/6/2014</td><td>4/6/2014</td><td rowspan="2">Date of LCBI Event = 1/6</td></tr>
<tr><td>S. epidermidis (1 of 2)</td><td>S. epidermidis (2 of 2)</td><td>No LCBI elements</td><td>Apnea documented</td></tr>
</table>
</td></tr>
<tr><td>Criterion</td><td>Mucosal Barrier Injury Laboratory-Confirmed Bloodstream Infection (MBI-LCBI)
When reporting an LCBI, it is required to indicate which of the underlying conditions of the MBI-LCBI criterion was met, if any. All CLABSI, whether LCBI or MBI-LCBI, must be reported.
Must meet one of the following criteria:</td></tr>
<tr><td>MBI-LCBI 1</td><td>Patient of any age meets criterion 1 for LCBI with at least one blood culture growing any of the following intestinal organisms <u>with no other organisms isolated</u> (See Comment #5): Bacteroides spp., Candida spp., Clostridium spp., Enterococcus spp.,</td></tr>
</table>

	Fusobacterium spp., *Peptostreptococcus* spp., *Prevotella* spp., *Veillonella* spp., or Enterobacteriaceae* ***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 culture: 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 culture was collected. 2. Is neutropenic, defined as at least 2 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 culture was collected (Day 1), the 3 calendar days before *and* the 3 calendar days after *(See Table 4 for example).* *See *Table 3* for partial list of eligible Enterobacteriaceae genera.
MBI-LCBI 2	Patient of any age meets criterion 2 for LCBI when the blood cultures are growing only viridans group streptococci with no other organisms isolated ***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 culture: 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 culture was collected.

	2. Is neutropenic, defined as at least 2 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 culture was collected (Day 1), the 3 calendar days before *and* the 3 calendar days after *(See Table 4 for example).*
MBI-LCBI 3	Patient ≤1 year of age meets criterion 3 for LCBI when the blood cultures are growing only viridans group streptococci <u>with no other organisms isolated</u> ***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 culture: a. Grade III or IV gastrointestinal graft versus host disease [GI GVHD] (See Comment #6) 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 culture is collected. 2. Is neutropenic, defined as at least 2 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 culture was collected (Day 1), the 3 calendar days before *and* the 3 calendar days after. *(See Table 4 for example)*.
Comments	1. In LCBI criterion 1, the term "recognized pathogen" includes any organism not included on the common commensal list *(see criteria 2 and 3).* 2. LCBI criteria 1 and 2 and MCI-LCBI criteria 1 and 2 may be used for patients of any age, including those patients ≤1 year of age. 3. In LCBI criteria 2 and 3, if the pathogen or common commensal is identified to the species level from one blood culture, and a companion blood culture 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 2 below)*. Only genus and species identification should be utilized 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, between facilities reporting LCBIs meeting criterion 2. Report the organism to the genus/species level only once, and if antibiogram data are available, report the results from the most resistant panel.

a) In LCBI criteria 2 and 3, the phrase "two or more blood cultures 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 2 separate blood draw site preparations were performed. This will reduce misidentification of contaminated blood cultures as LCBI. For example, blood cultures drawn from different sites (e.g., different venipunctures, a combination of venipuncture and lumen withdrawal, or different lumens of the same central line) should undergo separate decontaminations and are therefore considered drawn on "separate occasions".

N.B:

The term "on separate occasions" is included among the requirements for laboratory-confirmed bloodstream infections when only common commensals are cultured from the blood (LCBI 2). Poor blood culture technique can result in contamination of blood specimens and the growth of common commensals on culture. The requirement for at least 2 blood cultures with matching common commensals to be collected during separate occasions was developed in order to avoid mis-identifying contamination due to poor blood culture technique as a true bacteremia. Blood cultures drawn from different sites or at

different times should undergo separate decontamination (skin prep). Both of these are examples of “separate occasions". In each example, if both cultures sets are positive, the chances are less that contamination was the cause than if the 2 positive blood culture sets were collected from only a single blood collection (e.g., collected using a vacutainer and attaching multiple bottles after a single decontamination). IF a person were to perform skin preparation, and then perform a single accession (either skin puncture OR accessing the same line or port) and collect multiple bottles, those would be considered a single accession (or occurrence). Think about “occasions” as referring to the act of disinfection of the access site. The intention is to ensure that the blood cultures are collected following different site disinfections.

b) For pediatric patients, due to volume constraints, a blood culture may consist of a single bottle. Therefore, to meet this part of the criterion, each bottle from two, single bottle blood draws would have to be culture-positive for the same commensal.

