

CENTERS FOR DISEASE CONTROL AND PREVENTION

Bacteremia & Fungemia Surveillance Module Protocol

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Revision History

Version	Date	Revision Summary
V1	January 2026	Initial release of the Bacteremia & Fungemia Surveillance Module Protocol.

Introduction

Bloodstream infections (BSIs) are associated with high morbidity and mortality [1]. Some BSIs are classified as Central Line-Associated Bloodstream Infections (CLABSIs), which has been a focus of surveillance and infection prevention efforts for many years. As a result, CLABSIs have decreased from historical levels [2]. Less attention has been given to the prevention of bloodstream infections not associated with central lines.

The NHSN Bacteremia & Fungemia Surveillance Module provides a mechanism for automated reporting of bacteremia and fungemia events as part of patient-safety and quality improvement efforts. It provides acute care hospitals with an approach for tracking a broad scope of bloodstream infections, leveraging Healthcare Level Seven International® (HL7®) Fast Healthcare Interoperability Resources® (FHIR®) to enable algorithmic determinations from clinical data available in electronic health records (EHRs). Ongoing surveillance is designed to minimize burden of data collection on facilities, while enabling facility-level prevention targets and national benchmarking.

Settings and Patient Locations

All inpatient facilities (for example, general acute care hospitals, critical access hospitals, children's hospitals, oncology hospitals, long term acute care hospitals, and inpatient rehabilitation facilities) enrolled in NHSN are eligible to enroll and participate in the Bacteremia & Fungemia Surveillance Module. Long-term care facilities (LTCFs) and outpatient dialysis facilities are not yet eligible to participate in the Bacteremia & Fungemia Surveillance Module. Bacteremia & Fungemia events are determined for applicable inpatient locations, emergency departments and 24-hour observation locations.

Facilities are required to map all facility locations in which surveillance is performed according to the guidance in the [CDC Locations and Descriptions Manual](#). Facilities newly enrolled in NHSN must map locations according to the CDC Locations and Descriptions manual; for facilities already enrolled in NHSN, the Bacteremia and Fungemia Surveillance Module uses the locations that have been mapped in the Patient Safety Component.

Note:

- Data for all inpatient areas that qualify for the NHSN Bacteremia & Fungemia Surveillance Module reporting, including procedural areas like operating rooms, will be analyzed. This is different than NHSN Facility-wide Inpatient (FacWideIN) in some NHSN Modules that exclude procedural areas, such as the laboratory-Identified (LabID) event reporting for the Multidrug-Resistant Organism & Clostridioides difficile Infection Module.

Data Reporting Requirements

All participating inpatient facilities reporting data to the NHSN Bacteremia & Fungemia Surveillance Module must be able to report data electronically in adherence to HL7 FHIR US Core FHIR R4.0.1 data standards and specifications and NHSN instructions for reporting dQMs [3-5]. Technical reporting requirements are specified separately in the *CDC NHSN dQM FHIR Implementation Guide*. Facility personnel responsible for reporting data to NHSN must coordinate with their information-systems providers to allow generation of standard formatted file(s) that are imported into NHSN according to these standards and instructions. The NHSN Bacteremia & Fungemia Surveillance Module does not support manual data entry or Clinical Document Architecture (CDA) submission. NHSN performs FHIR queries on the 20th day of the calendar month; a monthly report reflects measures for the previous month.

