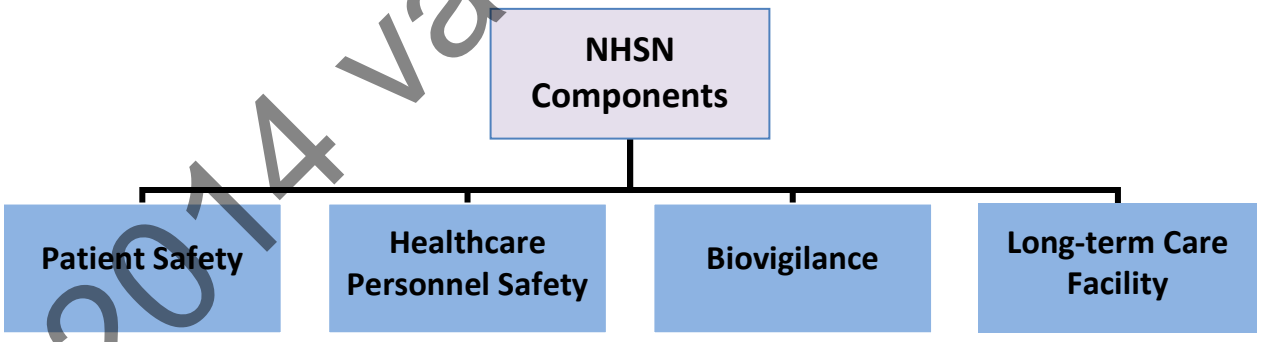
National Healthcare Safety Network (NHSN) Overview

The NHSN is a secure, Internet-based surveillance system that expands and integrates patient and healthcare personnel safety surveillance systems managed by the Division of Healthcare Quality Promotion at the Centers for Disease Control and Prevention. In addition, facilities that participate in certain reporting programs operated by the Centers for Medicare and Medicaid Services (CMS) can do so through use of NHSN. Some U.S. states utilize NHSN as a means for healthcare facilities to submit data on healthcare-associated infections (HAIs) mandated through their specific state legislation.

NHSN enables healthcare facilities to collect and use data about healthcare-associated infections, adherence to clinical practices known to prevent healthcare-associated infections, the incidence or prevalence of multidrug-resistant organisms within their organizations, trends and coverage of healthcare personnel safety and vaccination, and adverse events related to the transfusion of blood and blood products.

The NHSN includes four components: Patient Safety, Healthcare Personnel Safety, Biovigilance, and Long-term Care Facility (Figure).

Figure: NHSN Components



The Patient Safety Component includes 5 modules that focus on events associated with devices, procedures, or antimicrobial agents used during healthcare:

- Device-associated Module:
  - CLABSI – Central line-associated bloodstream infection
  - CLIP – Central line insertion practices adherence
  - CAUTI – Catheter-associated urinary tract infection
  - VAE – Ventilator-associated events (adult locations only)
  - VAP – Ventilator-associated pneumonia in pediatric locations (in-plan* or off-plan*), or NICU and adult locations (off-plan* only)
  - DE – Dialysis Event
- Procedure-associated Module:
  - SSI – Surgical site infection
- Antimicrobial Use and Resistance Module
- Multidrug-Resistant Organism and *Clostridium difficile* Infection (MDRO/CDI) Module
- Vaccination Module

***NOTE:** "In-plan" surveillance means that you have committed to following the NHSN surveillance protocol, in its entirety, for that particular event, as shown in your NHSN monthly reporting plan. "Off-plan" surveillance is surveillance that is done because you/your facility have decided to track a particular event for internal use. Data that are entered into NHSN "off-plan" are not included in NSHN annual reports or other NHSN publications. A facility makes no commitment to follow the NHSN protocol for "off-plan" events.

Instructions and standardized surveillance methods and definitions for each module of the Patient Safety Component are provided in this manual, except Dialysis Event, and on the NHSN website (www.cdc.gov/nhsn). Modules may be used singly or simultaneously and each module has its own minimum time period for required participation (see individual protocols for details). Information on Dialysis Event surveillance is provided at http://www.cdc.gov/nhsn/dialysis/index.html.

There are two modules in the Healthcare Personnel Safety (HPS) Component of NHSN: Blood/Body Fluid Exposure Modules With or Without Exposure Management and the Influenza Vaccination and Exposure Management Modules. These modules may be used separately or simultaneously. Instructions and standardized surveillance methods and definitions for each module are provided in the NHSN Manual: HPS Component Protocol (http://www.cdc.gov/nhsn/PDFs/HPS-manual/HPS_Manual-exp-plus-flu-portfolio.pdf).

The Biovigilance Component of NHSN was developed in collaboration with the transfusion and transplant communities. Biovigilance includes the collection of adverse event data to improve outcomes in the use of blood products, organs, tissues, and cellular therapies. The Hemovigilance Module is the first part of the Biovigilance Component to

be developed in NHSN. This module is designed for staff in healthcare facility transfusion services to track adverse events, including recipient adverse reactions and quality control incidents, related to blood transfusion. Instructions and standardized surveillance method and definitions for this module are provided in the NHSN Manual: http://www.cdc.gov/nhsn/PDFs/Biovigilance/BV-HV-protocol-current.pdf.

Surveillance Techniques

Some of the options in the following modules require active, patient-based, prospective surveillance of events and their corresponding denominator data by a trained Infection Preventionist (IP). This means that the IP shall seek out infections during a patient's stay by screening a variety of data sources, such as laboratory, pharmacy, admission/discharge/transfer, radiology/imaging, and pathology databases, as well as patient charts, including history and physical exam notes, nurses/physicians notes, temperature charts, etc. Others may be trained to screen data sources for these infections, but the IP must make the final determination. Laboratory-based surveillance should not be used alone, unless all possible criteria for identifying an infection are solely determined by laboratory evidence (e.g., LabID event detection in the MDRO/CDI Module). Retrospective chart reviews should be used only when patients are discharged before all information can be gathered. NHSN forms should be used to collect all required data, using the NHSN definitions of each data field. To minimize the IP's data collection burden, others may be trained to collect the denominator data and process of care data (e.g., central line insertion and inpatient influenza vaccination information).

Procedure-Associated Module

Surgical site infection (SSI) monitoring is offered through a protocol in this module. This protocol requires active, patient-based, prospective surveillance (see Surveillance Techniques above). To minimize IPs' workload of collecting denominator data, operating room data may be downloaded (see file specifications at: http://www.cdc.gov/nhsn/PDFs/ImportingProcedureData_current.pdf).

Both post-discharge and ante-discharge surveillance methods should be used to detect SSIs following in- and outpatient operative procedures. These methods include 1) direct examination of patients' wounds during hospitalization, or follow-up visits to either surgery clinics or physicians' offices, 2) review of medical records or surgery clinic patient records, 3) surgeon surveys by mail or telephone, and 4) patient surveys by mail or telephone (though patients may have a difficult time assessing their infections). Any combination of these methods is acceptable for use; however, CDC criteria for SSI must be used.

Device-Associated Module

Medical instrumentation increases the risk of development of an HAI and most patients admitted for health care are exposed to some kind of medical device in the course of their treatment. Such devices include, but are not limited to, venous and urinary catheters, and ventilators. NHSN enables facilities to monitor infectious complications associated with the use of these devices and also to monitor processes related to their use which might increase infection risk. Specifically, surveillance of central line-associated bloodstream infection (CLABSI), catheter-associated urinary tract infection (CAUTI), ventilator-associated events (VAE), and/or ventilator-associated pneumonia (VAP) is possible using the NHSN. See Dialysis Event Protocol for detailed instructions for Dialysis Event (DE) surveillance (http://www.cdc.gov/nhsn/dialysis/index.html). In addition, central line insertion practices (CLIP) can be monitored to inform facilities of the appropriateness of their processes and how they may relate to HAI development.

Device-associated denominator data should be collected at the same time each day. When denominator data are available from electronic databases (e.g., ventilator days from respiratory therapy), these sources may be used as long as the counts are not substantially different (+/- 5%) from manually-collected counts that have been validated for a minimum of 3 months.

See the respective device-associated event protocols for detailed surveillance instructions.

Antimicrobial Use and Resistance (AUR) Module

The use of antimicrobial agents has a direct effect on antimicrobial resistance patterns of pathogens. The observed increase in multidrug resistance is in part due to inappropriate prescription of, as well as incomplete completion of, courses of antibiotics.

The AUR Module allows facilities to collect information on the amount of antimicrobials that are utilized for patient care within their systems, as well as to collect data on the prevalence of drug-resistant organisms in their inpatient and outpatient areas. Electronic capture of microbiology and pharmacy data is the available option for this module.

See the Antimicrobial Use and Resistance protocol for detailed surveillance instructions (http://www.cdc.gov/nhsn/PDFs/pscManual/11pscAURcurrent.pdf).

Multidrug-resistant Organism and *Clostridium difficile* Infection *(MDRO/CDI)* Module

The NHSN MDRO/CDI Module offers a means for facilities to meet criteria and metrics that are outlined in several organizational guidelines to control and measure the spread of MDROs and CDI within their healthcare system. The module has both required and optional surveillance activities that can be tailored to the needs of the facility. Infection

surveillance and monitoring of proxy infection measures are choices available to facilities choosing to participate in this program within NHSN.

In addition, process measures related to adherence to contact precautions when caring for patients infected or colonized with an MDRO or *C. difficile*, and/or active surveillance testing for such organisms, or outcome measurements of incidence and prevalence of positive cultures of these organisms in patients can be undertaken.
See the MDRO/CDI protocol for detailed surveillance instructions (http://www.cdc.gov/nhsn/PDFs/pscManual/12pscMDRO_CDADcurrent.pdf).

Vaccination Module

Influenza continues to be associated with increased morbidity and mortality in certain patient populations including the very young, elderly, immunocompromised, and pregnant women. Hospitalization has been identified as a potential opportunity to provide influenza immunization not only to these at-risk individuals, but also to any patient.

The NHSN Patient Vaccination module was **not updated for the 2013-2014** influenza season. The module will be available for use through summer 2014 as a means for facilities to track the success of capitalizing on influenza vaccination opportunities. Two options are available related to patient susceptibility and adherence to vaccination recommendations. The module is slated to be removed in summer 2014; therefore, NHSN user support will not be available.

See the Vaccination protocol for detailed surveillance instructions (http://www.cdc.gov/nhsn/PDFs/pscManual/13pscHRIIVcurrent.pdf).

Identifying Healthcare-associated Infections (HAI) in NHSN

Present on Admission (POA) Infections

To standardize the classification of an infection as present on admission (POA) or a healthcare-associated infection (HAI), the following objective surveillance criteria have been adopted by NHSN. **NOTE:** This classification should **not** be applied to SSI, VAE, or LabID Events.

If all of the elements used to meet a CDC/NHSN site-specific infection criterion are present during the two calendar days before the day of admission, the first day of admission (day 1) and/or the day after admission (day 2) and are documented in the medical record, the infection is considered POA. Infections that are POA should not be reported as HAIs. Acceptable documentation does not include patient-reported signs and/or symptoms (e.g., patient reporting having a fever prior to arrival to the hospital). Instead, symptoms must be documented in the chart by a healthcare professional during the POA time frame (e.g., nursing home documents fever prior to arrival to the hospital). Physician diagnosis can be accepted as evidence of an infection that is POA only when physician diagnosis is an element of the specific infection definition.

For example, the admission history could indicate that the physician suspects a UTI. The patient was documented to have a fever in the nursing home the day before admission to the hospital, and upon admission to the hospital (day 1) a urine sample was collected and cultured yielding >100,000 cfu/ml of a pathogen. This infection would be considered a POA because the required elements of the CDC/NHSN site-specific infection criterion (for symptomatic urinary tract infection [SUTI]) were present during the two calendar days before admission, the day of admission, or the day after admission. In this example, items 1 and 2 are elements of SUTI criterion 1:

1. Fever, documented by history received from nursing home
2. Positive urine culture >100,000 CFU/ml

Illustration of present on admission (POA) time frame			
2 calendar days before admission	1 calendar day before admission	Day 1 (Day of facility admission)	Day 2 (Day after facility admission)
October 27	October 28	October 29	October 30

NOTES:

- For POA, the temperature value does not need to be known to establish the presence of a fever.
- Physician diagnosis of a UTI does not contribute to satisfying POA definition since physician diagnosis is not an element used to meet SUTI criteria.

Healthcare-associated infections (HAI)

For the purposes of NHSN surveillance in the acute care setting, a healthcare-associated infection (HAI) is a localized or systemic condition resulting from an adverse reaction to the presence of an infectious agent(s) or its toxin(s) that was not present on admission to the acute care facility. The HAI definition is not to be used in the SSI, VAE, or LabID Event protocols. An infection is considered an HAI if all elements of a CDC/NHSN site-specific infection criterion were not present during the POA time period but were all present on or after the 3rd calendar day of admission to the facility (the day of hospital admission is calendar day 1). All elements used to meet the CDC/NHSN site-specific infection criterion must occur within a timeframe that does not exceed a gap of 1 calendar day between any two adjacent elements. The definition of a gap day is a calendar day during which no infection criterion elements are present. Three examples of how to apply the HAI definition are shown in Table 1 utilizing the NHSN urinary tract infection (UTI) criteria. If all elements of a CDC/NHSN site-specific infection criterion are present on the day of transfer or the next day from one inpatient location to another in the same facility or a new facility, the infection is attributed to the transferring location or facility. Likewise, if all elements of a CDC/NHSN site-specific infection criterion are present on the day of discharge or the next day, the infection is attributed to the discharging location.

NOTE: At present time NHSN does not have a set time period during which only 1 infection of the same event type may be reported for the same patient. (VAE and LabID Event reporting is the exception, for which there is a 14-day window [see individual protocols for VAE and LabID Events].) Following an infection, which is either POA or an HAI, clinical information must be utilized to determine that the original infection had resolved before reporting a second infection at the same site. If the original infection had not resolved before subsequent positive cultures are collected from the same site, add the pathogens recovered from the subsequent cultures to those reported for the first infection, if it was an HAI. Depending on the infection type, information which may be useful to consider in determining if the infection has resolved includes signs and symptoms, results from diagnostic testing, as well as completion of antimicrobial therapy. For example, a change in blood culture in a patient with extended treatment for endocarditis may represent a new laboratory confirmed bloodstream infection (LCBI).

Table 1. ***Examples of Application of HAI Definition***

Day 1	Day 2	Day 3	Day 4	Day 5	Infection is …
50-year-old admitted to ICU • No UTI elements	ICU • No UTI elements	ICU • Suprapubic tenderness • Fever >38.0° • Urine culture collected, >100,000 cfu/ml *E. coli*			HAI attributable to ICU Rationale: • UTI criteria not fully met in first 2 hospital calendar days • All UTI elements present on or after hospital calendar day 3
50-year-old admitted to ICU • No UTI elements	ICU • Fever >38.0° C	ICU • Fever >38.0° C	ICU • Urine culture collected, > 100,000 cfu/ml *E. coli*		HAI attributable to ICU Rationale: • UTI criteria not fully met in first 2 hospital calendar days • All UTI elements present on or after hospital calendar day 3
50-year-old admitted to ICU • No UTI elements	ICU • No UTI elements	ICU • Fever >38.0° C	ICU • No UTI elements – *GAP day*	ICU • Urine culture collected, > 100,000 cfu/ml *E. coli*	HAI attributable to ICU Rationale: • UTI criteria not fully met in first 2 hospital calendar days • All UTI elements present on or after hospital calendar day 3. No more than a single gap day between adjacent elements

HAIs may be caused by infectious agents from endogenous or exogenous sources:

- Endogenous sources are body sites, such as the skin, nose, mouth, gastrointestinal (GI) tract, or vagina that are normally inhabited by microorganisms.
- Exogenous sources are those external to the patient, such as patient care personnel, visitors, patient care equipment, medical devices, or the healthcare environment.

Other important considerations include the following:

- Clinical evidence may be derived from direct observation of the infection site (e.g., a wound) or review of information in the patient chart or other clinical records.
- For certain types of infection, a physician or surgeon diagnosis of infection derived from direct observation during an invasive procedure, endoscopic examination, or other diagnostic studies or from clinical judgment may be an acceptable criterion for an HAI, unless there is compelling evidence to the contrary. For example, one of the criteria for SSI is ‘‘surgeon or attending physician or other designee diagnosis.’’ Unless stated explicitly, physician diagnosis alone is not an acceptable criterion for any specific type of HAI.
- Infections occurring in infants that result from passage through the birth canal are considered HAIs if they meet the definition of HAI above.

The following infections are not considered healthcare associated:

- Infections associated with complications or extensions of infections already present on admission (see POA definition), unless a change in pathogen or symptoms strongly suggests the acquisition of a new infection. This statement does not apply to SSIs, VAE, or LabID Events.
- Infections in infants that have been acquired transplacentally (e.g., herpes simplex, toxoplasmosis, rubella, cytomegalovirus, or syphilis) and become evident on the day of birth or the next day.
- Reactivation of a latent infection (e.g., herpes zoster [shingles], herpes simplex, syphilis, or tuberculosis).

The following conditions are not infections:

- Colonization, which means the presence of microorganisms on skin, on mucous membranes, in open wounds, or in excretions or secretions but are not causing adverse clinical signs or symptoms.
- Inflammation that results from tissue response to injury or stimulation by noninfectious agents, such as chemicals.

The complete set of CDC/NHSN HAI site-specific infection criteria, and the comments and reporting instructions integral to the correct application of the criteria, can be found in the Surveillance Definitions chapter.

Patient Safety Monthly Reporting Plan and Annual Surveys

The *Patient Safety Monthly Reporting Plan* form (CDC 57.106) is used by NHSN institutions to inform CDC which Patient Safety modules are used during a given month. This allows CDC to select the data that should be included in the aggregate data pool for analysis. Each participating institution must enter a monthly Plan to indicate the module(s) used, if any, and the events, locations and/or procedures they monitored. The monthly reporting plan is also the first step in indicating the data that should be submitted to CMS as part of the CMS Quality Reporting Programs. There must be a Plan completed for every month that data are entered into NHSN although a facility may choose "No NHSN Patient Safety Modules Followed this Month" as an option.

Upon enrollment into NHSN and/or activation of an NHSN component, one or more surveys must be completed. Thereafter, at the beginning of each year, the survey(s) must be updated to reflect data from the calendar year just completed. For example, upon NHSN enrollment in May 2014, the hospital completes a Hospital Survey reflecting data for 2013. Then at the beginning of 2015, the hospital completes a Hospital Survey containing data for 2014.

In the Patient Safety Component there are separate surveys for the following types of facilities:

- Hospital (includes general, acute care hospitals; surgical; oncology; orthopedic; pediatric; women's; women's and children's; military; psychiatric; and Veterans Affairs): *Patient Safety Component – Annual Hospital Survey* (57.103)
- Long-term Acute Care (LTAC) Hospital: *Patient Safety Component – Annual Facility Survey for LTAC* (57.150)
- Inpatient Rehabilitation Facility: *Patient Safety Component – Annual Facility Survey for IRF* (57.151)

Instructions for completing the *Patient Safety Monthly Reporting Plan* form and the applicable Annual Survey forms can be found in this chapter. The Table of Instructions provide brief instructions for collection and entry of each data element on each of the forms.

Central Line-Associated Bloodstream Infection (CLABSI) Event

Introduction: An estimated 41,000 central line-associated bloodstream infections (CLABSI) occur in U.S. hospitals each year.[1] These infections are usually serious infections typically causing a prolongation of hospital stay and increased cost and risk of mortality.

CLABSI can be prevented through proper insertion techniques and management of the central line. These techniques are addressed in the CDC's Healthcare Infection Control Practices Advisory Committee (CDC/HIPAC) *Guidelines for the Prevention of Intravascular Catheter-Related Infections, 2011*.[2]

Settings: Surveillance will occur in any inpatient location where denominator data can be collected, which may include critical/intensive care units (ICU), specialty care areas (SCA), neonatal units including neonatal intensive care units (NICUs), step down units, wards, and long term care units. A complete listing of inpatient locations and instructions for mapping can be found in the CDC Locations and Descriptions chapter.

NOTE: Surveillance for CLABSIs after the patient is discharged from the facility is not required. However, if discovered, any CLABSIs with event date on the day of discharge or the next day should be reported to NHSN (see Transfer Rule). No additional central line days are reported.

Requirements: Surveillance for HAI CLABSI is performed in at least one inpatient location in the healthcare institution for at least one calendar month as indicated in the *Patient Safety Monthly Reporting Plan* (CDC 57.106).

Definitions:

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

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

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

Date of event: For a BSI the date of event is the date when the last 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 NHSN system:

- Aorta
- Pulmonary artery
- Superior vena cava
- Inferior vena cava
- Brachiocephalic veins
- Internal jugular veins
- Subclavian veins
- External iliac veins
- Common iliac veins
- Femoral veins
- In neonates, the umbilical artery/vein.

NOTES:

1. Neither the insertion site nor the type of device may be used to determine if a line qualifies as a central line. The device must terminate in one of the great vessels or in or near the heart and be used for one of the purposes outlined above, to qualify as a central line.
2. An introducer is considered an intravascular catheter, and depending on the location of its tip and use, may be a central line.
3. 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.
4. The following devices are not considered central lines:
   - Extracorporeal membrane oxygenation (ECMO)
   - Femoral arterial catheters
   - Intraaortic 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

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

Central line-associated BSI (CLABSI): A laboratory-confirmed bloodstream infection (LCBI) where central line (CL) or umbilical catheter (UC) was in place for >2 calendar days on the date of event, with day of device placement being Day 1,
and
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 LCBI criteria must be fully met on the day of discontinuation or the next day. If the patient is admitted or transferred into a facility with a central line in place (e.g., tunneled or implanted central line), and that is the patient's only central line, day of first access as an inpatient is considered Day1. "Access" is defined as line placement, infusion or withdrawal through the line.

Notes:

- To distinguish subsequent LCBIs from a previously unresolved LCBI, see **Note** following HAI definition in Chapter 2.
- 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.

EXAMPLES:

- 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 on the date of event.
- 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.
- A central line is placed in the facility on May 30th. On June 3, the central line is removed and on June 4 patient spikes a fever of 38.3°C. Two blood culture sets collected on June 5 are positive for *S. epidermidis*. This is may be a healthcare-associated bloodstream infection but it is not a CLABSI because the central line was not place the day of or the day before LCBI Criterion 2 was met (June 5).

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 last element used to meet the LCBI criterion occurred (see exception 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.
- Facilities may choose to capture information about the presence of a dialysis catheter in patients with LCBIs. The BSI collection form includes a data field "Any hemodialysis catheter present," which may be marked yes or no, and utilized internally by facility to identify association of dialysis to LCBI.

EXCEPTION TO LOCATION OF ATTRIBUTION:

Transfer Rule: If all elements of a CLABSI are present on the day of transfer or the next day, in the same facility or a new facility the infection is attributed to the transferring location or facility. 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:

- 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 NHSN 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 NHSN 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 NHSN for, and by, Hospital A and attributed to the urology ward.

NOTE: Example of multiple transfers within the transfer rule time-frame:

3/22	3/23	3/24
Patient in Unit A	Patient transferred from Unit A to Unit B. Later that day, patient transferred to Unit C. (day of transfer)	Patient transferred from Unit C to Unit D. Last element for CLABSI criteria met. CLABSI attributed to Unit A since Unit A was the original unit initiating the transfer in the 2 day time-frame. (day after transfer)

Table 1. *Laboratory-Confirmed Bloodstream Infection Criteria*

Criterion	**Laboratory-Confirmed Bloodstream Infection (LCBI)** *Comments and reporting instructions that follow the site-specific criteria provide further explanation and are integral to the correct application of the criteria.* Must meet one of the following criteria:
LCBI 1	Patient 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.(See Appendix 1 Secondary BSI Guide)
LCBI 2	Patient has at least one of the following signs or symptoms: fever (>38°C), chills, or hypotension *and* positive laboratory results are 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 a timeframe that does not exceed a gap of 1 calendar day between two adjacent elements. (See complete list of common commensals at http://www.cdc.gov/nhsn/XLS/master-organism-Com-Commensals-

<table>
<tr><td></td><td>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>6/1/2013</td><td>6/2/2013</td><td>6/3/2103</td><td>6/4/2013</td><td rowspan="2">Date of LCBI Event = 6/3/2013</td></tr>
<tr><td>Fever >38°C</td><td>No LCBI elements</td><td>S. epidermidis (1 of 2)</td><td>S. epidermidis (1 of 2)</td></tr>
</table>
</td></tr>
<tr><td>LCBI 3</td><td>Patient ≤ 1 year of age has at least one of the following signs or symptoms: fever (>38°C core), hypothermia (<36°C core), apnea, or bradycardia

and

positive laboratory results are 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 the same or consecutive days and separate occasions (see Comment 3a below). Criterion elements must occur within a timeframe that does not exceed a gap of 1 calendar day between two adjacent elements. (See complete list of common commensals at http://www.cdc.gov/nhsn/XLS/master-organism-Com-Commensals-Lists.xlsx)

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Criterion	**Mucosal Barrier Injury Laboratory-Confirmed Bloodstream Infection (MBI-LCBI)** *In 2014 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 if CLABSI is part of your Monthly Reporting Plan.* Must meet one of the following criteria:
MBI-LCBI 1	Patient of any age meets criterion 1 for LCBI with at least one blood culture growing any of the following intestinal organisms with no other organisms isolated (See Comment #5): *Bacteroides* spp., *Candida* spp., *Clostridium* spp., *Enterococcus* spp., *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] (See Comment #6) 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] (See Comment #6) 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 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] (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 or Supporting Material section at http://www.cdc.gov/nhsn/acute-care-hospital/clabsi/index.html for the list of common commensals). 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 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".
    b. A blood culture may consist of a single bottle for a pediatric blood draw due to volume constraints. Therefore, to meet this part of the criterion, each bottle from two or 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 [3, 4] 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. 6. Grade III/IV GI GVHD is defined as follows: • In adults: ≥1 L diarrhea/day or ileus with abdominal pain • In pediatric patients: ≥20 cc/kg/day of diarrhea
REPORTING INSTRUCTIONS	1. Report organisms cultured from blood as BSI–LCBI when no other site of infection is evident (see Appendix 1. Secondary Bloodstream Infection [BSI] Guide). 2. Catheter tip cultures are not used to determine whether a patient has a primary BSI. 3. 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. 4. Purulent phlebitis confirmed with a positive semiquantitative culture of a catheter tip, but with either negative or no blood culture is considered a CVS-VASC, not a BSI, SST-SKIN, or a ST infection. 5. 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 NHSN application. You should, however, include the patient's central line days in the summary denominator count. 6. If your state or facility requires that you report healthcare-associated BSIs that are not central line-associated, enter "Central Line = No" in the NHSN application 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*

Table 3. ***Partial List of Criterion 1 MBI-LCBI Eligible Enterobacteriaceae Genera***
(See complete list of MBI Pathogens at NHSN Organisms Lists (All Organisms, Top Organisms, Common Commensals, MBI Organisms, & Uropathogens)

Citrobacter
Enterobacter
Escherichia
Klebsiella
Proteus
Providencia
Salmonella
Serratia
Shigella
Yersina

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 4value = 400]).

Numerator Data: The *Primary Bloodstream Infection (BSI)* form (CDC 57.108) is used to collect and report each CLABSI that is identified during the month selected for surveillance. 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, the organisms isolated from blood cultures, and the organisms' antimicrobial susceptibilities.

REPORTING INSTRUCTION:

- If no CLABSIs are identified during the month of surveillance, the Report No Events box must be checked on the appropriate denominator summary screen, e.g., Denominators for Intensive Care Unit (ICU)/Other locations (Not NICU or SCA), etc.

Denominator Data: Device days and patient days are used for denominators (see Key Terms chapter). Device-day denominator data that are collected differ according to the location of the patients being monitored; however, within a location, they should be collected at the same time each day. When denominator data are available from electronic databases, these sources may be used as long as the counts are not substantially different (+/- 5%) from manually-collected counts, pre-validated for a minimum of 3 months.

For locations other than specialty care areas/oncology (SCA/ONC) and NICUs, the number of patients with one or more central lines of any type is collected daily, at the same time each day, during the month and recorded on the *Denominators for Intensive Care Unit (ICU)/Other Locations (Not NICU or SCA/ONC)* form (CDC 57.118). Only the totals for the month are entered into NHSN. When denominator data are available from electronic sources (e.g., central line days from electronic charting), these sources may be used as long as the counts are not substantially different (+/- 5%) from manually-collected counts, pre-validated for a minimum of 3 months.

For specialty care areas/oncology, the number of patients with one or more central lines is dichotomized into those with permanent central lines and those with temporary central

lines on the *Denominators for Specialty Care Area (SCA)/Oncology (ONC)* form (CDC 57.117). Each is collected daily, at the same time each day. Only the totals for the month are entered into NHSN. This distinction in lines is made because permanent lines are commonly used in patients frequenting these areas and may be associated with lower rates of BSI than central lines inserted for temporary use. If a patient has both a temporary and a permanent central line, count the day only as a temporary line day. The Instructions for Completion of Denominators for Intensive Care Unit (ICU)/Other Locations (Not NICU and SCA/ONC) and Instructions for Completion of Denominators for Specialty Care Areas (SCA)/Oncology (ONC) contain brief instructions for collection and entry of each data element on the forms.

In NICUs, the number of patients with one or more central lines is stratified by birthweight in five categories since risk of BSI varies by birthweight. These data are collected on the *Denominators for Neonatal Intensive Care Unit (NICU)* form (CDC 57.116).

NOTE: The weight of the infant at the time of BSI is not used and should not be reported. For example, if a neonate weighs 1006 grams at birth but remains in the NICU for two months and has a body weight of 1650 grams when a CLABSI develops, record the birthweight of 1006 grams on the BSI form. The Instructions for Completion of Denominators for Neonatal Intensive Care Unit (NICU) form contains brief instructions for collection and entry of each data element on the forms.

Data Analyses: The Standardized Infection Ratio (SIR)[6] 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.[7]
NOTE: The SIR will be calculated only if the number of expected HAIs (numExp) is ≥1 to help enforce a minimum precision criterion.

NOTE: In the NHSN application, "predicted" is referred to as "expected".

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

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 specialty care areas in your facility.
NOTE: Only those locations for which baseline data have been published will be included in the SIR calculations.

The CLABSI rate per 1000 central line days is calculated by dividing the number of CLABSI 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, 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 birthweight categories in NICUs.

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

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[1]CDC Vital Signs. Making healthcare safer: reducing bloodstream infections. March 2011. Available at: http://www.cdc.gov/VitalSigns/HAI/index.html.

[2] O'Grady NP, Alexander M, Burns LA,, Dellinger EP, Garland J, Heard SO, Maki DG, et al. Guidelines for the prevention of intravascular catheter-related infections, 2011. Clinical Infectious Diseases 2011; 52 (a):1087-99.

[3] Clinical and Laboratory Standards Institute (CLSI). *Principles and Procedures for Blood Cultures; Approved Guideline*. CLSI document M47-A (ISBN 1-56238-641-7). Clinical and Laboratory Standards Institute, 940 West Valley Road, Suite 1400, Wayne, Pennsylvania, USA, 2007.

[4] Baron EJ, Weinstein MP, Dunne Jr WM, Yagupsky P, Welch DF, and Wilson DM. Cumitech IC: Blood Cultures IV. ASM Press: Washington, DC; 2005.

[5] Lee, A, Mirrett, S., Reller, LB., Weinstein, MP. Detection of bloodstream infections in adults: how many blood cultures are needed? Journal of Clinical Microbiology, 2007; Nov;45(11): 3546-8. Epub 2007 Sep 19.

[6] Your guide to the Standardized Infection Ratio (SIR). October 2010. http://www.cdc.gov/nhsn/PDFs/Newsletters/NHSN_NL_OCT_2010SE_final.pdf

[7] Edwards et al. (2009). National Healthcare Safety Network (NHSN) report: Data summary for 2006 through 2008, issued December 2009. Available at: http://www.cdc.gov/nhsn/PDFs/dataStat/2009NHSNReport.PDF

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 locations participating in in-plan VAE surveillance, refer to the VAE chapter for specific guidance on assigning a secondary BSI to a VAE.

Below are listed several scenarios that may occur with guidance on how to distinguish between the primary or secondary nature of a BSI, along with the definition of "matching organisms", and important notes and reporting instructions.

1. **Blood and site-specific specimen cultures match for at least one organism**: In a patient suspected of having an infection, blood and a site-specific specimen are collected for culture and both are positive for at least one matching organism. If the site-specific culture is an element used to meet the infection site criterion, then 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 from the same date grows *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 from the same date 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 *P. aeruginosa* is a logical pathogen for this site of infection.
    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 from the same date grows *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.

2. **Blood and site-specific specimen cultures do <u>not</u> 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 site-specific culture is an element used to meet the infection site criterion and the blood isolate is also an element used to meet another criterion at the same infection site, then the BSI is considered secondary to that site-specific infection.
    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 purulent drainage specimen but the blood grows *Bacteroides fragilis.* Because the patient meets IAB criteria 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 3c), 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.

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.

    i. Example: Postoperative patient has an intraabdominal 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.
    ii. 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 uropathogen organism in urine and blood in an asymptomatic patient.

3. **No site-specific specimen culture, only a positive blood culture**: In a patient suspected of having an infection, if the only specimen cultured is blood and it grows a logical pathogen for the suspected body site of infection, and a site-specific infection criterion is met, an element of which may or may not include a positive blood culture, the BSI is considered secondary to that site-specific infection.

a. Example: Postoperative patient has an abscess in the small bowel noted during reoperation. The only specimen cultured is blood which grows *B. fragilis*. Because gastrointestinal tract infection (GIT) criterion 1 is met with the surgically-identified abscess alone and because *B. fragilis* is a logical pathogen for this site of infection, the BSI is considered secondary to a GIT and *B. fragilis* is listed as the GIT infection pathogen.
b. Example: Patient has a positive blood culture with *E. coli* proximal in time with fever, abdominal pain, and CT scan evidence of intraabdominal abscess (IAB). This patient meets IAB criterion 3c, which includes a positive blood culture as one of its elements. The BSI is considered secondary to the IAB and *E. coli* is listed as the IAB infection pathogen.

4. **Negative site-specific specimen culture with positive blood culture**: In a patient suspected of having an infection, if a specimen from the suspected site of infection is cultured and yields no growth, but a blood specimen collected as part of the infection work-up is positive, that BSI is only considered a secondary BSI if another of the site-specific criteria that includes positive blood culture as an element is met. Otherwise, the BSI is considered a primary BSI, even if another criterion for that site is met and the blood isolate is a logical pathogen for the infection.
   a. Example: Patient has purulent material from the IAB space cultured and it yields no growth. The patient also has fever, abdominal pain, a positive blood culture with *Pseudomonas aeruginosa,* and radiographic evidence of IAB infection. This patient does not meet IAB criterion 1 (positive culture from purulent material) but does meet IAB criterion 3c, an element of which is a positive blood culture (signs/symptoms plus positive blood culture plus radiographic evidence). This BSI is considered secondary to the IAB and *P. aeruginosa* is listed as the IAB infection pathogen.
   b. Example: Postoperative knee replacement patient with a central line spikes a fever; blood and knee joint fluid are cultured. Only the blood cultures from at least two separate blood draws are positive for *S. epidermidis*. No other JNT infection criteria are met. This BSI should be reported as a CLABSI.
   c. Example: Patient has a central line in place for 10 days. Patient complains of knee joint tenderness and limited range of motion. CT scan findings suggest joint (JNT) infection but culture of a needle-aspirated joint fluid is negative. However, a blood culture from the same time period grows *S. aureus*. While this patient does not meet JNT criterion 1 (positive joint fluid culture), he does meet JNT criterion 3d (signs/symptoms plus positive laboratory test on blood [blood culture]). Since a positive blood culture is part of the criterion met for JNT infection, this BSI is considered secondary to the JNT infection and not reported as a CLABSI. *S. aureus* is reported as the pathogen for the JNT infection.

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 urine culture reported as yeast are considered to have matching organisms because the organisms are complementary, i.e. Candida is a type of yeast.

Notes:
1. 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 example 1c).
2. Antibiograms of the blood and potential primary site isolates do not have to match.
3. Blood and site-specific specimens do not have to be collected on the same day but there must be evidence of infection at the specific site at the time of blood culture collection.

Reporting Instructions:
1. For reporting secondary BSI for possible and probable VAP, see Chapter 10.
2. Do not report secondary bloodstream infection for vascular (VASC) infections, clinically-defined pneumonia (PNU1), Ventilator-Associated Conditions (VAC), or Infection-related Ventilator-Associated Complications (IVAC).
3. If a site-specific criterion requiring positive culture results is met, be sure to check the positive culture box when specifying the criteria used when adding the event, even if another criterion that does not include culture results is also met. For example, using the scenario in 2.a.i above, the following boxes for criteria used would be checked when entering the SSI into the NHSN application: fever, nausea, pain or tenderness, positive culture, positive blood culture, imaging test evidence of infection.

Central Line Insertion Practices (CLIP) Adherence Monitoring

Introduction: Central line-associated bloodstream infections (CLABSIs) can be prevented through proper placement and management of the central line. The CDC's Healthcare Infection Control Practices Advisory Committee (CDC/HICPAC) *Guidelines for the Prevention of Intravascular Catheter-Related Infections*, 2011[1] recommends evidence-based central line insertion practices known to reduce the risk of subsequent central line-associated bloodstream infection. These include hand hygiene by inserters, use of maximal sterile barriers during insertion, proper use of a skin antiseptic prior to insertion, and allowing that skin antiseptic to dry before catheter insertion.
Several centers have found it useful to monitor adherence to evidence-based central line insertion practices as a method for identifying quality improvement opportunities and strategically targeting interventions. Feedback of adherence data has been a component of multifaceted interventions that have successfully reduced CLABSI rates.

Participation in NHSN CLIP surveillance enables participating facilities and CDC to:

- Monitor central line insertion practices in individual patient care units and facilities and to provide aggregate adherence data for all participating facilities. Facilities have the option of recording inserter-specific adherence data.
- Facilitate quality improvement by identifying specific gaps in adherence to recommended prevention practices, thereby helping to target intervention strategies for reducing CLABSI rates.

Settings: Surveillance may occur in any type of patient care location where central lines are inserted.

Requirements: Surveillance for central line insertion practices in at least one location in the healthcare institution for at least one calendar month as indicated in the *Patient Safety Monthly Reporting Plan* (CDC 57.106). Participating facilities may perform surveillance for insertion practices during a month when concomitant CLABSI surveillance is being conducted, or may collect insertion practice data during a month when no CLABSI surveillance is being conducted or in locations where CLABSI are not monitored (e.g., emergency department, operating room, etc.). If participating facilities wish to identify associations between insertion practices and outcomes (i.e., CLABSI), surveillance for insertion practices and CLABSI must be done concomitantly.

Numerator and Denominator Data: The *Central Line Insertion Practices Adherence Monitoring Form* (CDC 57.125) is used to collect and report central line insertion practices for every central line insertion attempt, including unsuccessful attempts, occurring during the month in the unit(s) selected for surveillance. The *Table of Instructions for Completion of the Central Line Insertion Practices Adherence Monitoring Form* contains directions for collection and entry of each data element on the

form. The form can be completed at or near the time of insertion either by the inserter or an observer present at the insertion (e.g., nurse assisting with the catheter insertion), or the form can be completed from documentation in the patient chart (only if all elements of the monitoring form have been incorporated into standard central-line insertion procedure notes). The form includes information pertaining to demographics of the patient, information pertaining to the inserter, information on maximal sterile barriers used, the reason for central line insertion, whether the insertion was successful, skin antisepsis, hand hygiene practice before insertion, type of central line including whether it was antimicrobial coated, insertion site and, if placed because of suspected existing central line infection, the use of a guidewire. Elements of these data will be used to calculate adherence to recommended insertion practices.

Data Analyses: Adherence rates for specific insertion practices will be calculated by dividing the number of central line insertions during which the recommended practice was followed by the total number of central line insertions and multiplying the result by 100. Such calculations can also be done for a bundle of practices that have been shown to reduce the incidence of CLABSI. In NHSN, adherence to the bundle requires a "Yes" to all of the following:

- Hand hygiene performed
- Appropriate skin prep
    - Chlorhexidene gluconate (CHG) for patients ≥ 60 days old
    - Povidone iodine, alcohol, CHG, or other specified for children < 60 days old
- Skin prep agent has completely dried before insertion
- **All** 5 maximal sterile barriers used
    - Sterile gloves
    - Sterile gown
    - Cap
    - Mask worn
    - Large sterile drape (a large sterile drape covers the patient's entire body)

NOTE: CHG has not been labeled for use by the Food and Drug and Administration with patients < 2 months of age. Acceptance of CHG use for adherence to the CLIP bundle in this patient population does not reflect a recommendation of its use by the NHSN.

These calculations can be performed separately for different types of locations in the institution. Participants have the option of calculating inserter-specific adherence rates.

[1] O'Grady NP, Alexander M, Burns LA, Dellinger EP, Garland J, Heard SO, Maki DG, et al. Guidelines for the prevention of intravascular catheter-related infections, 2011. Clinical Infectious Diseases 2011; 52 (a):1087-99.

Central Line Insertion Practices (CLIP) Adherence Monitoring

Introduction: Central line-associated bloodstream infections (CLABSIs) can be prevented through proper placement and management of the central line. The CDC's Healthcare Infection Control Practices Advisory Committee (CDC/HICPAC) *Guidelines for the Prevention of Intravascular Catheter-Related Infections*, 2011[1] recommends evidence-based central line insertion practices known to reduce the risk of subsequent central line-associated bloodstream infection. These include hand hygiene by inserters, use of maximal sterile barriers during insertion, proper use of a skin antiseptic prior to insertion, and allowing that skin antiseptic to dry before catheter insertion.
Several centers have found it useful to monitor adherence to evidence-based central line insertion practices as a method for identifying quality improvement opportunities and strategically targeting interventions. Feedback of adherence data has been a component of multifaceted interventions that have successfully reduced CLABSI rates.

Participation in NHSN CLIP surveillance enables participating facilities and CDC to:

- Monitor central line insertion practices in individual patient care units and facilities and to provide aggregate adherence data for all participating facilities. Facilities have the option of recording inserter-specific adherence data.
- Facilitate quality improvement by identifying specific gaps in adherence to recommended prevention practices, thereby helping to target intervention strategies for reducing CLABSI rates.

Settings: Surveillance may occur in any type of patient care location where central lines are inserted.

Requirements: Surveillance for central line insertion practices in at least one location in the healthcare institution for at least one calendar month as indicated in the *Patient Safety Monthly Reporting Plan* (CDC 57.106). Participating facilities may perform surveillance for insertion practices during a month when concomitant CLABSI surveillance is being conducted, or may collect insertion practice data during a month when no CLABSI surveillance is being conducted or in locations where CLABSI are not monitored (e.g., emergency department, operating room, etc.). If participating facilities wish to identify associations between insertion practices and outcomes (i.e., CLABSI), surveillance for insertion practices and CLABSI must be done concomitantly.

Numerator and Denominator Data: The *Central Line Insertion Practices Adherence Monitoring Form* (CDC 57.125) is used to collect and report central line insertion practices for every central line insertion attempt, including unsuccessful attempts, occurring during the month in the unit(s) selected for surveillance. The *Table of Instructions for Completion of the Central Line Insertion Practices Adherence Monitoring Form* contains directions for collection and entry of each data element on the

form. The form can be completed at or near the time of insertion either by the inserter or an observer present at the insertion (e.g., nurse assisting with the catheter insertion), or the form can be completed from documentation in the patient chart (only if all elements of the monitoring form have been incorporated into standard central-line insertion procedure notes). The form includes information pertaining to demographics of the patient, information pertaining to the inserter, information on maximal sterile barriers used, the reason for central line insertion, whether the insertion was successful, skin antisepsis, hand hygiene practice before insertion, type of central line including whether it was antimicrobial coated, insertion site and, if placed because of suspected existing central line infection, the use of a guidewire. Elements of these data will be used to calculate adherence to recommended insertion practices.