4. Specimen Collection Considerations: Although blood cultures drawn through central lines can have a higher rate of contamination than blood cultures collected through peripheral venipuncture, all positive blood cultures, regardless of the sites from which they were collected, must be included when conducting in-plan CLABSI surveillance.

5. In MBI-LCBI 1, 2 and 3, “No other organisms isolated” means there is not isolation in a blood culture of another recognized pathogen (e.g., *S. aureus*) or common commensal (e.g., coagulase-negative staphylococci) other than listed in MBI-LCBI criterion 1, 2 or 3 that would otherwise meet LCBI criteria. If this occurs, the infection should not be classified as MBI-LCBI.

REPORTING INSTRUCTIONS	1. Report organisms cultured from blood as BSI–LCBI when no other site of infection is evident *(see Appendix 1. Secondary BSI Guide).* 2. When another blood culture 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. 3. Catheter tip cultures are not used to determine whether a patient has a primary BSI. 4. When there is a positive blood culture and clinical signs or symptoms of localized infection at a vascular access site, but no other infection can be found, the infection is considered a primary BSI. 5. Purulent phlebitis confirmed with a positive semi quantitative culture of a catheter tip, but with either negative or no blood culture is considered a CVS-VASC, not a BSI, SST-SKIN, or a ST infection. 6. Occasionally a patient with both peripheral and central IV lines develops a primary bloodstream infection (LCBI) that can clearly be attributed to the peripheral line (e.g., pus at the insertion site and/or matching pathogen from pus and blood). In this situation, enter "Central Line = No" in the KNHSS BSI form. You should, however, include the patient's central line days in the summary denominator count. 7. To report healthcare-associated BSIs that are not central line-associated, enter "Central Line = No" in the KNHSS-BSI form when reporting these BSIs. You should, however, include all of the patient's central line days in the summary denominator count.

Table 2. Examples of how to report speciated and unspeciated organisms isolated from blood cultures

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*

Important note:

Example: A patient had *S. capitis* in one culture and *S. auricularis* in another (on consecutive days). Since both coagulase-negative staphylococci were speciated and were found to be of different species, they are not considered as companion (i.e., matching) cultures and, therefore, do not meet LCBI 2 criteria.

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

Citrobacter
Enterobacter
Escherichia
Klebsiella
Proteus
Providencia
Salmonella
Serratia
Shigella
Yersina

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

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

		Day -7	Day -6	Day -5	Day -4	Day -3	Day -2	Day -1	Day 1*	Day 2	Day 3	Day 4
Pt. A	WBC	100	800	400	300	ND	ND	320	400 + BC* w/ *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 culture with intestinal organism (*Candida* spp.) and neutropenia (2 separate days of WBC <500 cells/mm^3 occurring on the date the positive blood culture 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 2 positive blood cultures with viridans group streptococci (in this case, 2 positive), and fever >38°C and neutropenia (2 separate days of ANC <500 cells/mm^3 occurring on the date the positive blood culture 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 culture with intestinal organism (*Candida* spp.) and neutropenia (2 separate days of WBC <500 cells/mm^3 occurring on the date the positive blood culture 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 4 value = 400]).

Numerator Data: The *Primary Bloodstream Infection (BSI)* form is used to collect and report each BSI that is identified during the month selected for surveillance. The Instructions for Completion of Primary Bloodstream Infection (BSI) form contains instructions for collection and entry of each data element on the form.