Minimum Requirements for Reporting dQMs

1. All information required for facility enrollment in NHSN is on file, including mapping of facility locations according to the [CDC Locations and Descriptions Manual](#).
2. A completed NHSN Patient Safety Component Annual Hospital Survey is on file for the reporting year.
3. A monthly FHIR bundle that conforms to [HL7 NHSN dQM Reporting Implementation Guide](#) and the [CDC NHSN dQMs Content Package Implementation Guide](#).
4. A Digital Measure Reporting Plan completed for the reporting month, which indicates the facility has committed to:
 - 1) Agreement the facility will permit access to data on the FHIR server for the required data elements.
 - 2) Conformance of the data transmitted by the facility to the NHSN Bacteremia & Fungemia Surveillance protocol.
 - 3) Adherence to technical specifications for value sets, including mapping local or non-standardized codes in the facility EHR to established value sets [see *Bacteremia and Fungemia Module Terminology Resource* file]. This includes mapping of any local codes used for medications to RxNorm, laboratory tests to LOINC, specimen and test result codes to SNOMED, and location codes to HSLOC. Facilities must work with their EHR vendors to download all the required value sets for mapping local or non-standardized codes to established value sets.
5. An acceptable minimal month of data required for generating a monthly intra-facility analytic report, including all the following:
 - 1) Patient identifiers (patient medical record number and encounter number, patient date of birth, patient sex).
 - 2) FHIR “MedicationRequest” and “MedicationAdministration” resources results with medication identifiers, including date/time of request (order) and administration.
 - 3) For the Bacteremia and Fungemia Surveillance Module, FHIR “Specimen” and “Observation” resource results with blood culture results, including specimen collected date and time and specimen type.

Measures are calculated only for submissions meeting the minimum requirements listed above.

Definitions

ED/OBS encounter: Any patient visit to an emergency department (ED) or observation (OBS) location. One patient visit equals one encounter. ED/OBS are considered outpatient locations.

Hospital Stay: NHSN defines a hospital stay to be inclusive of any: (a) ED/OBS encounters, (b) inpatient admissions, or (c) ED/OBS encounters that lead to inpatient admissions (within 1 hour of ED/OBS encounters).

Inpatient admission: For NHSN reporting purposes, the 'date admitted to the facility' is hospital day (HD) 1. NHSN defines an inpatient as any patient cared for or housed on an inpatient location. Local status may differ from NHSN definition; all days spent in an inpatient unit, regardless of local admission status and/or billing status are included in the counts of admissions and inpatient days. For NHSN reporting purposes, the date admitted to the facility is the calendar date that the patient physically locates to an inpatient location.

Measurement Period: Time period selected for report generation/metric calculation

Adult: Patients who are ≥ 18 years old on the calendar day of the start of the Hospital Stay

Pediatric: Patients who are < 18 years old on the calendar day of the start of the Hospital Stay

NICU: Patients who are housed in a NICU location at the time of index blood culture collection

Oncology/Neutropenia: Patient either 1) located in an Oncology ward, or 2) with neutropenia define an absolute neutrophil count (ANC) < 1000 cell/microL observed for ≥ 2 days in a +/- 7-day window period around the index blood culture

O-COB: Outpatient Community-onset Bacteremia & Fungemia Event

COB: Community-onset Bacteremia & Fungemia Event

HOB: Hospital-onset Bacteremia & Fungemia Event

Measure Logic

Events within the Bacteremia & Fungemia Surveillance Module are defined as follows, with onset assigned based on the patient location, date admitted to an inpatient location within the facility and date of blood culture specimen collection. HOB, COB and O-COB events are all identified by NHSN under this Module.

Initial Patient Population for the Bacteremia & Fungemia Surveillance Module:

All encounters for patients of any age in an ED, observation, or inpatient location and/or all encounters for patients of any age with an ED, observation, inpatient, or short stay status during the [measurement period](#).

Eligible Populations (based on patient physical location):

O-COB: All patients present in ED or Observation location during the [measurement period](#).

COB: All patients on inpatient day 1 – 3 of their hospital stay present in an inpatient location during the [measurement period](#).

HOB: All patients on inpatient day 4 or later of their hospital stay present in an inpatient location during the [measurement period](#).

Outpatient Community-onset Bacteremia & Fungemia (O-COB) Event:

An O-COB event occurs when a patient has a bacterial or fungal organism identified from a blood culture performed on a blood specimen collected while the patient is in an outpatient location (specifically ED or Observation).