Data Analyses: Adherence rates for specific insertion practices will be calculated by dividing the number of central line insertions during which the recommended practice was followed by the total number of central line insertions and multiplying the result by 100. Such calculations can also be done for a bundle of practices that have been shown to reduce the incidence of CLABSI. In NHSN, adherence to the bundle requires a "Yes" to all of the following:

- Hand hygiene performed
- Appropriate skin prep
    - Chlorhexidene gluconate (CHG) for patients ≥ 60 days old
    - Povidone iodine, alcohol, CHG, or other specified for children < 60 days old
- Skin prep agent has completely dried before insertion
- **All** 5 maximal sterile barriers used
    - Sterile gloves
    - Sterile gown
    - Cap
    - Mask worn
    - Large sterile drape (a large sterile drape covers the patient's entire body)

NOTE: CHG has not been labeled for use by the Food and Drug and Administration with patients < 2 months of age. Acceptance of CHG use for adherence to the CLIP bundle in this patient population does not reflect a recommendation of its use by the NHSN.

These calculations can be performed separately for different types of locations in the institution. Participants have the option of calculating inserter-specific adherence rates.

[1] O'Grady NP, Alexander M, Burns LA, Dellinger EP, Garland J, Heard SO, Maki DG, et al. Guidelines for the prevention of intravascular catheter-related infections, 2011. Clinical Infectious Diseases 2011; 52 (a):1087-99.

Ventilator-Associated Pneumonia (VAP) Event

Introduction: In 2002, an estimated 250,000 healthcare-associated pneumonias developed in U.S. hospitals and 36,000 of these were associated with deaths.[1] Patients with mechanically-assisted ventilation have a high risk of developing healthcare-associated pneumonia. For the year 2012, NHSN facilities reported more than 3,957 VAPs and the incidence for various types of hospital units ranged from 0.0-4.4 per 1,000 ventilator days.[2]

Prevention and control of healthcare-associated pneumonia is discussed in the CDC/HICPAC document, *Guidelines for Prevention of Healthcare-Associated Pneumonia, 2003*[3]. The Guideline strongly recommends that surveillance be conducted for bacterial pneumonia in ICU patients who are mechanically ventilated to facilitate identification of trends and for inter-hospital comparisons.

Settings: Surveillance will occur in any inpatient pediatric location where denominator data can be collected, which may include critical/intensive care units (PICUs), specialty care areas (SCA), step-down units, wards, and long term care units. In 2014, in-plan surveillance for ventilator-associated pneumonia (PNEU) using the criteria found in this chapter will be restricted to patients of any age in pediatric locations. In 2014, in-plan surveillance conducted for mechanically-ventilated patients in adult locations (regardless of age) will use the Ventilator-Associated Event (VAE) protocol (see VAE chapter). The PNEU definitions are still available for those units seeking to conduct off-plan PNEU surveillance for mechanically-ventilated adult and neonatal patients and non-ventilated adults or children. A complete listing of inpatient locations and instructions for mapping can be found in the CDC Locations and Descriptions chapter.

NOTE: It is not required to monitor for VAPs after the patient is discharged from the facility. However, if discovered, any VAPs with event date on the day of discharge or the next day should be reported to NHSN (see Transfer Rule below). No additional ventilator days are reported.

Requirements: Surveillance for VAP will occur in at least one inpatient pediatric location in the healthcare institution for at least one calendar month as indicated in the *Patient Safety Monthly Reporting Plan* (CDC 57.106).

Definitions:

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

POA reporting exception for PNEU/VAP: If all other elements are present per the POA criteria, one chest radiograph alone is acceptable to meet POA criteria for PNEU/VAP, protocol, regardless of whether the patient has underlying pulmonary or cardiac disease.

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

How to Apply HAI Definition to the PNEU/VAP Protocol:

A serial chest radiograph (CXR) on or after day 3 of admission (HAI) and a second later CXR may be used to meet the radiology finding requirement in a patient with underlying disease. The second CXR must occur within 7 days of the first. These findings can be used to fulfill the current HAI pneumonia/VAP criteria for the required 2 CXR findings are considered 1 element of the VAP/PNEU criteria. All other elements of PNEU/VAP should be met per the HAI definition. The VAP/PNEU HAI criteria are met even if all other elements required for PNEU/VAP are not present at the time the second CXR is obtained.

Pneumonia (PNEU) is identified by using a combination of radiologic, clinical and laboratory criteria. The following pages detail the various criteria that may be used for meeting the surveillance definition of healthcare-associated pneumonia (Tables 2-5 and Figures 1 and 2), general comments applicable to all specific site criteria, and reporting instructions. Table 6 shows threshold values for cultured specimens used in the surveillance diagnosis of pneumonia.

Date of event: For VAP the date of event is the date when the last element used to meet the Pneumonia (PNEU) criteria occurred. Synonyms: infection date.

Ventilator: A device to assist or control respiration continuously, inclusive of the weaning period, through a tracheostomy or by endotracheal intubation.

NOTE: Lung expansion devices such as intermittent positive-pressure breathing (IPPB); nasal positive end-expiratory pressure (PEEP); and continuous nasal positive airway pressure (CPAP, hypoCPAP) are not considered ventilators unless delivered via tracheostomy or endotracheal intubation (e.g., ET-CPAP).

Ventilator-associated PNEU (VAP): A pneumonia where the patient is on mechanical ventilation for >2 calendar days on the date of event, with day of ventilator placement being Day 1,
and
the ventilator was in place on the date of event or the day before. If the patient is admitted or transferred into a facility on a ventilator, the day of admission is considered Day1.

Location of attribution: The inpatient location where the patient was assigned on the date of the VAP event, which is further defined as the date when the last element used to meet the PNEU criterion occurred (see exception below).

EXCEPTION TO LOCATION OF ATTRIBUTION:

Transfer Rule: If all elements of a VAP are present within 2 days of transfer from one inpatient location to another in the same facility or a new facility (i.e., on the day of transfer or the next day), the infection is attributed to the transferring location or facility. If the patient was in multiple locations within the transfer rule time frame, attribute the infection to the original location initiating the transfer. 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:

- Child has been on a ventilator for 7 days in the PICU and is transferred on the ventilator to the pediatric surgical ward. On the next day, the patient meets the criteria for PNEU. This is reported to NHSN as a VAP for the PICU.
- Child has been on a ventilator for 5 days and is transferred in the morning to the pediatric medical ward from the pediatric medical critical care unit after having ventilator discontinued. Later that night, the child meets criteria for a PNEU. This is reported to NHSN as a VAP for the pediatric medical critical care unit.
- Pediatric patient on a ventilator is transferred from the neonatal intensive care unit (NICU) to the pediatric intensive care unit (PICU). After 4 days in the PICU, the patient meets the criteria for a PNEU. This is reported to NHSN as a VAP for the PICU.
- Pediatric patient on the Respiratory ICU (RICU) of Hospital A had the endotracheal tube and ventilator removed after being on the ventilator for 5 days 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 with a PNEU. This VAP should be reported to NHSN for, and by, Hospital A and attributed to the RICU. No additional ventilator days for the RICU are reported.

General comments applicable to all pneumonia specific site criteria:

1. Physician's diagnosis of pneumonia alone is not an acceptable criterion for healthcare-associated pneumonia.
2. Although specific criteria are included for infants and children, pediatric patients may meet any of the other pneumonia specific site criteria.
3. When assessing a patient for presence of pneumonia, it is important to distinguish between changes in clinical status due to other conditions such as myocardial infarction, pulmonary embolism, respiratory distress syndrome, atelectasis, malignancy, chronic obstructive pulmonary disease, hyaline membrane disease, bronchopulmonary dysplasia, etc. Also, care must be taken when assessing intubated patients to distinguish between tracheal colonization, upper respiratory tract infections (e.g., tracheobronchitis), and early onset pneumonia. Finally, it

should be recognized that it may be difficult to determine healthcare-associated pneumonia in the elderly, infants, and immunocompromised patients since such conditions may mask typical signs or symptoms associated with pneumonia. Alternate specific criteria for the elderly, infants and immunocompromised patients have been included in this definition of healthcare-associated pneumonia.

4. Healthcare-associated pneumonia can be characterized by its onset: early or late. Early-onset pneumonia occurs during the first four days of hospitalization and is often caused by *Moraxella catarrhalis, H. influenzae,* and *S. pneumoniae*. Causative agents of late-onset pneumonia are frequently Gram-negative bacilli or *S. aureus*, including methicillin-resistant *S. aureus*. Viruses (e.g., Influenza A and B or Respiratory Syncytial Virus) can cause early- and late-onset healthcare-associated pneumonia, whereas yeasts, fungi, legionellae, and *Pneumocystis carinii* are usually pathogens of late-onset pneumonia.
5. Pneumonia due to gross aspiration (for example, in the setting of intubation in the field, emergency room, or operating room) is considered healthcare-associated if it meets any specific criteria and the infection itself was not clearly present at the time of admission to the hospital.
6. Multiple episodes of healthcare-associated pneumonia may occur in critically ill patients with lengthy hospital stays. When determining whether to report multiple episodes of healthcare-associated pneumonia in a single patient, see **Note** following HAI definition in Chapter 2. The addition of or change in pathogen alone is not indicative of a new episode of pneumonia.
7. Positive Gram's stain for bacteria and positive KOH (potassium hydroxide) mount for elastin fibers and/or fungal hyphae from appropriately collected sputum specimens are important clues that point toward the etiology of the infection. However, sputum samples are frequently contaminated with airway colonizers and therefore must be interpreted cautiously. In particular, *Candida* is commonly seen on stain, but infrequently causes healthcare-associated pneumonia, especially in immunocompetent patients.

Table 1: Abbreviations used in PNEU laboratory criteria

BAL – bronchoalveolar lavage	LRT – lower respiratory tract
EIA – enzyme immunoassay	PCR – polymerase chain reaction
FAMA – fluorescent-antibody staining of membrane antigen	PMN – polymorphonuclear leukocyte
IFA – immunofluorescent antibody	RIA − radioimmunoassay

REPORTING INSTRUCTIONS:

- There is a hierarchy of specific categories within the major site pneumonia. Even if a patient meets criteria for more than one specific site, report only one:
    - If a patient meets criteria for both PNU1 and PNU2, report PNU2.
    - If a patient meets criteria for both PNU2 and PNU3, report PNU3.
    - If a patient meets criteria for both PNU1 and PNU3, report PNU3.
- Report concurrent lower respiratory tract infection (e.g., abscess or empyema) and pneumonia with the same organism(s) as PNEU.
- Lung abscess or empyema without pneumonia is classified as LUNG.
- Bronchitis, tracheitis, tracheobronchitis, or bronchiolitis without pneumonia are classified as BRON.

Table 2: Specific Site Algorithms for Clinically Defined Pneumonia (PNU1)

Radiology	Signs/Symptoms/Laboratory
Two or more serial chest radiographs with at least **one** of the following[1,2]: • New or progressive and persistent infiltrate • Consolidation • Cavitation • Pneumatoceles, in infants ≤1 year old NOTE: In patients **without** underlying pulmonary or cardiac disease (e.g., respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary edema, or chronic obstructive pulmonary disease), one definitive chest radiograph is acceptable.[1]	For ANY PATIENT, at least **one** of the following: • Fever (>38°C or >100.4°F) • Leukopenia (<4000 WBC/mm^3) or leukocytosis (≥12,000 WBC/mm^3) • For adults ≥70 years old, altered mental status with no other recognized cause **and** at least **two** of the following: • New onset of purulent sputum[3], or change in character of sputum[4], or increased respiratory secretions, or increased suctioning requirements • New onset or worsening cough, or dyspnea, or tachypnea[5] • Rales[6] or bronchial breath sounds • Worsening gas exchange (e.g., O_2 desaturations (e.g., PaO_2/FiO_2 ≤240)[7], increased oxygen requirements, or increased ventilator demand)
	ALTERNATE CRITERIA, for infants ≤1 year old: Worsening gas exchange (e.g., O_2 desaturations [e.g. pulse oximetry <94%], increased oxygen requirements, or increased ventilator demand) **and** at least **three** of the following: • Temperature instability • Leukopenia (<4000 WBC/mm^3) or leukocytosis (≥15,000 WBC/mm^3) and left shift (≥10% band forms) • New onset of purulent sputum[3] or change in character of sputum[4], or increased respiratory secretions or increased suctioning requirements • Apnea, tachypnea[5], nasal flaring with retraction of chest wall or nasal flaring with grunting • Wheezing, rales[6], or rhonchi • Cough • Bradycardia (<100 beats/min) or tachycardia (>170 beats/min)
	ALTERNATE CRITERIA, for child >1 year old or ≤12 years old, at least **three** of the following: • Fever (>38.4°C or >101.1°F) or hypothermia (<36.5°C or <97.7°F) • Leukopenia (<4000 WBC/mm^3) or leukocytosis (≥15,000 WBC/mm^3) • New onset of purulent sputum[3], or change in character of sputum[4], or increased respiratory secretions, or increased suctioning requirements • New onset or worsening cough, or dyspnea, apnea, or tachypnea[5]. • Rales[6] or bronchial breath sounds • Worsening gas exchange (e.g., O_2 desaturations [e.g., pulse oximetry <94%], increased oxygen requirements, or increased ventilator demand)

Table 3: Specific Site Algorithms for Pneumonia with Common Bacterial or Filamentous Fungal Pathogens and Specific Laboratory Findings (PNU2)

Radiology	Signs/Symptoms	Laboratory
Two or more serial chest radiographs with at least **one** of the following[1,2]: • New or progressive and persistent infiltrate • Consolidation • Cavitation • Pneumatoceles, in infants ≤1 year old NOTE: In patients **without** underlying pulmonary or cardiac disease (e.g., respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary edema, or chronic obstructive pulmonary disease), one definitive chest radiograph is acceptable.[1]	At least **one** of the following: • Fever (>38°C or >100.4°F) • Leukopenia (<4000 WBC/mm^3) or leukocytosis (≥12,000 WBC/mm^3) • For adults ≥70 years old, altered mental status with no other recognized cause **and** at least **one** of the following: • New onset of purulent sputum[3], or change in character of sputum[4], or increased respiratory secretions, or increased suctioning requirements • New onset or worsening cough, or dyspnea or tachypnea[5] • Rales[6] or bronchial breath sounds • Worsening gas exchange (e.g., O_2 desaturations [e.g., PaO_2/FiO_2 ≤240][7], increased oxygen requirements, or increased ventilator demand)	At least **one** of the following: • Positive growth in blood culture[8] not related to another source of infection • Positive growth in culture of pleural fluid • Positive quantitative culture[9] from minimally-contaminated LRT specimen (e.g., BAL or protected specimen brushing) • ≥5% BAL-obtained cells contain intracellular bacteria on direct microscopic exam (e.g., Gram's stain) • Histopathologic exam shows at least **one** of the following evidences of pneumonia: – Abscess formation or foci of consolidation with intense PMN accumulation in bronchioles and alveoli – Positive quantitative culture[9] of lung parenchyma – Evidence of lung parenchyma invasion by fungal hyphae or pseudohyphae

Table 4: Specific Site Algorithms for Viral, Legionella, and other Bacterial Pneumonias with Definitive Laboratory Findings (PNU2)

Radiology	Signs/Symptoms	Laboratory
Two or more serial chest radiographs with at least **one** of the following[1,2]: • New or progressive and persistent infiltrate • Consolidation • Cavitation • Pneumatoceles, in infants ≤1 year old NOTE: In patients **without** underlying pulmonary or cardiac disease (e.g., respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary edema, or chronic obstructive pulmonary disease), one definitive chest radiograph is acceptable.[1]	At least **one** of the following: • Fever (>38°C or >100.4°F) • Leukopenia (<4000 WBC/mm^3) or leukocytosis (≥12,000 WBC/mm^3) • For adults ≥70 years old, altered mental status with no other recognized cause **and** at least one of the following: • New onset of purulent sputum[3], or change in character of sputum[4], or increased respiratory secretions, or increased suctioning requirements • New onset or worsening cough or dyspnea, or tachypnea[5] • Rales[6] or bronchial breath sounds • Worsening gas exchange (e.g., O_2 desaturations [e.g., PaO_2/FiO_2 ≤240][7], increased oxygen requirements, or increased ventilator demand)	At least **one** of the following[10, 11, 12]: • Positive culture of virus or *Chlamydia* from respiratory secretions • Positive detection of viral antigen or antibody from respiratory secretions (e.g., EIA, FAMA, shell vial assay, PCR) • Fourfold rise in paired sera (IgG) for pathogen (e.g., influenza viruses, *Chlamydia*) • Positive PCR for *Chlamydia* or *Mycoplasma* • Positive micro-IF test for *Chlamydia* • Positive culture or visualization by micro-IF of *Legionella* spp, from respiratory secretions or tissue. • Detection of *Legionella pneumophila* serogroup 1 antigens in urine by RIA or EIA • Fourfold rise in *L. pneumo*phila serogroup 1 antibody titer to ≥1:128 in paired acute and convalescent sera by indirect IFA.

Table 5: Specific Site Algorithm for Pneumonia in Immunocompromised Patients (PNU3)

Radiology	Signs/Symptoms	Laboratory
Two or more serial chest radiographs with at least **one** of the following[1,2]: • New or progressive and persistent infiltrate • Consolidation • Cavitation • Pneumatoceles, in infants ≤1 year old NOTE: In patients **without** underlying pulmonary or cardiac disease (e.g., respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary edema, or chronic obstructive pulmonary disease), one definitive chest radiograph is acceptable.[1]	Patient who is immunocompromised[13] has at least **one** of the following: • Fever (>38°C or >100.4°F) • For adults ≥70 years old, altered mental status with no other recognized cause • New onset of purulent sputum[3], or change in character of sputum[4], or increased respiratory secretions, or increased suctioning requirements • New onset or worsening cough, or dyspnea, or tachypnea[5] • Rales[6] or bronchial breath sounds • Worsening gas exchange (e.g., O_2 desaturations [e.g., PaO_2/FiO_2 ≤240][7], increased oxygen requirements, or increased ventilator demand) • Hemoptysis • Pleuritic chest pain	At least **one** of the following: • Matching positive blood and sputum cultures with *Candida* spp.[14,15] • Evidence of fungi or *Pneumocystis carinii* from minimally-contaminated LRT specimen (e.g., BAL or protected specimen brushing) from one of the following: – Direct microscopic exam – Positive culture of fungi Any of the following from **LABORATORY CRITERIA DEFINED UNDER PNU2**

Footnotes to Algorithms:

1. Occasionally, in non-ventilated patients, the diagnosis of healthcare-associated pneumonia may be quite clear on the basis of symptoms, signs, and a single definitive chest radiograph. However, in patients with pulmonary or cardiac disease (for example, interstitial lung disease or congestive heart failure), the diagnosis of pneumonia may be particularly difficult. Other non-infectious conditions (for example, pulmonary edema from decompensated congestive heart failure) may simulate the presentation of pneumonia. In these more difficult cases, serial chest radiographs must be examined to help separate infectious from non-infectious pulmonary processes. To help confirm difficult cases, it may be useful to review radiographs on the day of diagnosis, 3 days prior to the diagnosis and on days 2 and 7 after the diagnosis. Pneumonia may have rapid onset and progression, but does not resolve quickly. Radiographic changes of pneumonia persist for several weeks. As a result, rapid radiographic resolution suggests that the patient does not have pneumonia, but rather a non-infectious process such as atelectasis or congestive heart failure.

2. Note that there are many ways of describing the radiographic appearance of pneumonia. Examples include, but are not limited to, "air-space disease", "focal opacification", "patchy areas of increased density". Although perhaps not specifically delineated as pneumonia by the radiologist, in the appropriate clinical setting these alternative descriptive wordings should be seriously considered as potentially positive findings.

3. Purulent sputum is defined as secretions from the lungs, bronchi, or trachea that contain $\geq$25 neutrophils and $\leq$10 squamous epithelial cells per low power field (x100). If your laboratory reports these data qualitatively (e.g., "many WBCs" or "few squames"), be sure their descriptors match this definition of purulent sputum. This laboratory confirmation is required since written clinical descriptions of purulence are highly variable.

4. A single notation of either purulent sputum or change in character of the sputum is not meaningful; repeated notations over a 24-hour period would be more indicative of the onset of an infectious process. Change in character of sputum refers to the color, consistency, odor and quantity.

5. In adults, tachypnea is defined as respiration rate >25 breaths per minute. Tachypnea is defined as >75 breaths per minute in premature infants born at <37 weeks gestation and until the 40th week; >60 breaths per minute in patients <2 months old; >50 breaths per minute in patients 2-12 months old; and >30 breaths per minute in children >1 year old.

6. Rales may be described as "crackles".

7. This measure of arterial oxygenation is defined as the ratio of the arterial tension (PaO_2) to the inspiratory fraction of oxygen (FiO_2).

8. Care must be taken to determine the etiology of pneumonia in a patient with positive blood cultures and radiographic evidence of pneumonia, especially if the patient has invasive devices in place such as intravascular lines or an indwelling urinary catheter. In general, in an immunocompetent patient, blood cultures positive for coagulase-negative staphylococci, common skin contaminants, and yeasts will not be the etiologic agent of the pneumonia.

9. Refer to threshold values for cultured specimens (Table 6). An endotracheal aspirate is not a minimally-contaminated specimen. Therefore, an endotracheal aspirate does not meet the laboratory criteria for PNU2 or PNU3.

10. Once laboratory-confirmed cases of pneumonia due to respiratory syncytial virus (RSV), adenovirus, or influenza virus have been identified in a hospital, a clinician's presumptive diagnosis of these pathogens in subsequent cases with similar clinical signs and symptoms is an acceptable criterion for presence of healthcare-associated infection.

11. Scant or watery sputum is commonly seen in adults with pneumonia due to viruses and *Mycoplasma* although sometimes the sputum may be mucopurulent. In infants, pneumonia due to RSV or influenza yields copious sputum. Patients, except premature infants, with viral or mycoplasmal pneumonia may exhibit few signs or symptoms, even when significant infiltrates are present on radiographic exam.

12. Few bacteria may be seen on stains of respiratory secretions from patients with pneumonia due to *Legionella* spp, mycoplasma, or viruses.

13. Immunocompromised patients include those with neutropenia (absolute neutrophil count <500/mm^3), leukemia, lymphoma, HIV with CD4 count <200, or splenectomy; those who are early post-transplant, are on cytotoxic chemotherapy, or are on high dose steroids (e.g., >40mg of prednisone or its equivalent (>160mg hydrocortisone, >32mg methylprednisolone, >6mg dexamethasone, >200mg cortisone) daily for >2weeks).

14. Blood and sputum specimens must be collected within 48 hours of each other.

15. Semiquantitative or nonquantitative cultures of sputum obtained by deep cough, induction, aspiration, or lavage are acceptable. If quantitative culture results are available, refer to algorithms that include such specific laboratory findings.

Figure 1: Pneumonia Flow Diagram

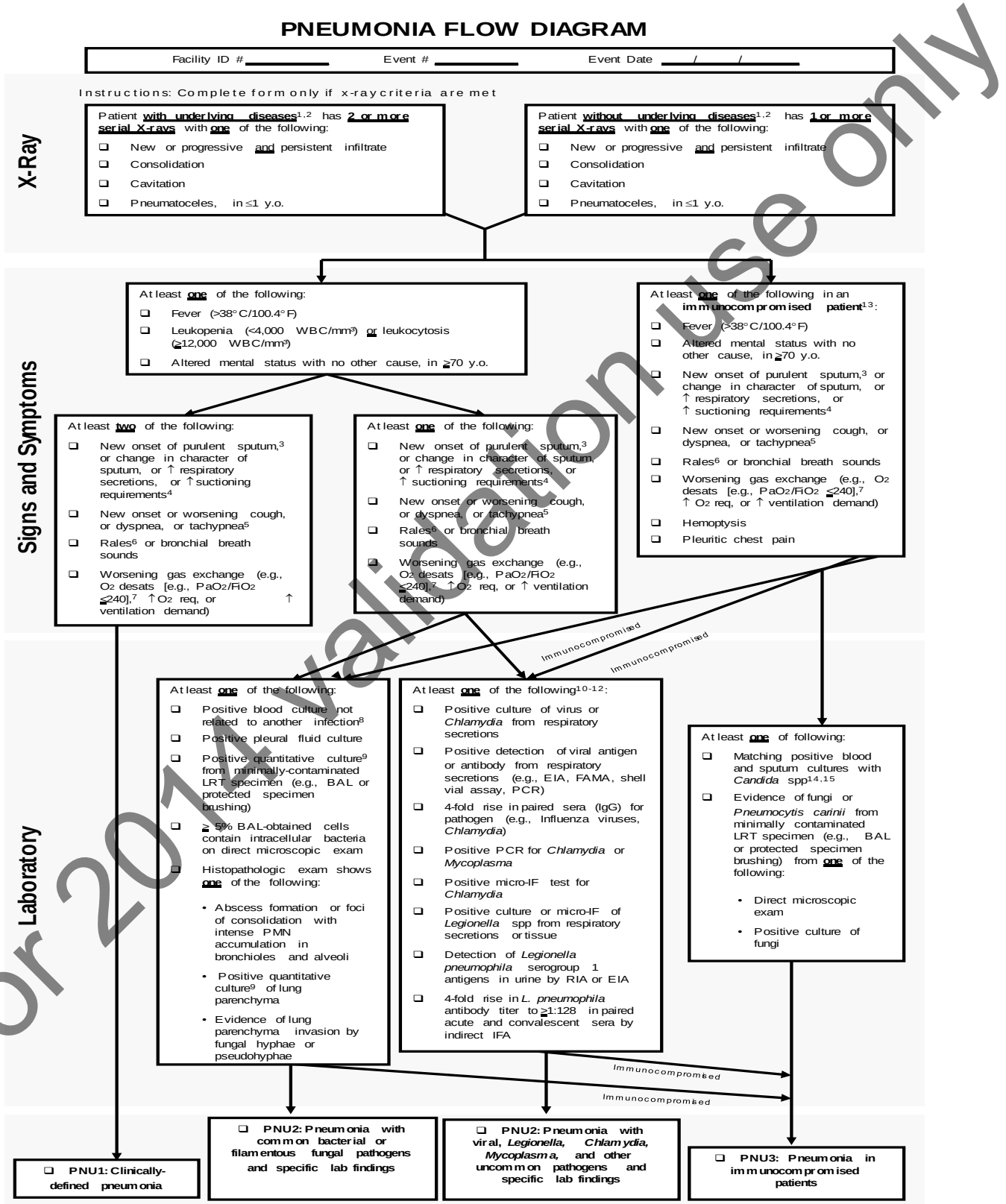

Figure 2: Pneumonia Flow Diagram, Alternative Criteria for Infants and Children

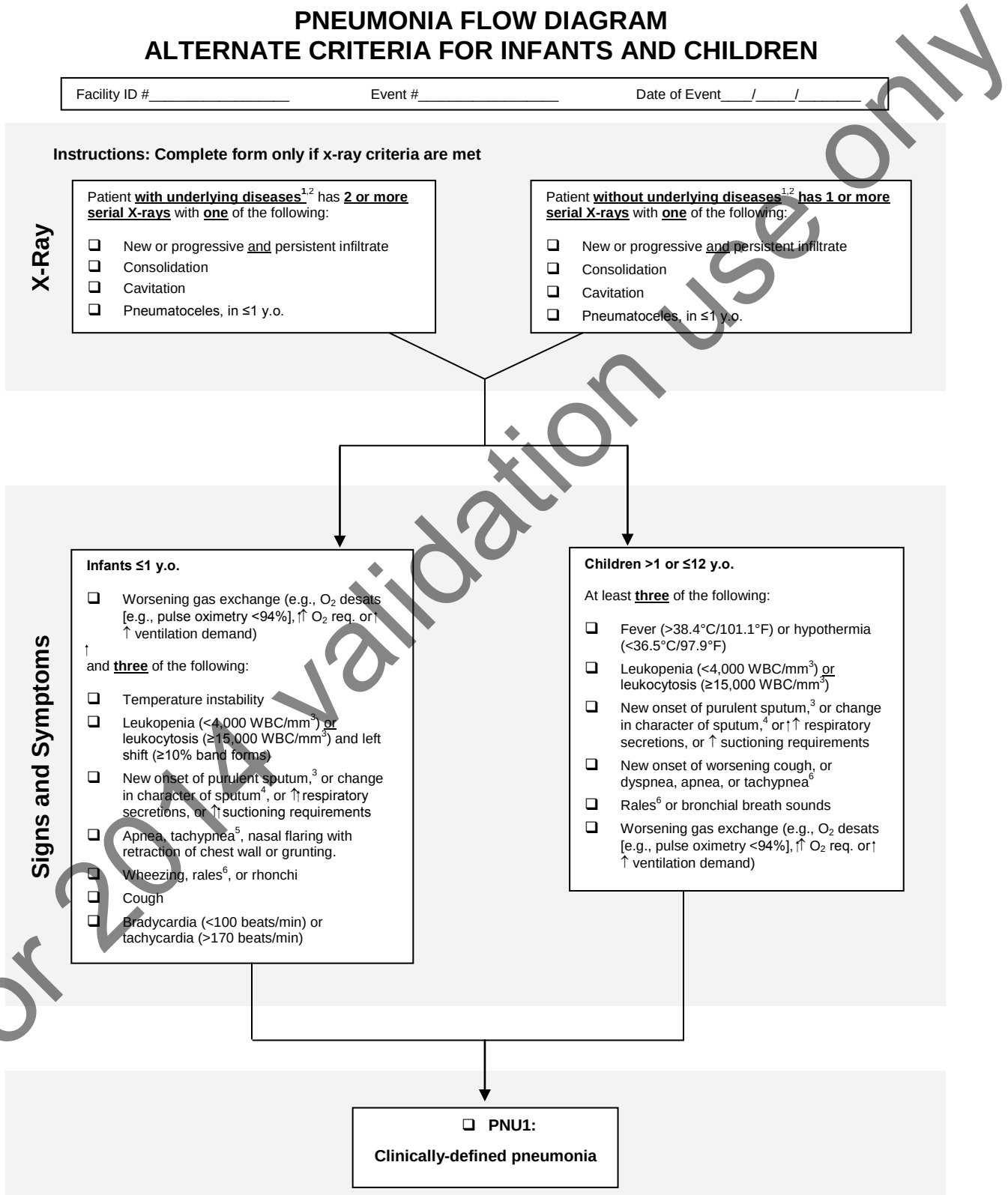

Table 6: Threshold values for cultured specimens used in the diagnosis of pneumonia

Specimen collection/technique	Values
Lung parenchyma*	≥10^4 CFU/g tissue
Bronchoscopically (B) obtained specimens	
Bronchoalveolar lavage (B-BAL)	≥10^4 CFU/ml
Protected BAL (B-PBAL)	≥10^4 CFU/ml
Protected specimen brushing (B-PSB)	≥10^3 CFU/ml
Nonbronchoscopically (NB) obtained (blind) specimens	
NB-BAL	>10^4 CFU/ml
NB-PSB	≥10^3 CFU/ml

CFU = colony forming units
g = gram
ml = milliliter
* Open-lung biopsy specimens and immediate post-mortem specimens obtained by transthoracic or transbronchial biopsy

Numerator Data: The *Pneumonia (PNEU)* form (CDC 57.111) is used to collect and report each VAP that is identified during the month selected for surveillance. The Instructions for Completion of Pneumonia (PNEU) form contains brief instructions for collection and entry of each data element on the form. The pneumonia form includes patient demographic information and information on whether or not mechanically-assisted ventilation was present. Additional data include the specific criteria met for identifying pneumonia, whether the patient developed a secondary bloodstream infection, whether the patient died, the organisms isolated from cultures, and the organisms' antimicrobial susceptibilities.

REPORTING INSTRUCTION:

- If no VAPs are identified during the month of surveillance, the *Report No Events* box must be checked on the appropriate denominator summary screen, e.g., Denominators for Intensive Care Unit (ICU)/Other Locations (Not NICU or SCA/ONC), etc.

Denominator Data: Device days and patient days are used for denominators (see Key Terms chapter). Ventilator days, which are the number of patients managed with a ventilatory device, are collected daily, at the same time each day, according to the chosen location using the appropriate form (CDC 57.116, 57.117, and 57.118). These daily counts are summed and only the total for the month is entered into NHSN. Ventilator days and patient days are collected for each of the locations monitored. When denominator data are available from electronic sources (e.g., ventilator days from respiratory therapy), these sources may be used as long as the counts are not substantially different (+/- 5%) from manually-collected counts, validated for a minimum of 3 months.

Data Analyses: The VAP rate per 1000 ventilator days is calculated by dividing the number of VAPs by the number of ventilator days and multiplying the result by 1000. The Ventilator Utilization Ratio is calculated by dividing the number of ventilator days by the number of patient days. These calculations will be performed separately for the different types of ICUs, SCAs, and other locations in the institution.

The Standardized Infection Ratio (SIR[4]) is another measure of VAP incidence that can be calculated by dividing the number of observed infections by the number of predicted infections. The number of predicted infections can be calculated using VAP rates from a standard population during a baseline time period, which represents a standard population's VAP experience.[5]

NOTE: The SIR should be calculated only if the number of expected HAIs (numExp) is ≥1 in order to enforce a minimum precision criterion

NOTE: The VAP SIR is not available from within the NHSN application, but can be calculated using the methods described above.

While the VAP SIR can be calculated for single locations, the measure also allows you to summarize your data by multiple locations, adjusting for differences in the incidence of infection among the location types. For example, you can calculate one VAP SIR adjusting for all locations reported. Similarly, you can calculate one VAP SIR for all oncology locations in your facility.

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

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[1]Klevens RM, Edward JR, Richards CL, et al. Estimating health care-associated infections and deaths in U.S. hospitals, 2002. Public Health Reports 2007;122:160-166.

[2]Duduck MA, Weiner LM, et al. National Healthcare Safety Network (NHSN) Report, Data Summary for 2012, Device-associated Module.

[3]Centers for Disease Control and Prevention. Guidelines for preventing health-care-associated pneumonia, 2003: recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee. MMWR 2004;53(No. RR-3).

[4]Your guide to the Standardized Infection Ratio (SIR). October 2010. http://www.cdc.gov/nhsn/PDFs/Newsletters/NHSN_NL_OCT_2010SE_final.pdf

[5] Edwards JR, Peterson KD, Mu Y, et al. National Healthcare Safety Network (NHSN) report: Data summary for 2006 through 2008, issued December 2009. Am J Infect Control 2009;37:783-805. Available at: http://www.cdc.gov/nhsn/PDFs/dataStat/2009NHSNReport.PDF.

Catheter-Associated Urinary Tract Infection (CAUTI) Event

Introduction: Urinary tract infections (UTIs) are tied with pneumonia as the second most common type of healthcare-associated infection, second only to SSIs. UTIs account for more than 15% of infections reported by acute care hospitals[1]. Virtually all healthcare-associated UTIs are caused by instrumentation of the urinary tract.

CAUTI can lead to such complications as cystitis, pyelonephritis, gram-negative bacteremia, prostatitis, epididymitis, and orchitis in males and, less commonly, endocarditis, vertebral osteomyelitis, septic arthritis, endophthalmitis, and meningitis in all patients. Complications associated with CAUTI cause discomfort to the patient, prolonged hospital stay, and increased cost and mortality[2]. Each year, more than 13,000 deaths are associated with UTIs.[3]

Prevention of CAUTIs is discussed in the CDC/HICPAC document, *Guideline for Prevention of Catheter-associated Urinary Tract Infection*[4].

Settings: Surveillance will occur in any inpatient locations where denominator data can be collected, which may include critical intensive care units (ICU), specialty care areas (SCA), step down units, and long term care wards. Neonatal ICUs may participate, but only off plan (not as a part of their monthly reporting plan). A complete listing of inpatient locations and instructions for mapping can be found in CDC Locations and Descriptions chapter.

NOTE: It is not required to monitor for CAUTIs after the patient is discharged from the facility. However, if discovered, any CAUTI with the date of event on the day of discharge or the next day should be reported to NHSN; day of discharge is considered Day 1. No additional indwelling catheter days are reported.

Requirements: Surveillance for HAI CAUTI is performed in at least one inpatient location in the healthcare institution for at least one calendar month as indicated in the *Patient Safety Monthly Reporting Plan* (CDC 57.106).

Definitions:

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

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

Urinary tract infections (UTI) are defined using Symptomatic Urinary Tract Infection (SUTI) criteria or Asymptomatic Bacteremic UTI (ABUTI) criteria (Table 1 and Figures 1-5).

Date of event: For a UTI the date of event is the date when the last element used to meet the UTI infection criterion occurred. Synonym: infection date.

Indwelling catheter: A drainage tube that is inserted into the urinary bladder through the urethra, is left in place, and is connected to a drainage bag (including leg bags). These devices are also called Foley catheters. Condom or straight in-and-out catheters are not included nor are nephrostomy tubes or suprapubic catheters unless a Foley catheter is also present. Indwelling urethral catheters that are used for intermittent or continuous irrigation are included in CAUTI surveillance.

Catheter-associated UTI (CAUTI): A UTI where an indwelling urinary catheter was in place for >2 calendar days on the date of event, with day of device placement being Day 1,
and
an indwelling urinary catheter was in place on the date of event or the day before. If an indwelling urinary catheter was in place for > 2 calendar days and then removed, the UTI criteria must be fully met on the day of discontinuation or the next day.

EXAMPLE: A patient has a Foley catheter inserted on an inpatient unit and the following morning the patient meets criteria for a UTI. Because the catheter has not been in place >2 calendar days when all elements of the infection criterion were first present together, this is not a CAUTI.

NOTE:

1. SUTI 1b and 2b and other UTI (OUTI), as defined in the Surveillance Definitions chapter, cannot be catheter-associated.

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

EXCEPTION TO LOCATION OF ATTRIBUTION:

Transfer Rule: If all elements of a CAUTI are present within 2 calendar days of transfer from one inpatient location to another in the same facility or a new facility (i.e., on the day of transfer or the next day), the infection is attributed to the transferring location or facility. 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:

- Patient with a Foley catheter in place in the SICU is transferred to the surgical ward. On the next day, UTI criteria are met. This is reported to NHSN as a CAUTI for the SICU.
- Patient is transferred in the morning to the medical ward from the MSICU after having the Foley catheter removed. Later that night, UTI criteria are met. This is reported to NHSN as a CAUTI for the MSICU.
- On Monday, patient with a Foley catheter in place is transferred from the medical ward to the coronary care ICU (CCU). Wednesday in the CCU, UTI criteria are met. This is reported to NHSN as a CAUTI for the CCU, as the UTI event date is on the 3rd calendar day after transfer.
- Patient on the urology ward of Hospital A had the Foley catheter removed after it had been in place for 5 days 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 with a UTI. This CAUTI should be reported to NHSN for Hospital A and attributed to the urology ward.

- **NOTE:** Example of multiple transfers within the transfer rule time-frame:

3.22	3/23	3/24
Patient in Unit A	Patient transferred from Unit A to Unit B. Later that day, patient transferred from Unit B to Unit C. (day of transfer)	Patient transferred from Unit C to Unit D. Last element for CAUTI criteria met. CAUTI attributed to Unit A since Unit A was the original unit initiating the transfer in the 2 day time-frame. (day after transfer)

Table 1. ***Urinary Tract Infection Criteria***

Criterion	Urinary Tract Infection (UTI)
	Symptomatic UTI (SUTI) Must meet at least 1 of the following criteria:
1a	Patient had an indwelling urinary catheter in place for >2 calendar days, with day of device placement being Day 1, and catheter was in place on the date of event *and* at least 1 of the following signs or symptoms: fever (>38°C); suprapubic tenderness*****; costovertebral angle pain or tenderness***** *and* a positive urine culture of $\geq 10^5$ colony-forming units (CFU)/ml and with no more than 2 species of microorganisms. Elements of the criterion must occur within a timeframe that does not exceed a gap of 1 calendar day between two adjacent elements. ----------OR---------- Patient had an indwelling urinary catheter in place for >2 calendar days and had it removed the day of or the day before the date of event *and* at least 1 of the following signs or symptoms: fever (>38°C); urgency*****; frequency*****; dysuria*****; suprapubic tenderness*****; costovertebral angle pain or tenderness***** *and* a positive urine culture of $\geq 10^5$ colony-forming units (CFU)/ml and with no more than 2 species of microorganisms. Elements of the criterion must occur within a timeframe that does not exceed a gap of 1 calendar day between two adjacent elements. *****With no other recognized cause
1b	Patient did not have an indwelling urinary catheter that had been in place for >2 calendar days and in place at the time of or the day before the date of event *and* has at least 1 of the following signs or symptoms: fever (>38°C) in a patient that is ≤65 years of age; urgency*****; frequency*****; dysuria*****; suprapubic tenderness*****; costovertebral angle pain or tenderness***** *and* a positive urine culture of $\geq 10^5$ CFU/ml and with no more than 2 species of microorganisms. Elements of the criterion must occur within a timeframe that does not exceed a gap of 1 calendar day between two adjacent elements. *****With no other recognized cause

Criterion	Urinary Tract Infection (UTI)
2a	Patient had an indwelling urinary catheter in place for >2 calendar days, with day of device placement being Day 1, and catheter was in place on the date of event. *and* at least 1 of the following signs or symptoms: fever (>38°C); suprapubic tenderness*****; costovertebral angle pain or tenderness***** *and* at least 1 of the following findings: a. positive dipstick for leukocyte esterase and/or nitrite b. pyuria (urine specimen with ≥10 white blood cells [WBC]/mm^3 of unspun urine or >5 WBC/high power field of spun urine) c. microorganisms seen on Gram's stain of unspun urine *and* a positive urine culture of ≥10^3 and <10^5 CFU/ml and with no more than 2 species of microorganisms. Elements of the criterion must occur within a timeframe that does not exceed a gap of 1 calendar day between two adjacent elements. ----------OR---------- Patient with an indwelling urinary catheter in place for > 2 calendar days and had it removed the day of or the day before the date of event *and* at least 1 of the following signs or symptoms: fever (>38°C); urgency*****; frequency*****; dysuria*****; suprapubic tenderness*****; costovertebral angle pain or tenderness***** *and* at least 1 of the following findings: a. positive dipstick for leukocyte esterase and/or nitrite b. pyuria (urine specimen with ≥10 WBC/mm^3 of unspun urine or >5 WBC/high power field of spun urine c. microorganisms seen on Gram's stain of unspun urine *and* a positive urine culture of ≥10^3 and <10^5 CFU/ml and with no more than 2 species of microorganisms. Elements of the criterion must occur within a timeframe that does not exceed a gap of 1 calendar day between two adjacent elements. *****With no other recognized cause

Criterion	Urinary Tract Infection (UTI)
2b	Patient did <u>not</u> have an indwelling urinary catheter that had been in place for >2 calendar days and in place at the time of, or the day before the date of event *and* has at least 1 of the following signs or symptoms: fever (>38°C) in a patient that is ≤65 years of age; urgency*****; frequency*****; dysuria*****; suprapubic tenderness*****; costovertebral angle pain or tenderness* *and* at least 1 of the following findings: a. positive dipstick for leukocyte esterase and/or nitrite b. pyuria (urine specimen with ≥10 WBC/mm^3 of unspun urine or >5 WBC/high power field of spun urine c. microorganisms seen on Gram's stain of unspun urine *and* a positive urine culture of ≥10^3 and <10^5 CFU/ml and with no more than 2 species of microorganisms. Elements of the criterion must occur within a timeframe that does not exceed a gap of 1 calendar day between two adjacent elements. *****With no other recognized cause
3	Patient ≤1 year of age with****** or without an indwelling urinary catheter has at least 1 of the following signs or symptoms: fever (>38°C core); hypothermia (<36°C core); apnea*****; bradycardia*****; dysuria*****; lethargy*****; vomiting* *and* a positive urine culture of ≥10^5 CFU/ml and with no more than 2 species of microorganisms. Elements of the criterion must occur within a timeframe that does not exceed a gap of 1 calendar day between two adjacent elements. *****With no other recognized cause ****** Patient had an indwelling urinary catheter in place for >2 calendar days, with day of device placement being Day 1 and catheter was in place on the date of event.
4	Patient ≤1 year of age with****** or without an indwelling urinary catheter has at least 1 of the following signs or symptoms: fever (>38°C core); hypothermia (<36°C core); apnea*****; bradycardia*****; dysuria*****; lethargy*****; vomiting***** *and* at least 1 of the following findings: a. positive dipstick for leukocyte esterase and/or nitrite b. pyuria (urine specimen with ≥10 WBC/mm^3 of unspun urine or >5 WBC/high power field of spun urine c. microorganisms seen on Gram's stain of unspun urine *and* a positive urine culture of between ≥10^3 and <10^5 CFU/ml and with no more than two species of microorganisms. Elements of the criterion must occur within a timeframe that does not exceed a gap of 1 calendar day between two adjacent

Criterion	Urinary Tract Infection (UTI)
	elements. *****With no other recognized cause ****** Patient had an indwelling urinary catheter in place for >2 calendar days, with day of device placement being Day 1 and catheter was in place on the date of event.