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 method is 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 . Only the totals for the month are entered into KNHSS. • 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). Each is collected daily, at the same time each day. Only the totals for the month are entered into KNHSS. This distinction in 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 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.* **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 instructions for collection and entry of each data element on the forms.

N.B.

Pre-existing central lines should be included in the central line-day count beginning on the first day that they are accessed and continuing until the patient is discharged or the line is discontinued, whichever comes first. Therefore, if a patient is admitted with a central line which is not accessed until hospital day 4, the line should not be included in the central-line day counts until day 4 and then included every day until the patient is discharged or the line is discontinued. If the line is never accessed, it is never counted in the central line day counts. "Access" is defined as line placement, infusion or withdrawal through the line. NOTE: if a patient has another central line in place at the same time, which is being accessed, central line days will be counted for the patient.

Data Analyses: The Standardized Infection Ratio (SIR) is calculated by dividing the number of observed infections by the number of predicted infections. The number of predicted infections is calculated using CLABSI rates from a standard population during a baseline time period, which represents a standard population's CLABSI experience.

NOTE: The SIR will be calculated only if the number of expected HAIs (num Exp) is ≥1 to help enforce a minimum precision criterion.

NOTE: "predicted" is referred to as "expected".

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

While the CLABSI SIR can be calculated for single locations, the measure also allows you to summarize your data across multiple locations, adjusting for differences in the incidence of

infection among the location types. For example, you will be able to obtain one CLABSI SIR adjusting for all locations reported. Similarly, you can obtain one CLABSI SIR for all ICUs in your facility.

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.

References:

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

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

- The purpose of using the CDC/NHSN infection criteria is to identify and consistently categorize infections that are healthcare-associated into major and specific infection sites or types. LCBI criteria include the caveat that the organism(s) cultured 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-defined primary site of infection that may have seeded the bloodstream secondarily; otherwise the bloodstream infection may be misclassified as a primary BSI or erroneously associated with the use of a central line, i.e., called a CLABSI.

For purposes of KNHSS, in order for a bloodstream infection to be determined to be secondary to a primary infection site, (i.e. related to an infection at another site, such that the primary site of infection may have seeded the bloodstream secondarily), the patient must meet all three‡ below:

1. Meet one of the NHSN site specific definitions (CDC/NHSN Surveillance Definitions for Specific Types of Infections),
2. Have a positive blood culture within the Secondary BSI Attribution Period AND
3. Meet requirements in Secondary BSI Scenario 1 or 2 below.

‡Exception:
Since necrotizing enterocolitis (NEC) criteria include neither a site specific culture nor a positive blood culture, 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 a positive blood culture(s) collected during the secondary BSI attribution period is positive for an LCBI pathogen or the same common commensal is cultured from two or more blood cultures drawn on separate occasions collected on the same or consecutive days.

Secondary BSI Scenarios

Below are two potential scenarios with guidance on how to distinguish between the primary or secondary nature of a BSI. The definition of "matching organisms", and important notes and reporting instructions are also provided.

See Figure 3: Secondary BSI Guide for algorithmic display of the following instructions.

Scenario 1: Blood and site-specific specimen cultures match for at least one organism:

In a patient suspected of having an infection, if blood and a site-specific specimen are collected for culture and both are positive for at least one matching organism, AND if the site-specific culture is an element used to meet the infection site criterion, the BSI is considered secondary to that site-specific infection.

a. Example: Patient meets HAI criteria for a symptomatic urinary tract infection (suprapubic tenderness and $>10^5$ CFU/ml of *E. coli*) and blood culture collected during the secondary BSI attribution period is positive for *E. coli*. This is an HAI SUTI with a secondary BSI and the reported organism is *E. coli*.

b. Example: Patient meets HAI criteria for a symptomatic urinary tract infection (suprapubic tenderness and $>10^5$ CFU/ml of *E. coli*) and blood culture collected during the SUTI secondary BSI attribution period grows *E. coli* and *P. aeruginosa*. This is an HAI SUTI with a secondary BSI and the reported organisms are *E. coli* and *P. aeruginosa*, since both site and blood culture are positive for at least one matching pathogen.

c. Example: Patient meets HAI criteria for a symptomatic urinary tract infection (suprapubic tenderness and $>10^5$ CFU/ml of *E. coli*) and blood culture collected during the SUTI secondary BSI attribution period *E. coli* and *S. epidermidis*. This is an HAI SUTI with a secondary BSI and the reported organism is only *E. coli*, since the single common commensal *S.epidermidis* positive blood culture by itself does not meet BSI criteria.