- A patient can have a single O-COB event per Hospital Stay
- The date for the O-COB will be attributed to the earliest date that a blood culture performed on a blood specimen is collected that has a bacterial or fungal organism identified while the patient is in an ED or Observation location
- All organisms identified from blood cultures performed on a blood specimen collected while in an ED or Observation location will be attributed to a single O-COB event

O-COB Exclusions:

1. **Bacterial skin commensals:** The organism must NOT be included in the value set for bacterial skin commensals.
2. **Prior O-COB event:** A patient with a previous O-COB event is excluded from additional O-COB events during the same Hospital Stay.

Community-onset Bacteremia & Fungemia (COB) Event:

A COB event occurs when a patient has a bacterial or fungal organism identified from a blood culture performed on a blood specimen collected on hospital day 1 through 3 (where the date of admission to an inpatient location is hospital day 1).

- A patient can have a single COB event per Hospital Stay
- The date for the COB will be attributed to the earliest date that a blood culture performed on a blood specimen is collected that has a bacterial or fungal organism identified during hospital day 1 through 3
- All organisms identified from blood cultures performed on a blood specimen collected during hospital day 1 through 3 will be attributed to a single COB event.

COB Event Exclusions:

1. **Bacterial skin commensals:** The organism must NOT be included in the value set for bacterial skin commensals.
2. **Previous matching O-COB Event:** A bacterial or fungal organism identified from a blood culture collected on hospital day 1 through 3 is excluded from a COB event if the patient has an O-COB event during the same Hospital Stay with a matching organism. The matching algorithm is defined below.
3. **Previous COB event:** A patient with a previous COB event is excluded from additional COB events during the same Hospital Stay.

COB events can also be identified by the following:

- NICU
- Oncology/Neutropenia

Hospital-Onset Bacteremia & Fungemia (HOB) Event:

Hospital Onset Bacteremia and Fungemia: An HOB event occurs when a patient has a bacterial or fungal organism identified from a blood culture performed on a blood specimen collected on the 4th calendar day of admission or later (where the date of admission to an inpatient location is calendar day 1).

- A patient can have a single HOB event per Hospital Stay
- The date for the HOB will be attributed to the earliest date that a blood culture performed on a blood specimen is collected that has a bacterial or fungal organism identified on or after hospital day 4
 - » HOB Infection Timeframe: Any subsequent positive blood culture findings during the subsequent 14 days will be considered part of the initial HOB event

HOB Event Exclusions:

1. **Bacterial skin commensals:** The organism must NOT be included in the value set for bacterial skin commensals.
2. **Previous matching COB or O-COB Event:** A bacterial or fungal organism identified from a blood culture collected on hospital day 4 or later is excluded from an HOB event if the patient has an O-COB or COB event during the same Hospital Stay with at least one matching organism. The matching algorithm is defined below.
3. **Previous HOB event:** A patient with a previous HOB event is excluded from additional HOB events during the same Hospital Stay.

Note: HOB events due to organisms in the following value set will be flagged as “community-associated organisms” as they primarily cause community-associated infections and are not known to (or rarely) cause healthcare-associated infections

- For full list of organisms designated as community-associated organisms, see [Community-associated Organisms value set](#)

HOB events can also be identified by the following:

- NICU
- Oncology/Neutropenia

Matching Organism Criteria

Step 1:

- The reported SNOMED codes for each identified organism will be compared, if they are the same, the two organisms are considered a match.