Criterion	Asymptomatic Bacteremic Urinary Tract Infection (ABUTI)
	Patient with***** or without an indwelling urinary catheter has no signs or symptoms (i.e., for any age patient, no fever (>38°C); urgency; frequency; dysuria; suprapubic tenderness; costovertebral angle pain or tenderness OR for a patient ≤1 year of age; no fever (>38°C core); hypothermia (<36°C core); apnea; bradycardia; dysuria; lethargy; or vomiting) *and* a positive urine culture of $\geq 10^5$ CFU/ml and with no more than 2 species of uropathogen microorganisms****** (see Comments section below) *and* a positive blood culture with at least 1 matching uropathogen microorganism to the urine culture, or at least 2 matching blood cultures drawn on separate occasions if the matching pathogen is a common skin commensal. Elements of the criterion must occur within a timeframe that does not exceed a gap of 1 calendar day between two adjacent elements. *****Patient had an indwelling urinary catheter in place for >2 calendar days, with day of device placement being Day 1, and catheter was in place on the date of event. ******Uropathogen microorganisms are: Gram-negative bacilli, *Staphylococcus spp.*, yeasts, beta-hemolytic *Streptococcus spp.*, *Enterococcus spp.*, *G. vaginalis*, *Aerococcus urinae*, and *Corynebacterium* (urease positive)$^{+}$. $^{+}$Report *Corynebacterium* (urease positive) as either *Corynebacterium species unspecified (COS*) or as *C. urealyticum* (CORUR) if so speciated. (See complete list of uropathogen microorganisms at http://www.cdc.gov/nhsn/XLS/master-organism-Com-Commensals-Lists.xlsx#uropathogens)
Comments	• Laboratory cultures reported as "mixed flora" represent at least 2 species of organisms. Therefore an additional organism recovered from the same culture, would represent >2 species of microorganisms. Such a specimen cannot be used to meet the UTI criteria. • Urinary catheter tips should not be cultured and are not acceptable for the diagnosis of a urinary tract infection. • Urine cultures must be obtained using appropriate technique, such as clean catch collection or catheterization. Specimens from indwelling catheters

	should be aspirated through the disinfected sampling ports. • In infants, urine cultures should be obtained by bladder catheterization or suprapubic aspiration; positive urine cultures from bag specimens are unreliable and should be confirmed by specimens aseptically obtained by catheterization or suprapubic aspiration. • Urine specimens for culture should be processed as soon as possible, preferably within 1 to 2 hours. If urine specimens cannot be processed within 30 minutes of collection, they should be refrigerated, or inoculated into primary isolation medium before transport, or transported in an appropriate urine preservative. Refrigerated specimens should be cultured within 24 hours. • Urine specimen labels should indicate whether or not the patient is symptomatic. • Report only pathogens in both blood and urine specimens for ABUTI. • Report *Corynebacterium* (urease positive) as either *Corynebacterium species* unspecified (COS) or as *C. urealyticum* (CORUR) if speciated.

Figure 1: Identification and Categorization of SUTI with Indwelling Catheter (see comments section page 7-7 thru 7-8 for important details)

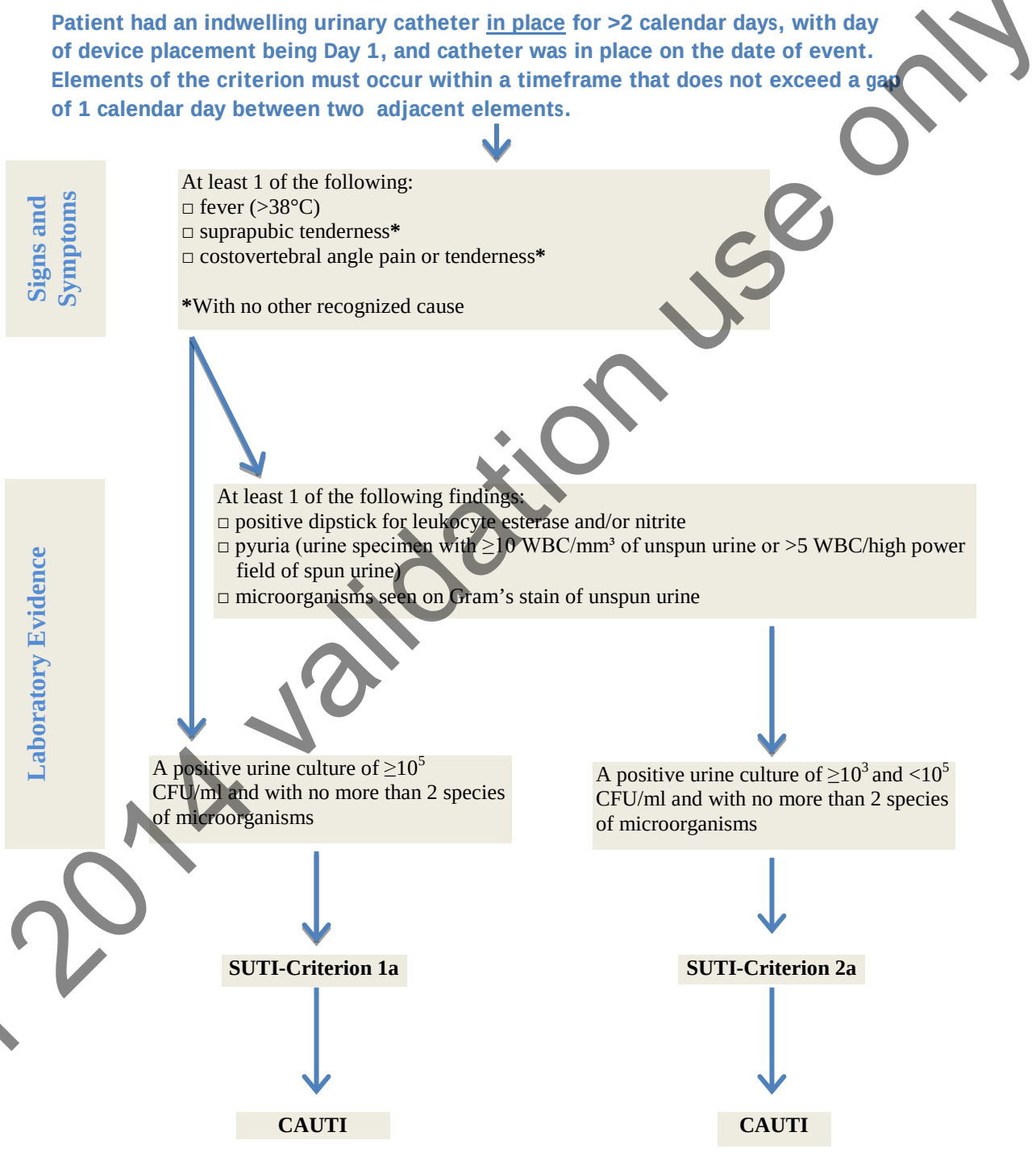


Figure 2: Identification and Categorization of SUTI When Indwelling Catheter has been removed (see comments section page 7-7 thru 7-8 for important details)

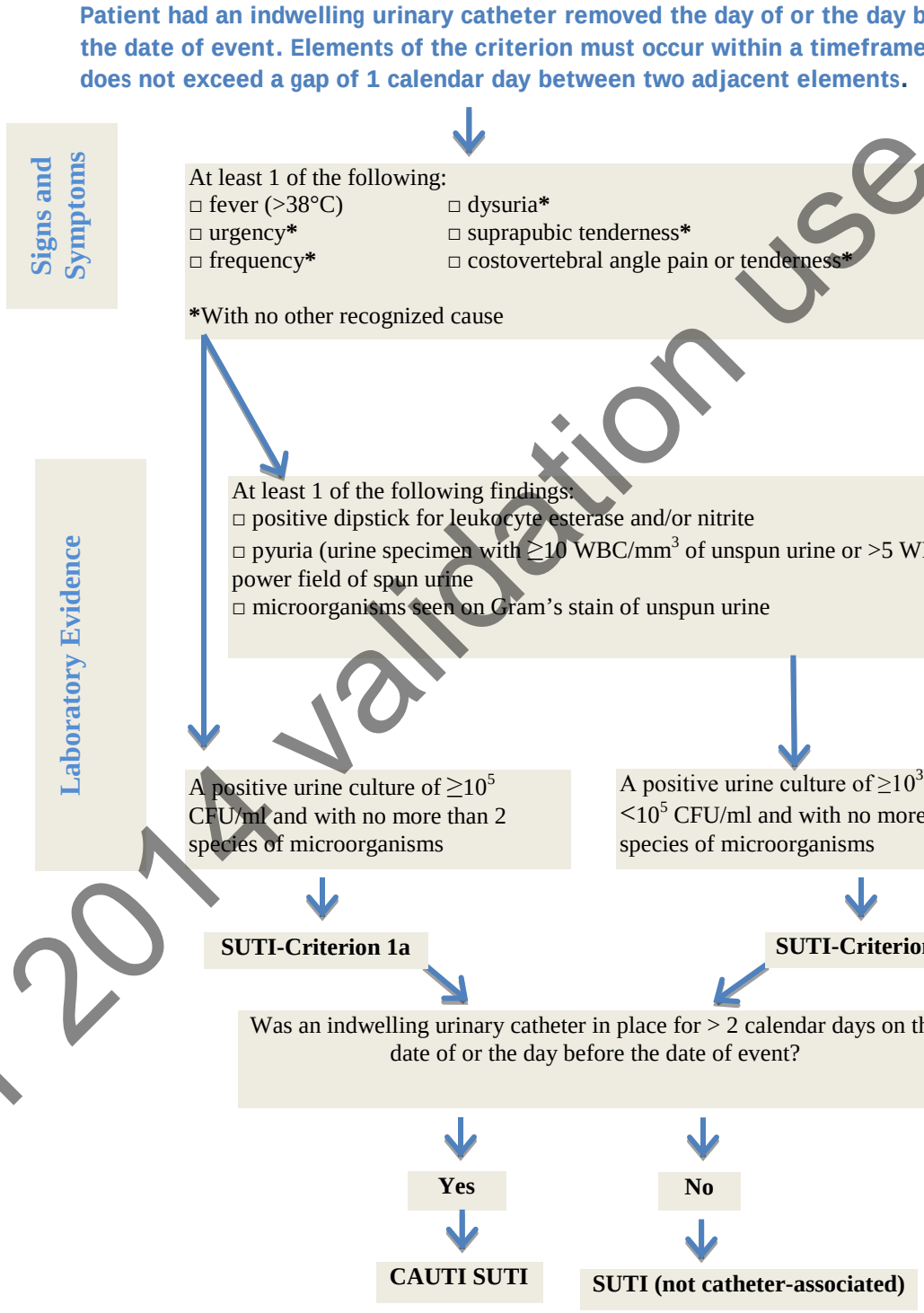


Figure 3: Identification and Categorization of SUTI without Indwelling Catheter (see comments section page 7-7 thru 7-8 for important details)

Patient did not have an indwelling urinary catheter that had been in place for >2 calendar days and in place at the time of or the day before the date of event. Elements of the criterion must occur within a timeframe that does not exceed a gap of 1 calendar day between two adjacent elements.

Signs and Symptoms

At least 1 of the following:
□ fever (>38°C) **in a patient that is ≤65 years of age**
□ urgency*
□ frequency*
□ dysuria*
□ suprapubic tenderness*
□ costovertebral angle pain or tenderness*

*With no other recognized cause

Laboratory Evidence

At least 1 of the following findings:
□ positive dipstick for leukocyte esterase and/or nitrite
□ pyuria (urine specimen with ≥10 WBC/mm^3 of unspun urine or >5 WBC/high power field of spun urine)
□ microorganisms seen on Gram's stain of unspun urine

A positive urine culture of ≥10^5 CFU/ml and with no more than 2 species of microorganisms

SUTI- Criterion 1b

A positive urine culture of ≥10^3 and <10^5 CFU/ml and with no more than 2 species of microorganisms

SUTI- Criterion 2b

Figure 4: Identification and Categorization of SUTI in Patient ≤1 Year of Age (see comments section page 7-7 thru 7-8 for important details)

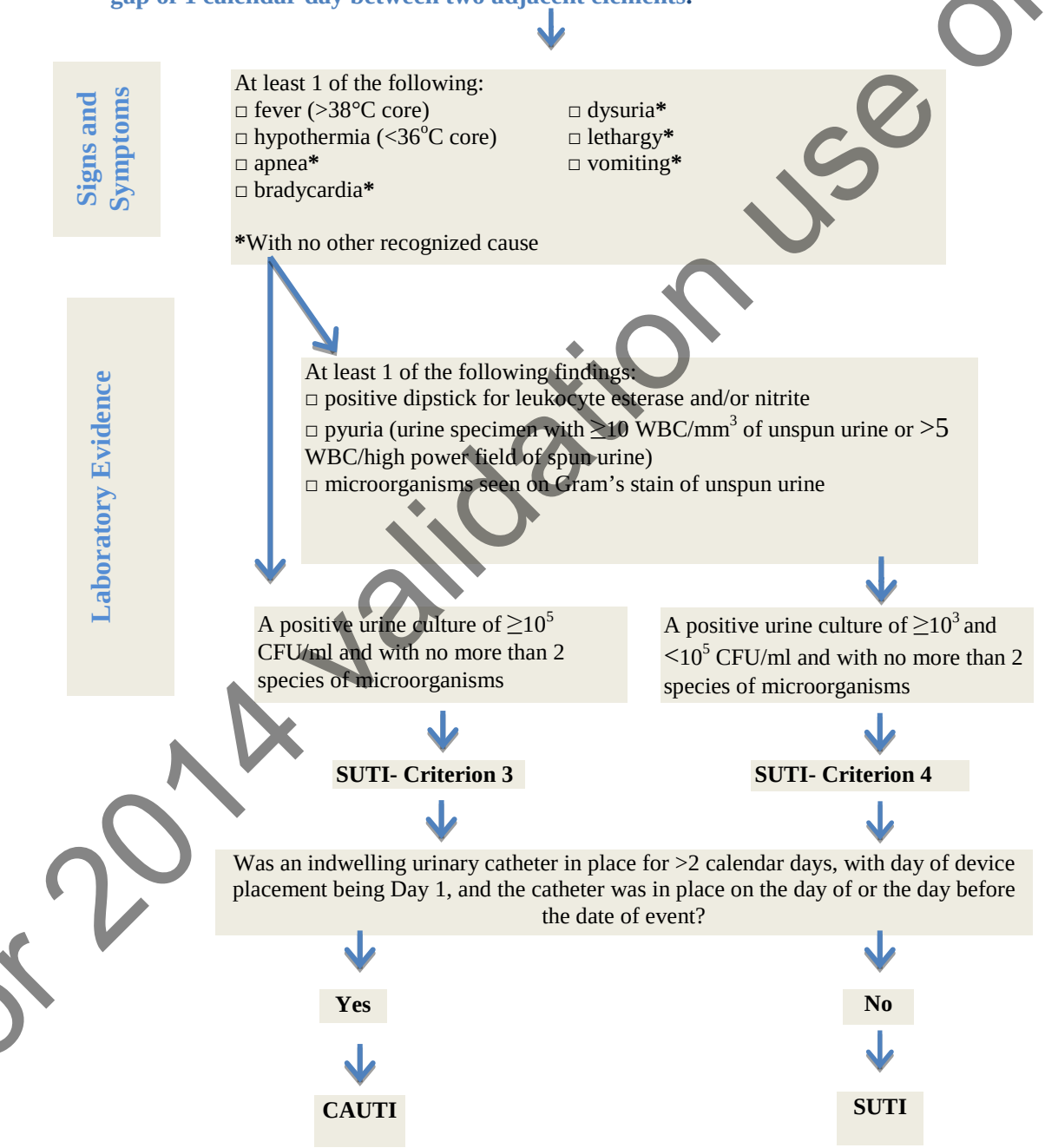
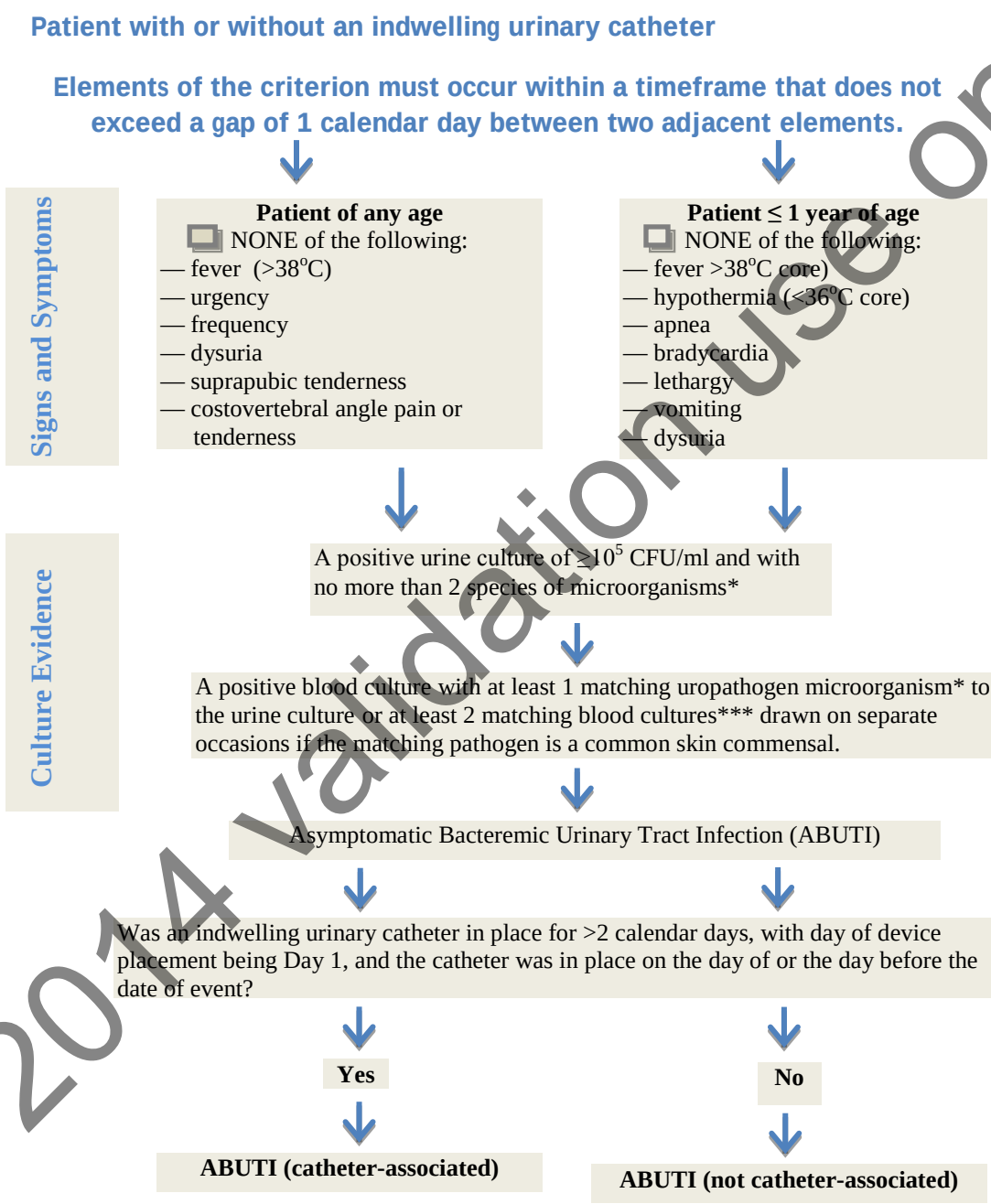


Figure 5: Identification of Asymptomatic Bacteremic Urinary Tract Infection (ABUTI)
(see comments section page 7-7 thru 7-8 for important details)



*(See complete list of uropathogen microorganisms at http://www.cdc.gov/nhsn/XLS/master-organism-Com-Commensals-Lists.xlsx#uropathogen)
Uropathogen microorganisms are: Gram-negative bacilli, *Staphylococcus* spp., yeasts, beta-hemolytic *Streptococcus* spp., *Enterococcus* spp., *G. vaginalis*, *Aerococcus urinae*, *Corynebacterium* (urease positive)†.

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.

†Report *Corynebacterium* (urease positive) as either *Corynebacterium species unspecified* (COS) or as C. *urealyticum (CORUR) if speciated*.

Numerator Data: The *Urinary Tract Infection (UTI)* form is used to collect and report each CAUTI that is identified during the month selected for surveillance. The Instructions for Completion of Urinary Tract Infection form include brief instructions for collection and entry of each data element on the form. The UTI form includes patient demographic information and information on whether or not an indwelling urinary catheter was present. Additional data include the specific criteria met for identifying the UTI, whether the patient developed a secondary bloodstream infection, whether the patient died, and the organisms isolated from cultures and their antimicrobial susceptibilities.

REPORTING INSTRUCTIONS:

- If no CAUTIs are identified during the month of surveillance, the Report No Events box must be checked on the appropriate denominator summary screen, e.g., *Denominators for Intensive Care Unit (ICU)/Other Locations (Not NICU or SCA/ONC)*.

Denominator Data: Device days and patient days are used for denominators (See Key Terms chapter). Indwelling urinary catheter days, which are the number of patients with an indwelling urinary catheter device, are collected daily, at the same time each day, according to the chosen location using the appropriate form (CDC 57.117 and 57.118). These daily counts are summed and only the total for the month is entered into NHSN. Indwelling urinary catheter days and patient days are collected separately for each of the locations monitored. When denominator data are available from electronic databases, these sources may be used as long as the counts are not substantially different (+/- 5%) from manually collected counts, pre-validated for a minimum of 3 months.

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 CAUTI rates from a standard population during a baseline time period, which represents a standard population's CAUTI experience.[5]

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

NOTE: In the NHSN application, "predicted" is referred to as "expected".

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

While the CAUTI SIR can be calculated for single locations, the measure also allows you to summarize your data by multiple locations, adjusting for differences in the incidence of infection among the location types. For example, you will be able to obtain one

CAUTI SIR adjusting for all locations reported. Similarly, you can obtain one CAUTI SIR for all specialty care areas in your facility.

NOTE: Only those locations for which baseline data have been published will be included in the SIR calculations.

The CAUTI rate per 1000 urinary catheter days is calculated by dividing the number of CAUTIs by the number of catheter days and multiplying the result by 1000. The Urinary Catheter Utilization Ratio is calculated by dividing the number of urinary catheter days by the number of patient days. These calculations will be performed separately for the different types of ICUs, specialty care areas, and other locations in the institution, except for neonatal locations.

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

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[1]Magill SS, Hellinger W, et al. Prevalence of healthcare-associated infections in acute care facilities. Infect Control Hosp Epidemiol. 2012;33:283-91.

[2]Scott Rd. The Direct Medical Costs of Healthcare-Associated Infections in U.S. Hospitals and the Benefits of Prevention, 2009. Division of Healthcare Quality Promotion, National Center for Preparedness, Detection, and Control of Infectious Diseases, Coordinating Center for Infectious Diseases, Centers for Disease Control and Prevention, February 2009.

[3]Klevens RM, Edward JR, et al. Estimating health care-associated infections and deaths in U.S. hospitals, 2002. Public Health Reports 2007;122:160-166.

[4]Gould CV, Umscheid CA, Agarwal RK, Kuntz G, Pegues DA. Guideline for prevention of catheter-associated urinary tract infections 2009. Infect Control Hosp Epidemiol. 2010;31:319-26.

[5]Duduck MA, Weiner LM, et al. National Healthcare Safety Network (NHSN) Report, Data Summary for 2012, Device-associated Module.

Surgical Site Infection (SSI) Event

Introduction: In 2010, an estimated 16 million operative procedures were performed in acute care hospitals in the United States [1]. A recent prevalence study found that SSIs were the most common healthcare-associated infection, accounting for 31% of all HAIs among hospitalized patients [2]. NHSN data for 2006-2008 (16,147 SSIs following 849,659 operative procedures) showed an overall SSI rate of 1.9% [3].

While advances have been made in infection control practices, including improved operating room ventilation, sterilization methods, barriers, surgical technique, and availability of antimicrobial prophylaxis, SSIs remain a substantial cause of morbidity, prolonged hospitalization, and death. SSI is associated with a mortality rate of 3%,and 75% of SSI-associated deaths are directly attributable to the SSI [4].

Surveillance of SSI with feedback of appropriate data to surgeons has been shown to be an important component of strategies to reduce SSI risk [5-8]. A successful surveillance program includes the use of epidemiologically-sound infection definitions and effective surveillance methods, stratification of SSI rates according to risk factors associated with SSI development, and data feedback [6, 7]. A new CDC and Healthcare Infection Control Practices Advisory Committee guideline for the prevention of surgical site infection is scheduled for publication in 2014, and will replace the previous *Guideline for Prevention of Surgical Site Infection, 1999* [8].

Settings: Surveillance of surgical patients will occur in any inpatient and/or outpatient setting where the selected NHSN operative procedure(s) are performed.

Requirements: Perform surveillance for SSI following at least one NHSN operative procedure category (Table 1) as indicated in the *Patient Safety Monthly Reporting Plan* (CDC 57.106). Collect SSI (numerator) and operative procedure category (denominator) data on all procedures included in the selected procedure categories for at least one month to meet NHSN requirements, or as otherwise specified by state or federal reporting requirements. A procedure must meet the NHSN definition of an operative procedure in order to be included in the surveillance.

SSI monitoring requires active, patient-based, prospective surveillance. Post-discharge and ante-discharge surveillance methods should be used to detect SSIs following inpatient and outpatient operative procedures. These methods include 1) direct examination of patients' wounds during follow-up visits to either surgery clinics or physicians' offices, 2) review of medical records or surgery clinic patient records, 3) surgeon surveys by mail or telephone, and 4) patient surveys by mail or telephone (though patients may have a difficult time assessing their infections). Any combination of these methods is acceptable for use; however, CDC criteria for SSI must be used. To minimize Infection Preventionists' (IPs) workload of collecting denominator data, operating room data may be downloaded (see file specifications at: http://www.cdc.gov/nhsn/PDFs/ImportingProcedureData_current.pdf).

An SSI will be associated with a particular NHSN operative procedure and the facility in which that procedure was performed. Refer to the NHSN application's Help system for instruction on linking an SSI to an operative procedure.

The *International Classification of Diseases, 9th Revision Clinical Modifications* (ICD-9-CM) codes, which are defined by the ICD-9 Coordination and Maintenance Committee of the National Center for Health Statistics and the Centers for Medicare and Medicaid Services (CMS), are developed as a tool for classification of morbidity data. The wide use enables the grouping of surgery types for the purpose of determining SSI rates. ICD-9-CM codes are updated annually in October and NHSN operative procedure categories are subsequently updated and changes shared with NHSN users. Table 1 lists NHSN operative procedure category groupings by ICD-9-CM codes. Because ambulatory surgery centers and hospital outpatient surgery departments may not use ICD-9-CM procedure codes, Table 1 provides Current Procedural Terminology (CPT) code mapping for certain NHSN operative procedure categories to assist users in determining the correct NHSN code to report for outpatient surgery cases. However, when available, ICD-9-CM codes take precedence over CPTcodes when determining the appropriate NHSN operative procedure category for inpatient surgery cases. Table 1 also includes a general description of the types of operations contained in the NHSN operative procedure categories. NHSN will provide updates as needed regarding the planned transition from ICD-9-CM to ICD-10 procedure terminology by late 2014.

Definition of an NHSN operative procedure:

An NHSN operative procedure is a procedure

- that is included in Table 1
  and
- takes place during an operation where at least one incision (including laporoscopic approach) is made through the skin or mucous membrane, or reoperation via an incision that was left open during a prior operative procedure
  and
- takes place in an operating room [OR], defined as a patient care area that met the Facilities Guidelines Institute's (FGI) or American Institute of Architects' (AIA) criteria for an operating room when it was constructed or renovated [9]. This may include an operating room, C-section room, interventional radiology room, or a cardiac catheterization lab.

Exclusions: Otherwise eligible procedures that are assigned an ASA score of 6 are not eligible for NHSN SSI surveillance

NOTE: As of 2014, incisional closure is NO LONGER a part of the NHSN operative procedure definition; all otherwise eligible procedures are included, regardless of closure type.

Table 1. ***NHSN Operative Procedure Category Mappings to ICD-9-CM Codes and CPT Codes*** **(**NHSN will provide updates as needed concerning the transition from ICD-9-CM to ICD-10 procedure coding)

When available, ICD-9-CM codes take precedence over CPT codes when determining the appropriate NHSN operative procedure category for inpatient surgery cases.

Legacy Code	Operative Procedure	Description	ICD-9-CM Codes / CPT Codes
AAA	Abdominal aortic aneurysm repair	Resection of abdominal aorta with anastomosis or replacement	38.34, 38.44, 38.64
AMP	Limb amputation	Total or partial amputation or disarticulation of the upper or lower limbs, including digits	84.00-84.19, 84.91
APPY	Appendix surgery	Operation of appendix (not incidental to another procedure)	47.01, 47.09, 47.2, 47.91, 47.92, 47.99
AVSD	Shunt for dialysis	Arteriovenostomy for renal dialysis	39.27, 39.42
BILI	Bile duct, liver or pancreatic surgery	Excision of bile ducts or operative procedures on the biliary tract, liver or pancreas (does not include operations only on gallbladder)	50.0, 50.12, 50.14, 50.21-50.23, 50.25, 50.26, 50.29, 50.3, 50.4, 50.61, 50.69, 51.31-51.37, 51.39, 51.41-51.43, 51.49, 51.51, 51.59, 51.61-51.63, 51.69, 51.71, 51.72, 51.79, 51.81-51.83, 51.89, 51.91-51.95, 51.99, 52.09, 52.12, 52.22, 52.3**,** 52.4, 52.51-52.53, 52.59-52.6, 52.7, 52.92, 52.95, 52.96, 52.99
BRST	Breast surgery	Excision of lesion or tissue of breast including radical, modified, or quadrant resection, lumpectomy, incisional biopsy, or mammoplasty	85.12, 85.20-85.23, 85.31-85.36, 85.41-85.48, 85.50, 85.53-85.55, 85.6, 85.70-85.76, 85.79, 85.93-85.96 19101, 19112, 19120, 19125, 19126, 19300, 19301, 19302, 19303, 19304, 19305, 19306, 19307, 19316, 19318, 19324, 19325, 19328, 19330, 19340, 19342, 19350, 19355, 19357, 19361, 19364, 19366, 19367, 19368, 19369, 19370, 19371, 19380

Legacy Code	Operative Procedure	Description	ICD-9-CM Codes / CPT Codes
CARD	Cardiac surgery	Procedures on the heart; includes valves or septum; does not include coronary artery bypass graft, surgery on vessels, heart transplantation, or pacemaker implantation	35.00-35.04, 35.06, 35.08, 35.10-35.14, 35.20-35.28, 35.31-35.35, 35.39, 35.42, 35.50, 35.51, 35.53, 35.54, 35.60-35.63, 35.70-35.73, 35.81-35.84, 35.91-35.95, 35.98-35.99, 37.10-37.12, 37.31-37.33, 37.35-37.37, 37.41, 37.49, 37.60
CEA	Carotid endarterectomy	Endarterectomy on vessels of head and neck (includes carotid artery and jugular vein)	38.12
CBGB	Coronary artery bypass graft with **both** chest and donor site incisions	Chest procedure to perform direct revascularization of the heart; includes obtaining suitable vein from donor site for grafting	36.10-36.14, 36.19
CBGC	Coronary artery bypass graft with chest incision only	Chest procedure to perform direct vascularization of the heart using, for example the internal mammary (thoracic) artery	36.15-36.17, 36.2
CHOL	Gallbladder surgery	Cholecystectomy and cholecystotomy	51.03, 51.04, 51.13, 51.21-51.24 47480, 47562, 47563, 47564, 47600, 47605, 47610, 47612, 47620
COLO	Colon surgery	Incision, resection, or anastomosis of the large intestine; includes large-to-small and small-to-large bowel anastomosis; does not include rectal operations	17.31-17.36, 17.39, 45.03, 45.26, 45.41, 45.49, 45.52, 45.71-45.76, 45.79, 45.81-45.83, 45.92-45.95, 46.03, 46.04, 46.10, 46.11, 46.13, 46.14, 46.43, 46.52, 46.75, 46.76, 46.94 44140, 44141, 44143, 44144, 44145, 44146, 44147, 44150, 44151, 44160, 44204, 44205, 44206, 44207, 44208, 44210
CRAN	Craniotomy	Excision repair, or exploration of the brain or meninges; does not include taps or punctures	01.12, 01.14, 01.20-01.25, 01.28, 01.29, 01.31, 01.32, 01.39, 01.41, 01.42, 01.51-01.53, 01.59, 02.11-02.14, 02.91-02.93, 07.51-07.54, 07.59, 07.61-07.65, 07.68, 07.69, 07.71, 07.72, 07.79, 38.01, 38.11, 38.31, 38.41, 38.51, 38.61, 38.81, 39.28

Legacy Code	Operative Procedure	Description	ICD-9-CM Codes / CPT Codes
CSEC	Cesarean section	Obstetrical delivery by Cesarean section	74.0, 74.1, 74.2, 74.4, 74.91, 74.99
FUSN	Spinal fusion	Immobilization of spinal column	81.00-81.08
FX	Open reduction of fracture	Open reduction of fracture or dislocation of long bones with or without internal or external fixation; does not include placement of joint prosthesis	79.21, 79.22, 79.25, 79.26, 79.31, 79.32, 79.35, 79.36, 79.51, 79.52, 79.55, 79.56 23615, 23616, 23630, 23670, 23680, 24515, 24516, 24538, 24545, 24546, 24575, 24579, 24586, 24587, 24635, 24665, 24666, 24685, 25337, 25515, 25525, 25526, 25545, 25574, 25575, 25607, 25608, 25609, 25652, 27236, 27244, 27245, 27248, 27254, 27269, 27283, 27506, 27507, 27511, 27513, 27514, 27535, 27536, 27540, 27758, 27759, 27766, 27769, 27784, 27792, 27814, 27822, 27826, 27827, 27828
GAST	Gastric surgery	Incision or excision of stomach; includes subtotal or total gastrectomy; does not include vagotomy and fundoplication	43.0, 43.42, 43.49, 43.5, 43.6, 43.7, 43.81, 43.82, 43.89, 43.91, 43.99, 44.15, 44.21, 44.29, 44.31, 44.38-44.42, 44.49, 44.5, 44.61-44.65, 44.68-44.69, 44.95-44.98
HER	Herniorrhaphy	Repair of inguinal, femoral, umbilical, or anterior abdominal wall hernia; does not include repair of diaphragmatic or hiatal hernia or hernias at other body sites	17.11-17.13, 17.21-17.24, 53.00-53.05, 53.10-53.17, 53.21, 53.29, 53.31, 53.39, 53.41-53.43, 53.49, 53.51, 53.59, 53.61-53.63, 53.69 49491, 49492, 49495, 49496, 49500, 49501, 49505, 49507, 49520, 49521, 49525, 49550, 49553, 49555, 49557, 49560, 49561, 49565, 49566, 49568, 49570, 49572, 49580, 49582, 49585, 49587, 49590, 49650, 49651, 49652, 49653, 49654, 49655, 49656, 49657, 49659, 55540
HPRO	Hip prosthesis	Arthroplasty of hip	00.70-00.73, 00.85-00.87, 81.51-81.53 27125, 27130, 27132, 27134, 27137, 27138, 27236, 27299

Legacy Code	Operative Procedure	Description	ICD-9-CM Codes / CPT Codes
HTP	Heart transplant	Transplantation of heart	37.51-37.55
HYST	Abdominal hysterectomy	Abdominal hysterectomy; includes that by laparoscope	68.31, 68.39, 68.41, 68.49, 68.61, 68.69 58150, 58152, 58180, 58200, 58210, 58541, 58542, 58543, 58544, 58548, 58570, 58571, 58572, 58573, 58951, 58953, 58954, 58956
KPRO	Knee prosthesis	Arthroplasty of knee	00.80-00.84, 81.54, 81.55 27438, 27440, 27441, 27442, 27443, 27445, 27446, 27447, 27486, 27487
KTP	Kidney transplant	Transplantation of kidney	55.61, 55.69
LAM	Laminectomy	Exploration or decompression of spinal cord through excision or incision into vertebral structures	03.01, 03.02, 03.09, 80.50, 80.51, 80.53, 80.54, 80.59, 84.60-84.69, 84.80-84.85
LTP	Liver transplant	Transplantation of liver	50.51, 50.59
NECK	Neck surgery	Major excision or incision of the larynx and radical neck dissection; does not include thyroid and parathyroid operations	30.1, 30.21, 30.22, 30.29, 30.3, 30.4, 31.45, 40.40-40.42
NEPH	Kidney surgery	Resection or manipulation of the kidney with or without removal of related structures	55.01, 55.02, 55.11, 55.12, 55.24, 55.31, 55.32, 55.34, 55.35, 55.39, 55.4, 55.51, 55.52, 55.54, 55.91
OVRY	Ovarian surgery	Operations on ovary and related structures	65.01, 65.09, 65.12, 65.13, 65.21-65.25, 65.29, 65.31, 65.39, 65.41, 65.49, 65.51-65.54, 65.61-65.64, 65.71-65.76, 65.79, 65.81, 65.89, 65.92-65.95, 65.99
PACE	Pacemaker surgery	Insertion, manipulation or replacement of pacemaker	00.50-00.54, 17.51, 17.52, 37.70-37.77, 37.79-37.83, 37.85-37.87, 37.89, 37.94-37.99
PRST	Prostate surgery	Suprapubic, retropubic, radical, or perineal excision of the prostate; does not include transurethral	60.12, 60.3, 60.4, 60.5, 60.61, 60.69

Legacy Code	Operative Procedure	Description	ICD-9-CM Codes / CPT Codes
		resection of the prostate	
PVBY	Peripheral vascular bypass surgery	Bypass operations on peripheral arteries	39.29
REC	Rectal surgery	Operations on rectum	48.25, 48.35, 48.40, 48.42, 48.43, 48.49-48.52, 48.59, 48.61-48.65, 48.69, 48.74
RFUSN	Refusion of spine	Refusion of spine	81.30-81.39
SB	Small bowel surgery	Incision or resection of the small intestine; does not include small-to-large bowel anastomosis	45.01, 45.02, 45.15, 45.31-45.34, 45.51, 45.61-45.63, 45.91, 46.01, 46.02, 46.20-46.24, 46.31, 46.39, 46.41, 46.51, 46.71-46.74, 46.93
SPLE	Spleen surgery	Resection or manipulation of spleen	41.2, 41.33, 41.41-41.43, 41.5, 41.93, 41.95, 41.99
THOR	Thoracic surgery	Noncardiac, nonvascular thoracic surgery; includes pneumonectomy and hiatal hernia repair or diaphragmatic hernia repair (except through abdominal approach)	32.09, 32.1, 32.20-32.23, 32.25, 32.26, 32.29, 32.30, 32.39, 32.41, 32.49, 32.50, 32.59, 32.6, 32.9, 33.0, 33.1, 33.20, 33.25, 33.28, 33.31-33.34, 33.39, 33.41-33.43, 33.48, 33.49, 33.98, 33.99, 34.01-34.03, 34.06, 34.1, 34.20, 34.26, 34.3, 34.4, 34.51, 34.52, 34.59, 34.6, 34.81-34.84, 34.89, 34.93, 34.99, 53.80-53.84
THYR	Thyroid and/or parathyroid surgery	Resection or manipulation of thyroid and/or parathyroid	06.02, 06.09, 06.12, 06.2, 06.31, 06.39, 06.4, 06.50-06.52, 06.6, 06.7, 06.81, 06.89, 06.91-06.95, 06.98, 06.99
VHYS	Vaginal hysterectomy	Vaginal hysterectomy; includes that by laparoscope	68.51, 68.59, 68.71, 68.79
VSHN	Ventricular shunt	Ventricular shunt operations, including revision and removal of shunt	02.21, 02.22, 02.31-02.35, 02.39, 02.42, 02.43, 54.95†
XLAP	Exploratory laparotomy	Abdominal operations not involving the gastrointestinal tract or biliary system; includes diaphragmatic hernia repair through abdominal approach	53.71, 53.72, 53.75, 54.0, 54.11, 54.12, 54.19, 54.3, 54.4, 54.51, 54.59, 54.61, 54.63, 54.64, 54.71-54.75, 54.92, 54.93

[†]Include only if this procedure involves ventricular shunt (i.e., is not a Ladd procedure to repair malrotation of intestines).

For a complete list of all ICD-9-CM codes mapped to their assignment as an NHSN operative procedure category, a surgical procedure other than an NHSN operative procedure (OTH), or a non-operative procedure (NO), see ICD-9-CM Procedure Code Mapping to NHSN Operative Procedure Categories at http://www.cdc.gov/nhsn/XLS/ICD-9-cmCODEScurrent.xlsx.

Denominator for Procedure Definitions:

ASA physical status: Assessment by the anesthesiologist of the patient's preoperative physical condition using the American Society of Anesthesiologists' (ASA) Classification of Physical Status [10, 11]. Patient is assigned one of the following:

1. A normally healthy patient
2. A patient with mild systemic disease
3. A patient with severe systemic disease
4. A patient with severe systemic disease that is a constant threat to life
5. A moribund patient who is not expected to survive without the operation.

   NOTE: Do NOT report procedures with an ASA physical status of 6 (a declared brain-dead patient whose organs are being removed for donor purposes) to NHSN.

Date of event: For an SSI the date of event is the date when the last element used to meet the SSI infection criterion occurred. Synonym: infection date.