Scenario 2: Blood and site-specific specimen cultures do not match:

There are two scenarios that can occur when a patient suspected of having an infection has blood and a site-specific specimen cultured but the organisms **do not match**.

a. If the blood isolate is an element used to meet the site-specific criterion, then the BSI is considered secondary to that site-specific infection. (for your convenience, a list of infection criterions that include positive blood culture as an element are included in table 5 below).

   i. Example: Postoperative patient becomes febrile and complains of nausea and abdominal pain. Blood and an aseptically-obtained T-tube drainage specimen are collected for culture. A CT scan done that day shows fluid collection suggestive of infection. Culture results show *Escherichia coli* from the T-tube drainage specimen but the blood grows *Bacteroides fragilis*. Because the patient meets IAB criteria during the infection window period, by positive site specific culture (IAB criterion 3a) and by positive blood culture as an element of a different criterion of the same infection site (IAB 3b), the blood is considered a secondary BSI to an IAB and both organisms would be listed as the IAB infection pathogens. No primary BSI would be reported.

   ii. Example: Patient is febrile, has a new onset of cough and has positive chest radiographs indicating the presence of an infiltrate. Blood and bronchoalveolar lavage (BAL) cultures are collected. Culture results show *Klebsiella pneumonia* > 10^4 cfu/ml from the BAL and *Pseudomonas aeruginosa* from the blood. Because the patient can meet PNU2 definition by using the positive blood culture as one of the elements of the infection criterion (i.e. infiltrate on chest x-rays, fever, new onset of cough and positive blood culture), the blood is considered a secondary BSI to a PNEU. No primary BSI would be reported.

b. If the site-specific culture is an element used to meet the infection site criterion and the blood isolate is not, then the BSI is considered a primary infection.

   iii. Example: Postoperative patient has an intra-abdominal abscess (IAB) noted during reoperation and purulent material is obtained at that time which grows *Escherichia coli*. The patient spikes a fever two days later and blood culture shows *Bacteroides fragilis*. Because the organisms from the site and blood cultures do not match, and no site-specific criterion that includes positive blood culture as an element is met, both a site-specific infection (criteria 1 and 2) and a primary BSI would be reported.

iv. Example: Unconscious ICU patient with a Foley catheter and central line for past 4 days spikes a fever; blood, urine and sputum specimens are collected for culture. The urine culture grows >100,000 CFU/ml of *Escherichia coli*, blood culture grows *Enterococcus faecium*, and sputum shows oral flora only. Because the organisms from the urine and blood cultures do not match, and a UTI criterion that includes positive blood culture as an element is not met, both a SUTI (SUTI criterion 1a) and a primary BSI would be reported. This infection does not meet the ABUTI criterion since that requires at least one matching organism in urine and blood in an asymptomatic patient.

Table 5: Site-specific criteria that require blood cultures

Organisms cultured from blood as an element			**Organisms cultured from blood with imaging test evidence of infection**		
Site	Element	page	Site	Element	Page
BURN	1	17-20	BONE	3a	17-4
JNT	3c	17-5	DISC	3a	17-4
MEN	2c&3c	17-7	GIT	2c	17-16
OREP	3a	17-19	IAB	3b	17-17
PNU2	Lab finding	6-6	SA	3a	17-8
PNU3	Lab finding	6-8	USI	3b &4b	17-23
UMB	1b	17-22	ENDO	4a,4b,5a &5b (specific organisms) 6e&7e plus other criteria are listed	17-9

A matching organism is defined as one of the following:

1. If genus and species are identified in both cultures, they must be the same.
   a. Example: A blood culture reported as *Enterobacter cloacae* and an intraabdominal specimen of *Enterobacter cloacae* are matching organisms.
   b. Example: A blood culture reported as *Enterobacter cloacae* and an intraabdominal specimen of *Enterobacter aerogenes* are NOT matching organisms as the species are different.