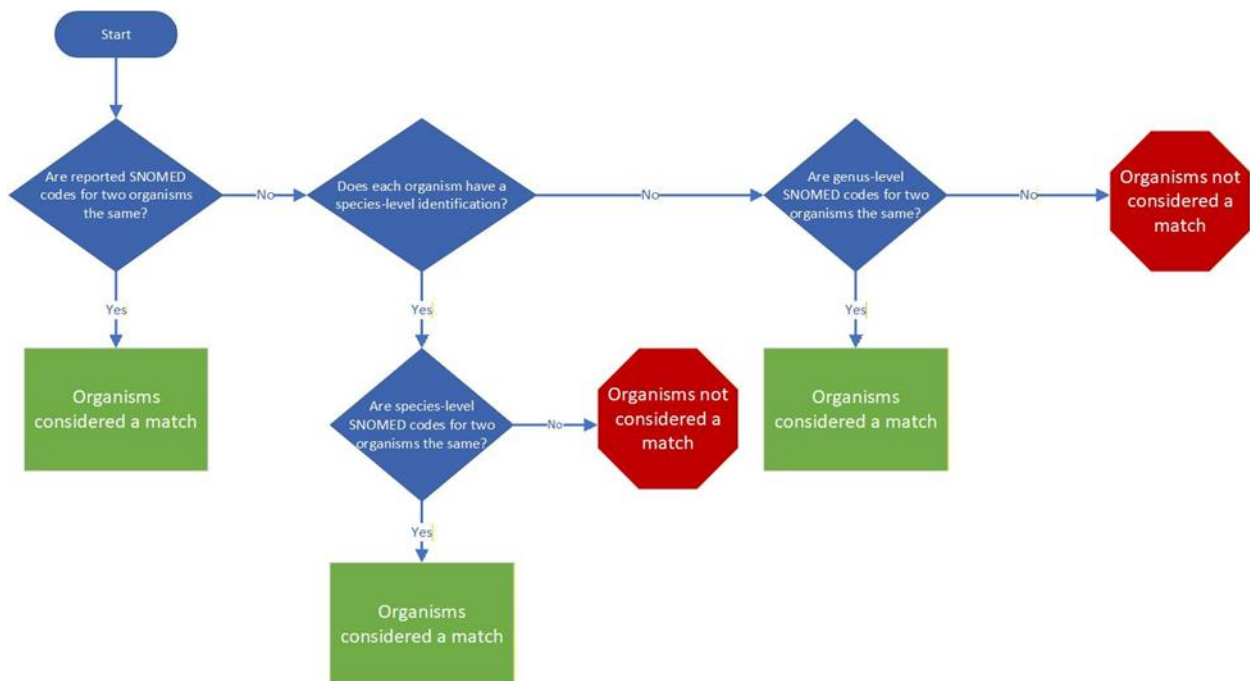
Step 2:

- If both organisms have species-level identification (species-level column contains a value) and the species-level identifications are the same, the two organisms are considered a match

Step 3:

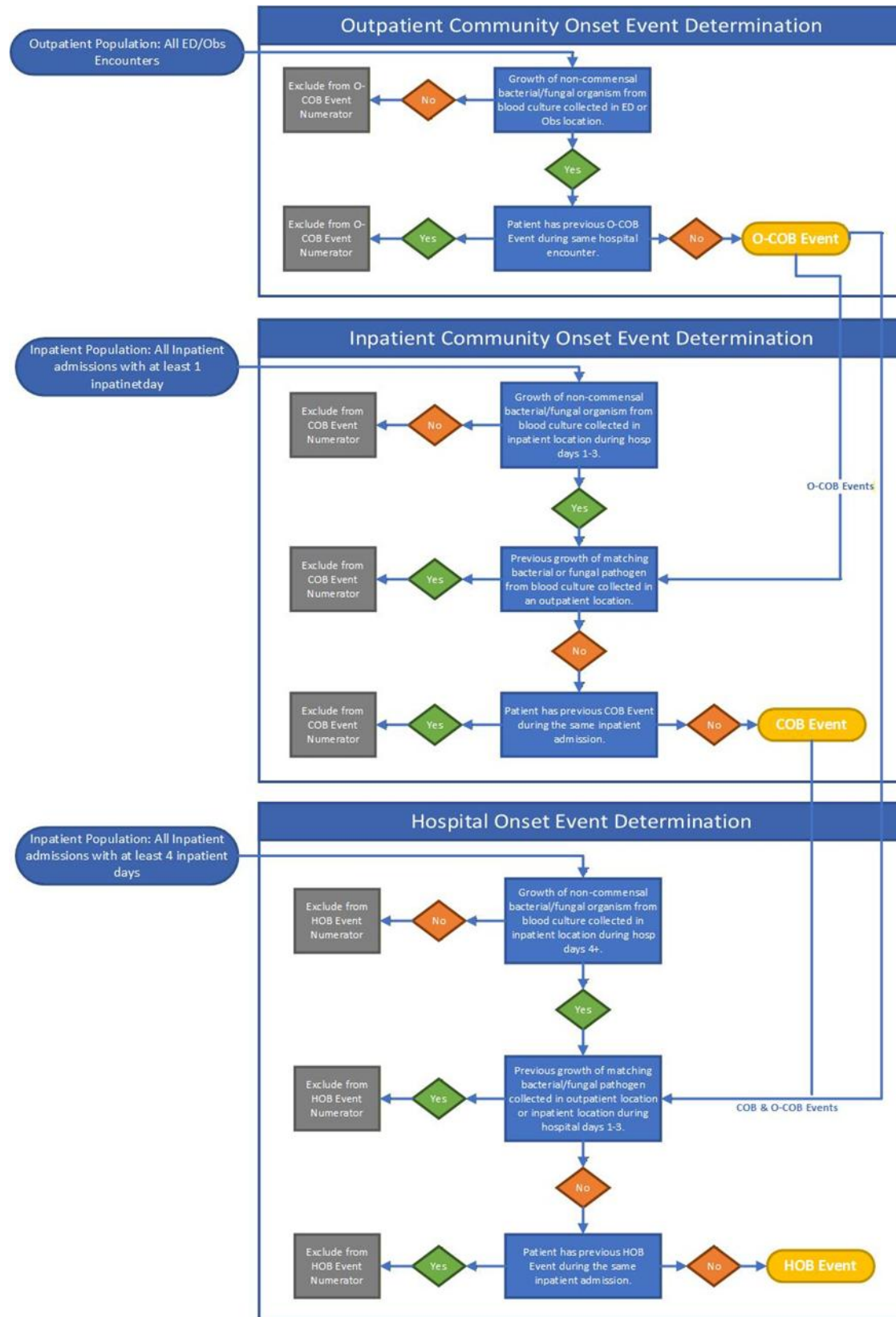
- If both organisms do not have species-level identification, but both have genus-level identification, compare organisms based on genus-level identification. If genus-level identifications are the same, the organisms are considered a match.

Figure 1: Matching Organism Algorithm



See [Bacteremia & Fungemia Surveillance Module Protocol Matching](#) file for examples.

Figure 2: Bacteremia & Fungemia Event Algorithms



Analysis and Reports

The following section describes the analytic features available for the Bacteremia & Fungemia Surveillance Module.

Data Set Generation

To access data reports, users must first complete a one-time initial data set generation. These data sets are user-specific; therefore, each NHSN user who intends to analyze Module data must generate their own. This step is required only the first time a user accesses the Bacteremia & Fungemia Surveillance Module analysis reports.

Data Analysis

Analysis is performed on all data submitted to the Bacteremia & Fungemia Surveillance Module. If data or months of data are missing, inaccurately coded, or mapped to inactive terminology, analysis results may be inaccurate or incomplete. Because some event determinations span calendar months (for example, when a blood culture is collected at the end of the month and final results are not yet available), analysis for the most recent month should be considered preliminary and will be updated upon receipt of the following month's data. Event counts may include cases from active admissions for which exclusion criteria have not yet been applied.

Stratification

Each metric can be stratified by location and by age group (Adult and Pediatric).

Available Reports

Line List

The line list provides a detailed patient-level review of all Module events, including information on NHSN's assignment of Bacteremia & Fungemia events.

Rate Tables

Rate tables provide measures of incidence and prevalence and can be generated by calendar month, quarter, half-year, or year. Rates are automatically generated for each unit and for the facility overall. Numerators and denominators are assigned to the month in which they occur, not to the admission date.