Diabetes: The NHSN, SSI surveillance definition of diabetes indicates that the patient has a diagnosis of diabetes requiring management with insulin or a non-insulin anti-diabetic agent. This includes patients with "insulin resistance" who are on management with anti-diabetic agents. This also includes patients with a diagnosis of diabetes who are noncompliant with their diabetes medications. The NHSN definition excludes patients with no diagnosis of diabetes, or a diagnosis of diabetes that is controlled by diet alone. The definition excludes patients who receive insulin for perioperative control of hyperglycemia but have no diagnosis of diabetes. Note: See December 2013 NHSN newsletter for interim reporting guidance.

Duration of operative procedure: The interval in hours and minutes between the Procedure/Surgery Start Time, and the Procedure/Surgery Finish Time, as defined by the Association of Anesthesia Clinical Directors (AACD) [12]:

- Procedure/Surgery Start Time (PST): Time when the procedure is begun (*e.g.*, incision for a surgical procedure).
- Procedure/Surgery Finish (PF): Time when all instrument and sponge counts are completed and verified as correct, all postoperative radiologic studies to be done in the OR are completed, all dressings and drains are secured, and the physicians/surgeons have completed all procedure-related activities on the patient.

Emergency operative procedure: A nonelective, unscheduled operative procedure. Emergency operative procedures are those that do not allow for the standard immediate preoperative preparation normally done within the facility for a scheduled operation (e.g., stable vital signs, adequate antiseptic skin preparation, colon decontamination in advance of colon surgery, etc.).

General anesthesia: The administration of drugs or gases that enter the general circulation and affect the central nervous system to render the patient pain free, amnesic, unconscious, and often paralyzed with relaxed muscles.

Height: The patient's most recent height documented in the medical record in feet (ft) and inches (in), or meters (m).

NHSN Inpatient: A patient whose date of admission to the healthcare facility and the date of discharge are different calendar days.

NHSN Outpatient: A patient whose date of admission to the healthcare facility and date of discharge are the same calendar day.

Non-primary Closure is defined as closure that is other than primary and includes surgeries in which the superficial layers are left completely open during the original surgery and therefore cannot be classified as having primary closure. For surgeries with non-primary closure, the deep tissue layers may be closed by some means (with the superficial layers left open), or the deep and superficial layers may both be left completely open. An example of a surgery with non-primary closure would be a laparotomy in which the incision was closed to the level of the deep tissue layers, sometimes called "fascial layers" or "deep fascia," but the superficial layers are left open. Another example would be an "open abdomen" case in which the abdomen is left completely open after the surgery. If the deep fascial levels of an incision are left open but the skin is closed, this is considered a non-primary closure since the incision was not closed at all tissue levels. Wounds that are "closed secondarily" at some later date, or described as "healing by secondary intention" should also be classified as having non-primary closure. Wounds with non-primary closure may or may not be described as "packed" with gauze or other material, and may or may not be covered with plastic, "wound vacs," or other synthetic devices or materials.

NOTE: Assign the surgical wound closure that applies when the patient leaves the OR from the principal operative procedure. This instruction should be followed in scenarios where a patient leaves the OR with non-primary closure, but returns to the OR for a subsequent procedure that results in primary closure of the procedure.

***** Primary Closure is defined as closure of all tissue levels during the original surgery, regardless of the presence of wires, wicks, drains, or other devices or objects extruding through the incision. This category includes surgeries where the skin is closed by some means, including incisions that are described as being "loosely closed" at the skin level. Thus, if any portion of the incision is closed at the skin level, by any manner, a designation of primary closure should be assigned to the surgery.

NOTE: Assign the surgical wound closure that applies when the patient leaves the OR from the principal operative procedure. This instruction should be followed in scenarios where a patient leaves the OR with non-primary closure, but returns to the OR for a subsequent procedure that results in primary closure of the procedure.

Scope: An instrument used to visualize the interior of a body cavity or organ. In the context of an NHSN operative procedure, use of a scope involves creation of several small incisions to perform or assist in the performance of an operation rather than use of a traditional larger incision (i.e., open approach). Robotic assistance is considered equivalent to use of a scope for NHSN SSI surveillance. See also Instructions for Completion of *Denominator for Procedure* Form and both Numerator Data and Denominator Data reporting instructions in this chapter.

Trauma: Blunt or penetrating injury.

Weight: The patient's most recent weight documented in the medical record in pounds (lbs) or kilograms (kg) prior to or otherwise closest to the procedure.

Wound class: An assessment of the degree of contamination of a surgical wound at the time of the operation. Wound class should be assigned by a person involved in the surgical procedure, e.g., surgeon, circulating nurse, etc. The wound class system used in NHSN is an adaptation of the American College of Surgeons wound classification schema[8].

Wounds are divided into four classes:

Clean: An uninfected operative wound in which no inflammation is encountered and the respiratory, alimentary, genital, or uninfected urinary tracts are not entered. In addition, clean wounds are primarily closed and, if necessary, drained with closed drainage. Operative incisional wounds that follow nonpenetrating (blunt) trauma should be included in this category if they meet the criteria. **NOTE:** The clean wound classification level will not be available for denominator data entry for the following NHSN operative procedure categories: APPY, BILI, CHOL, COLO, REC, SB, and VHYS.

Clean-Contaminated: Operative wounds in which the respiratory, alimentary, genital, or urinary tracts are entered under controlled conditions and without unusual contamination. Specifically, operations involving the biliary tract, appendix, vagina, and oropharynx are included in this category, provided no evidence of infection or major break in technique is encountered.

Contaminated: Open, fresh, accidental wounds. In addition, operations with major breaks in sterile technique (e.g., open cardiac massage) or gross spillage from the gastrointestinal tract, and incisions in which acute, nonpurulent inflammation is encountered including necrotic tissue without evidence of purulent drainage (e.g., dry gangrene) are included in this category.

Dirty or Infected: Includes old traumatic wounds with retained devitalized tissue and those that involve existing clinical infection or perforated viscera. This definition suggests that the organisms causing postoperative infection were present in the operative field before the operation.

Table 2. ***Surgical Site Infection Criteria***

Criterion	Surgical Site Infection (SSI)
	Superficial incisional SSI Must meet the following criteria:
	Infection occurs within 30 days after any NHSN operative procedure (where day 1 = the procedure date), including those coded as 'OTH'***** a*nd* involves only skin and subcutaneous tissue of the incision *and* patient has at least one of the following: a. purulent drainage from the superficial incision. b. organisms isolated from an aseptically-obtained culture of fluid or tissue from the superficial incision. c. superficial incision that is deliberately opened by a surgeon, attending physician** or other designee and is culture positive or not cultured *and* patient has at least one of the following signs or symptoms: pain or tenderness; localized swelling; redness; or heat. A culture negative finding does not meet this criterion. d. diagnosis of a superficial incisional SSI by the surgeon or attending physician** or other designee . *****http://www.cdc.gov/nhsn/XLS/ICD-9-cmCODEScurrent.xlsx ** The term attending physician for the purposes of application of the NHSN SSI criteria may be interpreted to mean the surgeon(s), infectious disease, other physician on the case, emergency physician or physician's designee (nurse practitioner or physician's assistant).
Comments	There are two specific types of superficial incisional SSIs: 1. Superficial Incisional Primary (SIP) – a superficial incisional SSI that is identified in the primary incision in a patient that has had an operation with one or more incisions (e.g., C-section incision or chest incision for CBGB) 2. Superficial Incisional Secondary (SIS) – a superficial incisional SSI that is identified in the secondary incision in a patient that has had an operation with more than one incision (e.g., donor site incision for CBGB)
REPORTING INSTRUCTIONS for Superficial SSI	**The following do not qualify as criteria for meeting the NHSN definition of superficial SSI:** • A stitch abscess alone (minimal inflammation and discharge confined to the points of suture penetration) • A localized stab wound or pin site infection. While it would be considered either a skin (SKIN) or soft tissue (ST) infection, depending on its depth, it is not reportable under this module.

	• Diagnosis of "cellulitis", by itself, does not meet criterion d for superficial incisional SSI. • Circumcision is not an NHSN operative procedure. An infected circumcision site in newborns is classified as CIRC and is not reportable under this module. • An infected burn wound is classified as BURN and is not reportable under this module.
	Deep incisional SSI Must meet the following criteria:
	Infection occurs within 30 or 90 days after the NHSN operative procedure (where day 1 = the procedure date) according to the list in Table 3 *and* involves deep soft tissues of the incision (e.g., fascial and muscle layers) *and* patient has at least one of the following: a. purulent drainage from the deep incision. b. a deep incision that spontaneously dehisces or is deliberately opened by a surgeon, attending physician** or other designee and is culture-positive or not cultured *and* patient has at least one of the following signs or symptoms: fever (>38°C); localized pain or tenderness. A culture-negative finding does not meet this criterion. c. an abscess or other evidence of infection involving the deep incision that is detected on direct examination, during invasive procedure, or by histopathologic examination or imaging test. ** The term attending physician for the purposes of application of the NHSN SSI criteria may be interpreted to mean the surgeon(s), infectious disease, other physician on the case, emergency physician or physician's designee (nurse practitioner or physician's assistant).
Comments	There are two specific types of deep incisional SSIs: 1. Deep Incisional Primary (DIP) – a deep incisional SSI that is identified in a primary incision in a patient that has had an operation with one or more incisions (e.g., C-section incision or chest incision for CBGB) 2. Deep Incisional Secondary (DIS) – a deep incisional SSI that is identified in the secondary incision in a patient that has had an operation with more than one incision (e.g., donor site incision for CBGB)

	Organ/Space SSI Must meet the following criteria:
	Infection occurs within 30 or 90 days after the NHSN operative procedure (where day 1 = the procedure date) according to the list in Table 3 *and* infection involves any part of the body, excluding the skin incision, fascia, or muscle layers, that is opened or manipulated during the operative procedure *and* patient has at least one of the following: a. purulent drainage from a drain that is placed into the organ/space b. organisms isolated from an aseptically-obtained culture of fluid or tissue in the organ/space c. an abscess or other evidence of infection involving the organ/space that is detected on direct examination, during invasive procedure, or by histopathologic examination or imaging test *and* meets at least one criterion for a specific organ/space infection site listed in Table 4.
Comments	Because an organ/space SSI involves any part of the body, excluding the skin incision, fascia, or muscle layers, that is opened or manipulated during the operative procedure, the criterion for infection at these body sites must be met in addition to the organ/space SSI criteria. For example, an appendectomy with subsequent subdiaphragmatic abscess would be reported as an organ/space SSI at the intraabdominal specific site (SSI-IAB) when both organ/space SSI and IAB criteria are met. Table 4 list the specific sites that must be used to differentiate organ/space SSI. These criteria are in the Surveillance Definitions for Specific Types of Infections chapter.
REPORTING INSTRUCTIONS	• If a patient has an infection in the organ/space being operated on, subsequent continuation of this infection type during the remainder of the surveillance period is considered an organ/space SSI, if organ/space SSI and site-specific infection criteria are met. • Report mediastinitis following cardiac surgery that is accompanied by osteomyelitis as SSI-MED rather than SSI-BONE. • If meningitis (MEN) and a brain abscess (IC) are present together after operation, report as SSI-IC. Similarly, if meningitis and spinal abscess (SA) are present together after an operation, report as SSI-SA. • Report CSF shunt infection as SSI-MEN if it occurs within 90 days of placement; if later or after manipulation/access, it is considered CNS-MEN and is not reportable under this module.

Table 3. ***Surveillance Period for Deep Incisional or Organ/Space SSI Following Selected NHSN Operative Procedure Categories. Day 1 = the date of the procedure.***

30-day Surveillance			
Code	**Operative Procedure**	**Code**	**Operative Procedure**
AAA	Abdominal aortic aneurysm repair	LAM	Laminectomy
AMP	Limb amputation	LTP	Liver transplant
APPY	Appendix surgery	NECK	Neck surgery
AVSD	Shunt for dialysis	NEPH	Kidney surgery
BILI	Bile duct, liver or pancreatic surgery	OVRY	Ovarian surgery
CEA	Carotid endarterectomy	PRST	Prostate surgery
CHOL	Gallbladder surgery	REC	Rectal surgery
COLO	Colon surgery	SB	Small bowel surgery
CSEC	Cesarean section	SPLE	Spleen surgery
GAST	Gastric surgery	THOR	Thoracic surgery
HTP	Heart transplant	THYR	Thyroid and/or parathyroid surgery
HYST	Abdominal hysterectomy	VHYS	Vaginal hysterectomy
KTP	Kidney transplant	XLAP	Exploratory Laparotomy
		OTH	Other operative procedures not included in the NHSN categories

90-day Surveillance	
Code	**Operative Procedure**
BRST	Breast surgery
CARD	Cardiac surgery
CBGB	Coronary artery bypass graft with both chest and donor site incisions
CBGC	Coronary artery bypass graft with chest incision only
CRAN	Craniotomy
FUSN	Spinal fusion
FX	Open reduction of fracture
HER	Herniorrhaphy
HPRO	Hip prosthesis
KPRO	Knee prosthesis
PACE	Pacemaker surgery
PVBY	Peripheral vascular bypass surgery
RFUSN	Refusion of spine
VSHN	Ventricular shunt

NOTE: Superficial incisional SSIs are only followed for a 30-day period for all procedure types.

Table 4. *Specific Sites of an Organ/Space SSI*. Criteria for these sites can be found in the NHSN Help system (must be logged in to NHSN) or the Surveillance Definitions for Specific Types of Infections chapter.

Code	Site	Code	Site
BONE	Osteomyelitis	LUNG	Other infections of the respiratory tract
BRST	Breast abscess or mastitis	MED	Mediastinitis
CARD	Myocarditis or pericarditis	MEN	Meningitis or ventriculitis
DISC	Disc space	ORAL	Oral cavity (mouth, tongue, or gums)
EAR	Ear, mastoid	OREP	Other infections of the male or female reproductive tract
EMET	Endometritis	OUTI	Other infections of the urinary tract
ENDO	Endocarditis	PJI	Periprosthetic Joint Infection
EYE	Eye, other than conjunctivitis	SA	Spinal abscess without meningitis
GIT	GI tract	SINU	Sinusitis
HEP	Hepatitis	UR	Upper respiratory tract
IAB	Intraabdominal, not specified	VASC	Arterial or venous infection
IC	Intracranial, brain abscess or dura	VCUF	Vaginal cuff
JNT	Joint or bursa		

Numerator Data: All patients having any of the procedures included in the selected NHSN operative procedure category(s) are monitored for signs of SSI. The *Surgical Site Infection (SSI)* form is completed for each such patient found to have an SSI. If no SSI events are identified during the surveillance month, check the "Report No Events" field in the Missing PA Events tab of the Incomplete/Missing List.

The Instructions for Completion of the Surgical Site Infection form include brief instructions for collection and entry of each data element on the form. The SSI form includes patient demographic information and information about the operative procedure, including the date and type of procedure. Information about the SSI includes the date of SSI, specific criteria met for identifying the SSI, when/how the SSI was detected, whether the patient developed a secondary bloodstream infection, whether the patient died, and the organisms isolated from cultures and the organisms' antimicrobial susceptibilities.

SSI EVENT REPORTING INSTRUCTIONS:

1. **Multiple tissue levels are involved in the infection:** The type of SSI (superficial incisional, deep incisional, or organ/space) reported should reflect the deepest tissue layer involved in the infection:
    a) Report infection that involves the organ/space as an organ/space SSI, whether or not it also involves the superficial or deep incision sites.
    b) Report infection that involves the superficial and deep incisional sites as a deep incisional SSI.

2. **Attributing SSI to a NHSN procedure when several are performed on different dates:** If a patient has several NHSN operative procedures performed on different dates prior to an infection, report the operative procedure code of the operation that was performed most closely in time prior to the infection date, unless there is evidence that the infection was associated with a different operation. Note: for multiple NHSN operative procedures performed within a 24 hour period, see Denominator Reporting Instruction 7.

3. **Attributing SSI to NHSN procedures that involve multiple primary incision sites:** If multiple primary incision sites of the same NHSN operative procedure become infected, only report as a single SSI, and assign the type of SSI (superficial incisional, deep incisional, or organ/space) that represents the deepest tissue level involved at any of the infected sites. For example:
    a) If one laparoscopic incision meets criteria for a superficial incisional SSI and another meets criteria for a deep incisional SSI, only report one deep incisional SSI.
    b) If one or more laparoscopic incision sites meet criteria for superficial incisional SSI but the patient also has an organ/space SSI related to the laparoscopic procedure, only report one organ/space SSI.
    c) If an operative procedure is limited to a single breast and involves multiple incisions in that breast that become infected, only report a single SSI.
    d) In a colostomy formation or reversal (take down) procedure,the stoma and other abdominal incision sites are considered primary incisions. If both the stoma and another abdominal incision site develop superficial incisional SSI, report only as one SSI (SIP).

4. **Attributing SSI to NHSN procedures that have secondary incision sites**: Certain procedures can involve secondary incisions, when applicable, including BRST, CBGB, CEA, FUSN, REC, PVBY, RFUSN. The superficial incisionaland deep incisional SSI surveillance periods for any secondary incision site are 30 days, regardless of the required deep incisional or organ/space SSI surveillance period for the primary incision site(s) (Table 3). Procedures meeting this designation are reported as only one operative procedure. For example:
    a) A saphenous vein harvest incision site in a CBGB procedure is considered the secondary incision. One CBGB procedure is reported, the saphenous vein harvest site is monitored for 30 days after surgery for SSI, and the chest incision is monitored for 90 days.
    b) A tissue harvest site (e.g., Transverse Rectus Abdominis Myocutaneous [TRAM] flap) in a BRST procedure is considered the secondary incision site. One BRST procedure is reported, and if the secondary incision gets infected, report as either SIS or DIS as appropriate.

5. **SSI detected at another facility:** It is required that if an SSI is detected at a facility other than the one in which the operation was performed, notify the IP of the index facility with enough detail so the infection can be reported to NHSN. When reporting the SSI, the index facility should indicate that Detected = RO.

6. **SSI Attribution after Surgical Multiple types of NHSN procedures are performed during a single trip to the OR:** If more than one NHSN operative procedure category was performed through a single incision during a single trip to the operating room, attribute the SSI to the procedure that is thought to be associated with the infection. If it is not clear, as is often the case when the infection is an incisional SSI, use the NHSN Principal Operative Procedure Category Selection Lists (Table 5) to select the operative procedure to which the SSI should be attributed. For example, if a patient develops SSI after a single trip to the OR in which both a COLO and SB were performed, and the source of the SSI is not apparent, assign the SSI to the COLO procedure.

7. **SSI following invasive manipulation/accession of the operative site:** If during the post-operative period the surgical site has an invasive manipulation/accession for diagnostic or therapeutic purposes (e.g., needle aspiration), and following this manipulation/accession an SSI develops, the infection is not attributed to the operation. This reporting instruction does NOT apply to closed manipulation (e.g., closed reduction of a dislocated hip after an orthopedic procedure). Invasive manipulation does not include wound packing, or changing of wound packing materials as part of postoperative care.

8. **Reporting instructions for specific post-operative infection scenarios:** As of 2014, an SSI that otherwise meets the NHSN definitions should be reported to NHSN without regard to post-operative accidents, falls, inappropriate showering or bathing practices, or other occurrences that may or may not be attributable to patients' intentional or unintentional postoperative actions. Also, SSI should also be reported regardless of the presence of certain skin conditions (e.g., dermatitis, blister, impetigo) that occur near an incision, and regardless of the possible occurrence of a "seeding" event from an unrelated procedure (e.g., dental work). This revised instruction concerning various postoperative circumstances is necessary to reduce subjectivity and data collection burden associated with because the previously exempted scenarios.

Table 5. ***NHSN Principal Operative Procedure Category Selection Lists***
The following lists are derived from the operative procedures listed in Table 1. The categories with the highest risk of SSI are listed before those with lower risks.

Priority	Code	Abdominal Operations
1	LTP	Liver transplant
2	COLO	Colon surgery
3	BILI	Bile duct, liver or pancreatic surgery
4	SB	Small bowel surgery
5	REC	Rectal surgery
6	KTP	Kidney transplant
7	GAST	Gastric surgery
8	AAA	Abdominal aortic aneurysm repair
9	HYST	Abdominal hysterectomy
10	CSEC	Cesarean section
11	XLAP	Laparotomy
12	APPY	Appendix surgery
13	HER	Herniorrhaphy
14	NEPH	Kidney surgery
15	VHYS	Vaginal Hysterectomy
16	SPLE	Spleen surgery
17	CHOL	Gall bladder surgery
18	OVRY	Ovarian surgery
Priority	**Code**	**Thoracic Operations**
1	HTP	Heart transplant
2	CBGB	Coronary artery bypass graft with donor incision(s)
3	CBGC	Coronary artery bypass graft, chest incision only
4	CARD	Cardiac surgery
5	THOR	Thoracic surgery
Priority	**Code**	**Neurosurgical (Brain/Spine) Operations**
1	VSHN	Ventricular shunt
2	RFUSN	Refusion of spine
3	CRAN	Craniotomy
4	FUSN	Spinal fusion
5	LAM	Laminectomy
Priority	**Code**	**Neck Operations**
1	NECK	Neck surgery
2	THYR	Thyroid and or parathyroid surgery

Denominator Data: For all patients having any of the procedures included in the NHSN Operative Procedure category(s) selected for surveillance during the month, complete the *Denominator for Procedure* form. The data are collected individually for each operative procedure performed during the month specified on the *Patient Safety Monthly Reporting Plan*. The Instructions for Completion of the Denominator for Procedure Form include brief instructions for collection and entry of each data element on the form.

DENOMINATOR REPORTING INSTRUCTIONS:

1. **Closure type**:As of 2014, incisional closure is NO LONGER a part of the NHSN operative procedure definition; all otherwise eligible procedures are included in the denominator reporting, regardless of closure type. The closure technique is entered for each denominator for procedure. Note: See December 2013 NHSN newsletter for interim reporting guidance.

2. **Wound class**: A wound class is not an exclusion for denominator reporting. If the procedure meets the definition of an NHSN operative procedure it should be reported in the denominator data regardless of wound class. NHSN will use the wound class for risk adjustment, as appropriate.

3. **Different operative procedure categories performed during same trip to the OR:** If procedures in more than one NHSN operative procedure category are performed during the same trip to the operating room through the same or different incisions, a *Denominator for Procedure* form is reported for each NHSN operative procedure category being monitored. For example, if a CARD and CBGC are done through the same incision, a *Denominator for Procedure* form is reported for each. In another example, if following a motor vehicle accident, a patient has an open reduction of fracture (FX) and splenectomy (SPLE) performed during the same trip to the operating room and both procedure categories are being monitored, complete a *Denominator for Procedure* form for each.

   EXCEPTION: If a patient has both a CBGC and CBGB during the same trip to the operating room, report only as a CBGB. Only report as a CBGC when there is a chest incision only. CBGB and CBGC are never reported for the same patient for the same trip to the operating room. The time from chest incision to chest primary closure is reported as the duration of the procedure.

4. **Duration of the procedure when more than one category of NHSN operative procedure is done through the same incision:** If more than one NHSN operative procedure category is performed through the same incision during the same trip to the operating room, record the combined duration of all procedures, which is the time from procedure/surgery start time to procedure/surgery finish time. For example, if a CBGC and a CARD are performed on a patient during the same trip to the operating room, the time from start time to finish time is reported for both operative procedures.

5. **Same operative procedure category but different ICD-9-CM codes during same trip to the OR:** If procedures of different ICD-9-CM codes from the same NHSN operative procedure category are performed through the same incision, record only one procedure for that category. For example, a facility is performing surveillance for CARD procedures. A patient undergoes a replacement of both the mitral and tricuspid valves (35.23 and 35.27, both CARD) during the same trip to the operating room. Complete one CARD *Denominator for Procedure* form because ICD-9-CM codes 35.23 and 35.27 fall in the same operative procedure category [CARD] (see Table 1).

6. **Bilateral procedures:** For operative procedures that can be performed bilaterally during same trip to operating room (e.g., KPRO, HPRO, BRST), two separate *Denominator for Procedure* forms are completed. To document the duration of the procedures, indicate the procedure/surgery start time to procedure/surgery finish time for each procedure separately or, alternatively, take the total time for both procedures and split it evenly between the two.

7. **More than one operative procedure through same incision within 24 hours:** If a patient goes to the operating room more than once during the same admission and another procedure of the same or different NHSN procedure category is performed through the same incision and the start time of the second procedure is within 24 hours of the finish time of the original operative incision, report only one *Denominator for Procedure* form for the original procedure, combining the durations for both procedures based on the procedure start times and finish times for both procedures. For example, a patient has a CBGB lasting 4 hours. He returns to the OR six hours later to correct a bleeding vessel (OTH). The second operation has a duration of 1.5 hours. Record the operative procedure as one CBGB and the duration of operation as 5 hour 30 minutes. If the wound class has changed, report the higher wound class. If the ASA class has changed, report the higher ASA class. Do not report an 'OTH' record.

8. **Patient expires in the OR:** If a patient expires in the operating room, do not complete a *Denominator for Procedure* form. This operative procedure is excluded from the denominator.

9. **Laparoscopic hysterectomy – HYST or VHYS:** When assigning the correct ICD-9-CM hysterectomy procedure code, a trained coder must determine what structures were detached and how they were detached based on the medical record documentation. The code assignment is based on the surgical technique or approach used for the detachment of those structures, not on the location of where the structures were physically removed from the patient's body. Therefore, a total laparoscopic HYST procedure will have detachment of the entire uterus and cervix from the surrounding supporting structures via the laparoscopic technique. A laparoscopically-assisted VHYS involves detachment of the uterus and upper supporting structures via laparoscope but the lower supporting structures and cervix are detached via vaginal incision.

10. **Incidental appendectomy - reporting instruction change:** Any appendectomy (APPY) should be reported regardless of whether it is incidental.

11. **XLAP – reporting instruction change:** Any exploratory laparotomy (XLAP) should be reported regardless of whether it results in a procedure from another category being performed.

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 SSI probabilities estimated from multivariate logistic regression models constructed from NHSN data during a baseline time period, which represents a standard population's SSI experience [3].

There are three SSI SIR models available from NHSN, each briefly described in the table below.

All SSI SIR Model	• Includes Superficial, Deep & Organ/Space SSIs • Superficial & Deep incisional SSIs limited to primary incisional SSIs only • Includes SSIs identified on admission, readmission & via post-discharge surveillance
Complex A/R SSI Model	• Includes only Deep incisional primary SSIs & Organ/Space SSIs • Includes only SSIs identified on Admission/Readmission to facility where procedure was performed • Includes only inpatient procedures • Used for the National SIR Report, published annually
Complex 30-day SSI model (used for CMS IPPS)	• Includes only in-plan, inpatient COLO and HYST procedures in adult patients (i.e., ≥ 18 years of age) • Includes only deep incisional primary SSIs and organ/space SSIs with an event date within 30 days of the procedure • Uses only age and ASA to determine risk • Used only for CMS IPPS reporting and for public reporting on Hospital Compare

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

NOTE: In the NHSN application, "predicted" is referred to as "expected".

NOTE: All of the SSI SIRs that utilize the 2006-2008 SSI baseline data will include only those procedures that were reported with a primary closure method.[3]

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

While the SSI SIR can be calculated for single procedure categories and for specific surgeons, the measure also allows you to summarize your data across multiple procedure categories while adjusting for differences in the estimated probability of infection among the patients included across the procedure categories. For example, you will be able to obtain one SSI SIR adjusting for all procedures reported. Alternatively, you can obtain one SSI SIR for all colon surgeries (COLO) only within your facility.

NOTE: SSIs will be included in the numerator of an SIR based on the date of procedure, not the date of event.

SSI rates per 100 operative procedures are calculated by dividing the number of SSIs by the number of specific operative procedures and multiplying the results by 100. SSIs will be included in the numerator of a rate based on the date of procedure, not the date of event. Using the advanced analysis feature of the NHSN application, SSI rate calculations can be performed separately for the different types of operative procedures and stratified by the basic risk index.

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

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Ventilator-Associated Event (VAE)

For use in adult locations only

Table of Contents:

Introduction: Mechanical ventilation is an essential, life-saving therapy for patients with critical illness and respiratory failure. Studies have estimated that more than 300,000 patients receive mechanical ventilation in the United States each year [1-3]. These patients are at high risk for complications and poor outcomes, including death [1-5]. Ventilator-associated pneumonia (VAP), sepsis, Acute Respiratory Distress Syndrome (ARDS), pulmonary embolism, barotrauma, and pulmonary edema are among the complications that can occur in patients receiving mechanical ventilation; such complications can lead to longer duration of mechanical ventilation, longer stays in the ICU and hospital, increased healthcare costs, and increased risk of disability and death. Mortality in patients with acute lung injury on mechanical ventilation has been estimated to range from 24% in persons 15-19 years of age to 60% for patients 85 years and older [4].

Surveillance for ventilator-associated events in the National Healthcare Safety Network (NHSN) prior to 2013 was limited to VAP. For the year 2010, NHSN facilities reported more than 3,525 VAPs, and the VAP incidence for various types of hospital units ranged from 0.0-5.8 per 1,000 ventilator days [6]. However, there is currently no valid, reliable definition for VAP, and even the most widely-used VAP criteria and definitions are neither sensitive nor specific [7-10].

A particular difficulty with many commonly-used VAP definitions, including the NHSN PNEU definitions (revised in 2002), is that they require radiographic findings of pneumonia. Evidence suggests that chest radiograph findings do not accurately identify VAP. The subjectivity and

variability inherent in chest radiograph technique, interpretation, and reporting make chest imaging ill-suited for inclusion in a definition algorithm to be used for the potential purposes of public reporting, inter-facility comparisons, and pay-for-reporting and pay-for-performance programs. Another major difficulty with available VAP definitions is their reliance on specific clinical signs or symptoms, which are subjective and may be poorly or inconsistently documented in the medical record. The NHSN PNEU protocol includes multiple definition pathways and special criteria for selected patient populations (e.g., children, immunocompromised patients), increasing its complexity.

The limitations of VAP surveillance definitions have implications for prevention. Valid and reliable surveillance data are necessary for assessing the effectiveness of prevention strategies. It is notable that some of the most effective measures for improving outcomes of patients on mechanical ventilation do not specifically target pneumonia prevention [11-14].

In 2011 CDC convened a Working Group composed of members of several stakeholder organizations to address the limitations of the NHSN PNEU definitions and propose a new approach to surveillance for Ventilator-Associated Events (VAE) for NHSN [15]. The organizations represented in the Working Group include: the Critical Care Societies Collaborative (the American Association of Critical-Care Nurses, the American College of Chest Physicians, the American Thoracic Society, and the Society for Critical Care Medicine); the American Association for Respiratory Care; the Association of Professionals in Infection Control and Epidemiology; the Council of State and Territorial Epidemiologists; the Healthcare Infection Control Practices Advisory Committee's Surveillance Working Group; the Infectious Diseases Society of America; and the Society for Healthcare Epidemiology of America.

The VAE surveillance definition algorithm developed by the Working Group and implemented in the NHSN in January 2013 is based on objective, streamlined, and potentially automatable criteria that will intentionally identify a broad range of conditions and complications occurring in mechanically-ventilated adult patients [16]. There are three definition tiers within the VAE algorithm: 1) Ventilator-Associated Condition (VAC); 2) Infection-related Ventilator-Associated Complication (IVAC); and 3) Possible and Probable VAP. Data indicate that streamlined, objective algorithms to detect ventilator-associated complications (similar to the VAC tier of the VAE algorithm) are easily implemented, can make use of electronic health record systems to automate event detection, and identify events that are clinically important and associated with outcomes such as ICU and hospital length of stay and mortality [16,17]. Research suggests that most VACs are due to pneumonia, ARDS, atelectasis, and pulmonary edema [16]. These are significant clinical conditions that may be preventable.

NOTE: The VAE definition algorithm is for use in surveillance; it is not a clinical definition algorithm and is not intended for use in the clinical management of patients. Examples provided throughout this protocol and in the VAE "Frequently-Asked Questions" are for illustration purposes only and are not intended to represent actual clinical scenarios.

Settings: Inpatient locations eligible to participate in VAE surveillance are those adult locations in acute care hospitals, long term acute care hospitals, and inpatient rehabilitation facilities where denominator data (ventilator and patient days) can be collected for patients. Such locations may include critical/intensive care units (ICU), specialty care areas (SCA), step-down units, wards, and long term care units. A complete listing of adult inpatient locations can be found in Chapter 15.

NOTE: It is not required to monitor for VAEs after discharge if a patient is transferred to another facility while still on mechanical ventilation. However, VAEs discovered within 2 calendar days of discharge (where the day of discharge is day 1) should be reported to NHSN. No additional ventilator days are reported.

Requirements: Surveillance for VAE in at least one inpatient location in the healthcare institution for at least one calendar month as indicated in the *Patient Safety Monthly Reporting Plan* (CDC 57.106). The VAE algorithm is only applicable to mechanically-ventilated patients in adult locations.

Definitions:

VAE: VAEs are identified by using a combination of objective criteria: deterioration in respiratory status after a period of stability or improvement on the ventilator, evidence of infection or inflammation, and laboratory evidence of respiratory infection. The following pages outline the criteria that must be used for meeting the VAE surveillance definitions (Figures 1-5). To report VAEs, use the *Ventilator-Associated Event* form (CDC 57.112) and *Instructions for Completion*.

> NOTE: Patients must be mechanically ventilated for more than 2 calendar days to be eligible for VAE. The earliest day on which VAE criteria can be fulfilled is day 4 of mechanical ventilation (where the day of intubation and initiation of mechanical ventilation is day 1). The earliest date of event for VAE (the date of onset of worsening oxygenation) is day 3 of mechanical ventilation. Line lists of VAE data elements demonstrating scenarios that meet and do not meet the VAE definitions are presented in "Frequently-Asked Questions (FAQs)" number (no.) 2 at the end of this chapter.
>
> NOTE: The baseline period of stability or improvement on the ventilator is defined as the 2 calendar days immediately preceding the first day of increased daily minimum PEEP or FiO_2, and must be characterized by ≥ 2 calendar days of stable or decreasing daily minimum FiO_2 or PEEP values (i.e., the daily minimum PEEP or FiO_2 on the second day of the baseline period of stability or improvement must be equal to or less than the daily minimum PEEP or FiO_2 on the first day of the baseline period of stability or improvement). The definitions of "daily minimum PEEP" and "daily minimum FiO_2" are included below. Note that the minimum daily PEEP or FiO2 used for VAE surveillance is the lowest setting during a calendar day that was maintained for at least 1 hour.

For the purposes of VAE surveillance, PEEP values between 0 cmH_2O and 5 cmH_2O will be considered equivalent. This means that patients with daily minimum PEEP values from 0 to 5 cmH_2O must then have an increase in the daily minimum PEEP to at least 8 cmH_2O, sustained for at least 2 calendar days, to meet the VAC definition.

EXAMPLE: In the example below, the baseline period is defined by mechanical ventilation (MV) days 1 through 4 (shaded in light gray), and the period of worsening oxygenation by MV days 5 and 6 (shaded in darker gray), where the daily minimum PEEP is ≥ 3 cmH_2O greater than the daily minimum PEEP during the baseline period. Note that there is no VAC on MV day 3, because PEEP values 0-5 cmH_2O are considered equivalent for the purposes of this surveillance.

MV Day	Daily minimum PEEP (cmH_2O)	Daily minimum FiO_2 (oxygen concentration, %)	VAE
1	0	1.00 (100%)	
2	0	0.50 (50%)	
3	**5**	0.50 (50%)	
4	**5**	0.50 (50%)	
5	**8**	0.50 (50%)	**VAC**
6	**8**	0.50 (50%)	

EXAMPLE: In the example below, the baseline period is defined by mechanical ventilation (MV) days 1 through 4 (shaded in light gray), and the period of worsening oxygenation by MV days 5 and 6 (shaded in darker gray), where the daily minimum PEEP is ≥ 3 cmH_2O greater than the daily minimum PEEP during the baseline period. In this example, note that MV days 1-4 are considered a baseline period even though the daily minimum PEEP increases from 0 to 3 to 5 cmH_2O during this time period—because PEEP values from 0-5 cmH_2O are considered equivalent for the purposes of this surveillance.

MV Day	Daily minimum PEEP (cmH_2O)	Daily minimum FiO_2 (oxygen concentration, %)	VAE
1	0	1.00 (100%)	
2	0	0.50 (50%)	
3	**3**	0.50 (50%)	
4	**5**	0.50 (50%)	
5	**8**	0.50 (50%)	**VAC**
6	**8**	0.50 (50%)	

EXAMPLE: In the example below, the baseline period is defined by mechanical ventilation (MV) days 3 and 4 (shaded in light gray), and the period of worsening oxygenation by MV days 5 and 6 (shaded in darker gray), where the daily minimum FiO_2 is ≥ 0.20 (20 points) over the daily minimum FiO_2 during the baseline period.

MV Day	Daily minimum PEEP (cmH_2O)	Daily minimum FiO_2 (oxygen concentration, %)	VAE
1	8	1.00 (100%)	
2	6	0.50 (50%)	
3	5	**0.40 (40%)**	
4	5	**0.40 (40%)**	
5	6	**0.70 (70%)**	**VAC**
6	6	**0.70 (70%)**	

EXAMPLE: In the example below, there is no VAC, because the FiO_2 on MV day 4 is higher than the FiO_2 on MV day 3 (and therefore not stable or decreasing) – even though the FiO_2 on MV days 3 and 4 meets the 20-point threshold when compared with the daily minimum FiO_2 on MV days 5 and 6.

MV Day	Daily minimum PEEP (cmH_2O)	Daily minimum FiO_2 (oxygen concentration, %)	VAE
1	8	1.0 (100%)	
2	6	0.50 (50%)	
3	5	0.35 (35%)	
4	5	0.40 (40%)	
5	6	0.70 (70%)	No event
6	6	0.70 (70%)	

NOTE: Patients on high frequency ventilation or extracorporeal life support are EXCLUDED from VAE surveillance.

NOTE: Patients who are receiving a conventional mode of mechanical ventilation while in the prone position and patients who are receiving a conventional mode of mechanical ventilation while receiving nitric oxide therapy, helium-oxygen mixtures (heliox) or epoprostenol therapy are INCLUDED in VAE surveillance.

NOTE: Patients on Airway Pressure Release Ventilation (APRV) or related modes (see FAQ nos. 22 and 23), are INCLUDED, but the VAE period of stability or improvement on the ventilator and the period of worsening oxygenation should be determined by changes in FiO_2 only, since changes in PEEP as indicated in this surveillance algorithm may not be applicable to APRV. In addition, patients with VAE who are on APRV or related modes of mechanical ventilation should be indicated as such on the VAE Form (CDC 57.112).

NOTE: VAEs are defined by a 14-day period, starting on the day of onset of worsening oxygenation (the event date, day 1). A new VAE cannot be identified or reported until this 14-day period has elapsed. See FAQ no. 4.

Date of event: The date of onset of worsening oxygenation. This is defined as the first calendar day in which the daily minimum PEEP or FiO_2 increases above the thresholds outlined in the VAE definition algorithm (i.e., day 1 of the required ≥ 2-day period of worsening oxygenation following a ≥ 2-day period of stability or improvement on the ventilator).

EXAMPLE: A patient is intubated in the Emergency Room for severe community-acquired pneumonia and admitted to the MICU (day 1). The patient stabilizes and improves on days 2-5, with a daily minimum FiO_2 of 0.35 (35%) on days 4 and 5. On day 6, the patient experiences respiratory deterioration, and requires a minimum FiO_2 of 0.60 (60%) on days 6 and 7, meeting the criteria for a VAC. The date of the VAC event is day 6.

NOTE: The "date of event" is NOT the date on which all VAE criteria have been met. It is the first day (of a ≥ 2-day period) on which either of the worsening oxygenation thresholds (for PEEP or FiO_2) is met.

VAE Window Period: This is the period of days around the event date (i.e., the day of onset of worsening oxygenation) within which other VAE criteria must be met. It is usually a 5-day period and includes the 2 days before, the day of, and the 2 days after the VAE event date (i.e., the first day of worsening oxygenation, the day of VAE onset). There is an exception, however, in which the VAE Window Period is only 3 or 4 days, as follows:

In cases where the VAE event date corresponds to MV day 3 or day 4, the window period described above may only be a 3-day or a 4-day window, because it can NOT include any days before the 3rd day of MV. For example, if the VAE event date is MV day 3, then the window period includes only the day of VAE onset and the 2 days after VAE onset (because the 2 days before VAE onset are before the 3rd day of MV).

Positive End-Expiratory Pressure (PEEP): "A technique used in respiratory therapy in which airway pressure greater than atmospheric pressure is achieved at the end of exhalation by the introduction of a mechanical impedance to exhalation" [18]. In patients on mechanical ventilation, PEEP is one of the key parameters that can be adjusted depending on the patient's oxygenation needs, and is typically in the range of 0 to 15 cmH_2O. A sustained increase (defined later in this protocol) in the daily minimum PEEP of ≥ 3 cmH_2O following a period of stability or improvement on the ventilator is one of two criteria that can be used in meeting the VAC definition. For the purposes of this surveillance, PEEP values from 0 to 5 cmH_2O are considered equivalent.

Fraction of inspired oxygen (FiO_2): The fraction of oxygen in inspired gas. For example, the FiO_2 of ambient air is 0.21; the oxygen concentration of ambient air is 21%. In patients on mechanical ventilation, the FiO_2 is one of the key parameters that can be adjusted depending on the patient's oxygenation needs, and is typically in the range of 0.30 (oxygen concentration of 30%) to 1.0 (oxygen concentration of 100%). A sustained increase (defined later in this protocol) in the daily minimum FiO_2 of $\geq$ 0.20 (20%) following a period of stability or improvement on the ventilator is the second of the two criteria that can be used in meeting the VAC definition.

Daily minimum PEEP: The lowest value of PEEP during a calendar day that is set on the ventilator and *maintained for at least 1 hour*. This requirement that the daily minimum PEEP be the lowest setting maintained for at least 1 hour will ensure that units monitoring and recording PEEP settings hourly or more frequently than once per hour are able to apply the VAE surveillance PEEP criterion in a standardized way. In the event that ventilator settings are monitored and recorded less frequently than once per hour, the daily minimum PEEP is simply the lowest value of PEEP set on the ventilator during the calendar day. In circumstances where the lowest value of PEEP is set late in the calendar day, that value may still be considered the daily minimum PEEP for VAE surveillance as long as that lowest PEEP setting is maintained for at least 1 hour, even if that 1 hour period goes into the next calendar day.

> NOTE: In units tracking PEEP settings every hour or more frequently than every hour, there must be sufficient consecutive recordings of a specific PEEP setting to meet the minimum required duration of 1 hour. For example, in units tracking PEEP every 15 minutes, 5 consecutive recordings of PEEP at a certain level would be needed to meet the required 1 hour minimum duration (e.g., at 09:00, 09:15, 09:30, 09:45 and 10:00). In units tracking PEEP every 30 minutes, 3 consecutive recordings of PEEP at a certain level would be needed to meet the required 1 hour minimum duration (e.g., at 09:00, 09:30, and 10:00). In units tracking PEEP every hour, 2 consecutive recordings of PEEP at a certain level would be needed to meet the required 1 hour minimum duration (e.g., at 09:00 and 10:00).

> EXAMPLE: The patient is intubated at 6 pm. PEEP is set at the following values through the remainder of the calendar day:

Time	**6 pm**	**7 pm**	**8 pm**	**9 pm**	**10 pm**	**11 pm**
PEEP (cmH_2O)	10	8	5	5	8	8

> In this example, the daily minimum PEEP for the purposes of VAE surveillance is 5 cmH_2O. PEEP settings are being monitored and recorded every hour. There are two consecutive hours where the PEEP setting is noted to be 5 cmH_2O (8 pm and 9 pm), and therefore required minimum duration of 1 hour is met.