2. If the organism is less definitively identified in one culture than the other, the identifications must be complementary.

a. Example: A surgical wound growing *Pseudomonas* spp. and a blood culture growing *Pseudomonas aeruginosa* are considered a match at the genus level and therefore the BSI is reported as secondary to the SSI.

b. Example: A blood culture reported as *Candida albicans* and a culture from a decubitus reported as yeast are considered to have matching organisms because the organisms are complementary, i.e. Candida is a type of yeast

Notes:

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

Reporting Instructions:

- 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).

N.B:

A secondary BSI cannot be attributed to PNU1. If a BSI is thought to be secondary to a pneumonia and the blood culture collection date did not occur within the infection window period such that it could be used as an element to meet the PNU2 definition, reassess to determine if the PNU2 definition can be met within the PNU1 RIT. See the example and table below

- All elements necessary to satisfy the PNU1 definition occur within the infection window period. The date of event is 2/14.
- The PNU1 RIT is 2/14 through and including 2/27. Blood cultures collected on 2/20 are reported as positive for *Pseudomonas aeruginosa*.
- While this collection date is within the secondary BSI attribution period for PNU1, a secondary BSI cannot be reported for PNU1 as the blood culture is not used to satisfy the PNU1 definition and there is no site specific culture to which the blood culture pathogen can match.
- However, during the RIT, all elements needed to meet the PNU2 definition are present such that the PNU2 definition can be met using the blood culture as an element.

- The specific event reported is edited to represent PNU2 (PNU1 changed to PNU2).
- The date of event remains as 2/14, as does the originally determined RIT (2/14 through 2/27). The BSI can be attributed as secondary to PNEU.
- If the PNU2 definition had not been met as described above and additionally, another specific site infection for which the BSI could be attributed as a secondary was not found, the BSI would be reported as a primary BSI/CLABSI.

Date	RIT	Infection Window Period	Secondary BSI Attrib. Period
2/10			
2/11			
2/12			
2/13			
2/14		CXR: new infiltrate, new onset cough	
15		CXR: infiltrate, T = 38.9°C, cough, worsening gas exchange	
16			
17			
18			
19			
20		Blood Cx : Pseudomonas aeruginosa, CXR: infiltrate, WBC = ≥ 12,000, increased respiratory secretions	
21		CXR: infiltrate,	
22			
23			
24			
25			
26			
27			
28			
29			

Pathogen Assignment

Pathogens cultured 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.

Example 1 below:

A secondary BSI pathogen may be assigned to two different primary site infections (e.g., UTI and an IAB infection). 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. Therefore the pathogen is reported for both primary sites as a secondary bloodstream infection.

Example 1: Pathogen Assignment

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)

Hospital Day	BSI	RIT	Infection Window Period	Infection Window Period	RIT	BSI
1.						
2.						
3.						
4.		1.	**Urine Culture:** >100,000 cfu/ml *K.pneumoniae*			
5.		2.	Fever > 38.0 ^{o}C			
6.		3.				
7.		4.				
8.		5.		Fever > 38.0 ^{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.						
			SUTI & Secondary BSI Date of Event = 4 Pathogen = *K.pneumoniae*	**IAB & Secondary BSI Date of Event = 8 Pathogen= *K.pneumoniae***		

Example 2 below:

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). 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.