Onset	Metric	Numerator	Denominator	Multiplier	Notes
Outpatient Community Onset	O-COB Prevalence Rate	Number of outpatient O-COB events occurring within the measurement period	Number of outpatient (ED/OBS) encounters occurring within the measurement period	x 100	
Inpatient Community Onset	Inpatient COB Prevalence Rate	Number of inpatient COB events occurring within the measurement period	Number of inpatient stays where at least one of the first three inpatient calendar days falls within the measurement period	x 100	
Hospital Onset	HOB Crude Risk	Number of inpatient stays with at least one HOB event occurring within the measurement period	Number of inpatient stays where there are any inpatient days eligible for a hospital-onset event during the measurement period	x 100	<p>The denominator for HOB admission risk will include only those inpatient stays who were eligible for an HOB event in the measurement period:</p> <ul style="list-style-type: none"> • Stays where day 4 (or later) of their admission occurred during the measurement period. • If an event occurs, then a stay will not be included in the denominator of subsequent measurement periods.
	HOB Incidence Density	Number of HOB events	Number of inpatient days eligible for a hospital-onset event during the measurement period	x 10,000	<p>Eligible patient days are defined as:</p> <ul style="list-style-type: none"> • Inpatient day 4 until discharge or index HOB event date.

References

1. Surbhi Leekha, Robinson GL, Jacob JT, et al. Evaluation of hospital-onset bacteraemia and fungaemia in the USA as a potential healthcare quality measure: a cross-sectional study. *BMJ Quality & Safety*. 2024;33(8):487-498. doi: <https://doi.org/10.1136/bmjqs-2023-016831>
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Appendices

Appendix A. Examples of Bacteremia & Fungemia Events

Examples of O-COB Events

Inpatient Admission Day	N/A	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6+
Location	ED	Inpatient	Inpatient	Inpatient	Inpatient	Inpatient	Inpatient
Blood Culture with growth of <i>S. aureus</i>	+	(O-COB event)					

The positive blood culture (*S. aureus*) collected in an ED location is an O-COB event.

Inpatient Admission Day	N/A	N/A	Day 1	Day 2	Day 3	Day 4	Day 5
Location	ED	ED	Inpatient	Inpatient	Inpatient	Inpatient	Inpatient
Blood Culture with growth of <i>S. aureus</i>	+	(O-COB Event)					
Blood Culture with growth of <i>E. coli</i>		+	(Added to O-COB Event)				

The positive blood culture (*S. aureus*) collected in an ED location is an O-COB event. The second blood culture collected in an ED location is not a separate event as there is only one O-COB event per hospital stay. The organism identified (*E. coli*) is added to the organism list for the initial O-COB event.

Examples of COB Events

Inpatient Admission Day	N/A	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6+
Location	ED	Inpatient	Inpatient	Inpatient	Inpatient	Inpatient	Inpatient
Blood Culture with growth of <i>S. aureus</i>		+					
		(COB Event)					
Blood Culture with growth of <i>E. coli</i>			+				
			(Not eligible for new COB)				

The positive blood culture (*S. aureus*) collected on day 1 in an inpatient location is a COB event. The second blood culture collected on inpatient admission day 2 is not a separate event as there is only one COB event per hospital stay. The organism identified (*E. coli*) is added to the organism list for the initial COB event.

Inpatient Admission Day	N/A	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6+
Location	ED	Inpatient	Inpatient	Inpatient	Inpatient	Inpatient	Inpatient
Blood Culture with growth of <i>E. coli</i>	+						
	(O-COB Event)						
Blood Culture with growth of <i>S. aureus</i>			+				
			(COB Event)				

The positive blood culture (*S. aureus*) collected in an ED location is an O-COB event. The second blood culture collected on inpatient admission day 2 is a COB event as the organism (*S. aureus*) does not match the organism identified for the O-COB event (*E. coli*).

Inpatient Admission Day	N/A	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6+
Location	ED	Inpatient	Inpatient	Inpatient	Inpatient	Inpatient	Inpatient
Blood Culture with growth of <i>E. coli</i>	+						
	(O-COB Event)						
Blood Culture with growth of <i>E. coli</i>				+			
				(Excluded)			

The positive blood culture (*E. coli*) collected in an ED location is an O-COB event. The second blood culture collected on inpatient admission day 3 is not eligible for a COB event as the organism matches the organism identified for the O-COB event (*E. coli*).