EXAMPLE: The patient is intubated at 6 pm. PEEP is set at the following values through the remainder of the calendar day:

Time	**6 pm**	**7 pm**	**8 pm**	**9 pm**	**10 pm**	**11 pm**
PEEP (cmH_2O)	10	8	5	8	8	5

In this example, the daily minimum PEEP for the purposes of VAE surveillance is 8 cmH_2O. PEEP settings are being monitored and recorded every hour. Although the lowest PEEP is 5 cmH_2O, it is recorded at two non-consecutive time points only (8 pm, then 11 pm)), and so the required 1 hour minimum duration is not met. There are two consecutive hours where the PEEP setting is noted to be 8 cmH_2O (9 pm and 10 pm), and therefore the required minimum duration of 1 hour is met to allow use of this setting as the daily minimum value for VAE surveillance.

EXAMPLE: PEEP is set at the following values through the course of a calendar day:

Time	**12 am**	**4 am**	**8 am**	**12 pm**	**4 pm**	**8 pm**
PEEP (cmH_2O)	5	8	5	8	8	10

In this example, the daily minimum PEEP is 5 cmH_2O. PEEP settings are being monitored and recorded every 4 hours; therefore the lowest recorded PEEP setting for the calendar day is the value used in VAE surveillance.

EXAMPLE: You are reviewing a patient's ventilator settings on Wednesday morning to determine the daily minimum PEEP values for Monday and Tuesday. The MICU monitors and records PEEP settings for mechanically ventilated patients every 30 minutes. You see that the lowest PEEP setting on Monday (5 cmH_2O) was recorded at 11:30 pm; the patient remained at this PEEP setting for an additional 30 minutes on Tuesday morning, and was then maintained on PEEP 10 cmH_2O for the rest of the day on Tuesday. What do you record as the daily minimum PEEP for Monday and for Tuesday? In this example, the PEEP setting of 5 cmH_2O was instituted Monday night, and maintained for one hour, into Tuesday morning. Because the PEEP setting was set on Monday night and was maintained for at least 1 hour, the daily minimum PEEP for Monday should be recorded as 5 cmH_2O. On Tuesday, the daily minimum PEEP should be recorded as 10 cmH_2O, which is the lowest PEEP setting maintained for at least 1 hour on Tuesday.

Day	**Time**	**PEEP (cmH_2O)**
Monday	23:30	5
Tuesday	00:00	5
Tuesday	00:30	5
Tuesday	01:00	10
Tuesday	01:30	10
Tuesday	02:00 through 23:30	10

Daily minimum FiO_2: The lowest value of FiO_2 during a calendar day that is set on the ventilator and *maintained for at least 1 hour*. This requirement that the daily minimum FiO_2 be the lowest setting maintained for at least 1 hour will ensure that units monitoring and recording FiO_2 settings hourly or more frequently than once per hour are able to apply the VAE surveillance FiO_2 criterion in a standardized way. In the event that ventilator settings are monitored and recorded less frequently than once per hour, the daily minimum FiO_2 is simply the lowest value of FiO_2 set on the ventilator during the calendar day.

NOTE: In units tracking FiO_2 settings every hour or more frequently than every hour, there must be sufficient consecutive recordings of a specific FiO_2 setting to meet the minimum required duration of 1 hour. For example, in units tracking FiO_2 every 15 minutes, 5 consecutive recordings of FiO_2 at a certain level would be needed to meet the required 1 hour minimum duration (e.g., 09:00, 09:15, 09:30, 09:45 and 10:00). In units tracking FiO_2 every 30 minutes, 3 consecutive recordings of FiO_2 at a certain level would be needed to meet the required 1 hour minimum duration (e.g., 09:00, 09:30, and 10:00). In units tracking FiO_2 every hour, 2 consecutive recordings of FiO_2 at a certain level would be needed to meet the required 1 hour minimum duration (e.g., 09:00 and 10:00).

EXAMPLE: The patient is intubated at 6 pm. FiO_2 is set at the following values through the remainder of the calendar day:

Time	**6 pm**	**7 pm**	**8 pm**	**9 pm**	**10 pm**	**11 pm**
PEEP (cmH_2O)	1.0	0.8	0.5	0.5	0.8	0.8

In this example, the daily minimum FiO_2 for the purposes of VAE surveillance is 0.5. FiO_2 settings are being monitored and recorded every hour. There are two consecutive hours where the FiO_2 setting is noted to be 0.5 (8 pm and 9 pm), and therefore required minimum duration of 1 hour is met.

EXAMPLE: The patient is intubated at 6 pm. FiO_2 is set at the following values through the remainder of the calendar day:

Time	**6 pm**	**7 pm**	**8 pm**	**9 pm**	**10 pm**	**11 pm**
PEEP (cmH_2O)	1.0	0.8	0.5	0.8	0.8	0.5

In this example, the daily minimum FiO_2 for the purposes of VAE surveillance is 0.8. FiO_2 settings are being monitored and recorded every hour. Although the lowest FiO_2 is 0.5, it is recorded at two non-consecutive time points only (8 pm, and then 11 pm), and so the required 1 hour minimum duration is not met. There are two consecutive hours where the FiO_2 setting is noted to be 0.8 (9 pm and 10 pm), and therefore the required minimum duration of 1 hour is met to allow use of this setting as the daily minimum value for VAE surveillance.

EXAMPLE: FiO_2 is set at the following values through the course of a calendar day:

Time	**2 pm**	**4 pm**	**6 pm**	**8 pm**	**10 pm**	**12 am**
FiO_2	1.0	0.60	0.40	0.50	0.55	0.60

In this example, the patient was intubated at 2 pm. The daily minimum FiO_2 is 0.40. FiO_2 settings are being monitored and recorded every 2 hours; therefore, the lowest recorded FiO_2 setting for the calendar day is the value used in VAE surveillance.

EXAMPLE: You are reviewing a patient's ventilator settings on Friday morning to determine the daily minimum FiO_2 value for Thursday. The ICU monitors and records FiO_2 settings for mechanically ventilated patients every 15 minutes. Based on the information recorded in the table below, what should you record as the daily minimum

FiO_2 for Thursday? In this example, the lowest FiO_2 setting on Thursday *that was maintained for at least 1 hour* is 0.55 (55%). Note that FiO2 0.50 was recorded from 09:45 until 10:30, but since the FiO_2 setting increased to 0.55 (55%) at 10:45, 0.50 cannot be considered the daily minimum FiO_2 for the purposes of VAE surveillance.

Day	**Time**	**FiO_2**
Thursday	00:00 to 09:00	0.80
	09:15	0.60
	09:30	0.60
	09:45	0.50
	10:00	0.50
	10:15	0.50
	10:30	0.50
	10:45	0.55
	11:00	0.55
	11:15	0.55
	11:30	0.55
	11:45	0.55
	12:00 to 23:45	0.60

Ventilator: A device to assist or control respiration continuously, inclusive of the weaning period, through a tracheostomy or by endotracheal intubation.

NOTE: Lung expansion devices such as intermittent positive-pressure breathing (IPPB); nasal positive end-expiratory pressure (nasal PEEP); and continuous nasal positive airway pressure (CPAP, hypoCPAP) are not considered ventilators unless delivered via tracheostomy or endotracheal intubation (e.g., ET-CPAP).

Episode of mechanical ventilation: Defined as a period of days during which the patient was mechanically ventilated for some portion of each consecutive day.

NOTE: A break in mechanical ventilation of at least one full calendar day, followed by reintubation and/or reinitiation of mechanical ventilation during the same hospitalization, defines a new episode of mechanical ventilation.

EXAMPLE: A patient is intubated and mechanical ventilation is initiated at 11 pm on hospital day 1. The patient remains intubated and mechanically ventilated from hospital days 2-10. The patient is extubated at 9 am on hospital day 11, and remains extubated on hospital day 12. The patient is reintubated and mechanical ventilation is reinitiated on hospital day 13. The patient remains intubated and mechanically ventilated from hospital day 14-18. This patient has had two episodes of mechanical ventilation (days 1-11 and days 13-18), separated by at least one full calendar day off of mechanical ventilation.

New antimicrobial agent: Defined as any agent listed in the Appendix that is initiated on or after the third calendar day of mechanical ventilation AND in the VAE Window Period (i.e., the period typically defined by the 2 calendar days before, the day of, and the 2 calendar days after the onset date of the VAE). The agent is considered new for the purposes of this definition if it was NOT given to the patient on either of the 2 days preceding the current start date.

> EXAMPLE: A patient is intubated and mechanically ventilated on hospital day 1 in the MSICU. Ceftriaxone and azithromycin are started on day 1 and administered daily. After 3 days of improving respiratory status, the patient's oxygenation deteriorates on days 4 and 5, with a daily minimum PEEP that is 4 cmH_2O higher than it was on days 2 and 3. Criteria for the VAC definition are met; the date of the event is hospital day 4. Ceftriaxone is discontinued and meropenem is begun on day 5. Azithromycin is continued. In this case, meropenem is a new antimicrobial agent: 1) it was begun on day 5 of mechanical ventilation, and 2) within the VAE Window Period (on the day after VAE onset), and 3) it was not given to the patient on either of the 2 days preceding the current start date. By contrast, ceftriaxone and azithromycin would not be considered new antimicrobial agents, since they were begun on day 1 of mechanical ventilation and continued daily into the VAE Window Period.

The antimicrobial agent(s) must have been given by one of the routes of administration outlined in Table 1, and therapy with one or more new antimicrobial agents must be continued for at least 4 calendar days (referred to as 4 "qualifying antimicrobial days" or "QADs"). For further guidance on identification of new antimicrobial agents and on how to determine whether the requirement for 4 QADs is met, refer to FAQs nos. 6-10 at the end of this chapter.

Table 1. Definitions of routes of administration

Route of Administration[a]	**Definition**[b]
Intravenous	An intravascular route that begins with a vein.
Intramuscular	A route that begins within a muscle.
Digestive Tract	A route that begins anywhere in the digestive tract extending from the mouth through rectum.
Respiratory Tract	A route that begins within the respiratory tract, including the oropharynx and nasopharynx.

[a]Other routes of administration are excluded (e.g., antibiotic locks, intraperitoneal, intraventricular, irrigation, topical).
[b]Definitions per SNOMED Reference Terminology

Qualifying Antimicrobial Day (QAD): A day on which the patient was administered an antimicrobial agent that was determined to be "new" within the VAE Window Period. Four consecutive QADs are needed to meet the IVAC antimicrobial criterion—starting within the VAE Window Period. Days on which a new antimicrobial agent is administered count as QADs. Days between administrations of a new antimicrobial agent also count as QADs as long as there is a gap of no more than 1 calendar day between administrations. For example, if levofloxacin is given on VAE Day 1, has not been given in the 2 preceding calendar days, and is given again on VAE Days 3, 5 and 7, there are 7 QADs—because the days between levofloxacin doses also count as QADs. By contrast, days between administrations of different antimicrobial agents do NOT count as QADs; for example, if levofloxacin is given to the patient on VAE Days -2 and -1 only, no antimicrobials are given on VAE Day 1, and meropenem is given only on VAE Day 2 (remember there is no VAE Day 0), then there are not 4 consecutive QADs. VAE Days -2 and -1 count as 2 consecutive QADs, but VAE Day 1 cannot be counted as a QAD because it is a day between different antimicrobial agents.

Purulent Respiratory Secretions: Defined as secretions from the lungs, bronchi, or trachea that contain ≥25 neutrophils and ≤10 squamous epithelial cells per low power field [lpf, x100].

> NOTE: Some clinical laboratories may use different results reporting formats for direct examinations of respiratory secretions. Additional instructions for using the purulent respiratory secretions criterion are provided in Table 2, below.

Table 2. Instructions for using the purulent respiratory secretions criterion, based on laboratory reporting of respiratory secretion direct examination results.

How do I use the purulent respiratory secretions criterion if …	Instruction
My laboratory reports counts of "white blood cells" or "polymorphonuclear leukocytes" or "leukocytes" rather than counts of "neutrophils"?	Assume that counts of cells identified by these other descriptors (e.g., "white blood cells") are equivalent to counts of neutrophils, unless the laboratory tells you this is not the case.
My laboratory reports semi-quantitative results (not quantitative results) for numbers of neutrophils and squamous epithelial cells?	Check with the laboratory to get information about what quantitative ranges the semi-quantitative reports correspond to.
My laboratory cannot provide additional information on how its semi-quantitative reporting corresponds to quantitative reporting ranges for neutrophils and squamous epithelial cells?	Use the following direct examination results to meet the purulent respiratory secretions criterion: heavy, 4+, or ≥25 neutrophils per low power field (lpf) [x100], AND rare, occasional, few, 1+ or 2+, or ≤10 squamous epithelial cells per lpf [x100] [19].
My laboratory reports only the numbers of neutrophils present, without reporting the number of squamous epithelial cells?	In this situation, the purulent secretions criterion may be met using the specified quantitative and semi-quantitative thresholds for neutrophils alone (i.e., heavy, 4+, or ≥25 neutrophils per lpf [x100]).
My laboratory uses different reporting thresholds for neutrophils and squamous epithelial cells (e.g., maximum report of ≥ 20 neutrophils per low power field [x100], or minimum report of ≤ 15 squamous epithelial cells per low power field [x100])?	In this situation, the purulent secretions criterion may be met using the laboratory's specified maximum quantitative threshold for neutrophils, and/or minimum quantitative threshold for squamous epithelial cells.
My laboratory processes respiratory specimens such as bronchoalveolar lavage fluid using a centrifugation procedure (e.g., "cytospin"), and there is no quantitation or semi-quantitation of neutrophils or white blood cells in the direct examination report?	In this situation, a report indicating the presence of white blood cells, without quantitation, is sufficient to meet the purulent secretions criterion.

Location of attribution: The inpatient location where the patient was assigned on the date of the VAE, which is further defined as the date of onset of worsening oxygenation.

EXAMPLE: Patient is intubated and ventilated in the Operating Room on hospital day 1, and then is admitted post-operatively to the SICU on hospital day 1, still on the ventilator. On hospital day 3, the patient experiences the onset of worsening oxygenation, manifested by an increase in the daily minimum FiO_2 of ≥ 0.20 (20%). On day 4 (also the 4th day of mechanical ventilation) the patient meets criteria for a VAC. This is reported to NHSN as a VAC for the SICU.

EXCEPTION:
Transfer Rule: If a VAE develops on the day of transfer or the day following transfer from one inpatient location to another in the same facility or to a new facility (where the day of transfer is day 1), the event is attributed to the transferring location. This is called the Transfer Rule, and examples are shown below:

EXAMPLE: Patient on a ventilator in the SICU who has had improving oxygenation for 3 days is transferred to the MICU, still on the ventilator. On the day of transfer, after the patient has arrived in the MICU, the patient experiences an acute decompensation, requiring an increase of 0.30 (30 points) in FiO_2 that persists during the following calendar day. VAC criteria are met on calendar day 2 in the MICU. Because the onset of worsening oxygenation occurred on the day of transfer to the MICU, the VAC event is attributed to the SICU.

EXAMPLE: Patient is extubated in the MICU and transferred to the medical stepdown unit on hospital day 6. The next day, while in the stepdown unit (day 7), the patient experiences worsening oxygenation and is reintubated and transferred back to the MICU. Criteria for VAC are met the next day (day 8). In this case, the day prior to extubation and the day of extubation (hospital days 5 and 6) count as the required 2-day period of stability or improvement. The day of reintubation (day 7) and the following day (day 8) count as the required 2-day period of worsening oxygenation. Because the onset of worsening oxygenation occurred on the day following transfer out of the MICU, the event is reported to NHSN as a VAC for the MICU.

EXAMPLE: Patient intubated and mechanically ventilated for 8 days in the MSICU of Hospital A is transferred for further care on day 8 to the MSICU of Hospital B. The patient was stable on the ventilator in Hospital A from days 3-8. On the day of transfer to Hospital B (day 1 in Hospital B), the patient's respiratory status deteriorates. The day after transfer (day 2 in Hospital B), the patient meets criteria for VAC. The date of the event is day 1 in Hospital B, the first day of the period of worsening oxygenation meeting VAE PEEP or FiO_2 thresholds. The infection preventionist (IP) from Hospital B calls the Hospital A IP to report that this patient was admitted to Hospital B with a VAC. This

VAC should be reported to NHSN for and by Hospital A, and attributed to the Hospital A MSICU. No additional ventilator days are reported by Hospital A.

REPORTING INSTRUCTIONS (additional guidance may be found in the FAQs at the end of this chapter):

- Conducting in-plan VAE surveillance means assessing patients for the presence of ALL events included in the algorithm—from VAC to IVAC to Possible and Probable VAP. At this time, a unit conducting in-plan VAE surveillance cannot decide, for example, that only surveillance for VAC (and not for IVAC or possible or probable VAP) will be performed.
- There is a hierarchy of definitions within VAE:
  - If a patient meets criteria for VAC and IVAC, report as IVAC.
  - If a patient meets criteria for VAC, IVAC and Possible VAP, report Possible VAP.
  - If a patient meets criteria for VAC, IVAC and Probable VAP, report Probable VAP.
  - If a patient meets criteria for VAC, IVAC, Possible VAP and Probable VAP, report Probable VAP.
- Pathogens are not reported for VAC or IVAC events.
- Secondary BSIs are not reported for VAC or IVAC events (refer to VAE Additional FAQ document for guidance).
- Pathogens may be reported for Possible and Probable VAP events, provided they are isolated or identified from appropriate specimen types according to the requirements of the algorithm and are NOT on the list of excluded organisms and culture results:
  - Excluded organisms and culture results that cannot be used to meet the Possible or Probable VAP definitions are as follows: "Normal respiratory flora," "normal oral flora," "mixed respiratory flora," "mixed oral flora," "altered oral flora" or other similar results indicating isolation of commensal flora of the oral cavity or upper respiratory tract; *Candida* species or yeast not otherwise specified; coagulase-negative *Staphylococcus* species; and *Enterococcus* species, when isolated from cultures of sputum, endotracheal aspirates, bronchoalveolar lavage, or protected specimen brushings.

    NOTE: ANY organism isolated from cultures of lung tissue or pleural fluid, including *Candida* species or yeast not otherwise specified, coagulase-negative *Staphylococcus* species or *Enterococcus* species may be reported as pathogens for Possible or Probable VAP.

- See Table 3 for the required quantitative culture thresholds associated with various specimen types in the Probable VAP definition. Note that if your laboratory reports semi-quantitative culture results, you should check with your laboratory to confirm that semi-quantitative results match the quantitative thresholds noted in Table 3.

Table 3. Threshold values for cultured specimens used in the Probable VAP definition

Specimen collection/technique	Values
Lung tissue	$\geq 10^4$ cfu/g tissue*
Bronchoscopically (B) obtained specimens	
Bronchoalveolar lavage (B-BAL)	$\geq 10^4$ cfu/ml*
Protected BAL (B-PBAL)	$\geq 10^4$ cfu/ml*
Protected specimen brushing (B-PSB)	$\geq 10^3$ cfu/ml*
Nonbronchoscopically (NB) obtained (blind) specimens	
NB-BAL	$> 10^4$ cfu/ml*
NB-PSB	$\geq 10^3$ cfu/ml*
Endotracheal aspirate (ETA)	$\geq 10^5$ cfu/ml*

cfu = colony forming units, g = gram, ml = milliliter
*Or equivalent semi-quantitative result.

- Secondary BSIs may be reported for Possible and Probable VAP events, provided that at least one organism isolated from the blood culture matches an organism isolated 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 Possible or Probable VAP definitions. In addition, the positive blood culture must have been collected during the 14-day event period, where day 1 is the day of onset of worsening oxygenation (refer to VAE Additional FAQ document for guidance).
  - In cases where Possible VAP is met with only the purulent respiratory secretions criterion and no culture is performed, and there is also a positive blood culture during the 14-day event period, a secondary BSI is not reported because there was no matching respiratory tract culture.
  - In cases where Probable VAP is met with only the histopathology criterion and no culture is performed, and there is also a positive blood culture, a secondary BSI is not reported.
  - In cases where a culture of respiratory secretions, pleural fluid or lung tissue is performed but is negative or does not grow an organism that matches an organism isolated from blood, a secondary BSI is not reported.

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

Figure 1: Ventilator-Associated Events (VAE) Surveillance Algorithm

Patient has a baseline period of stability or improvement on the ventilator, defined by ≥ 2 calendar days of stable or decreasing daily minimum* FiO_2 or PEEP values. The baseline period is defined as the 2 calendar days immediately preceding the first day of increased daily minimum PEEP or FiO_2.

*Daily minimum defined by lowest value of FiO_2 or PEEP during a calendar day that is maintained for at least 1 hour.

After a period of stability or improvement on the ventilator, the patient has at least one of the following indicators of worsening oxygenation:

1) Increase in daily minimum* FiO_2 of ≥ 0.20 (20 points) over the daily minimum FiO_2 in the baseline period, sustained for ≥ 2 calendar days.

2) Increase in daily minimum* PEEP values of ≥ 3 cmH_2O over the daily minimum PEEP in the baseline period†, sustained for ≥ 2 calendar days.

*Daily minimum defined by lowest value of FiO_2 or PEEP during a calendar day that is maintained for at least 1 hour.

†Daily minimum PEEP values of 0-5 cmH_2O are considered equivalent for the purposes of VAE surveillance.

Ventilator-Associated Condition (VAC)

On or after calendar day 3 of mechanical ventilation and within 2 calendar days before or after the onset of worsening oxygenation, the patient meets both of the following criteria:

1) Temperature > 38 °C or < 36°C, **OR** white blood cell count ≥ 12,000 cells/mm^3 or ≤ 4,000 cells/mm^3.

AND

2) A new antimicrobial agent(s) (see Appendix for eligible antimicrobial agents) is started, and is continued for ≥ 4 calendar days.

Infection-related Ventilator-Associated Complication (IVAC)

On or after calendar day 3 of mechanical ventilation and within 2 calendar days before or after the onset of worsening oxygenation, ONE of the following criteria is met:

1) Purulent respiratory secretions (from one or more specimen collections)
- Defined as secretions from the lungs, bronchi, or trachea that contain ≥25 neutrophils and ≤10 squamous epithelial cells per low power field [lpf, x100].
- If the laboratory reports semi-quantitative results, those results must correspond to the above quantitative thresholds.
- See additional instructions for using the purulent respiratory secretions criterion in the VAE Protocol.

2) Positive culture (qualitative, semi-quantitative or quantitative) of sputum*, endotracheal aspirate*, bronchoalveolar lavage*, lung tissue, or protected specimen brushing*

**Possible Ventilator-Associated Pneumonia*

Excludes the following:
- Normal respiratory/oral flora, mixed respiratory/oral flora or equivalent
- *Candida* species or yeast not otherwise specified
- Coagulase-negative *Staphylococcus* species
- *Enterococcus* species

On or after calendar day 3 of mechanical ventilation and within 2 calendar days before or after the onset of worsening oxygenation, ONE of the following criteria is met:

1) Purulent respiratory secretions (from one or more specimen collections—and defined as for possible VAP)
AND one of the following:
- Positive culture of endotracheal aspirate*, ≥ 10^5 CFU/ml or equivalent semi-quantitative result
- Positive culture of bronchoalveolar lavage*, ≥ 10^4 CFU/ml or equivalent semi-quantitative result
- Positive culture of lung tissue, ≥ 10^4 CFU/g or equivalent semi-quantitative result
- Positive culture of protected specimen brush*, ≥ 10^3 CFU/ml or equivalent semi-quantitative result

**Probable Ventilator-Associated Pneumonia*

Same organism exclusions as noted for Possible VAP.

2) One of the following (without requirement for purulent respiratory secretions):
- Positive pleural fluid culture (where specimen was obtained during thoracentesis or initial placement of chest tube and NOT from an indwelling chest tube)
- Positive lung histopathology
- Positive diagnostic test for *Legionella* spp.
- Positive diagnostic test on respiratory secretions for influenza virus, respiratory syncytial virus, adenovirus, parainfluenza virus, rhinovirus, human metapneumovirus, coronavirus

Figure 2: Ventilator-Associated Condition (VAC)

Patient has a baseline period of stability or improvement on the ventilator, defined by ≥ 2 calendar days of stable or decreasing daily minimum* FiO_2 or PEEP values. The baseline period is defined as the 2 calendar days immediately preceding the first day of increased daily minimum PEEP or FiO_2.

*Daily minimum defined by lowest value of FiO_2 or PEEP during a calendar day that is maintained for at least 1 hour.

AND

After a period of stability or improvement on the ventilator, the patient has at least one of the following indicators of worsening oxygenation:

1) Increase in daily minimum* FiO_2 of ≥ 0.20 (20 points) over the daily minimum FiO_2 in the baseline period, sustained for ≥ 2 calendar days.

2) Increase in daily minimum* PEEP values of ≥ 3 cmH_2O over the daily minimum PEEP in the baseline period†, sustained for ≥ 2 calendar days.

*Daily minimum defined by lowest value of FiO_2 or PEEP during a calendar day that is maintained for at least 1 hour.

†Daily minimum PEEP values of 0-5 cmH_2O are considered equivalent for the purposes of VAE surveillance.

Figure 3: Infection-related Ventilator-Associated Complication (IVAC)

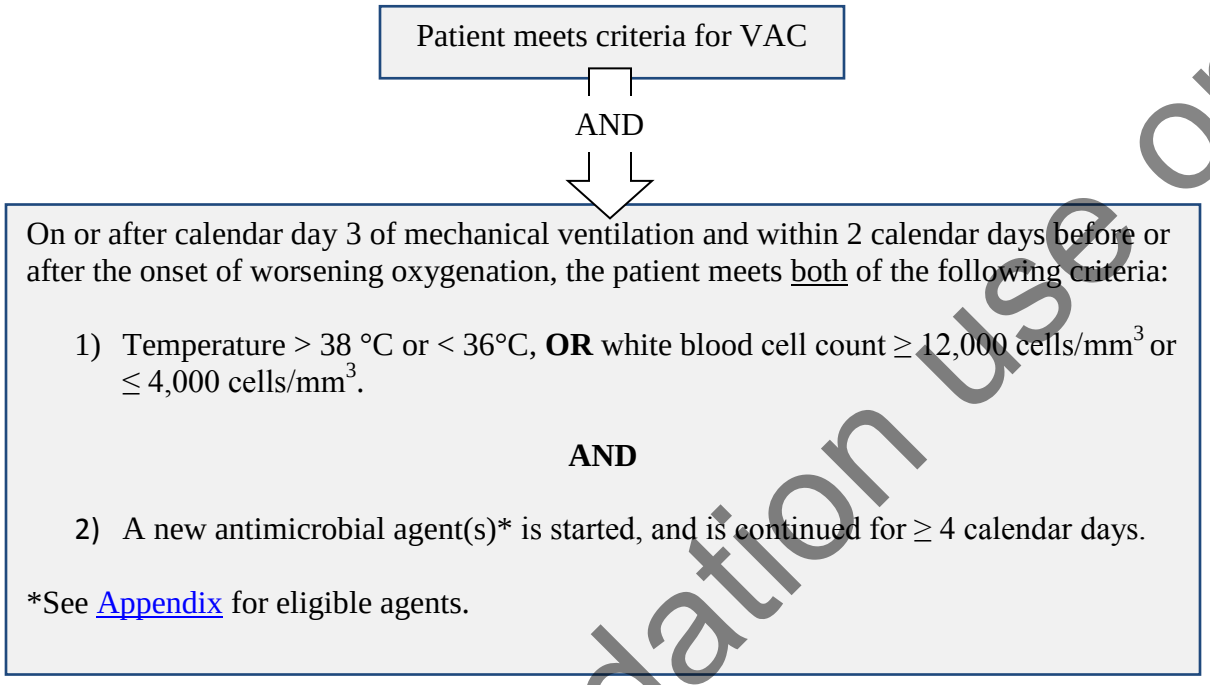

Figure 4: Possible Ventilator-Associated Pneumonia (VAP)

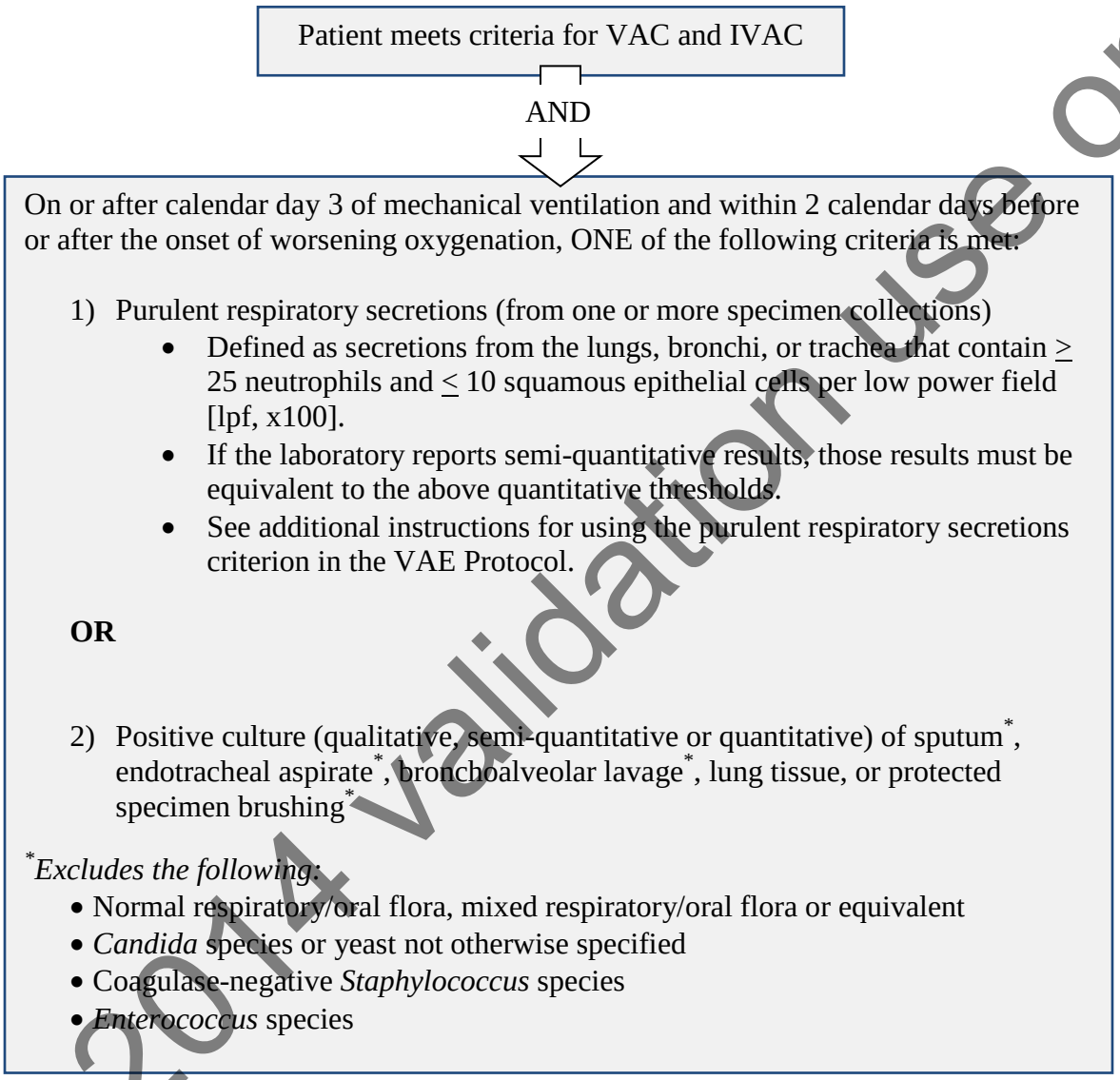

Figure 5: Probable Ventilator-Associated Pneumonia (VAP)

Patient meets criteria for VAC and IVAC

AND

On or after calendar day 3 of mechanical ventilation and within 2 calendar days before or after the onset of worsening oxygenation, ONE of the following criteria is met:

1) Purulent respiratory secretions (from one or more specimen collections—and defined as for possible VAP)

AND one of the following (see Table 2):

- Positive culture of endotracheal aspirate*, $\geq 10^5$ CFU/ml or equivalent semi-quantitative result
- Positive culture of bronchoalveolar lavage*, $\geq 10^4$ CFU/ml or equivalent semi-quantitative result
- Positive culture of lung tissue, $\geq 10^4$ CFU/g or equivalent semi-quantitative result
- Positive culture of protected specimen brush*, $\geq 10^3$ CFU/ml or equivalent semi-quantitative result

**Same organism exclusions as noted for Possible VAP.*

OR

2) One of the following (without requirement for purulent respiratory secretions):

- Positive pleural fluid culture (where specimen was obtained during thoracentesis or initial placement of chest tube and NOT from an indwelling chest tube)
- Positive lung histopathology
- Positive diagnostic test for *Legionella* spp.
- Positive diagnostic test on respiratory secretions for influenza virus, respiratory syncytial virus, adenovirus, parainfluenza virus, rhinovirus, human metapneumovirus, coronavirus

Numerator Data: The *Ventilator-Associated Event* form (CDC 57.112) is used to collect and report each VAE that is identified during the month selected for surveillance. The Instructions for Completion of Ventilator-Associated Event Form includes brief instructions for collection and entry of each data element on the form. The VAE form includes patient demographic information and information on the start date and location of initiation of mechanical ventilation. Additional data include the specific criteria met for identifying VAE, whether the patient developed a secondary bloodstream infection, whether the patient died, and, where applicable, the organisms detected and their antimicrobial susceptibilities.

REPORTING INSTRUCTION:

- If no VAEs are identified during the month of surveillance, the Report No Events box must be checked on the appropriate denominator summary screen, e.g., Denominators for Intensive Care Unit (ICU)/Other locations (Not NICU or SCA), etc.

Denominator Data: Device days and patient days are used for denominators (see Chapter 16 Key Terms). Ventilator days, which are the numbers of patients managed with ventilatory devices, are collected daily, at the same time each day, according to the chosen location using the appropriate form (CDC 57.117 and 57.118). These daily counts are summed and only the total for the month is entered into NHSN. Ventilator and patient days are collected for each of the locations monitored. When denominator data are available from electronic sources (e.g., ventilator days from respiratory therapy), these sources may be used as long as the counts are not substantially different (+/- 5%) from manually-collected counts, pre-validated for a minimum of 3 months.

NOTE: All ventilator days are counted, including ventilator days for patients on mechanical ventilation for < 3 days, and patients on high frequency ventilation and other therapies excluded from VAE surveillance. Patients with tracheostomies who are undergoing weaning from mechanical ventilation using tracheostomy collar trials are included in ventilator day counts as long as they spend some portion of the day on mechanical ventilation at a time that overlaps with the daily time during which ventilator day counts are performed.

NOTE: In addition to the total number of patients on ventilators on each day of surveillance, the number of patients on ventilators who are on the APRV mode of mechanical ventilation or related modes (which is a subset of all patients on ventilators) should also be indicated on the appropriate form (CDC 57.117 and 57.118). See FAQ nos. 22 and 23.

Data Analyses: The VAE rate per 1000 ventilator days is calculated by dividing the number of VAEs by the number of ventilator days and multiplying the result by 1000. Rates that may be appropriate for use in public reporting, inter-facility comparisons, and pay-for-reporting/pay-for-performance programs are the overall VAE rate (where the numerator consists of all events meeting at least the VAC definition) and the "IVAC-plus" rate (where the numerator consists of all events meeting at least the IVAC definition). Rates that may be appropriate for internal use within an individual unit or facility include rates of specific event types (e.g., events meeting

only the VAC definition, events meeting only the IVAC definition, events meeting only the Possible or Probable VAP definition), and rates of combined Possible and Probable VAP. Ventilator Utilization Ratio is calculated by dividing the number of ventilator days by the number of patient days. These calculations will be performed separately for the different types of ICUs, SCAs, and other locations in the institution.

****The information that follows regarding the Standardized Infection Ratio (SIR) is for informational purposes only, until a baseline period of VAE reporting has been established.****

The SIR is calculated by dividing the number of observed events by the number of expected events. The number of expected events, in the context of statistical prediction, is calculated using VAE rates from a standard population during a baseline time period as reported in the NHSN Report.

NOTE: The SIR should be calculated only if the number of expected VAEs (numExp) is ≥ 1.

SIR = Observed (O) VAEs / Expected (E) VAEs

While the VAE SIR can be calculated for single locations, the measure also allows you to summarize your data by multiple locations, adjusting for differences in the incidence of VAEs among the location types. For example, you can obtain one VAE SIR adjusting for all locations reported. Similarly, you can obtain one VAE SIR for all specialty care areas in your facility.

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

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Appendix. List of Antimicrobials Agents Eligible for IVAC, Possible and Probable VAP

Antimicrobial Agent
AMIKACIN
AMPHOTERICIN B
AMPHOTERICIN B LIPOSOMAL
AMPICILLIN
AMPICILLIN/SULBACTAM
ANIDULAFUNGIN
AZITHROMYCIN
AZTREONAM
CASPOFUNGIN
CEFAZOLIN
CEFEPIME
CEFOTAXIME
CEFOTETAN
CEFOXITIN
CEFTAROLINE
CEFTAZIDIME
CEFTIZOXIME
CEFTRIAXONE
CEFUROXIME
CIPROFLOXACIN
CLARITHROMYCIN
CLINDAMYCIN
COLISTIMETHATE
DORIPENEM
DOXYCYCLINE
ERTAPENEM
FLUCONAZOLE
FOSFOMYCIN
GEMIFLOXACIN
GENTAMICIN
IMIPENEM/CILASTATIN
ITRACONAZOLE

LEVOFLOXACIN
LINEZOLID
MEROPENEM
METRONIDAZOLE
MICAFUNGIN
MINOCYCLINE
MOXIFLOXACIN
NAFCILLIN
OSELTAMIVIR
OXACILLIN
PENICILLIN G
PIPERACILLIN
PIPERACILLIN/TAZOBACTAM
POLYMYXIN B
POSACONAZOLE
QUINUPRISTIN/DALFOPRISTIN
RIFAMPIN
SULFAMETHOXAZOLE/TRIMETHOPRIM
SULFISOXAZOLE
TELAVANCIN
TELITHROMYCIN
TETRACYCLINE
TICARCILLIN/CLAVULANATE
TIGECYCLINE
TOBRAMYCIN
VANCOMYIN, intravenous only
VORICONAZOLE
ZANAMIVIR

VAE FREQUENTLY-ASKED QUESTIONS

1) When should I use VAE? Are there circumstances in which I should still use PNEU?

- VAE surveillance is location based, and restricted to adult inpatient units only.
- Pediatric and neonatal units are excluded from VAE surveillance (even in circumstances where a pediatric unit may occasionally care for patients who are 18 years of age and older).
- Locations mapped to mixed age CDC location codes are excluded from VAE surveillance.
- Ventilated patients who are 18 years of age and older and who are cared for in pediatric units should be included in PedVAP surveillance.

NOTE: it is NOT recommended to include in VAE surveillance young children housed in adult ICU locations who are not thought to be physiologically similar to the location's adult patient population. Facilities may want to evaluate their location mapping to be sure that locations are mapped appropriately to the correct CDC location codes. In circumstances where the populations of adults and children cared for in the same physical location is more mixed (e.g., 50% adult patients and 50% pediatric patients), it is recommended that facilities weigh the possibility of establishing a virtual pediatric location for the purposes of surveillance. More information on virtual locations and location mapping can be found here:
http://www.cdc.gov/nhsn/PDFs/pscManual/15LocationsDescriptions_current.pdf

- Patients on high frequency ventilation or extracorporeal life support are EXCLUDED from VAE surveillance.

  NOTE: Patients who are receiving a conventional mode of mechanical ventilation while in the prone position and patients who are receiving a conventional mode of mechanical ventilation while receiving nitric oxide therapy, helium-oxygen mixtures (heliox), or epoprostenol therapy are INCLUDED.

  NOTE: Patients on Airway Pressure Release Ventilation (APRV) and related modes of mechanical ventilation (see FAQ nos. 22 and 23) are INCLUDED, but the VAE period of stability or improvement on the ventilator and the period of worsening oxygenation should be determined by changes in FiO_2 only, since changes in PEEP as indicated in this surveillance algorithm may not be applicable to APRV. In addition, patients with VAE who are on APRV or a related mode of mechanical ventilation at the time of VAE onset should be indicated as such on the VAE Form (CDC 57.112).

- In-plan surveillance for ventilator-associated PNEU may still be conducted for pediatric patients ONLY ("PedVAP" surveillance).
- The PNEU definitions are still available for those units seeking to conduct off-plan PNEU/VAP surveillance for patients of any age.

2) I am having difficulty visualizing how to arrange the VAE data elements to facilitate easy identification of events. Can you provide some additional guidance?

- For units in which VAE surveillance will be conducted manually, we recommend that you organize the necessary data elements in a table or spreadsheet to assist in identifying VAEs. There are a number of different ways in which to organize the data – you may consider limiting your spreadsheet to just include the daily minimum PEEP and FiO_2 values, and then, if a VAC event is identified, utilize other data sources to gather information on the data elements included in the IVAC, Possible VAP, and Probable VAP definitions. Alternatively, you may choose to include columns for all data elements (from VAC through Probable VAP) in a single spreadsheet.

  NOTE: For most patients under surveillance for VAE, the only data elements you will need to record are the ventilator days, minimum daily PEEP, and minimum daily FiO_2. The maximum and minimum daily temperatures and white blood cell counts only need to be recorded for those patients who are identified as having met criteria for VAC. The antimicrobial criterion only needs to be assessed for those patients with VAC and with an abnormal temperature or white blood cell count that meets the criteria within the IVAC definition. Microbiology and related data elements included as criteria in the Possible and Probable VAP definitions only need to be assessed for those patients who have met the IVAC definition.

  NOTE: Keep in mind that the baseline period of stability or improvement on the ventilator is defined as the 2 calendar days immediately preceding the first day of increased daily minimum PEEP or FiO_2, and must be characterized by ≥ 2 calendar days of stable or decreasing daily minimum FiO_2 or PEEP values (i.e., the daily minimum PEEP or FiO_2 on the second day of the baseline period of stability or improvement must be equal to or less than the daily minimum PEEP or FiO_2 on the first day of the baseline period of stability or improvement). Keep in mind, too, that PEEP values of 0 to 5 cmH_2O are considered equivalent for the purposes of VAE surveillance. This means that any daily minimum value of 0 to 5 cmH_2O will be evaluated as if it were 5 cmH_2O when determining whether a VAC has occurred or not. Also, the daily minimum PEEP or FiO2 is defined as the lowest setting during a calendar day that is maintained for at least 1 hour.

  EXAMPLE: In the table below, the data elements used to meet VAC, IVAC and Possible VAP definitions are organized in a fashion that facilitates identification of an event, highlighted in the shaded region. In this example, MV days 3 and 4 constitute the baseline period, with stable minimum PEEP of 5 cmH_2O on each day. On MV days 5 and 6, the daily minimum PEEP is 8 cmH_2O, which meets the VAC criterion for worsening oxygenation. If we scan across the table, we can see that the IVAC temperature/white blood cell count criterion is not met (there are no temperatures < 36°C or > 38°C, and no white blood cell counts ≤ 4,000 cells/mm^3 or ≥ 12,000 cells/mm^3) – so even though the patient was started on a new antimicrobial agent and continued on that agent for 4 calendar days, IVAC is not met. Therefore, this event would be reported as a VAC, with the date of event being MV day 5.