Example 2: Pathogen Assignment (continued)

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

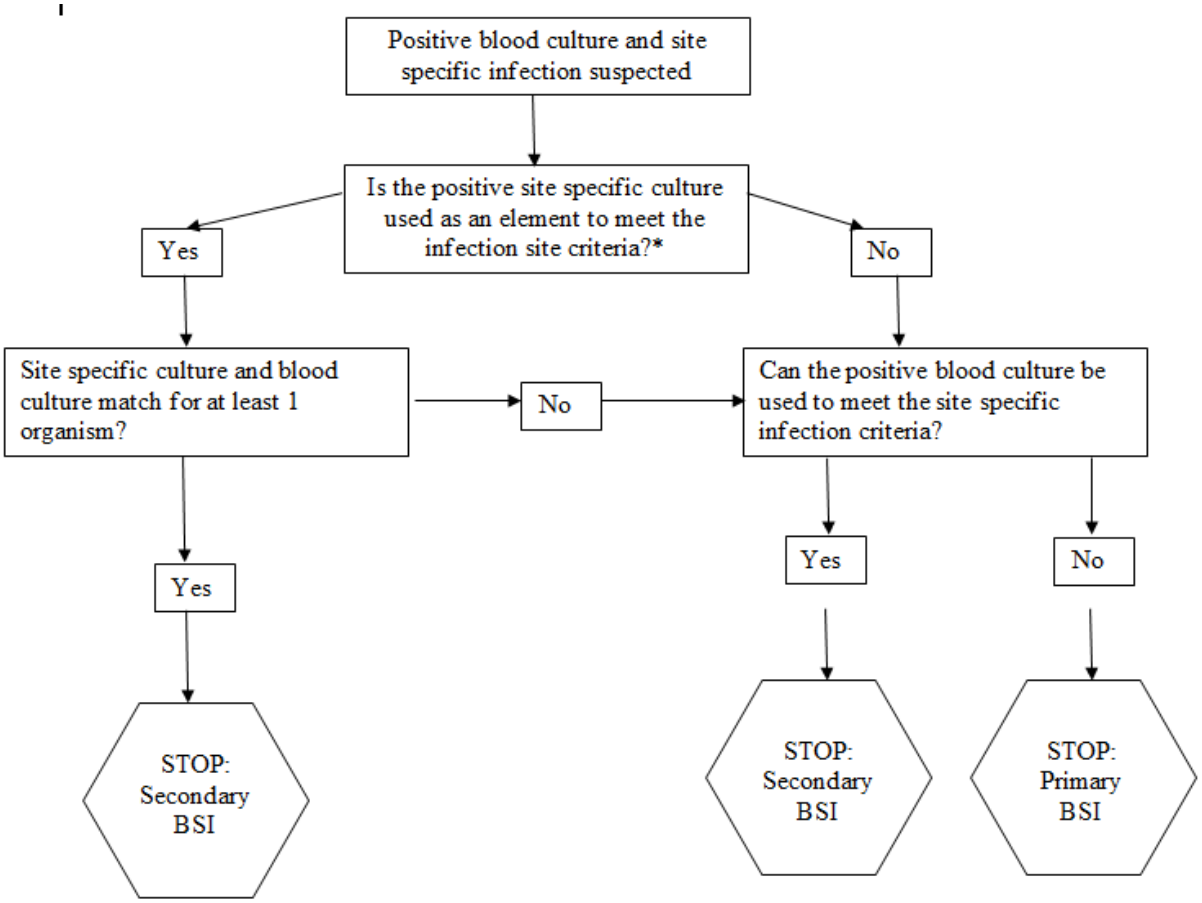
(Infection Window Period + RIT)

Date of Event (DOE)

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

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**	

Figure 3: Secondary BSI Guide for eligible organisms*‡
(Not applicable to Ventilator-associated Events [VAE}



*If an organism is excluded as a causative agent for a site specific infection (i.e. yeast in UTI), the blood cannot be considered secondary to that site.

‡**Exception:** Since necrotizing enterocolitis (NEC) criteria include neither a site specific culture nor a positive blood culture, 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 a positive blood culture(s) collected during the secondary BSI attribution period is positive for an LCBI pathogen or the same common commensal is cultured from 2 or more blood cultures drawn on separate occasions collected on the same or consecutive days.