Inpatient Admission Day	N/A	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6+
Location	ED	Inpatient	Inpatient	Inpatient	Inpatient	Inpatient	Inpatient
Blood Culture with growth of <i>E. coli</i>			+				
			(COB Event)				
Blood Culture with growth of <i>S. epidermidis</i>						+	
						(Excluded)	

The positive blood culture (*E. coli*) collected on day 2 in an inpatient location is a COB event. The second blood culture collected on inpatient admission day 5 is not a separate event because the organism (*S. epidermidis*) in the bacterial skin commensals value set.

Examples of HOB Events

Inpatient Admission Day	N/A	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6+
Location	ED	Inpatient	Inpatient	Inpatient	Inpatient	Inpatient	Inpatient
Blood Culture with growth of <i>S. aureus</i>					+		
					(HOB Event)		

The positive blood culture (*S. aureus*) collected on inpatient admission day 4 is considered an HOB event if there are no prior events with matching organism.

Inpatient Admission Day	N/A	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6+
Location	ED	Inpatient	Inpatient	Inpatient	Inpatient	Inpatient	Inpatient
Blood Culture with growth of <i>E. coli</i>	+	(O-COB Event)					
Blood Culture with growth of <i>S. aureus</i>					+	(HOB Event)	

The positive blood culture (*E. coli*) collected in an ED location is an O-COB event. A positive blood culture (*S. aureus*) collected on inpatient admission day 4 is considered an HOB event as it is not an organism match to the O-COB event.

The following examples do NOT meet HOB Event criteria:

Inpatient Admission Day	N/A	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6+
Location	ED	Inpatient	Inpatient	Inpatient	Inpatient	Inpatient	Inpatient
Blood Culture with growth of <i>S. aureus</i>		+	(COB Event)				
Blood Culture with growth of <i>S. aureus</i>						+	(Excluded)

The positive blood culture collected during the community onset period (inpatient admission day 1) is a COB event. A positive blood culture collected after inpatient admission day 4 that matches an organism that was collected prior to inpatient admission day 4 is NOT considered an HOB event.

Inpatient Admission Day	N/A	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6+
Location	ED	Inpatient	Inpatient	Inpatient	Inpatient	Inpatient	Inpatient
Blood Culture with growth of <i>E. coli</i>		+	(COB Event)				
Blood Culture with growth of <i>E. coli/ S. aureus</i>						+	(Excluded)

If multiple organisms are identified from a blood culture, the positive blood culture is excluded from an HOB event if any of the organisms match an organism from an O-COB or COB event during the current hospital stay.

Inpatient Admission Day	Day 10	Day 11	Day 12	Day 13	Day 14	Day 15	Day 16
Location	Inpatient	Inpatient	Inpatient	Inpatient	Inpatient	Inpatient	Inpatient
Blood Culture with growth of <i>P. aeruginosa</i>	+	(HOB Event)					
Blood Culture with growth of <i>E. coli</i>							+
							(Added to the HOB event)

If a patient has a previous HOB event (*P. aeruginosa*) during the current hospital stay, any additional organisms identified from positive blood cultures during the 14-day HOB infection timeframe (*E. coli*) are added to the organism list for the initial HOB event.

Inpatient Admission Day	Day 10	Day 11	Day 12	...	Day 26	Day 27	Day 28
Location	Inpatient	Inpatient	Inpatient	...	Inpatient	Inpatient	Inpatient
Blood Culture with growth of <i>P. aeruginosa</i>	+	(HOB Event)					
Blood Culture with growth of <i>E. coli</i>							+
							(Excluded)

If a patient has a previous HOB during the current hospital stay, a subsequent positive blood culture outside of the 14-day HOB infection timeframe is excluded from an HOB event, regardless of organism identified or time since prior event.

Inpatient Admission Day	N/A	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6+
Location	ED	Inpatient	Inpatient	Inpatient	Inpatient	Inpatient	Inpatient
Blood Culture with growth of <i>S. epidermidis</i>						+	
						(Excluded)	

The positive blood culture includes an organism (*S. epidermidis*) in the bacterial skin commensals value set; therefore, the culture is NOT considered a qualifying event.