Patient	MV Day	$PEEP_{min}$	FiO_{2min}	$Temp_{min}$	$Temp_{max}$	WBC_{min}	WBC_{max}	Abx	Specimen	Polys / Epis	Organism	VAE
1	1	10	1.0	37.1	37.6	4.3	4.3	None	--	--	--	--
1	2	5	0.60	36.8	37.2	4.6	4.6	None	--	--	--	--
1	3	5	0.40	37.0	37.9	5.4	5.4	None	--	--	--	--
1	4	5	0.40	36.5	37.3	9.2	9.2	Yes	--	--	--	--
1	5	8	0.50	36.3	36.9	8.4	8.4	Yes	ETA	≥ 25 / ≤ 10	Mixed flora	**VAC**
1	6	8	0.40	37.2	37.5	8.5	8.8	Yes	--	--	--	
1	7	5	0.40	37.8	37.9	7.6	7.6	Yes	--	--	--	

MV = mechanical ventilation. $PEEP_{min}$ = Daily minimum PEEP. FiO_{2min} = Daily minimum FiO_2. $Temp_{min}$ = Daily minimum temperature. $Temp_{max}$ = Daily maximum temperature. WBC_{min} = Daily minimum white blood cell count. WBC_{max} = Daily maximum white blood cell count. Abx = antimicrobial agents. Polys / epis = Polymorphonuclear leukocytes and squamous epithelial cells from respiratory specimen.

EXAMPLE: In the table below, by scanning across the data elements, you can see that there are no periods in which there is a stable, 2-day baseline period followed by a 2-day period where the PEEP or FiO_2 are increased 3 cmH_2O or 20 points over baseline. On MV days 2 and 3, the PEEP values are 7 cmH_2O and 6 cmH_2O respectively, and then increase to 9 cmH_2O on MV days 4 and 5 – but the difference between day 4 or day 5 and day 2 is only 2 cmH_2O, rather than the required 3 cmH_2O. Also, the gradual increase in FiO_2 from the time of initiation of mechanical ventilation means that there are not two days on which the FiO_2 is at least 20 points higher than on the 2 previous days. Therefore, although the temperature and white blood cell counts exceed the required thresholds for IVAC on several occasions, and the patient appears to have received a new antimicrobial agent for several days in the setting of a positive blood culture, the VAC definition is not met, and so no VAE is reported.

Patient	MV Day	$PEEP_{min}$	FiO_{2min}	$Temp_{min}$	$Temp_{max}$	WBC_{min}	WBC_{max}	Abx	Specimen	Polys / Epis	Organism	VAE
2	1	5	0.30	37.1	37.6	4.3	4.3	None	--	--	--	--
2	2	7	0.30	36.8	37.2	4.6	4.6	None	--	--	--	--
2	3	6	0.45	37.0	37.9	5.4	5.4	None	--	--	--	--
2	4	9	0.45	36.5	37.3	9.2	9.2	None	--	--	--	--
2	5	9	0.60	36.3	36.9	8.4	8.4	None	ETA	≥ 25 / ≤ 10	Mixed flora	--
2	6	8	0.60	37.2	37.5	8.5	8.8	None	--	--	--	--
2	7	6	0.75	37.8	37.9	7.6	7.6	None	--	--	--	--
2	8	6	0.75	38.2	38.4	10.5	11.9	Yes	Blood	--	*S. aureus*	--
2	9	5	0.80	38.5	38.9	12.7	12.7	Yes	--	--	--	--
2	10	5	0.75	37.4	38.1	12.9	12.9	Yes	--	--	--	--
2	11	5	0.70	37.2	37.9	9.4	9.4	Yes	--	--	--	--
2	12	5	0.60	37.3	37.5	9.5	9.5	Yes	--	--	--	--
2	13	7	0.60	37.2	37.8	8.2	8.2	Yes	--	--	--	--
2	14	8	0.60	37.0	37.7	8.6	8.6	Yes	--	--	--	--

3) Is there a hierarchy of reporting for VAE? How do I know whether to report a VAC, an IVAC or a Possible or Probable VAP?
   - Conducting in-plan VAE surveillance means assessing patients for the presence of ALL events included in the algorithm—from VAC to IVAC to Possible and Probable VAP. At this time, a unit participating in in-plan VAE surveillance cannot decide, for example, that only surveillance for VAC (and not for IVAC or Possible or Probable VAP) will be performed.
   - There is a hierarchy of definitions within VAE:
     - If a patient meets criteria for VAC and IVAC, report as IVAC.
     - If a patient meets criteria for VAC, IVAC and Possible VAP, report Possible VAP.
     - If a patient meets criteria for VAC, IVAC and Probable VAP, report Probable VAP.
     - If a patient meets criteria for VAC, IVAC, Possible VAP and Probable VAP, report Probable VAP.

4) How do I determine the duration of a VAE? Can a patient have more than one VAE during a hospitalization?
   - Patients may have multiple VAEs during a single hospitalization. The event period is defined by the 14-day period that starts on the date of onset of worsening oxygenation. VAE criteria met during that 14-day period are attributed to the current VAE.

     EXAMPLE: Patient is intubated and mechanical ventilation is initiated in the MICU (day 1). The patient is stable during the following 4 calendar days (days 2 through 5). On days 6 and 7 the patient's minimum daily FiO_2 is increased more than 0.20 (20 points) over baseline, therefore meeting the VAC FiO_2 threshold. The VAC episode is defined by the period encompassing days 6 through 19 (14 days, starting on day 1 of worsening oxygenation, which in this case is day 6). If the patient were to experience a period of stability or improvement on the ventilator on days 18 and 19, followed by another 2-day period of worsening on days 20 and 21, a new VAE would be reported, since the second period of worsening oxygenation has occurred more than 14 days after the start of the initial period of worsening oxygenation.

5) Sometimes patients are intubated, extubated, and reintubated several times during a single hospitalization. How do I define an episode of mechanical ventilation, and can a VAE occur in a patient who has recently been extubated?
   - An episode of mechanical ventilation is defined as a period of days during which the patient was mechanically ventilated for some portion of each consecutive day during the period.

     EXAMPLE: A patient is intubated and mechanically ventilated on hospital day 1. The patient remains on mechanical ventilation from hospital day 2 through 12 noon on hospital day 6. At noon on hospital day 6, the patient is extubated. The patient remains extubated on hospital day 7, and is then reintubated on hospital day 8. In this case, the

first episode of mechanical ventilation is defined by days 1 through 6. Since the patient was extubated on day 6 and remained extubated for a full calendar day on day 7, the re-intubation of the patient on day 8 defines the start of a second episode of mechanical ventilation. See figure, below.

Hosp Day No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
MV Episode	1	1	1	1	1	1	--	2	2	2
MV Day No.	1	2	3	4	5	6—extubated at noon	--	1--reintubated	2	3

1 full calendar day off mechanical ventilation, followed by reintubation, defines a new episode of mechanical ventilation.

EXAMPLE: A patient is intubated and mechanically ventilated on hospital day 1. The patient remains on mechanical ventilation from hospital day 2 through hospital day 6 at 12 noon. At noon on hospital day 6, the patient is extubated. The patient is reintubated at 9 pm on hospital day 7, and remains intubated and mechanically ventilated till 2 pm on day 10. The patient is extubated at 2 pm on day 10 and remains extubated until hospital discharge on day 15. In this case, there is only a single episode of mechanical ventilation, defined by days 1 through 10, because the patient was extubated on day 6 but reintubated the next calendar day (day 7). See figure, below.

Hosp Day No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
MV Episode	1	1	1	1	1	1	1	1	1	1
MV Day No.	1	2	3	4	5	6—extubated at noon	7—reintubated at 9 pm	8	9	10—extubated at 2 pm

Patient was reintubated on the calendar day following extubation (days 6-7). Because there is not 1 calendar day off mechanical ventilation, there is only 1 episode of mechanical ventilation.

- A VAE can occur in a patient who has been extubated and is then reintubated, subject to the amount of time the patient was off the ventilator, as noted in the examples below.

  EXAMPLE: A patient is intubated and mechanically ventilated on hospital day 1. The patient remains on mechanical ventilation from hospital day 2 through 12 noon on hospital day 6. At noon on hospital day 6, the patient is extubated. The patient remains extubated on hospital day 7, and is then reintubated on hospital day 8. In this case, because the patient has been extubated for 1 full calendar day (day 7), the "VAE clock" starts over with reintubation on hospital day 8. To meet VAE during this second episode of mechanical ventilation, the patient would have to have at least 2 days of stability or improvement and at least 2 days of worsening oxygenation on the ventilator; therefore, the earliest date on which the patient could meet VAE criteria would be hospital day 11 (stable or improving settings on days 8 and 9, increased ventilator settings on days 10 and 11). The VAE event date would be reported as day 10—the first day of worsening oxygenation meeting VAE criteria. See figure, below.

Hosp Day No.	1	2	3	4	5	6	7	8	9	10	11
MV Episode	1	1	1	1	1	1	--	2	2	2	2
MV Day No.	1	2	3	4	5	6—extubated at noon	--	1-- reintubated	2	3	4
VAE Criterion	--	--	--	--	--	--	--	Day 1 of stability or improvement	Day 2 of stability or improvement	Day 1 of worsening oxygenation	Day 2 of worsening oxygenation

EXAMPLE: A patient is intubated and mechanically ventilated on hospital day 1. The patient remains on mechanical ventilation from hospital day 2 through 12 noon on hospital day 6, when the patient is extubated. The patient is reintubated at 9 pm on hospital day 7. In this case, there is no "new" episode of mechanical ventilation, since there was not a full, ventilator-free calendar day. Therefore, the period of worsening oxygenation may be determined to have started on day 7, the day of reintubation, as long as PEEP or FiO_2 criteria are met. PEEP and FiO_2 data from hospital days 5 and 6 (through the time of extubation) may be used to determine whether a period of stability and improvement occurred, and these data may be compared to PEEP and FiO_2 data obtained from the time of reintubation on day 7 and beyond to determine whether at least 2 days of worsening oxygenation occurred. The earliest that the patient could meet VAE criteria would be day 8 (assuming stable or improving ventilator settings on days 5 and 6, and two days of worsening oxygenation meeting criteria on days 7 and 8). The VAE event date would be reported as day 7—the first day of worsening oxygenation meeting VAE criteria. See figure, below.

Hosp Day No.	1	2	3	4	5	6	7	8	9	10
MV Episode	1	1	1	1	1	1	1	1	1	1
MV Day No.	1	2	3	4	5	6—extubated at noon	7—reintubated at 9 pm	8	9	10
VAE Criterion					Day 1 of stability or improvement	Day 2 of stability or improvement	Day 1 of worsening oxygenation	Day 2 of worsening oxygenation		

- A patient may also meet criteria for VAC while intubated, and then meet criteria for IVAC (or Possible or Probable VAP) following extubation.

  EXAMPLE: A patient is intubated and mechanically ventilated on hospital day 1. The patient remains on mechanical ventilation till 11 am on hospital day 10, when the patient is extubated. Criteria for VAC are met during the episode of mechanical ventilation, based on 2 days of stability or improvement (MV days 5 and 6) followed by 2 days of worsening oxygenation (MV days 7 and 8). The date of the event is MV day 7, the day of onset of worsening oxygenation. Within the 2 days before and 2 days after the day of onset of worsening oxygenation, the patient has a temperature of 38.4°C, and a new antimicrobial agent is started (meropenem, on MV day 9—see FAQ no. 6-10). The new antimicrobial agent is continued for at least 4 days (hospital days 8 through 11). Therefore, even though the patient was extubated on hospital day 10 and remained extubated on hospital day 11 (the day on which all IVAC criteria were fulfilled), the event should be reported as an IVAC. See figure, below.

Hosp Day No.	4	5	6	7	8	9	10	11
MV Day No.	**4**	**5**	**6**	**7**	**8**	**9**	**Extubated at 11 am**	**--**
VAE Criterion	--	Day 1 of stability or improvement	Day 2 of stability or improvement	Day 1 of worsening oxygenation	Day 2 of worsening oxygenation	Temp 38.4°C	--	--
Antimicrobial agent	Ceftriaxone	Ceftriaxone	Ceftriaxone	**Ceftriaxone**	**Meropenem**	**Meropenem**	**Meropenem**	**Meropenem**

Patient has fulfilled all IVAC criteria, and IVAC should be reported. Date of the IVAC event is hospital day/MV day 7.

6) What antimicrobial agents are included in the IVAC definition?
   - See the Appendix for a list of the antimicrobial agents eligible for consideration in the IVAC definition (as well as the Possible and Probable VAP definitions).
   - See Table 1 for eligible routes of administration.

7) How do I figure out if an antimicrobial agent is "new" for the IVAC definition?
   - A new antimicrobial agent is defined as any agent listed in the Appendix that is initiated on or after 3 days of mechanical ventilation AND in the VAE Window Period (defined by the two days before, the day of, and the two days after the onset date of the VAE—as long as all of these days are on or after the 3rd day of mechanical ventilation). The agent is considered new for the purposes of this definition if it was NOT given to the patient on either of the 2 days preceding the current start date. The agent must be administered via one of the routes listed in Table 1. See the example in the figure below:

MV Day No.	4	5	6	7	8	9	10	11
VAE Criterion				Onset (day 1) of worsening oxygenation meeting VAE PEEP or FiO_2 thresholds	Day 2 of worsening oxygenation meeting VAE PEEP or FiO_2 thresholds			

Example of the 5-day period during which the first dose of a new antimicrobial agent must be given to meet requirements of IVAC definition

EXAMPLE: A single dose of intravenous vancomycin is given to a patient on the VAE onset date (which is the day of onset of worsening oxygenation meeting VAE criteria, in this case MV day 7), and was not given to the patient during the 2 previous days (MV days 5 and 6). Vancomycin is therefore considered a new antimicrobial agent (see figure below).

MV Day No.	4	5	6	7	8	9	10
VAE Criterion	--	Day 1 of stability or improvement	Day 2 of stability or improvement	Day 1 of worsening oxygenation	Day 2 of worsening oxygenation		
Antimicrobial agent	None	None	None	**Single dose of vancomycin ordered and administered**	**None**	**None**	**Single dose of vancomycin ordered and administered**

A single dose of vancomycin is ordered and administered to the patient within the period defined by the two days before, the day of, and the two days after the VAE onset date. Note that no vancomycin was given in the 2 preceding days, and so vancomycin is a "new" antimicrobial agent for the purposes of the VAE definition.

EXAMPLE: If meropenem is given to a patient on the VAE onset date (which is the day of onset of worsening oxygenation meeting VAE criteria, in this case MV day 7), and was not given to the patient during the 2 previous days (MV days 5 and 6), then meropenem is considered a new antimicrobial agent (see figure below). Note that the patient is also receiving ceftriaxone, and receives doses during the 5-day period around the onset of worsening oxygenation (first dose during the 5-day period was on MV day 5). However, because ceftriaxone was given to the patient the day before the 5-day period (on MV day 4), ceftriaxone does not count as a new antimicrobial agent for the purposes of the IVAC definition.

MV Day No.	4	5	6	7	8	9	10
VAE Criterion	--	Day 1 of stability or improvement	Day 2 of stability or improvement	Day 1 of worsening oxygenation	Day 2 of worsening oxygenation		
Antimicrobial agent	Ceftriaxone	Ceftriaxone	Ceftriaxone	**Meropenem**	**Meropenem**	**Meropenem**	**Meropenem**

First dose of meropenem during the 5-day period around the onset of worsening oxygenation. Note that no meropenem was given in the 2 preceding days, and so meropenem is a "new" antimicrobial agent for the purposes of the VAE definition.

8) I have figured out that a new antimicrobial agent was given to the patient. How do I determine whether it was continued for 4 days?

- Make sure you are using the Medication Administration Record. You need to know which antimicrobial agents were actually administered to the patient. Antimicrobial orders or dispensing information is not sufficient.
- You do not need to know the dose or frequency of administration.
- Four consecutive Qualifying Antimicrobial Days (QADs)—starting within the VAE Window Period—are needed to meet the IVAC criterion. A QAD is a day on which the patient was administered an antimicrobial agent that was determined to be "new" within the VAE Window Period. Days between administrations of a new antimicrobial agent also count as QADs as long as there is a gap of no more than 1 calendar day between administrations of the same antimicrobial agent. For example, if levofloxacin is given on VAE Day 1, has not been given in the 2 preceding calendar days, and is given again on VAE Days 3, 5 and 7, there are 7 QADs—because the days between levofloxacin doses also count as QADs.
- The requirement for 4 consecutive QADs can be met with 4 days of therapy with the same antimicrobial (with a gap of no more than 1 calendar day between administrations of that antimicrobial)—or it can be met with 4 days of therapy with multiple antimicrobial agents, as long as each antimicrobial was started within the VAE Window Period.

EXAMPLE: In the figure below, meropenem would meet the antimicrobial criterion of the IVAC definition because at least one dose was given on 4 consecutive days.

MV Day No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
VAE Criterion	--	Day 1 of Stability or improvement	Day 2 of stability or improvement	Day 1 of worsening oxygenation	Day 2 of worsening oxygenation		
Antimicrobial agent	Ceftriaxone	Ceftriaxone	Ceftriaxone	**Meropenem**	**Meropenem**	**Meropenem**	**Meropenem**
QAD	No	No	No	**Yes**	**Yes**	**Yes**	**Yes**

EXAMPLE: In the figure below, the 3 drugs shown in bold lettering all qualify as new antimicrobial agents, and therefore the antimicrobial criterion of IVAC is met, since the patient is given 4 consecutive days of new antimicrobial agents.

MV Day No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
VAE Criterion	--	Day 1 of Stability or improvement	Day 2 of stability or improvement	Day 1 of worsening oxygenation	Day 2 of worsening oxygenation		
Antimicrobial agent	Ceftriaxone	Ceftriaxone	Ceftriaxone	**Meropenem**	**Imipenem**	**Piperacillin/ tazobactam**	**Piperacillin/ tazobactam**
QAD	No	No	No	**Yes**	**Yes**	**Yes**	**Yes**

EXAMPLE: In the figure below, levofloxacin is a new antimicrobial agent (it was started during the VAE Window Period, on MV day 3, and was not given in the 2 days preceding the first day of administration). There are gaps of no more than 1 calendar days between days on which levofloxacin is given, and so the intervening days also count as QADs. In this example, there are 5 QADs (MV days 3-7); therefore the antimicrobial criterion of IVAC is met.

MV Day No.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
VAE Criterion	--	Day 1 of Stability or improvement	Day 2 of stability or improvement	Day 1 of worsening oxygenation	Day 2 of worsening oxygenation		
Antimicrobial agent			**Levofloxacin**		**Levofloxacin**		**Levofloxacin**
QAD	No	No	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**

9) There are many patients in my ICU with renal insufficiency and/or who are receiving hemodialysis. These patients may receive certain antimicrobial agents on an infrequent dosing schedule (for example, every 48 hours). How do I determine whether they have received 4 consecutive days of new antimicrobial therapy?
   - See above. You do not need to know the patient's renal function, the dose of the antimicrobial agent, or the frequency of administration. The antimicrobial criterion rules remain the same, regardless of whether patients have renal dysfunction or not.

10) What if the patient is being given one-time doses of intravenous vancomycin? How do I take that into account when using the IVAC surveillance definition?
   - The rules for determining whether the antimicrobial criterion is met do not require that you know the dose or frequency of administration.
   - Make sure that vancomycin qualifies as a new antimicrobial agent—that it was not given in the 2 days preceding the day on which vancomycin was given during the VAE Window Period.
   - Check to see whether there are 4 consecutive QADs with vancomycin; if there are gaps of no more than 1 calendar day between days on which vancomycin is given, the intervening days may be counted as QADs. If there are gaps of longer than 1 calendar day between days of vancomycin therapy, the requirement for 4 consecutive QADs cannot be met using vancomycin alone—but make sure to check whether the 4 consecutive QAD requirement is met by considering any other antimicrobials being administered to the patient.

     EXAMPLE: A patient is given a single dose of vancomycin 1 gram IV on MV day 5. Since vancomycin was started on or after day 3 of mechanical ventilation, and no vancomycin was administered on MV days 2, 3 or 4, vancomycin qualifies as a new antimicrobial agent. A second, single dose of vancomycin 1 gram IV is administered on MV day 8. Because there is a gap of more than 1 calendar day between days of vancomycin administration (there is a gap of 2 days in this

example), the requirement for 4 consecutive QADs is not met, and therefore the IVAC antimicrobial criterion is not met.

MV Day No.	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
VAE Criterion	--	--	Day 1 of Stability or improvement	Day 2 of stability or improvement	Day 1 of worsening oxygenation	Day 2 of worsening oxygenation		
Antimicrobial agent	None	None	None	**Vancomycin 1 gram IV x 1 dose**	None	None	**Vancomycin 1 gram IV x 1 dose**	None
QAD	No	No	No	**Yes**	No	No	**Yes**	No

11) Can I report pathogens or secondary BSIs for VAC and IVAC?

- Pathogens are NOT reported for VAC or IVAC events.
- Secondary BSIs are NOT reported for VAC or IVAC events.

EXAMPLE: A patient hospitalized and mechanically-ventilated in the MICU for 14 days develops worsening oxygenation following a 7-day period of stability on the ventilator. VAC criteria are met on hospital day 15 (stable ventilator settings on days 12 and 13, increased ventilator settings on days 14 and 15). The onset date is day 14. The white blood cell count is noted to be 15,500 cells/mm^3 on day 14. Meropenem and intravenous vancomycin are begun on day 15, administered through the patient's right-sided central line, which was inserted on ICU admission. The antibiotics continue to be administered on day 18, meeting IVAC criteria. Endotracheal aspirate cultures done on days 15 and 16 grow scant upper respiratory flora. A blood culture collected on day 15 is positive for *Klebsiella oxytoca*. There are no other signs or symptoms of infection. This patient should be reported as having an IVAC and a central line-associated BSI. The BSI cannot be reported as secondary to the IVAC event.

12) Can I report pathogens for Possible and Probable VAP?

- Pathogens may be reported for Possible and Probable VAP events, provided they are isolated or identified from appropriate specimen types according to the requirements of the algorithm and are NOT on the list of excluded organisms and culture results:
  - Excluded organisms and culture results that cannot be used to meet the Possible or Probable VAP definitions are as follows: "Normal respiratory flora," "normal oral flora," "mixed respiratory flora," "mixed oral flora," "altered oral flora" or other similar results indicating isolation of commensal flora of the oral cavity or upper respiratory tract; *Candida* species or yeast not otherwise specified; coagulase-negative *Staphylococcus* species; and *Enterococcus* species, when isolated from cultures of sputum, endotracheal aspirates, bronchoalveolar lavage, or protected specimen brushings.

NOTE: When *Candida* species or yeast not otherwise specified, coagulase-negative *Staphylococcus* species or *Enterococcus* species are isolated from cultures of lung tissue

or pleural fluid, these organisms may be reported as Possible or Probable VAP pathogens.

- See Table 3 for the required quantitative culture thresholds associated with various specimen types in the Probable VAP definition. Note that if your laboratory reports semi-quantitative culture results, you should check with your laboratory to confirm that semi-quantitative results match the quantitative thresholds noted in Table 3.

13) Can I report secondary BSIs for Possible and Probable VAP?

- Secondary BSIs may be reported for Possible and Probable VAP events, provided that the organism isolated from the blood culture matches an organism isolated from an appropriate respiratory tract specimen (including respiratory secretions, pleural fluid and lung tissue). The respiratory tract specimen must have been collected within 2 calendar days before or after the day of onset of worsening oxygenation to be considered as a criterion for meeting the Possible or Probable VAP definitions. In addition, the positive blood culture must have been collected during the 14-day event period, where day 1 is the day of onset of worsening oxygenation.
    - In cases where Possible VAP is met with only the purulent respiratory secretions criterion and no culture is performed, and there is also a positive blood culture during the 14-day event period, a secondary BSI is not reported because there was no matching respiratory tract culture.
    - In cases where Probable VAP is met with only the histopathology criterion and no culture is performed, and there is also a positive blood culture, a secondary BSI is not reported.
    - In cases where a culture of respiratory secretions, pleural fluid or lung tissue is performed but is negative or does not grow an organism that matches an organism isolated from blood, a secondary BSI is not reported.

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

EXAMPLE: Patient hospitalized and mechanically ventilated in the MICU for 14 days develops worsening oxygenation following a 7-day period of stability on the ventilator. VAC criteria are met on hospital day 15 (stable ventilator settings on days 12 and 13, increased ventilator settings on days 14 and 15). The onset date is day 14. The white blood cell count is noted to be 15,500 cells/mm^3 on day 14. Meropenem and vancomycin are begun on day 15, administered through the patient's right-sided central line (inserted on ICU admission). The antibiotics continue to be administered on day 18, meeting IVAC criteria. Endotracheal aspirate specimens collected on days 15 and 16 grow heavy *Klebsiella oxytoca*. Endotracheal aspirate quality is not reported. A blood culture collected on day 15 is positive for *K. oxytoca*. This patient should be reported as having a Possible VAP with a secondary BSI due to *K. oxytoca*.

EXAMPLE: Patient hospitalized and mechanically ventilated in the MICU for 14 days develops worsening oxygenation following a 7-day period of stability on the ventilator. VAC criteria are met on hospital day 15 (stable ventilator settings on days 12 and 13, increased ventilator settings on days 14 and 15). The onset date is day 14. The white blood cell count is noted to be 15,500 cells/mm^3 on day 14. Meropenem and vancomycin are begun on day 15, administered through the patient's right-sided central line (inserted on ICU admission). The antibiotics continue to be administered on day 18, meeting IVAC criteria. A thoracentesis is performed on day 15 at the patient's bedside using aseptic technique. Pleural fluid is sent for culture and grows *Candida albicans*. A blood culture collected on day 16 is positive for *C. albicans*. This patient should be reported as having a Probable VAP with a secondary BSI due to *C. albicans.*

EXAMPLE: Patient hospitalized and mechanically ventilated in the MICU for 14 days develops worsening oxygenation following a 7-day period of stability on the ventilator. VAC criteria are met on hospital day 15 (stable ventilator settings on days 12 and 13, increased ventilator settings on days 14 and 15). The onset date is day 14. The white blood cell count is noted to be 15,500 cells/mm^3 on day 14. Meropenem and vancomycin are begun on day 15, administered through the patient's right-sided central line (inserted on ICU admission). The antibiotics continue to be administered on day 18, meeting IVAC criteria. An endotracheal aspirate collected on day 15 is a good quality specimen, with ≥ 25 neutrophils and ≤ 10 squamous epithelial cells per low power field, and grows *Staphylococcus aureus* (qualitative result). A blood culture collected on day 24 is positive for *S. aureus* and for coagulase-negative staphylococci (CoNS). This patient should be reported as having a Possible VAP, with *S. aureus* reported as the pathogen. A secondary BSI should also be reported for the Possible VAP, since the positive blood culture was collected within the 14-day period of the VAE, and an organism isolated from blood (*S. aureus*) matched an organism isolated from culture of the endotracheal aspirate. The CoNS also isolated from the blood culture on day 24 is <u>not</u> reported as a pathogen for the Possible VAP because it is an excluded organism.

14) <u>Can I only report pathogens if they are isolated in cultures of appropriate specimens? What about pathogens identified by non-culture-based diagnostic testing?</u>

- Probable VAP is the only VAE definition that incorporates results of non-culture-based microbiological diagnostic testing. For Probable VAP, pathogens that are grown in culture OR that are identified as a result of other laboratory testing (e.g., antigen testing, PCR, immunohistochemistry, etc.) should be reported. Do not limit reporting to just those organisms isolated in culture. For example, influenza A identified by polymerase chain reaction (PCR) in a patient meeting probable VAP criteria should be reported as a pathogen for that event.

15) The "Probable VAP" criteria include "positive diagnostic tests" for *Legionella* species, and selected viruses. What kinds of diagnostic tests can be used to meet the definition?

- Diagnostic testing practices may vary from facility to facility and change over time as better tests are developed. Listed here are some examples of diagnostic tests for specific pathogens included in the Probable VAP definition. Positive results of these tests may be used in meeting the Probable VAP definition. Your facility may use other testing methods; positive results obtained using these methods may also be appropriate for use in meeting the Probable VAP definition. If you have a question regarding a diagnostic test method, check with your laboratory.
- For *Legionella* species, positive results of any of the following, performed on the appropriate specimen: urinary antigen, *Legionella*-specific respiratory culture, paired serology (4-fold rise in titer between acute and convalescent specimens), direct fluorescent antibody stain, immunohistochemistry stain, or nucleic acid detection assays (such as PCR) performed on a respiratory specimen.
- For respiratory viruses (influenza, respiratory syncytial virus [RSV], parainfluenza viruses, human metapneumovirus, coronaviruses, rhinoviruses and adenovirus), positive results for any of the following:
    - Performed on an appropriate respiratory specimens – PCR or other viral nucleic acid detection methods, antigen detection methods, including rapid tests, viral cell culture, or
    - Performed on appropriate pathologic specimens – immunohistochemical assays, cytology, microscopy, or
    - Performed on appropriately timed paired sera (acute and convalescent) – serological assays demonstrating seroconversion or a significant rise in antibody titer.

16) What about pneumonitis that occurs in a mechanically-ventilated patient and is determined to be due to herpes simplex virus (HSV) or cytomegalovirus (CMV)? Can these infections be reported as VAEs?

- In most cases pneumonitis due to HSV and CMV represents reactivation of a latent infection, and therefore would not be considered healthcare-associated, according to the NHSN definition of a healthcare-associated infection.

17) Are there any culture results or microorganisms that CANNOT be used to meet the Possible and Probable VAP definitions?

- The following pathogens and culture results may NOT be used to meet the definitions and may NOT be reported as causes of Possible or Probable VAP when they are obtained from cultures of sputum, endotracheal aspirates, bronchoalveolar lavages or protected specimen brushings:
    - Culture results reported as "Normal respiratory flora," "normal oral flora," "mixed respiratory flora," "mixed oral flora," "altered oral flora" or other similar results indicating isolation of commensal flora of the oral cavity or upper respiratory tract.
    - *Candida* species or yeast not otherwise specified

- Coagulase-negative *Staphylococcus* species
- *Enterococcus* species

NOTE: These organisms are excluded because they are common upper respiratory tract commensals, colonizers or contaminants, and are unusual causes of VAP. Their exclusion from the surveillance definitions should NOT be used in clinical decision-making regarding patient treatment. Providers must independently determine the clinical significance of these organisms isolated from respiratory specimen cultures and the need for treatment.

NOTE: When *Candida* species or yeast not otherwise specified, coagulase-negative *Staphylococcus* species or *Enterococcus* species are isolated from cultures of lung tissue or pleural fluid, these organisms may be reported as Possible or Probable VAP pathogens.

- When sputum, endotracheal aspirate, bronchoalveolar lavage or protected specimen brushing culture results are mixed and contain one or more of the excluded pathogens in addition to one or more non-excluded pathogens, the culture may be used to meet the Possible or Probable VAP definition (depending on whether a qualitative, semi-quantitative or quantitative culture was performed, and whether the semi-quantitative or quantitative cfu/ml thresholds were met) BUT only the non-excluded pathogen(s) should be reported.

  EXAMPLE: Patient intubated and mechanically ventilated in the MSICU meets IVAC criteria on day 8 of mechanical ventilation. On the day after the onset of worsening oxygenation, an endotracheal aspirate is collected. The gram stain shows ≥ 25 neutrophils and ≤ 10 squamous epithelial cells per low power field, and the culture grows "heavy *Staphylococcus aureus*" and "heavy *Candida albicans*." This patient should be reported as having a Probable VAP due to *Staphylococcus aureus* – as long as the semi-quantitative result "heavy" is equivalent to the quantitative threshold of ≥ 10^5 cfu/ml for endotracheal aspirates. *Candida albicans* from the endotracheal aspirate culture is not reported, because it is an excluded result.

18) What about pleural fluid cultures and lung tissue cultures? Can I report any pathogen isolated from a lung tissue culture, or from a pleural fluid culture, assuming the specimen was obtained during thoracentesis or at the time of chest tube insertion?

- Any pathogen cultured from lung tissue, when that lung tissue was obtained during an open lung biopsy, video-assisted thoracoscopic surgery, or via other transthoracic or transbronchial biopsy approach, may be reported.
- Any pathogen cultured from pleural fluid, when that fluid was obtained during thoracentesis or at the time of initial chest tube insertion, may be reported.

19) How are "purulent respiratory secretions" defined?

- Purulent respiratory secretions used to meet Possible and Probable VAP definitions are specifically defined as:
    - Defined as secretions from the lungs, bronchi, or trachea with ≥ 25 neutrophils and ≤ 10 squamous epithelial cells per low power field [lpf, x100].
    - If the laboratory reports semi-quantitative results, you should check with your laboratory to be certain that the semi-quantitative results match the quantitative thresholds noted above.
- If your laboratory is not able to provide additional information on how a semi-quantitative reporting system corresponds to quantitative reporting ranges for neutrophils and squamous epithelial cells, here is some guidance from the *Clinical Microbiology Procedures Handbook* (3rd ed., 2010)*:

    1+ = occasional or rare = <1 cell per low power field [lpf, x100]
    2+ = few = 1-9 cells per low power field [lpf, x100]
    3+ = moderate = 10-25 cells per low power field [lpf, x100]
    4+ = heavy = >25 cells per low power field [lpf, x100]

    - With this range in mind, and in the absence of additional information from your laboratory, "purulent respiratory secretions" are defined as secretions that contain heavy, 4+ or ≥25 neutrophils per low power field [lpf, x100]AND rare, occasional, few, 1+ or 2+, or ≤10 squamous epithelial cells per low power field [lpf, x100].

      *Reference: Garcia, LS (Ed.). (2010). Clinical Microbiology Procedures Handbook. Herndon, VA: ASM Press, page 3.2.1.16.

- If your laboratory uses a different reporting format for results of direct examination of respiratory secretions, you may still be able to use the purulent respiratory secretions in meeting the Possible and Probable VAP definitions. See the instructions available in the VAE Protocol, Table 2.

20) What is the definition of "positive lung histopathology" that can be used to meet the Probable VAP definition?

- If the lung tissue specimen was obtained via open lung biopsy, video-assisted thoracoscopic surgery, or via other transthoracic or transbronchial biopsy approach, it is eligible for consideration in meeting the Probable VAP definition.
- Histopathological findings that can be used to meet the possible and probable VAP definitions include:
    - Abscess formation or foci of consolidation with intense neutrophil accumulation in bronchioles and alveoli;
    - Evidence of lung parenchyma invasion by fungi (hyphae, pseudohyphae or yeast forms);

- Evidence of infection with the viral pathogens listed in FAQ no. 14 based on results of immunohistochemical assays, cytology, or microscopy performed on lung tissue.

21) I am still having trouble understanding the time frame that defines a VAE. Can you explain what is meant by this statement that appears in the algorithm: *"On or after calendar day 3 of mechanical ventilation and within 2 calendar days before or after the onset of worsening oxygenation"*?

- The intent of these criteria is to determine whether a VAC is due to an infectious process (IVAC) and/or pneumonia (Possible or Probable VAP) by looking for corroborating inflammatory and infectious signs at the time of VAC onset. The criterion, "on or after calendar day 3" is intended to exclude inflammatory and infectious signs present on the first two days of mechanical ventilation because they are more likely to be due to pre-existing conditions than ventilator-acquired complications. The criterion, "within 2 calendar days before or after the onset of worsening oxygenation," is intended to identify infectious and inflammatory signs that arise at the same time as VAC and may therefore point to the cause of the VAC.

- The figures below illustrate the time frame that defines a VAE. The event date is the first day of worsening oxygenation, defined by the PEEP and FiO_2 thresholds outlined in the algorithm. The event date defines the time frame within which all other criteria must be met. In the examples below, the shaded area defines the VAE Window Period in which IVAC criteria (temperature or white count abnormalities, plus a new antimicrobial agent started and continued for at least 4 days) must be met, and in which Possible or Probable VAP criteria must be met.

  NOTE: Keep in mind that VAE criteria must be met based on specimens collected or antimicrobial agents started after day 2 of mechanical ventilation.

  EXAMPLE 1: When the onset date of the VAE occurs early in the course of mechanical ventilation (e.g., day 3 or 4 of mechanical ventilation), the period in which certain inflammatory and infectious criteria are sought for IVAC and possible or probable VAP is shorter, because the first 2 days of mechanical ventilation are excluded from the normal 5 day window surrounding the day of increased ventilator support.

MV Day No.	1	2	3	4	5	6	7
Worsening oxygenation	--	Day 1 of Stability or improvement	Day 2 of stability or improvement	Day 1 of worsening oxygenation	Day 2 of worsening oxygenation		
Temperature abnormality or white blood cell count abnormality			←An abnormal temperature or white blood cell count, according to the algorithm parameters, must be documented within this shaded period→				
Antimicrobial agent			←New agent must be started on any day within this shaded period, and then continued for at least 4 days→				
Purulent respiratory secretions, positive culture, positive histopathology			←Specimen must be collected on any day within this shaded period→				

EXAMPLE 2: When the onset date of the VAE occurs later in the course of mechanical ventilation, the period in which certain criteria must be met is a day longer, because the patient has already been on mechanical ventilation for more than 3 days and therefore inflammatory and infectious signs arising anywhere in the full 5-day window surrounding the day of increased ventilator settings can count towards IVAC and possible or probable VAP.

MV Day No.	10	11	12	13	14	15	16
Worsening oxygenation	--	Day 1 of Stability or improvement	Day 2 of stability or improvement	Day 1 of worsening oxygenation	Day 2 of worsening oxygenation		
Temperature abnormality or white blood cell count abnormality		←An abnormal temperature or white blood cell count, according to the algorithm parameters, must be documented within this shaded period→					
Antimicrobial agent		←New agent must be started on any day within this shaded period, and then continued for at least 4 days→					
Purulent respiratory secretions, positive culture, positive histopathology		←Specimen must be collected on any day within this shaded period→					

22) Providers in my ICU use different types of mechanical ventilation for different patients. Can you explain the circumstances in which mechanically-ventilated patients are to be excluded from VAE surveillance, and the circumstances in which mechanically-ventilated patients should be included in VAE surveillance?

- VAE surveillance is restricted to adult inpatient locations. Patients on mechanical ventilation who are in adult inpatient locations in acute care and long-term acute care hospitals and inpatient rehabilitation facilities are eligible for inclusion in VAE surveillance.
- Patients are excluded from VAE surveillance if they are receiving high frequency ventilation, or if they are receiving extracorporeal life support (extracorporeal membrane oxygenation).
- Patients are included in surveillance if they are on a ventilator (as defined in the VAE surveillance protocol), and are being mechanically ventilated through an endotracheal or tracheostomy tube using a conventional mode of mechanical ventilation (such as volume controlled, pressure controlled, or pressure support mechanical ventilation).
    - Patients on conventional mechanical ventilation who are receiving nitric oxide, helium-oxygen mixtures (heliox) or epoprostenol therapy are included in surveillance.
    - Patients on conventional mechanical ventilation who are being ventilated in the prone position are included in surveillance.
- Patients are also included in surveillance if they are on a ventilator (as defined in the VAE surveillance protocol), and are being mechanically ventilated through an endotracheal or tracheostomy tube using Airway Pressure Release Ventilation (APRV) or related modes. Some terms that are used to indicate APRV or a related mode of

mechanical ventilation include (but may not be limited to): BiLevel, Bi Vent, BiPhasic, PCV+, and DuoPAP.

- For patients on APRV or related modes, the period of worsening oxygenation following a period of stability or improvement on the ventilator that is required for identification of a VAE will be defined by the FiO_2 criterion within the VAE surveillance definition algorithm. The PEEP criterion may not be applicable in patients on APRV or related modes of mechanical ventilation.

- If you have questions about mechanical ventilation, you should check with the Respiratory Care or Respiratory Therapy and/or Critical Care departments in your facility.

23) Why do I need to indicate if a patient was on APRV at the time of VAE onset, and why do I need to indicate the number of patients on APRV in my ICU for each day of VAE surveillance?

- We are trying to find out more about how frequently APRV and related modes of mechanical ventilation are being used, and the frequency with which VAEs are identified in patients on APRV and related modes, to determine whether the VAE surveillance definition algorithm may need to be modified in the future.
- If the VAE occurred in a patient on Airway Pressure Release Ventilation (APRV) or a related mode of mechanical ventilation (e.g., BiLevel, Bi Vent, BiPhasic, PCV+, DuoPAP) at the time of VAE onset, indicate "Yes" in the "APRV" field on the VAE Form (CDC 57.112). Otherwise, indicate "No."
- On the appropriate denominator form (CDC 57.117 or 57.118), in the column for "Number of patients on a ventilator," you will see that there are two sub-columns. In the sub-column, "Total patients," enter the total number of patients on a ventilator on that day. In the sub-column, "Number on APRV," enter the number for the subset of patients on a ventilator on that day who are on the APRV mode of mechanical ventilation or related modes (e.g., BiLevel, Bi Vent, BiPhasic, PCV+, DuoPAP) at the time the count is performed. If there are no patients on APRV or a related mode of mechanical ventilation, enter "0" (zero).

24) My laboratory only performs semi-quantitative cultures of lower respiratory tract specimens, and cannot provide me with additional guidance to help me know what semi-quantitative culture result corresponds to the quantitative thresholds specified in the Probable VAP definition. Can you provide more information?

- For the purposes of this surveillance, and in the absence of additional information available from your laboratory, a semi-quantitative result of "moderate" or "heavy" growth, or 2+, 3+ or 4+ growth, meets the Probable VAP definition when accompanied by purulent respiratory secretions as defined in the protocol (see FAQ no. 19).

Antimicrobial Use and Resistance (AUR) Module

Table of Contents

Introduction
This module contains two options, one focused on antimicrobial usage and the second on antimicrobial resistance. To participate in either option, facility personnel responsible for reporting antimicrobial use (AU) or resistance (AR) data to the National Healthcare Safety Network (NHSN) must coordinate with their laboratory and/or pharmacy information software providers to configure their system to enable the generation of standard formatted file(s) to be imported into NHSN. The format provided for data submission follows the Health Level (HL7) Clinical Document Architecture (CDA).[7] Manual data entry is not available for the AUR Module.

Purpose:
The goal of this National Healthcare Safety Network (NHSN) AUR Module is to provide a mechanism for facilities to report and analyze antimicrobial use and/or resistance as part of local or regional efforts to reduce antimicrobial resistant infections through antimicrobial stewardship efforts or interruption of transmission of resistant pathogens at their facility[6].

1. Antimicrobial Use (AU) Option

Introduction

Rates of resistance to antimicrobial agents continue to increase at hospitals in the United States.[1] The two main reasons for this increase are patient-to-patient transmission of resistant organisms and selection of resistant organisms because of antimicrobial exposure.[2] Previous studies have shown that feedback of reliable reports of rates of antimicrobial use and resistance to clinicians can improve the appropriateness of antimicrobial usage.[3-5]

Objectives: The primary objective of the Antimicrobial Use option is to facilitate risk-adjusted inter- and intra-facility benchmarking of antimicrobial usage. A secondary objective is to evaluate trends of antimicrobial usage over time at the facility and national levels.

Methodology: The primary antimicrobial usage metric reported to this module is antimicrobial days per 1000 days present. An antimicrobial day (also known as day of therapy) is defined by any amount of a specific antimicrobial agent administered in a calendar day to a particular patient as documented in the electronic medication administration record (eMAR) and/or bar coding medication record (BCMA) (refer to Numerator Data Section); all antimicrobial days for a specific agent administered across a population are summed in aggregate.[8-11] Days present are defined as the aggregate number of patients housed to a patient-care location or facility anytime throughout a day during a calendar month (refer to Denominator Data Section). For each facility, the numerator (i.e., antimicrobial days) is aggregated by month for each patient-care location and overall for inpatient areas facility-wide (i.e., facility-wide-inpatient). Similarly, the denominator (i.e., days present) is calculated for the corresponding patient-care-location-month or facility-wide-inpatient-month. A secondary antimicrobial usage metric for facility-wide-inpatient also reported to this module is antimicrobial days per 1000 admissions. The numerator and denominators are further defined below and must adhere to the data format prescribed by the HL7 CDA Implementation Guide developed by the CDC and HL7.[7]

Settings: NHSN encourages submission of all NHSN-defined inpatient locations, facility-wide-inpatient, and select outpatient acute-care settings (i.e., outpatient emergency department, pediatric emergency department, 24-hour observation area) at each facility (Table 1). The patient-care areas may include adult, pediatric, or neonatal units as defined by NHSN Codes (Chapter 15 CDC Locations and Descriptions). A comprehensive submission will enable a facility to optimize inter- and/or intra-facility comparisons among specific wards, combined wards, and hospital-wide data. The optional and minimal requirements for participation in the Antimicrobial Use option are listed in Table 1.

The minimal requirement for participation is submission of data for all four of the following locations (if applicable to facility): 1) all medical critical care units(s) and

surgical critical care units(s) [if combined units, then report as medical/surgical critical care unit(s)]; 2) all medical ward(s) and surgical ward(s) [if combined wards, then report as medical/surgical ward(s)]; 3) at least one specialty care area; and 4) facility-wide-inpatient (both days present and admissions must be reported for this location).

Table 1. ***CDC Location[a]: Optional and Minimal Requirements for AU Option***

Inpatient Locations	Minimal Submission Requirements (if applicable for facility)
Adult Critical Care Units	**Requirement**: For facilities with only adult critical care unit(s): submit all medical critical care unit(s) and surgical critical care units(s) [if combined units, then report as medical/surgical critical care unit(s)]. For facilities with adult and pediatric critical care unit(s), the minimum requirement is the submission of data from all adult and pediatric critical care locations.
Pediatric Critical Care Units	**Requirement**: For facilities with only pediatric critical care unit(s): submit all medical critical care unit(s) and surgical critical care units(s) [if combined units, then report as medical/surgical critical care unit(s)]. For facilities with adult and pediatric critical care unit(s), the minimum requirement is the submission of data from all adult and pediatric critical care locations.
Neonatal Units	Optional (i.e., no minimal submission requirement)
Inpatient Specialty Care Areas	**Requirement:** At least one Specialty Care Area
Inpatient Adults Wards	**Requirement:** For facilities with only adult medical and surgical ward(s), submit all medical ward(s) and surgical ward(s) [if combined wards, then report as medical/surgical ward(s)]. For facilities with adult and pediatric medical and surgical ward(s), the minimum requirement is the submission of data from all adult and pediatric medical and surgical ward locations.
Inpatient Pediatric Wards	**Requirement:** For facilities with only pediatric medical and surgical ward(s), submit all medical ward(s) and surgical ward(s) [if combined wards, then report as medical/surgical ward(s)]. For facilities with adult and pediatric medical and surgical ward(s), the minimum requirement is the submission of data from all adult and pediatric medical and surgical ward locations.
Step Down Units	Optional (i.e., no minimal submission requirement)

Inpatient Locations	Minimal Submission Requirements (if applicable for facility)
Operating Rooms	Optional (i.e., no minimal submission requirement)
Long Term Care	Optional (i.e., no minimal submission requirement)
Facility-Wide	**Minimal Submission Requirements (if applicable for facility)**
Facility-wide-inpatient	**Requirement:** Facility-wide-inpatient
Outpatient Locations	**Minimal Submission Requirements (if applicable for facility)**
Select Acute Care Settings Outpatient Emergency Department Pediatric Emergency Department 24-Hour Observation Area	Optional (i.e., no minimal submission requirement)

[a]**CDC Location:** A CDC-defined designation given to a patient-care area housing patients who have similar disease conditions or who are receiving care for similar medical or surgical specialties. Each facility location that is monitored is "mapped" to one CDC Location. The specific CDC Location code is determined by the type of patients cared for in that area according to the **80% Rule**. That is, if 80% of patients are of a certain type (e.g., pediatric patients with orthopedic problems), then that area is designated as that type of location (in this case, an Inpatient Pediatric Orthopedic Ward). See Locations chapter for more information regarding location mapping.

Requirements:

An acceptable minimal month of data includes:
a. Data submitted for all four of the following locations (if applicable to facility): 1) all medical critical care unit(s) and surgical critical care unit(s) [if combined units, then report as medical/surgical critical care unit(s)]; 2) all medical ward(s) and surgical ward(s) [if combined wards, then report as medical/surgical ward(s)]; 3) at least one specialty care area; and 4) facility-wide-inpatient (both days present and admissions must be reported for this location).
b. Each month, the facility must choose to monitor antimicrobial use data on the *Patient Safety Monthly Reporting Plan* (CDC 57.106)
c. All data fields outlined in the *Table of Instructions* (Appendix A) for the AU option are completed via CDA for each location.

Numerator Data (Antimicrobial Days):

Antimicrobial Days (Days of Therapy): Defined as the aggregate sum of days for which any amount of a specific antimicrobial agent was administered to individual patients as documented in the eMAR and/or BCMA.[8-11] Appendix B provides a list of antimicrobial agents. Aggregate antimicrobial days are reported monthly for inpatient locations, facility-wide-inpatient, and select outpatient acute-care settings (e.g., outpatient emergency department, pediatric emergency department, 24-hour observation area) for select antimicrobial agents and stratified by route of administration (e.g., intravenous,

intramuscular, digestive and respiratory). Refer to Table 2 and Table 3 for definitions of drug-specific antimicrobial days and stratification based on route of administration. For example, a patient to whom 1 gram vancomycin is administered intravenously twice daily for three days will be attributed three "Vancomycin Days (total)" and three "Vancomycin Days (IV)" when stratified by intravenous route of administration. Appendix C provides additional examples for the calculation of antimicrobial days. Table 4 summarizes the data elements for numerator calculation. Please note that "zero" should be recorded when no aggregate usage occurred during a given reporting period for a specific antimicrobial agent at a facility in which the agent is used, while "not applicable" should be recorded when data are not available for a specific antimicrobial agent at a facility (e.g., the agent can't be electronically captured at that facility). A value (e.g., a specific number, "zero", or "not applicable") should be reported for every antimicrobial agent listed in Appendix B.

Table 2. ***Classification and Definitions of Route of Administrations for Antimicrobial Days***

Classification: Route of Administration[a]	**Definition**[b,c]
Intravenous	An intravascular route that begins with a vein.
Intramuscular	A route that begins within a muscle.
Digestive Tract	A route that begins anywhere in the digestive tract extending from the mouth through rectum.
Respiratory Tract	A route that begins within the respiratory tract, including the oropharynx and nasopharynx.

[a] Other routes of administration are excluded in this module (e.g., antibiotic locks, intraperitoneal, intraventricular, irrigation, topical).
[b]Definitions per SNOMED Reference Terminology
[c]Mapping of standardized terminology for route of administration are provided PHIN VADS

Table 3. ***Example Stratification of Antimicrobial Days by Route of Administration***

Month/ Year- Location	**Antimicrobial Agent**	**Drug-specific Antimicrobial Days**				
		Total[a]	**IV**	**IM**	**Digestive**[b]	**Respiratory**
Month-Year/ Location	Tobramycin	Tobramycin Days (Total)	Tobramycin Days (IV)	Tobramycin Days (IM)	Tobramycin Days (Digestive)	Tobramycin Days (Respiratory)

[a]Drug-specific antimicrobial days (total) attributes one antimicrobial day for any route of administration. For example, a patient to whom tobramycin was administered intravenously and via a respiratory route on the same day would be attributed "one Tobramycin Day (Total)"; the stratification by route of administration would be "one Tobramycin Day (IV)" and "one Tobramycin Day (Respiratory)".
[b] For purposes of example of route stratification only (tobramycin not FDA approved for administration via the digestive route).

Table 4. ***Data Elements for Antimicrobial Days***

	Antimicrobial Days
Antimicrobial Agents	Defined as select antimicrobial agents and stratified by route of administration (i.e., intravenous, intramuscular, digestive and respiratory). Refer to Appendix B for a complete list of antimicrobial agents. The list of select antimicrobial agents will evolve with time as new agents become commercially available. *Topical antimicrobial agents are not included in this module option.*
Data source	Antimicrobial days are derived from administered data documented in the eMAR and/or BCMA only. Usage derived from other data sources (e.g., pharmacy orders, doses dispensed, doses billed) cannot be submitted.
Location	Antimicrobial days are aggregated for inpatient locations, facility-wide-inpatient, and select outpatient acute-care settings (i.e., outpatient emergency department, pediatric emergency department, 24-hour observation area) per NHSN location definitions.
Time Unit	Antimicrobial days for a specific antimicrobial agent and stratification by route of administration are aggregated monthly per location.

Denominator Data (Days Present and Admissions): The numerator will be analyzed against the denominator of days present and also admissions for facility-wide-inpatient only. The denominators are further defined below.

Days present: Defined as time period during which a given patient is at risk for antimicrobial exposure for a given patient location. The definition of days present differs from conventional definition of patient days used in other NHSN modules and that recommended by the SHEA/HIPAC guidance for surveillance of multidrug-resistant organisms.[12] Days present is further defined below in context of calculation for patient care location specific analyses and facility-wide-inpatient analyses. Please note that a separate calculation for days present is required for patient-care location compared to facility-wide-inpatient.

For patient-care location-specific analyses, days present is calculated as the number of patients who were present for any portion of each day of a calendar month for a patient-care location; the aggregate measure is calculated by summing up all of the days present for that location and month. The day of admission, discharge, and transfer to and from locations will be included in days present. For example, a patient admitted to the medical ward on Monday and discharged two days later on Wednesday will be attributed three days present on that medical ward. Another example, on the day a patient is transferred from a medical critical-care unit to a medical ward; the patient will be attributed one day present on the medical critical care unit as well as one day present on the medical ward. Similarly, a patient's exposure to the operating room or emergency department will be included in days present for these types of units. However, one patient can account for only one day present for a specific location per calendar day (e.g., one patient cannot contribute more than 1 day present to any one unique location on the same day, but can contribute a day present to two different locations on the same day). For example, a

patient transferred from the surgical ward to the operating room and back to the surgical ward in a calendar day contributes one day present to the surgical ward and one day present to the operating room.

For facility-wide-inpatient analyses, days present is calculated as the number of patients who were present for any portion of each day of a calendar month at the facility-wide-inpatient location; the aggregate measure is calculated by summing up all of the days present for facility-wide-inpatient for a given month. Thus, a sum of days present from location-specific analyses would be higher than days present for the facility, because transfers between wards can account for multiple location "days present" for a given patient. Therefore, the individual summing of days present for location-specific analyses to achieve facility-wide-inpatient is not permissible. The calculation must be a separate summation for facility-wide-inpatient analyses.

Admissions: Admissions are defined as the aggregate number of patients admitted to the facility (i.e., facility-wide-inpatient) starting on first day of each calendar month through the last day of the calendar month. This is the same definition for admissions utilized in the NHSN MDRO/CDI Module. In the AU option, admissions are reported only for facility-wide-inpatient.

Table 5. ***Location-specific and Facility-wide-inpatient Metrics***

Metric Collected	Metric Definition	Comments
Inpatient Care Location-Specific Analyses		
Antimicrobial Days/Days present	Drug-specific antimicrobial days per patient-care location per month/Days present per patient-care location per month	One patient can contribute only one day present per calendar day for each specific location. Summed total may be higher when compared to facility-wide measure (reflecting transfers between locations).
Facility-wide-inpatient Analyses		
Antimicrobial Days/Days present	Drug-specific antimicrobial days for a facility per month/Days present per facility-wide-inpatient per month	One patient can contribute only one day present per calendar day for a facility. Thus, one denominator is obtained for an entire facility. The day present measure for facility-wide-inpatient may be lower when compared to sum total from location-specific comparison.
Antimicrobial Days/Admissions	Drug-specific antimicrobial days for a facility per month/Admissions per facility-wide-inpatient per month	Only calculated for facility-wide-inpatient for AU Option.

Data Analyses:
Antimicrobial use data are expressed as incidence density rates of antimicrobial days per days present stratified by patient-care location and facility-wide-inpatient. Antimicrobials may be grouped during analysis by route of administration, spectrum of activity, therapeutic indication, or drug classification.
A secondary metric, antimicrobial days per admissions, will also be analyzed for facility-wide-inpatient.

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Appendix A. Table of Instructions: Antimicrobial Use

Data Field	Instructions for CDA of Antimicrobial Use Data
Facility identifier	Required. Must be assigned to facility and included in the importation file prior to submission to CDC.
Month	Required. Record the 2-digit month during which the data were collected for this location.
Year	Required. Record the 4-digit year during which the data were collected for this location.
Location	Required. Record location; must be (if applicable to facility): 1) all medical critical care unit(s) and surgical critical care unit(s) [if combined units, then report as medical/surgical critical care unit(s)]; 2) all medical ward(s) and surgical ward(s) [if combined wards, then report as medical/surgical ward(s)]; 3) at least one specialty care area; and 4) facility-wide-inpatient
Numerator: Antimicrobial days per month per location	Required. Antimicrobial days are defined as the aggregate sum of the days of exposure for which a specific antimicrobial was administered. These are required to be extracted from electronic medication administration record (eMAR) and/or bar coding medication record (BCMA). Antimicrobials days will be collected for select antimicrobial agents (refer to Appendix B) and stratified by route of administration.
Denominator: Days present Admissions	Required. Days present is defined as risk for antimicrobial exposure per time unit of analysis stratified by location. For patient-care location-specific analyses, days present is calculated as the number of patients who were present for any portion of each day of a calendar month for a patient-care location. For facility-wide-inpatient analyses, days present is calculated as the number of patients who were present for any portion of each day of a calendar month at the facility-wide-inpatient location Admissions are defined as the aggregate number of patients admitted to the facility (i.e., facility-wide-inpatient) starting on first day of each calendar month through the last day of the calendar month. In the AUR Use Option, admissions are only reported for facility-wide-inpatient.

Appendix B. List of Antimicrobials

Please note that mapping of standardized terminology (RXNORM) are provided PHIN Vocabulary Access and Distribution System (VADS).

Antimicrobial Agent	Antimicrobial Category	Antimicrobial Class[a]	Antimicrobial Subclass[a]
AMANTADINE	Anti-influenza	M2 ion channel inhibitors	
AMIKACIN	Antibacterial	Aminoglycosides	
AMOXICILLIN	Antibacterial	Penicillins	Aminopenicillin
AMOXICILLIN/ CLAVULANATE	Antibacterial	Penicillins	B-lactam/ B-lactamase inhibitor combination
AMPHOTERICIN B	Antifungal	Polyenes	
AMPHOTERICIN B LIPOSOMAL	Antifungal	Polyenes	
AMPICILLIN	Antibacterial	Penicillins	Aminopenicillin
AMPICILLIN/ SULBACTAM	Antibacterial	Penicillins	B-lactam/ B-lactamase inhibitor combination
ANIDULAFUNGIN	Antifungal	Echinocandins	
AZITHROMYCIN	Antibacterial	Macrolides	
AZTREONAM	Antibacterial	Monobactams	
CASPOFUNGIN	Antifungal	Echinocandins	
CEFACLOR	Antibacterial	Cephalosporins	Cephalosporin 2rd generation
CEFADROXIL	Antibacterial	Cephalosporins	Cephalosporin 1st generation
CEFAZOLIN	Antibacterial	Cephalosporins	Cephalosporin 1st generation
CEFDINIR	Antibacterial	Cephalosporins	Cephalosporin 3rd generation
CEFDITOREN	Antibacterial	Cephalosporins	Cephalosporin 3rd generation
CEFEPIME	Antibacterial	Cephalosporins	Cephalosporin 4th generation
CEFIXIME	Antibacterial	Cephalosporins	Cephalosporin 3rd generation
CEFOTAXIME	Antibacterial	Cephalosporins	Cephalosporin 3rd generation
CEFOTETAN	Antibacterial	Cephalosporins	Cephamycin
CEFOXITIN	Antibacterial	Cephalosporins	Cephamycin
CEFPODOXIME	Antibacterial	Cephalosporins	Cephalosporin 3rd generation
CEFPROZIL	Antibacterial	Cephalosporins	Cephalosporin 2rd generation
CEFTAROLINE	Antibacterial	Cephalosporins	Cephalosporin 5th generation
CEFTAZIDIME	Antibacterial	Cephalosporins	Cephalosporin 3rd generation
CEFTIBUTEN	Antibacterial	Cephalosporins	Cephalosporin 3rd generation
CEFTIZOXIME	Antibacterial	Cephalosporins	Cephalosporin 3rd generation
CEFTRIAXONE	Antibacterial	Cephalosporins	Cephalosporin 3rd generation

Antimicrobial Agent	Antimicrobial Category	Antimicrobial Class[a]	Antimicrobial Subclass[a]
CEFUROXIME	Antibacterial	Cephalosporins	Cephalosporin 2rd generation
CEPHALEXIN	Antibacterial	Cephalosporins	Cephalosporin 1st generation
CHLORAMPHENICOL	Antibacterial	Phenicols	
CIPROFLOXACIN	Antibacterial	Fluoroquinolones	
CLARITHROMYCIN	Antibacterial	Macrolides	
CLINDAMYCIN	Antibacterial	Lincosamides	
COLISTIMETHATE	Antibacterial	Polymyxins	
DAPTOMYCIN	Antibacterial	Lipopeptides	
DICLOXACILLIN	Antibacterial	Penicillins	Penicillinase-stable penicillins
DORIPENEM	Antibacterial	Carbapenems	
DOXYCYCLINE	Antibacterial	Tetracyclines	
ERTAPENEM	Antibacterial	Carbapenems	
ERYTHROMYCIN	Antibacterial	Macrolides	
ERYTHROMYCIN/ SULFISOXAZOLE	Antibacterial	Folate pathway inhibitors/ Sulfonamides	
FIDAXOMICIN	Antibacterial	Macrocyclic	
FLUCONAZOLE	Antifungal	Azoles	
FOSFOMYCIN	Antibacterial	Fosfomycins	
GEMIFLOXACIN	Antibacterial	Fluoroquinolones	
GENTAMICIN	Antibacterial	Aminoglycosides	
IMIPENEM/ CILASTATIN	Antibacterial	Carbapenems	
ITRACONAZOLE	Antifungal	Azoles	
LEVOFLOXACIN	Antibacterial	Fluoroquinolones	
LINEZOLID	Antibacterial	Oxazolidinones	
MEROPENEM	Antibacterial	Carbapenems	
METRONIDAZOLE	Antibacterial	Nitroimidazoles	
MICAFUNGIN	Antifungal	Echinocandins	
MINOCYCLINE	Antibacterial	Tetracyclines	
MOXIFLOXACIN	Antibacterial	Fluoroquinolones	
NAFCILLIN	Antibacterial	Penicillins	Penicillinase-stable penicillins
NITROFURANTOIN	Antibacterial	Nitrofurans	
OSELTAMIVIR	Anti-influenza	Neuraminidase inhibitors	

Antimicrobial Agent	Antimicrobial Category	Antimicrobial Class[a]	Antimicrobial Subclass[a]
OXACILLIN	Antibacterial	Penicillins	Penicillinase-stable penicillins
PENICILLIN G	Antibacterial	Penicillins	Penicillin
PENICILLIN V	Antibacterial	Penicillins	Penicillin
PIPERACILLIN	Antibacterial	Penicillins	Ureidopenicillin
PIPERACILLIN/ TAZOBACTAM	Antibacterial	Penicillins	B-lactam/ B-lactamase inhibitor combination
POLYMYXIN B	Antibacterial	Polymyxins	
POSACONAZOLE	Antifungal	Azoles	
QUINUPRISTIN/ DALFOPRISTIN	Antibacterial	Streptogramins	
RIFAMPIN	Antibacterial	Rifampin	
RIMANTADINE	Anti-influenza	M2 ion channel inhibitors	
SULFAMETHOXAZOLE/ TRIMETHOPRIM	Antibacterial	Folate pathway inhibitors	
SULFISOXAZOLE	Antibacterial	Folate pathway inhibitors	
TELAVANCIN	Antibacterial	Lipo-glycopeptides	
TELITHROMYCIN	Antibacterial	Ketolides	
TETRACYCLINE	Antibacterial	Tetracyclines	
TICARCILLIN/ CLAVULANATE	Antibacterial	Penicillins	B-lactam/ B-lactamase inhibitor combination
TIGECYCLINE	Antibacterial	Glycylcyclines	
TINIDAZOLE	Antibacterial	Nitroimidazoles	
TOBRAMYCIN	Antibacterial	Aminoglycosides	
VANCOMYCIN	Antibacterial	Glycopeptides	
VORICONAZOLE	Antifungal	Azoles	
ZANAMIVIR	Anti-influenza	Neuraminidase inhibitors	

[a] Adapted from CLSI January 2010

Appendix C. Example Calculations of Antimicrobial Days

Example 1. Example eMAR and Calculation of Antimicrobial Days

This example illustrates the calculation of antimicrobial days from a patient receiving meropenem 1gram intravenously every 8 hours and amikacin 1000mg intravenously every 24 hours in the medical ward. Table 1 provides an example of administered doses for this patient documented in eMAR. Table 2 illustrates the calculation of meropenem and amikacin days by drug-specific (total) and stratified by route of administration based upon the administered doses of meropenem and amikacin documented in eMAR. Table 3 illustrates the contribution of this patient's antimicrobial days to the aggregate monthly report per patient-care location.

Table 1. ***Example eMAR for Patient housed in Medical Ward***

Medical Ward	Monday December 28	Tuesday December 29	Wednesday December 30
Meropenem 1gram intravenously every 8 hours	Given: 2300	Given: 0700 Given: 1500 Given: 2300	Given: 0700
Amikacin 1000mg intravenously every 24 hours	Given: 2300	Given: 2300	

Table 2. ***Example of calculation of antimicrobial days***

Calculation	Monday December 28	Tuesday December 29	Wednesday December 30
Drug-specific Antimicrobial Days (total)	Meropenem Days = 1 Amikacin Days = 1	Meropenem Days = 1 Amikacin Days = 1	Meropenem Days = 1 Amikacin Days = 0
Drug-specific Antimicrobial Days by Stratification of Route of Administration	Meropenem Days (IV) = 1 Amikacin Days (IV) = 1	Meropenem Days (IV) = 1 Amikacin Days (IV) = 1	Meropenem Days (IV) = 1 Amikacin Days (IV) = 0

Table 3. ***Example of antimicrobial days per month per patient-care location***

Month/ Year-Location	Antimicrobial Agent	Drug-specific Antimicrobial Days				
		Total	IV	IM	Digestive	Respiratory
December Medical Ward	Meropenem	3	3	0	0	0
December Medical Ward	Amikacin	2	2	0	0	0

Example 2. Differences in Calculation for Patient-Care Location and Facility-Wide-Inpatient for a Patient Transferred Between Patient-Care Locations

This example illustrates the calculation of antimicrobial days from a patient receiving vancomycin 1gram every 8 hours that was transferred from the MICU to a medical ward on December 1. Table 1 provides an example of doses documented in eMAR administered to this patient in the MICU and medical ward. Table 2 illustrates the calculation of vancomycin days by drug-specific (total) and stratified by route of administration based upon the administered doses of vancomycin documented in eMAR. Table 3 illustrates the contribution of this patient's vancomycin days to the aggregate monthly report per patient-care location and facility-wide-inpatient.

Table 1. ***Example eMAR for Patient transferred from MICU to Medical Ward on December 1.***

	Tuesday December 1 Location: MICU	**Tuesday December 1 Location: Medical Ward**
Vancomycin 1gram intravenously every 8 hours	Given: 0700	Given: 1500 Given: 2300

Table 2. ***Example of calculation of antimicrobial days for December 1***

Calculation	**Tuesday, December 1 Location: MICU**	**Tuesday December 1Location: Medical Ward**
Drug-specific Antimicrobial Days (total)	Vancomycin Days = 1	Vancomycin Days = 1
Drug-specific Antimicrobial Days by Stratification of Route of Administration	Vancomycin Days (IV) = 1	Vancomycin Days (IV) = 1

Table 3. ***Example of antimicrobial days per month per patient-care location and facility-wide inpatient contributed from December 1***

Month/ Year-Location	**Antimicrobial Agent**	**Drug-specific Antimicrobial Days**				
		Total	**IV**	**IM**	**Digestive**	**Respiratory**
December MICU	Vancomycin	1	1	0	0	0
December Medical Ward	Vancomycin	1	1	0	0	0
December Facility-wide-inpatient	Vancomycin	1	1	0	0	0

Example 3. Calculation of Antimicrobial Days for a Patient-Care Location when a Patient Admission extends over Two Different Months

This example illustrates the calculation of antimicrobial days from a patient receiving ceftriaxone 1gram intravenously every 24 hours for two days in the surgical ward (but spanning different months). Table 1 provides an example of administered doses for this patient documented in eMAR. Table 2 illustrates the calculation of ceftriaxone days by drug-specific (total) and stratification of route of administration based upon the administered doses of ceftriaxone documented in eMAR. Table 3 illustrates the contribution of this patient's ceftriaxone days to the aggregate monthly report per patient-care location.

Table 1. ***Example eMAR for Patient housed in Surgical Ward***

	Thursday December 31 Location: Surgical Ward	**Friday January 1 Location: Surgical Ward**
Ceftriaxone gram intravenously every 24 hours	Given: 0800	Given: 0800

Table 2. ***Example of calculation of antimicrobial days***

Calculation	**Thursday December 31 Location: Surgical Ward**	**Friday January 1 Location: Surgical Ward**
Drug-specific Antimicrobial Days (total)	Ceftriaxone Day = 1	Ceftriaxone Day = 1
Drug-specific Antimicrobial Days by Stratification of Route of Administration	Ceftriaxone Day (IV) = 1	Ceftriaxone Day (IV) = 1

Table 3. ***Example of antimicrobial days per month per patient-care location***

Month/ Year-Location	**Antimicrobial Agent**	**Drug-specific Antimicrobial Days**				
		Total	**IV**	**IM**	**Digestive**	**Respiratory**
December/ Surgical Ward	Ceftriaxone	1	1	0	0	0
January/ Surgical Ward	Ceftriaxone	1	1	0	0	0

2. Antimicrobial Resistance (AR) Option

Introduction

Common measures of antimicrobial resistance include the proportion of isolates resistant to specific antimicrobial agents. This proportion resistant (%R) is used to aid in clinical decision making (hospital antibiograms) as well as for assessing impact of cross transmission prevention success or antimicrobial stewardship success, although the measure may not be very sensitive to measuring success of efforts in the short term. An additional value of measuring the proportion resistant includes a local or regional assessment of progression or improvement of a particular resistance problem, to guide local or regional cross-transmission prevention efforts. By utilizing standard methodology of aggregating proportion resistant, better local and regional assessments of the magnitude of a particular resistance phenotype will be more valid.

Objectives:

1. Facilitate evaluation of antimicrobial resistance data using a standardized approach to
    a. Provide local practitioners with an improved awareness of a variety of antimicrobial-resistance problems to both aid in clinical decision making and prioritize transmission prevention efforts
    b. Provide facility-specific measures in context of a regional and national perspective (i.e., benchmarking) which can inform decisions to accelerate transmission prevention efforts and reverse propagation of emerging or established problematic resistant pathogens.
2. Regional and national assessment of resistance of antimicrobial resistant pathogens of public health importance including ecologic assessments and infection burden

Methodology:

Antimicrobial resistance data are reported as a proportion and rate in this module.[8] The proportion resistant is defined as the number of resistant isolates divided by the number of isolates tested for the specific antimicrobial agent being evaluated. In comparison, the antimicrobial resistance rate is defined as the number of resistant isolates per 1000 patient days. For each facility, the numerator (i.e., number of resistant isolates) is derived from isolate-level reports submitted. The denominator is reported directly (i.e., not derived from other reports). The numerator and denominator are further defined below and must adhere to the data format prescribed by the HL7 CDA Implementation Guide developed by the CDC and HL7.[7]

Settings:

NHSN requires reports to cover all NHSN-defined inpatient locations and select outpatient acute-care settings (i.e., outpatient emergency department, pediatric emergency department, 24-hour observation area) at each facility. Eligible facilities include acute care facilities including long-term acute care and inpatient rehabilitation facilities.

Requirements:

Each month,

1. The facility must choose to monitor antimicrobial resistance data on the *Patient Safety Monthly Reporting Plan* (CDC 57.106)
2. Two record types must be reported for each month of surveillance.
   - One for the isolate-based reports
   - One for the denominator data report (facility-wide inpatients-FacWideIN).

Isolate-based report

Report all required data each month for each eligible Isolate-based report. Eligible Isolate-based reports must have had susceptibility testing performed. Two distinct events should be reported. (See Appendix A)

1. **First** eligible pathogen isolated from invasive source per patient, per 14 day period even across calendar months (i.e., report all *unique* invasive source).
2. **First** eligible pathogen isolated from any eligible non-invasive culture source, per patient, per month. This should be consistent with CLSI M39 Guidance on reporting cumulative susceptibility test results.

A. Eligible pathogens include:
   - *Acinetobacter*
   - *Candida albicans*
   - *Candida glabrata*
   - *Citrobacter freundii*
   - *Enterobacter spp.*
   - *Enterococcus faecalis*
   - *Enterococcus faecium,*
   - *Enterococcus spp. NOS (not otherwise specified to the species level)*
   - *Escherichia coli*
   - *Group B Streptococcus*
   - *Klebsiella oxytoca*
   - *Klebsiella pneumoniae*
   - *Morganella morganii*
   - *Proteus mirabilis*
   - *Pseudomonas aeruginosa*
   - *Serratia marcescens*
   - *Staphylococcus aureus*
   - *Stenotrophomonas maltophilia*
   - *Streptococcus pneumoniae*

B. Specimen Sources

- Eligible non-invasive source (one per patient, per month) include:
  - Lower respiratory (e.g., sputum, endotracheal, bronchoalveolar lavage)
  - Urine

- Unique invasive source(one per patient)
  - CSF
  - Blood:
    - Report blood or CSF cultures growing same eligible pathogen with no intervening positive blood or CSF culture (with same eligible pathogen) within 14 days.
    - In a patient who already has a blood or CSF culture isolate-based report for a specific organism, report an additional Isolate-based report from an additional blood or CSF culture only if there is no prior positive blood or CSF culture for the same genus/species within 14 days, even across calendar months.
    - There should be a full 14 days with no positive blood or CSF culture result with the same genus/species from the same patient before another unique invasive source is reported. (e.g., there should be >14 days since previous isolation)

Use SNOMED codes to identify eligible specimen types to be included in identification of Isolate-based report. (Appendix B)

C. Required data includes mostly data available from the laboratory information system and some from administrative data systems. The set of variables for each isolate consists of a technical variable, healthcare facility identifier and epidemiological variables which are further classified into variables at isolate level and variables at antimicrobial test level. The first level includes data referring to the isolate which are repeated in all records reporting the antimicrobial susceptibility tests performed for that isolate (See Appendix C).

- Isolate / Patient related data
  - Patient identifier
  - Date of Birth
  - Gender
  - Date admitted to hospital
  - Specimen Collection Date
  - Specimen source (SNOMED)
  - Location code – (mapped to CDC location codes)
  - Isolate identifier (unique isolate ID)
  - Pathogen (Appendix A)

- Antimicrobial susceptibility data
  - Antibiotic (Appendix A)
  - PBP2a-agglutination (only if STAAUR)
  - PCR mec-gene (only if STAAUR)
  - E-test sign
  - E-test value
  - Interpretation of E-test
  - MIC sign
  - MIC value
  - Interpretation of MIC test
  - Zone sign
  - Zone value
  - Interpretation of zone test (disk diffusion)
  - Final interpretation result

- Technical variable
  - Facility ID (facility identifier, unique to NHSN)

D. Remove Same Day Duplicates

The goal of this option to capture the first isolate per patient per month from non-invasive culture source and in addition, every unique invasive isolate per patient per month (maximum of 3 per month per patient). However, often multiple isolates of the same species are processed on the same day, often with conflicting results. Only one isolate should be chosen, retaining the unique nature of the test results. Rules must be in place to ensure duplicate isolate reports are removed. Duplicates are defined as same species or same genus when identification to species level is not provided from same patient on same day. Identify observations reflecting multiple isolates within the same day (i.e., using the field Isolate ID when available) and select the isolate to report to NHSN based on these rules:

- For non-invasive source isolate selection, lower respiratory isolates should be selected over urine isolates
- For invasive source isolate selection, CSF isolates should be selected over blood isolates
- Eliminate isolates on same day without susceptibility test results
- On a single isolate if no final interpretation, prioritize test results for "E-test interpretation> MIC interpretation > Zone Interpretation"
- Do not merge test results across multiple isolates (i.e., don't summarize results across different isolates tested on same day)
- If testing results are indistinguishable, choose isolate test with more complete fields for other variables
- Interpretation of test results (E-test, MIC test, Zone test) includes the following results S=Susceptible, S-DD – Susceptible-Dose Dependent, I =Intermediate, R=Resistant NS = Non-Susceptible, N = Not Tested

Examples should reflect the above rules:

- Example 1: two different tests on same date are performed, producing conflicting SIR interpretations. Results should be merged into a single observation, with the "Final interpretation" variable being populated by the final determination of the laboratory.
- Example 2: Same test but conflicting results. Report most resistant (i.e., R > I > S).
- Example 3: If two isolates from the same day are sensitive and resistant to a disjointed set of antimicrobial agents, considering the protocol states not to merge the susceptibility results of isolates if they are different, pick the first in the sequence of the encounter recorded in the laboratory information system (LIS).
- Example 4: Same test and same results. Report result with most complete fields for other variables.

Denominator data report

For each month, report facility-wide denominator data (See Appendix D)

1. Patient Days: Number of patients present in the hospital at the same time period on each day of the month, summed across all days in the month
2. Admissions: Number of patients admitted to the hospital each month
3. Number of blood cultures performed, each month (for all locations included in the reporting plan).

   For further information on counting patient days and admissions http://www.cdc.gov/nhsn/PDFs/PatientDay_SumData_Guide.pdf.

Minimizing Bias
Source of test results should be from the hospital laboratory-information system (LIS). However, efforts should be made to reduce selection bias inherent in systems that have suppression rules in place preventing testing results from being placed into the LIS. Efforts should be made to optimize suppression rules so resistant results are not suppressed (i.e. only suppress susceptible results of candidates to be suppressed). Alternatively, allow transmission of suppressed results to LIS but construct LIS-based selective suppression of reports to clinicians (but not laboratorians).

Data Analyses:
Antimicrobial resistance data will be expressed using several metrics, likely at quarterly, semi-annual, or annual time frame depending on how rare the isolates occurred. (See Table 1)

Table 1. ***Proposed Resistance Metrics***

Metric	Definition	Comments
Facility-wide-inpatient: standard output for facility and group user.		
% non-susceptible	(# Resistant + # Intermediate/ # tested) Drug-specific antimicrobial resistance for a facility /Number of isolates tested per facility for specific microorganism-antimicrobial pairing	Custom output can include stratification by specimen source; blood, urine, other; helpful for empiric prescribing for suspected pathogen. Report non-susceptible since many organisms lack resistant breakpoint to specific drugs, reporting would be similar to, EARS-Net and more closely represents clinical care setting.
BSI % non-susceptible	(# Resistant BSI + # Intermediate BSI/# tested) Drug-specific antimicrobial resistance among positive blood cultures for a facility/Number of isolates from blood cultures tested per facility for specific microorganism-antimicrobial pairing	Most comparable to EARS-net. If patient identifiers are retained, this can be de-duplicated to be fully comparable with EARS-Net with a 1 patient/year measure.
Hospital- onset antimicrobial resistance rate	Drug-specific antimicrobial resistance (i.e., # non-susceptible) among isolates collected >3 days after admission, for a facility/1000 patient-days	Focuses on incident cultures, proxy for transmission within a hospital or exogenous acquisition. May be good outcome for stewardship
BSI resistance incidence (stratified by timing of onset)	Drug-specific antimicrobial resistance (i.e., # non-susceptible) unique blood culture positive tests /100 admissions. Evaluate by timing of blood culture (hospital onset vs. present on admission)	Overall good measure of community and hospital-based occurrence, estimates crude burden, can be split by crude hospital onset and crude community onset

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Appendix A. List of Microorganisms for Antimicrobial Resistance[9]

Please note that mapping of standardized terminology (SNOMED) are provided via the hai-voc spreadsheet.

Micro-organism	Specimen Type	Antimicrobial Agents
Acinetobacter	Blood, Urine, Lower Respiratory, CSF	Ampicillin-sulbactam Ceftazidime Ciprofloxacin Levofloxacin Imipenem Meropenem Gentamicin Tobramycin Amikacin Piperacillin-tazobactam Ticarcillin-clavulanate Cefepime Cefotaxime Ceftriaxone Doxcycline Minocycline Tetracycline Piperacillin Trimethoprim-sulfamethoxazole
	Additional Agents for Urine	None
Candida albicans *Candida glabrata*	Blood, Urine, CSF [Lower respiratory will not be collected for Candida spp.],	Anidulafungin Caspofungin Fluconazole Flucytosine Itraconazole Micafungin Posaconazole Voriconazole
	Additional Agents for Urine	None
Citrobacter freundii *Enterobacter* spp. *Escherichia coli* *Klebsiella oxytoca* *Klebsiella pneumoniae* *Morganella morganii* *Proteus mirabilis* *Serratia marcescens*	Blood, Urine, Lower Respiratory, CSF	Ampicillin Cefazolin Gentamicin Tobramycin Amikacin Amoxicillin-clavulanic acid Ampicillin-sulbactam Piperacillin-tazobactam

Micro-organism	Specimen Type	Antimicrobial Agents
		Ticarcillin-clavulanic acid Cefuroxime Cefepime Cefoxitin Cefotaxime Ceftriaxone Ciprofloxacin Levofloxacin Doripenem Ertapenem Imipenem Meropenem Piperacillin Trimethoprim-sulfamethoxazole Aztreonam Ceftazidime Chloramphenicol Tetracycline
	Additional Agents for Urine	Cephalothin Lomefloxacin Ofloxacin Norfloxacin Nitrofurantoin Sulfisoxazole Trimethoprim
Enterococcus faecalis *Enterococcus faecium* *Enterococcus* spp. NOS (not otherwise specified) (excluding *E. faecalis* and *E. faecium, and excluding other identified species)*	Blood, Urine, Lower Respiratory, CSF	Ampicillin Penicillin Daptomycin Linezolid Quinupristin/dalfopristin Vancomycin High-level Resistance Screen for Gentamicin and Streptomycin (non-urine isolates only); synergistic test result will be reported as susceptible; non-synergistic test result will be reported as resistant.

Micro-organism	Specimen Type	Antimicrobial Agents
	Additional Agents for Urine	Ciprofloxacin Levofloxacin Norfloxacin Nitrofurantoin Tetracycline
Pseudomonas aeruginosa	Blood, Urine, Lower Respiratory, CSF	Ceftazidime Gentamicin Tobramycin Piperacillin Amikacin Aztreonam Cefepime Ciprofloxacin Levofloxacin Imipenem Meropenem Piperacillin-tazobactam Ticarcillin
	Additional Agents for Urine	Lomefloxacin Ofloxacin Norfloxacin
Staphylococcus aureus	Blood, Urine, Lower Respiratory, CSF	Azithromycin Clarithromycin Erythromycin Clindamycin Oxacillin Cefoxitin Penicillin Trimethoprim-sulfamethoxazole Daptomycin Linezolid Telithromycin Doxycycline Minocycline Tetracycline Vancomycin Rifampin Chloramphenicol Ciprofloxacin Levofloxacin Ofloxacin Moxifloxacin

Micro-organism	Specimen Type	Antimicrobial Agents
		Gentamicin Quinupristin-dalfoprisin
	Additional Agents for Urine	Lomefloxacin Norfloxacin Nitrofurantoin Sulfisoxazole Trimethoprim
Stenotrophomonas maltophilia	Blood, Urine, Lower Respiratory, CSF	Trimethoprim-sulfamethoxazole Ceftazidime Chloramphenicol Levofloxacin Minocycline Ticarcillin-clavulanate
	Additional Agents for Urine	None
Streptococcus pneumoniae	Blood, Urine, Lower Respiratory, CSF	Erythromycin azithromycin Penicillin (meningitis breakpoint) Penicllin (non-meningitis breakpoint) Penicillin V (oral breakpoint) Trimethoprim-sulfamethoxazole Cefepime, Cefotaxime (meningitis breakpoint) Cefotaxime (non-meningitis breakpoint) Ceftriaxone(meningitis breakpoint) Ceftriaxone (non-meningitis breakpoint) Clindamycin Gemifloxacin Levofloxacin Moxifloxacin Ofloxacin Meropenem Telithromycin Tetracycline Vancomycin Amoxicillin

Micro-organism	Specimen Type	Antimicrobial Agents
		Amoxicillin-clavulanic acid Cefuroxime Chloramphenicol Ertapenem Imipenem Linezolid Rifampin
	Additional Agents for Urine	None
Group B Streptococcus	Blood, Urine, Lower Respiratory, CSF	Clindamycin Erythromycin Cefotaxime Cefazolin Cefoxitin Ampicillin Penicillin Levofloxacin Ciprofloxacin Tetracycline Vancomycin Daptomycin Linezolid

Appendix B. SNOMED Codes to Identify Eligible Specimen Types

[a]Mapping of standardized terminology for specimen type are provided via the hai-voc spreadsheet

Specimen Type	Description[a]	SNOMED CT Code
Blood	Blood specimen (specimen)	119297000
Urine	Urinary specimen (specimen)	122575003
Cerebral Spinal Fluid	Cerebrospinal fluid sample (specimen)	258450006
Lower Respiratory Specimens	coughed sputum specimen (specimen)	119335007
	specimen from trachea (specimen)	119390000
	specimen from lung obtained by bronchial washing procedure (specimen)	122609004
	specimen from lung obtained by biopsy (specimen)	122610009
	specimen from lung obtained by fiberoptic bronchoscopic biopsy (specimen)	122611008
	upper respiratory fluid specimen obtained by tracheal aspiration (specimen)	122877000
	tissue specimen from bronchus (specimen)	128158009
	tissue specimen from trachea (specimen)	128173005
	bronchial fluid sample (specimen)	258446004
	sputum specimen obtained by aspiration (specimen)	258608003
	sputum specimen obtained by aspiration from trachea (specimen)	258609006
	sputum specimen obtained by sputum induction (specimen)	258610001
	sputum specimen obtained from sputum suction trap (specimen)	258611002
	lower respiratory tissue sample (specimen)	309170008
	lower respiratory fluid sample (specimen)	309171007
	transbronchial lung biopsy sample (specimen)	309173005
	bronchial biopsy sample (specimen)	309174004
	bronchial brushings sample (specimen)	309176002
	tissue specimen from lung (specimen)	399492000
	specimen obtained by bronchial aspiration (specimen)	441903006
	specimen obtained by bronchioloalveolar lavage procedure (specimen)	441917002
	specimen from trachea obtained by aspiration (specimen)	445447003
	specimen obtained by bronchial trap (specimen)	446838005
	bronchial fluid specimen obtained from bronchial trap (specimen)	447345009

Specimen Type	Description[a]	SNOMED CT Code
	sputum specimen (specimen)	119334006
	specimen from bronchus (specimen)	119391001
	specimen from lung (specimen)	127458004
	lower respiratory sample (specimen)	258606004
	bronchoalveolar lavage fluid sample (specimen)	258607008
	tracheal biopsy sample (specimen)	309169007

Appendix C. Technical and Isolate Based Report Variables

NAME	DESCRIPTION OF FIELD	CODE VALUE LIST	LEVEL OF REQUIREMENT
Facility ID	NHSN-assigned facility ID number	NHSN	Required
Patient ID	Alphanumeric patient ID assigned by the hospital and may consist of any combination of numbers and/or letters. This should be an ID that remains the same for the patient across all visits and admissions.		Required
Date of Birth	The date of the patient's birth including month, day , year		Required
Gender	M (Male), F (Female), O (Other) to indicate the gender of the patient		Required
Date admitted to facility	Date patient was admitted to an inpatient acute care facility Including month, day ,year If the laboratory specimen is reported from an outpatient location enter a null value		Required
Specimen collection date	Date the specimen was collected including month, day, year		Required
Specimen source	Specimen source from which the isolate was recovered (e.g. urine, lower respiratory, blood, CSF)	(SNO MED)	Required
Location	Patient care area where patient was when the laboratory specimen was collected. Use patient location obtained from administrative data system (ADT)	CDC Location Codes	Required
Isolate identifier	Isolate identifier unique for each isolate within laboratory and year.		Required
Pathogen	Pathogen identified from specimen collected (Appendix A)	SNOMED	Required
Antibiotic	Antibiotic(s) tested for susceptibility (Appendix A will define agents by pathogen and specimen source)		Required
PBP2a-agglutination	Result for PBP2a-agglutination (only if SA) Pos/Neg/Unk		Conditional (for Staph aureus)
PCR mec-gene	Result for PCR mec-gene (only if SA) Pos/Neg/Unk		Conditional (for Staph aureus)

NAME	DESCRIPTION OF FIELD	CODE VALUE LIST	LEVEL OF REQUIREMENT
E-test sign	E-test sign (> < =).		Conditional
E-test value	E-test (Value in micrograms/liter). Use '.' as decimal delimiter, e.g. 0.25		Conditional
Interpretation of E-test	Interpretation result of the E-test susceptibility test performed		Conditional
MIC sign	MIC sign (> < =).		Conditional
MIC value	MIC (Value in micrograms/liter). Use '.' as decimal delimiter, e.g. 0.25		Conditional
Interpretation of MIC test	Interpretation result of the MIC susceptibility test performed		Conditional
Zone sign	Zone sign (> < =).		Conditional
Zone value	Zone value in millimeters		Conditional
Interpretation of Zone test	Interpretation result of the zone susceptibility test performed		Conditional
Final Interpretation result	Final interpretation result of all different susceptibility tests performed		Required

Appendix D. Denominator Data Variables

	DESCRIPTION OF FIELD	CODE VALUE LIST	LEVEL OF REQUIREMENT
Facility Wide Denominator			
Facility ID	NHSN –assigned facility ID number	NHSN	Required
Location	FacWideIN		Required
Month	2-Digit month		Required
Year	4-Digit year		Required
Patient Days	For facility wide inpatient locations enter the total number of patient days collected at the same time each day combined for the month. All of the facility's inpatient locations with an overnight stay should be included where denominators can be accurately collected.		Required
Admission Count	For facility wide inpatients, enter the total number of admissions for all facility inpatient locations combined for the month. All the facility's inpatient locations with an overnight stay should be included where denominators can be accurately collected.		Required
Blood cultures performed	Number of blood cultures performed, each month (for all inpatient locations included in the reporting plan).		Required

Multidrug-Resistant Organism & *Clostridium difficile* Infection (MDRO/CDI) Module

Table of Contents

Background: Methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant *Enterococcus* spp. (VRE), and certain gram-negative bacilli have increased in prevalence in U.S. hospitals over the last three decades, and have important implications for patient safety. A primary reason for concern about these multidrug-resistant organisms (MDROs) is that options for treating patients with these infections are often extremely limited, and MDRO infections are associated with increased lengths of stay, costs, and mortality. Many of these traits have also been observed for *Clostridium difficile* infection (CDI). The Healthcare Infection Control Practices Advisory Committee (HICPAC) has approved guidelines for the control of MDROs.[1] These are available at (http://www.cdc.gov/ncidod/dhqp/pdf/ar/mdroGuideline2006.pdf). The MDRO and CDI module of the NHSN can provide a tool to assist facilities in meeting some of the criteria outlined in the guidelines. In addition, many of the metrics used in this module are consistent with "Recommendations for Metrics for Multidrug-Resistant Organisms in Healthcare Settings: SHEA/HICPAC Position Paper."[2]

Clostridium difficile (C. difficile) is responsible for a spectrum of *C. difficile* infections (CDI), including uncomplicated diarrhea, pseudomembranous colitis, and toxic megacolon which can, in some instances, lead to sepsis and even death. Although CDI represents a subset of gastroenteritis and gastrointestinal tract infections in the current CDC definitions for HAIs, specific standard definitions for CDI [3] should be incorporated to obtain a more complete understanding of how *C. difficile* is being transmitted in a healthcare facility.

As outlined in the HICPAC guideline[1], these MDRO and *C. difficile* pathogens may require specialized monitoring to evaluate if intensified infection control efforts are required to reduce the occurrence of these organisms and related infections. The goal of this module is to provide a mechanism for facilities to report and analyze these data that will inform infection prevention professionals of the impact of targeted prevention efforts.

This module contains two reporting options for MDRO and *C. difficile*, one focused on Laboratory-identified (LabID) Events reporting and the second on Infection Surveillance reporting. Reporting options are summarized in Table 1. Participants may choose either 1 or both of the 2 core reporting options and then may also choose to participate in any of the supplemental monitoring methods described in Table 1.

NOTE: LabID Event reporting and Infection Surveillance reporting are two separate and independent reporting options. See Appendix 3: *Differentiating Between LabID Event and Infection Surveillance* for key differences between the two options.

Table 1. ***Core and Supplemental Reporting Choices for MDRO and CDI Module***

	MDRO			CDI
Reporting Choices	**MRSA or MRSA/MSSA**	**VRE**	***Klebsiella* spp. (CephR or CRE), *E. coli* (CRE), *Acinetobacter* spp. (MDR)**	***C. difficile***
Core	**Method**	**Method**	**Method**	**Method**
Proxy Infection Measures LabID Event Choose ≥1 organism	A, B, C, D	A, B, C, D	A, B, C, D	±A, B, C
AND/OR				
Infection Surveillance Choose ≥1 organism	A, B	A, B	A, B	±A, B
Supplemental	**Method**	**Method**	**Method**	**Method**
Prevention Process Measures Options: • Hand Hygiene Adherence • Gown and Gloves Use Adherence • Active Surveillance Testing (AST) Adherence	 B B B	 B B B	 B B N/A	 B B N/A
AST Outcome Measures • Incident and Prevalent Cases using AST	B	B	N/A	N/A

N/A – not available or contraindicated.

±No surveillance for CDI will be performed in Neonatal Intensive Care Units (NICU), Specialty Care Nurseries (SCN), babies in LDRP (Labor, Delivery, Recovery, and Post-partum), well-baby nurseries, or well-baby clinics. And, if conducting facility-wide monitoring (Method C) the denominator counts (admissions, patient-days, encounters) for these locations must be removed.

Reporting Method (must choose to monitor by LabID Event or Infection Surveillance reporting before supplemental methods can also be used for monitoring):

A: **Facility-wide by location.** Report for each location separately and cover all locations in a facility. This reporting method requires the most effort, but provides the most detail for local and national statistical data.

B: **Selected locations within the facility (1 or more).** Report separately from one or more specific locations within a facility. This includes reporting individual Events and denominator data for each of the selected locations. This reporting method is ideal for use during targeted prevention programs.

C: **Overall facility-wide.** Report only one denominator for the entire facility and individual LabID Events from each inpatient location. Options include: overall Facility-wide Inpatient (FacWideIN) to cover all inpatient locations or overall Facility-wide Outpatient (FacWideOUT) to cover all outpatient locations. Facilities may choose to monitor both FacWideIN and FacWideOUT.

D: **Overall facility-wide: *Blood Specimens* Only.** This method is available for MDRO LabID Events only and targets the most invasive events. Options include: overall Facility-wide Inpatient (FacWideIN) to cover all inpatient locations or overall Facility-wide Outpatient (FacWideOUT) to cover all outpatient locations. Facilities may choose to monitor both FacWideIN and FacWideOUT.

I. Core Reporting

Option 1: Laboratory-Identified (LabID) Event Reporting

Introduction: LabID Event reporting option allows laboratory testing data to be used without clinical evaluation of the patient, allowing for a much less labor-intensive method to track MDROs and *C. difficile*. These provide proxy infection measures of MDRO and/or *C. difficile* healthcare acquisition, exposure burden, and infection burden based almost exclusively on laboratory data and limited admission date data, including patient care location. LabID Event reporting is ONLY for collecting and tracking positive laboratory results (e.g., cultures) that are collected for "clinical" purposes (i.e., for diagnosis and treatment). This means that the results of laboratory specimens collected for active surveillance testing (AST) purposes only should not be reported as LabID Events.

LabID Events can be monitored at the overall facility-wide level for inpatient areas (FacWideIN) and/or at the overall facility-wide level for outpatient areas (FacWideOUT). At the overall FacWide levels, the MDROs can be monitored for all specimen types or for *blood specimens* only. LabID Events can also be monitored for specific locations with unique denominator data required from each of the specific locations (i.e., facility-wide locations monitored separately [Method A] allowing for both facility-wide and location-specific data, or by selected locations only [Method B]).

Laboratory and admission data elements can be used to calculate a variety of distinct proxy measures including (see Table 2): admission prevalence rate and overall patient prevalence rate (measures of exposure burden), MDRO bloodstream infection incidence rate (measure of infection burden and healthcare

acquisition), overall MDRO infection/colonization incidence rate (measure of healthcare acquisition), and CDI incidence rate (measure of infection burden and healthcare acquisition).

Use NHSN forms to collect all required data, using the definitions of each data field as indicated in the Tables of Instructions. When denominator data are available from electronic databases, these sources may be used as long as the counts are not substantially different (+ or – 5%) from manually collected counts.

A. MDRO LabID Event Reporting

Methodology: Facilities may choose to monitor one or more of the following MDROs: MRSA, MRSA and MSSA, VRE, CephR- *Klebsiella* spp., CRE-*Klebsiella* spp., CRE-*E. coli*, and multidrug-resistant *Acinetobacter* spp. (see definitions below). For *S. aureus*, both the resistant (MRSA) and the susceptible (MSSA) phenotypes can be tracked to provide concurrent measures of the susceptible pathogens as a comparison to those of the resistant pathogens in a setting of active MRSA prevention efforts.
NOTE: No Active Surveillance Culture/Testing (ASC/AST) results are to be included in this reporting of individual results (See *Key Terms chapter*). Do NOT enter surveillance nasal swabs or other surveillance cultures as reports of LabID Events. AST tracking should be recorded under Process & Outcome Measures.

MDRO Definitions: MDROs included in this module are defined below.

MRSA: Includes ***S. aureus*** cultured from any specimen that tests oxacillin-resistant, cefoxitin-resistant, or methicillin-resistant by standard susceptibility testing methods, or by a laboratory test that is FDA-approved for MRSA detection from isolated colonies; these methods may also include a positive result by any FDA-approved test for MRSA detection from specific sources.

MSSA: ***S. aureus*** cultured from any specimen testing intermediate or susceptible to oxacillin, cefoxitin, or methicillin by standard susceptibility testing methods, or by a negative result from a test that is FDA-approved for MRSA detection from isolated colonies; these methods may also include a positive result from any FDA-approved test for MSSA detection from specific specimen sources.

VRE: Any ***Enterococcus* spp.** (regardless of whether identified to the species level), that is resistant to vancomycin, by standard susceptibility testing methods or by results from any FDA-approved test for VRE detection from specific specimen sources.

CephR-*Klebsiella*: Any ***Klebsiella* spp**. testing non-susceptible (i.e., resistant or intermediate) to ceftazidime, cefotaxime, ceftriaxone, or cefepime.

CRE-*Ecoli*: Any ***E. coli*** testing non-susceptible (i.e., resistant or intermediate) to imipenem, meropenem, or doripenem, by standard susceptibility testing methods or by a positive result for any method FDA-approved for carbapenemase detection from specific specimen sources.

CRE-*Klebsiella*: Any ***Klebsiella* spp**. testing non-susceptible (i.e., resistant or intermediate) to imipenem, meropenem, or doripenem, by standard susceptibility testing methods or by a positive result for any method FDA-approved for carbapenemase detection from specific specimen sources.

MDR-*Acinetobacter:* Any ***Acinetobacter*** spp. testing non-susceptible (i.e., resistant or intermediate) to at least one agent in at least 3 antimicrobial classes of the following 6 antimicrobial classes:

β-lactam/β-lactam β-lactamase inhibitor combination	**Aminoglycosides**	**Carbapenems**	**Fluoroquinolones**
Piperacillin Piperacillin/tazobactam	Amikacin Gentamicin Tobramycin	Imipenem Meropenem Doripenem	Ciprofloxacin Levofloxacin
Cephalosporins	**Sulbactam**		
Cefepime Ceftazidime	Ampicillin/sulbactam		

Settings: MDRO LabID Event reporting can occur in any location: inpatient or outpatient.

Requirements: Facilities choose at least 1 of the reporting methods listed below and report data accordingly:

Method	**Numerator Data Reporting**	**Denominator Data Reporting**
Facility-wide by location ***(Must monitor All Specimen sources)***	Enter each MDRO LabID Event from all locations separately	Report separate denominators for each location in the facility as specified in the NHSN Monthly Reporting Plan
Selected locations ***(Must monitor All Specimen sources)***	Enter each MDRO LabID Event from selected locations separately	Report separate denominators for each location monitored as specified in the NHSN Monthly Reporting Plan
Overall Facility-wide Inpatient (FacWideIN), *All Specimens*	Enter each MDRO LabID Event from all inpatient locations separately	Report only one denominator for the entire facility (e.g., total number of admissions and total number of patient days)
Overall Facility-wide Outpatient (FacWideOUT), *All Specimens*	Enter each MDRO LabID Event from all outpatient locations separately	Report only one denominator for all outpatient locations (e.g., total number of encounters)
Overall Facility-wide Inpatient, *Blood Specimens* Only	Enter each MDRO LabID Blood Specimen Event from all inpatient locations separately	Report only one denominator for the entire facility (e.g., total number of admissions and total number of patient days)
Overall Facility-wide Outpatient, *Blood Specimens* Only	Enter each MDRO LabID Blood Specimen Event from all outpatient locations separately	Report only one denominator for all outpatient locations (e.g., total number of encounters)

NOTE: Facilities must indicate each reporting choice chosen for the calendar month on the *Patient Safety Monthly Reporting Plan* (CDC 57.106).

For each MDRO being monitored, all MDRO test results are evaluated using either the algorithm in Figure 1 (*All Specimens*) or Figure 2 (*Blood Specimens only*) to determine reportable LabID events for each calendar month, for each facility location as determined by the reporting method chosen. If monitoring *all specimens*, all first MDRO isolates (chronologically) per patient, per month, per location are reported as a LabID event regardless of specimen source (EXCLUDES tests related to active surveillance testing) (Figure 1); if a duplicate MDRO isolate is from blood, or if monitoring *blood specimens* only, it is reported as a LabID event only if it represents a unique blood source [i.e., no prior isolation of the MDRO in blood from the same patient and location in ≤2 weeks, even across calendar months] (Figures 1 & 2). As a general rule, at a maximum, there should be no more than 3 blood isolates reported, which would be very rare. If monitoring *all specimens* and a blood isolate is entered as the first specimen of the month, then no non-*blood specimens* can be entered that month for that patient and location. Report each LabID Event individually on a separate form.

Definitions:

MDRO Isolate: Any specimen, obtained for clinical decision making, testing positive for an MDRO (as defined above). NOTE: Excludes tests related to active surveillance testing.

Duplicate MDRO Isolate: If monitoring *all specimens*, any MDRO isolate from the same patient and location after an initial isolation of the specific MDRO during a calendar month, regardless of specimen source, except unique blood source (Figure 1).

> EXAMPLE: On January 2, a newly admitted ICU patient has a positive MRSA urine culture. The following week, while still in the ICU, the same patient has MRSA cultured from an infected decubitus ulcer. The MRSA wound culture is considered a duplicate MDRO isolate, since it is the second non-blood MRSA isolate collected from the same patient and location during the same calendar month.

Unique Blood Source: For this organism and location an MDRO isolate from blood in a patient with no prior positive blood culture for the same MDRO and location in ≤2 weeks, even across calendar months (Figure 2) and if following *all specimens* the first MDRO for the patient, month, and location has already been reported. There should be 14 days with no positive blood culture result from the laboratory for the patient, MDRO, and location before another Blood LabID Event is entered into NHSN for the patient, MDRO, and location. NOTE: The date of specimen collection is considered Day 1.

> EXAMPLE: On January 1, an ICU patient has a positive MRSA blood culture which **is** entered into NHSN. On January 4, while in the same location (ICU), the same patient has another positive MRSA blood culture which is **not** entered into NHSN because it has not been 14 days since the original positive MRSA blood culture while in the same location. On January 16, while in the same location (ICU), the same patient has another positive MRSA blood culture. While it has been more than 14 days since the initial positive MRSA blood culture from the same patient and location was

entered into NHSN (January 1), it has not been >14 days since the patient's most recent positive MRSA blood culture (January 4) while in the same location. Therefore, the positive blood culture for January 16 is **not** entered into NHSN. On January 31, the patient has another positive MRSA blood culture while in the same location (ICU). Since it has been >14 days since the patient's most recent positive culture (January 16) while in the same location, this event **is** entered into NHSN.

Laboratory-Identified (LabID) Event: All non-duplicate MDRO isolates from any specimen source and unique blood source MDRO isolates, including specimens collected in the facility's own emergency department (ED) or affiliated outpatient clinic visit, if collected the same calendar day as patient admission [EXCLUDES tests related to active surveillance testing] (See Figures 1 & 2). Even if reporting at the FacWide level, all reporting must follow rules by location for reporting. **Note:** Sometime in 2014, a LabID Event calculator will be available on the NHSN website to help with data entry decision making around the 14-day rule.

EXAMPLE: If monitoring *all specimens*, on January 2, a newly admitted ICU patient with no previously positive laboratory isolates during this admission has a positive MRSA urine culture. This specimen represents a LabID Event since it is the first MRSA isolate for the patient, the location, and the calendar month.

EXAMPLE: If monitoring *all specimens*, on January 2, a VRE culture is collected from an ED patient's wound at 05:00. The patient is then admitted to 4W on the same calendar day. The ED culture result may be entered as the inpatient LabID event for the 4W location for January 2, since the patient was admitted on the same calendar day.

EXAMPLE: If monitoring *blood specimens only*, on January 26, a newly admitted ICU patient with no previously positive laboratory isolates during this admission has a positive MRSA urine culture which is not entered as a LabID Events since *blood specimens* only are being monitored. The following day, while in the same location, the same patient has a positive MRSA blood culture. This specimen represents a LabID Event since it is a unique blood source (the first MRSA **blood** isolate for the same patient and same location). While remaining in ICU, the same patient has another positive blood culture on February 5. This does **not** represent a new LabID Event since it has not been >14 days since the most recent MRSA positive blood isolate for this patient and location.

Reporting Instructions: All LabID Events must be reported separately and independently of Events reported through MDRO Infection Surveillance reporting and/or HAIs reported through the Device-associated and/or Procedure-associated Modules. See *Appendix 1. Guidance for Handling MDRO and CDI Module Infection Surveillance and LabID Event Reporting When Also Following Other NHSN Modules* for instructions on unique reporting scenarios. See *Appendix 3. Differentiating Between LabID Event and Infection Surveillance*

Numerator Data: Data will be reported using the *Laboratory-identified MDRO or CDI Event* form (CDC 57.128).

Denominator Data: Patient days, admissions (for inpatient locations), and encounters for emergency department and other affiliated outpatient locations are reported using the *MDRO and CDI Prevention Process and Outcome Measures Monthly Monitoring* form (CDC 57.127). See Tables of Instructions for completion instructions. An encounter is defined as a patient visit to an outpatient location. When determining a patient's admission dates to both the facility and specific inpatient location, the NHSN user must take into account all such days, including any days spent in an inpatient location as an "observation" patient before being officially admitted as an inpatient to the facility, as these days contribute to exposure risk. Therefore, all such days are included in the counts of admissions and patient days for the facility and specific location; facility and specific location admission dates must be moved back to the first day spent in the inpatient location. For further information on counting patient days and admissions, see Appendix 2.

Data Analysis: Based on data provided on the LabID Event form, each event will be categorized by NHSN to populate different measures. By classifying positive cultures obtained on day 1 (admission date), day 2, and day 3 of admission as CO LabID Events and positive cultures obtained on or after day 4 as HO LabID Events, all HO LabID Events will have occurred more than 48 hours after admission.

The following categorizations and prevalence and incidence calculations are built into the analysis capabilities of NHSN, and are based on timing of admission to a facility and/or location, specimen collection, and location where specimen was collected. Descriptions are provided to explain how the categories and metrics are defined in NHSN.

Categorizing MDRO LabID Events – *Based on Date Admitted to Facility and Date Specimen Collected*:

Community-Onset (CO): LabID Event specimen collected as an outpatient or an inpatient ≤3 days after admission to the facility (i.e., days 1, 2, or 3 of admission).

Healthcare Facility-Onset (HO): LabID Event specimen collected >3 days after admission to the facility (i.e., on or after day 4).

MRSA Bloodstream Infection Standardized Infection Ratio (SIR):

The SIR is calculated by dividing the number of observed events by the number of predicted events. The number of predicted events is calculated using LabID probabilities estimated from negative binomial models constructed from NHSN data during a baseline time period, which represents standard populations.[4] MRSA Bloodstream Infection SIRs are calculated for FacWideIN surveillance only.

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

NOTE: In the NHSN application, "predicted" is referred to as "expected".

Facility MRSA Bloodstream Infection Incidence SIR = Number of all unique blood source LabID Events identified >3 days after admission to the facility (i.e., HO events, when monitoring by overall facility-wide inpatient = FacWideIN) / Number of expected HO MRSA blood LabID Events

Proxy Measures for Exposure Burden of MDROs – *All specimens*:

Inpatient Reporting:

- Admission Prevalence Rate = Number of 1st LabID Events per patient per month identified ≤3 days after admission to the location (if monitoring by inpatient location), or the facility (if monitoring by overall facility-wide inpatient=FacWideIN) / Number of patient admissions to the location or facility x 100

- Location Percent Admission Prevalence that is Community-Onset = Number of Admission Prevalent LabID Events to a location that are CO / Total number Admission Prevalent LabID Events x 100

- Location Percent Admission Prevalence that is Healthcare Facility-Onset = Number of Admission Prevalent LabID Events to a location that are HO / Total number of Admission Prevalent LabID Events x 100

- Overall Patient Prevalence Rate = Number of 1st LabID Events per patient per month regardless of time spent in location (i.e., prevalent + incident, if monitoring by inpatient location), or facility (i.e., CO + HO, if monitoring by overall facility-wide inpatient=FacWideIN) / Number of patient admissions to the location or facility x 100

Outpatient Reporting:

- Outpatient Prevalence Rate = Number of 1st LabID Events per patient per month for the location (if monitoring by outpatient location), or the facility (if monitoring by overall facility-wide outpatient = FacWideOUT) / Number of patient encounters for the location or facility x 100

Measures for MDRO Bloodstream Infection: Calculated when monitoring either *all specimens* or *Blood specimens* only. NOTE: the Blood specimen's only option can only be used at the FacWideIN and FacWideOUT levels.

Inpatient Reporting:

- MDRO Bloodstream Infection Admission Prevalence Rate = Number of all unique blood source LabID Events per patient per month identified ≤3 days after admission to the location (if monitoring by inpatient location), or facility (if monitoring by overall facility-wide inpatient=FacWideIN)/ Number of patient admissions to the location or facility x 100

- MDRO Bloodstream Infection Incidence Rate = Number of all unique blood source LabID Events per patient per month identified >3 days after admission to the location (if monitoring by inpatient location), or facility (if monitoring by overall facility-wide inpatient=FacWideIN) / Number of patient admissions to the location or facility x 100 (will be removed from NHSN analysis in July 2013)

- MDRO Bloodstream Infection Incidence Density Rate = Number of all unique blood source LabID Events per patient per month identified >3 days after admission to the location (if monitoring by inpatient location), or facility (if monitoring by overall facility-wide inpatient=FacWideIN) / Number of patient days for the location or facility x 1,000 (will be referred to in NHSN analysis as Incidence Rate after July 2013)

- MDRO Bloodstream Infection Overall Patient Prevalence Rate = Number of 1st Blood LabID Events per patient per month regardless of time spent in location (i.e., prevalent + incident, if monitoring by inpatient location), or facility (i.e., CO + HO, if monitoring by overall facility-wide inpatient=FacWideIN) / Number of patient admissions to the location or facility x 100

Outpatient Reporting:

- MDRO Bloodstream Infection Outpatient Prevalence Rate = Number of all unique blood source LabID Events per patient per month for the location (if monitoring by outpatient location), or the facility (if monitoring by overall facility-wide outpatient=FacWideOUT) / Number of patient encounters for the location or facility x 100

Proxy Measures for MDRO Healthcare Acquisition:

- Overall MDRO Infection/Colonization Incidence Rate = Number of 1st LabID Events per patient per month among those with no documented prior evidence of previous infection or colonization with this specific organism type from a previously reported LabID Event, and identified >3 days after admission to the location (if monitoring by inpatient location), or facility (if monitoring by overall facility-wide inpatient=FacWideIN) / Number of patient admissions to the location or facility x 100 (will be removed from NHSN analysis in July 2013)

- Overall MDRO Infection/Colonization Incidence Density Rate = Number of 1st LabID Events per patient per month among those with no documented prior evidence of previous infection or colonization with this specific organism type from a previously reported LabID Event, and identified >3 days after admission to the location (if monitoring by inpatient location), or facility (if monitoring by overall facility-wide inpatient=FacWideIN) / Number of patient days for the location or facility x 1,000 (will be referred to in NHSN analysis as Incidence Rate after July 2013)

B. *Clostridium difficile* (C. *difficile*) LabID Event Reporting

Methodology: Facilities may choose to monitor *C. difficile* where *C. difficile* testing in the laboratory is performed routinely only on unformed (i.e., conforming to the shape of the container) stool samples. *C. difficile* LabID events may be monitored from all available inpatient locations as well as all available affiliated outpatient locations where care is provided to patients post discharge or prior to admission (e.g., emergency departments, outpatient clinics, and physician offices that submit samples to the facility's laboratory).

Settings: *C. difficile* LabID Event reporting can occur in any location: inpatient or outpatient. Surveillance will NOT be performed in NICU, SCN, babies in LDRP, well-baby nurseries, or well-baby clinics. If LDRP locations are being monitored, baby counts must be removed.

Requirements: Facilities must choose one or more of the reporting choices listed below and report data accordingly:

Method	Numerator Data Reporting	Denominator Data Reporting
Facility-wide by location	Enter each CDI LabID Event from all locations separately	Report separate denominators for each location in the facility
Selected locations	Enter each CDI LabID Event from selected locations separately	Report separate denominators for each location monitored as specified in the NHSN Monthly Reporting Plan
Overall Facility-wide Inpatient (FacWideIN)	Enter each CDI LabID Event from all inpatient locations separately	Report only one denominator for the entire facility (e.g., total number of admissions and total number of patient days)
Overall Facility-wide Outpatient (FacWideOUT)	Enter each CDI LabID Event from all outpatient locations separately	Report only one denominator for all outpatient locations (e.g., total number of encounters)

NOTE: Facilities must indicate each reporting choice chosen for the calendar month on the *Patient Safety Monthly Reporting Plan* (CDC 57.106).

Definitions:

CDI-positive laboratory assay:
A positive laboratory test result for *C. difficile* toxin A and/or B, (includes molecular assays [PCR] and/or toxin assays)
OR
A toxin-producing *C. difficile* organism detected by culture or other laboratory means performed on a stool sample.

Duplicate C. *difficile*-positive test: Any *C. difficile* toxin-positive laboratory result from the same patient and location, following a previous *C. difficile* toxin-positive laboratory result within the past two weeks (14 days) (even across calendar months). There should be 14 days with no *C. difficile* toxin-positive laboratory result for the patient and location, before another *C. difficile* LabID Event is entered into NHSN for the patient and location. The date of specimen collection is considered Day 1.

EXAMPLE: On January 1, an ICU patient has a *C. difficile* toxin-positive laboratory result which **is** entered into NHSN. On January 4, while in the same location (ICU), the same patient has another positive *C. difficile* toxin-positive laboratory result which is **not** entered into NHSN because it has not been >14 days since the original *C. difficile* toxin-positive laboratory result while in the same location. On January 16, while in the same location (ICU), the same patient has another *C. difficile* toxin-positive laboratory result. While it has been more than 14 days since the initial positive *C. difficile* toxin-positive laboratory result was entered into NHSN (January 1) for the same patient and same location, it has not been >14 days since the patient's most recent *C. difficile* toxin-positive laboratory result (January 4) while in the same location. Therefore, the *C. difficile* toxin-positive laboratory result for January 16 is **not** entered into NHSN. On January 31, the patient has another *C. difficile* toxin-positive laboratory result while in the same location (ICU). Since it has been >14 days since the patient's most recent *C. difficile* toxin-positive laboratory result (January 16) while in the same location, this event **is** entered into NHSN.

Laboratory-Identified (LabID) Event: All non-duplicate *C. difficile* toxin-positive laboratory results. Can include specimens collected in the Emergency Department of the admitting facility or other affiliated outpatient location, if collected same calendar day as patient admission (See Figure 3). Even if reporting at the FacWide level, all reporting must follow rules by location for reporting. Note: Sometime in 2014, a LabID Event calculator will be available on the NHSN website to help with data entry decision making around the 14-day rule.

Reporting Instructions: All *C. difficile* LabID Events must be reported separately and independently of Events reported using the *C. difficile* Infection Surveillance reporting option and/or HAI reporting.

Numerator: Data will be reported using the *Laboratory-Identified MDRO or CDI Event* form (CDC 57.128).

Denominator Data: Patient days, admissions (for inpatient locations), and encounters for emergency department and other affiliated outpatient locations are reported using the *MDRO and CDI Prevention Process and Outcome Measures Monthly Monitoring* form (CDC 57.127). See Tables of Instructions for completion instructions. An **encounter** is defined as a patient visit to an outpatient location for care. When determining a patient's admission dates to both the facility and specific inpatient location, the NHSN user must take into account all days, including any days spent in an inpatient location as an "observation" patient before being officially admitted as an inpatient to the facility, as these days contribute to exposure risk. Therefore, all such days are included in the counts of admissions and patient days for the facility and specific location; facility and specific location admission dates must be moved back to the first day spent in the inpatient location. For further information on counting patient days and admissions, see ***Appendix 2: Determining Patient Days for Summary Data Collection: Observation vs. Inpatients***

CDI Data Analysis: Based on data provided on the LabID Event form, each event will be categorized by NHSN to populate different measures. By classifying positive cultures obtained on day 1 (admission date), day 2, and day 3 of admission as CO LabID Events and positive cultures obtained on or after day 4 as HO LabID Events. All HO LabID Events will have occurred more than 48 hours after admission.

The following categorizations and prevalence and incidence calculations are built into the analysis capabilities of NHSN, and are based on timing of admission to a facility and/or location, specimen collection, and location where specimen was collected. Descriptions are provided to explain how the categories and metrics are defined in NHSN.

Categorization Based on Current Date Specimen Collected and Prior Date Specimen Collected of a previous CDI LabID Event:

- Incident CDI Assay: Any CDI LabID Event from a specimen obtained >8 weeks after the most recent CDI LabID Event (or with no previous CDI LabID Event documented) for that patient.

- Recurrent CDI Assay: Any CDI LabID Event from a specimen obtained >2 weeks and ≤8 weeks after the most recent CDI LabID Event for that patient.

NOTE: For Facility-wide surveillance, CDI Assay is assigned based on Events within the same setting only. For example, when performing both FacWideIN and FacWideOUT surveillance, CDI Assay of inpatient CDI LabID Events will be determined by a review of previously-entered CDI LabID Events from inpatient locations only.

The incident and recurrent CDI LabID Events are further categorized within NHSN. The following categorizations, as well as prevalence and incidence calculations are built into the analysis capabilities of NHSN, and are based on timing of admission to facility and/or location, specimen collection, location where specimen was collected, and previous discharge. Descriptions are provided to explain how the categories and metrics are defined in NHSN.

Categorizing CDI LabID Events – Based on Date Admitted to Facility and Date Specimen Collected:

- Community-Onset (CO): LabID Event collected as an outpatient or an inpatient ≤3 days after admission to the facility (i.e., days 1, 2, or 3 of admission).

- Community-Onset Healthcare Facility-Associated (CO-HCFA): CO LabID Event collected from a patient who was discharged from the facility ≤4 weeks prior to current date of stool specimen collection. Data from outpatient locations (e.g., outpatient encounters) are not included in this definition.

- Healthcare Facility-Onset (HO): LabID Event collected >3 days after admission to the facility (i.e., on or after day 4).

CDI Standardized Infection Ratio (SIR):

The SIR is calculated by dividing the number of observed events by the number of predicted events. The number of predicted events is calculated using LabID probabilities estimated from negative binomial models constructed from NHSN data during a baseline time period, which represents standard populations. CDI SIRs are calculated for FacWideIN surveillance only.[4]

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

NOTE: In the NHSN application, "predicted" is referred to as "expected".

Facility CDI Incidence SIR = Number of all Incident CDI LabID Events identified >3 days after admission to the facility (i.e., HO events when monitoring by overall facility-wide inpatient = FacWideIN) / Number of expected Incident HO CDI LabID Events

Calculated CDI Prevalence Rates:

Inpatient Reporting:

- Admission Prevalence Rate = Number of non-duplicate CDI LabID Events per patient per month identified ≤3 days after admission to the location (if monitoring by inpatient location), or facility (if monitoring by overall facility-wide inpatient=FacWideIN) (includes CO and CO-HCFA events) / Number of patient admissions to the location or facility x 100

- Community-Onset Admission Prevalence Rate = Number of CDI LabID events that are CO, per month, in the facility / Number of patient admissions to the facility x 100 (this calculation is only accurate for Overall Facility-wide Inpatient reporting)

- Location Percent Admission Prevalence that is Community-Onset = Number of Admission Prevalent LabID Events to a location that are CO / Total number Admission Prevalent LabID Events x 100 (Note: The numerator in this formula does not include Admission Prevalent LabID Events that are CO-HFCA.)

- Location Percent Admission Prevalence that is Community-Onset Healthcare Facility-Associated = Number of Admission Prevalent LabID Events to a location that are CO-HCFA / Total number Admission Prevalent LabID Events x 100

- Location Percent Admission Prevalence that is Healthcare Facility-Onset = Number of Admission Prevalent LabID Events to a location that are HO / Total number of Admission Prevalent LabID Events x 100

- Overall Patient Prevalence Rate = Number of 1st CDI LabID Events per patient per month regardless of time spent in location (i.e., prevalent + incident, if monitoring by inpatient location), or facility (i.e., CO + CO-HCFA + HO, if monitoring by overall facility-wide inpatient=FacWideIN) / Number of patient admissions to the location or facility x 100

Outpatient Reporting:

- Outpatient Prevalence Rate = Number of all non-duplicate CDI LabID Events per patient per month for the location (if monitoring by outpatient location), or the facility (if monitoring by overall facility-wide outpatient=FacWideOUT) / Number of patient encounters for the location or facility x 100

Calculated CDI Incidence Rates: (see categorization of Incident, HO, and CO-HCFA above).

- Location CDI Incidence Rate = Number of Incident CDI LabID Events per month identified >3 days after admission to the location / Number of patient days for the location x 10,000

- Facility CDI Healthcare Facility-Onset Incidence Rate = Number of all Incident HO CDI LabID Events per month in the facility/ Number of patient days for the facility x 10,000 (this calculation is only accurate for Overall Facility-wide Inpatient reporting)

- Facility CDI Combined Incidence Rate = Number of all Incident HO and CO-HCFA CDI LabID Events per month in the facility / Number of patient days for the facility x 10,000 (this calculation is only accurate for Overall Facility-wide Inpatient reporting)

Figure 1. ***MDRO Test Result Algorithm for <u>All Specimens</u> Laboratory-Identified (LabID) Events***

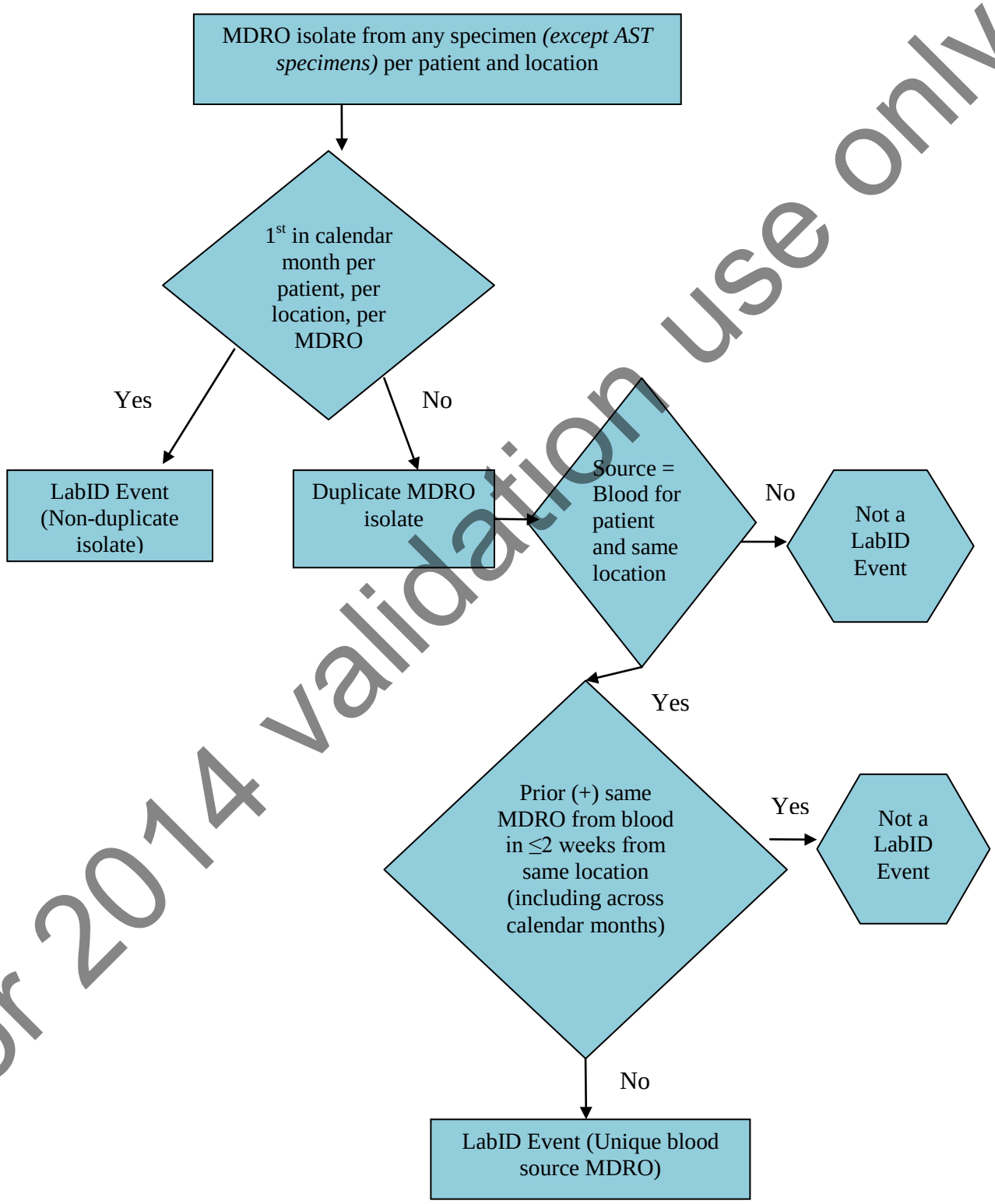


Figure 2. ***MDRO Test Result Algorithm for Blood Specimens Only Laboratory-Identified (LabID) Events***

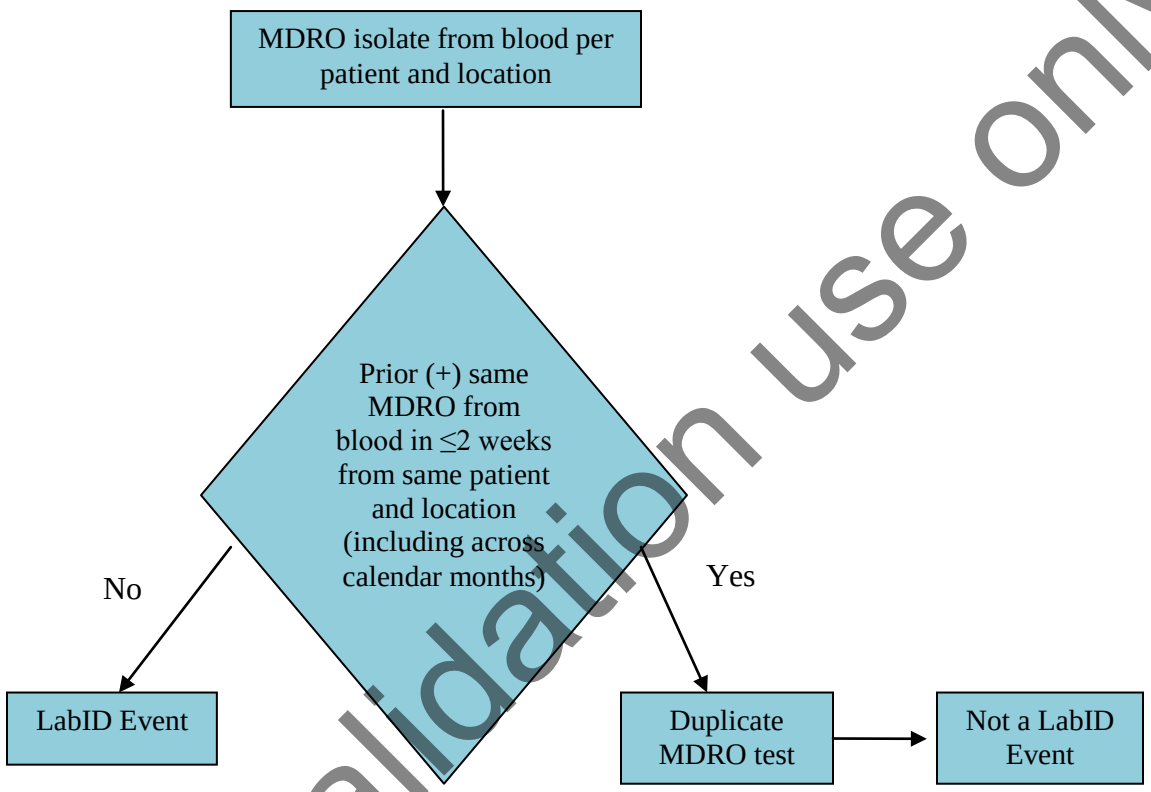
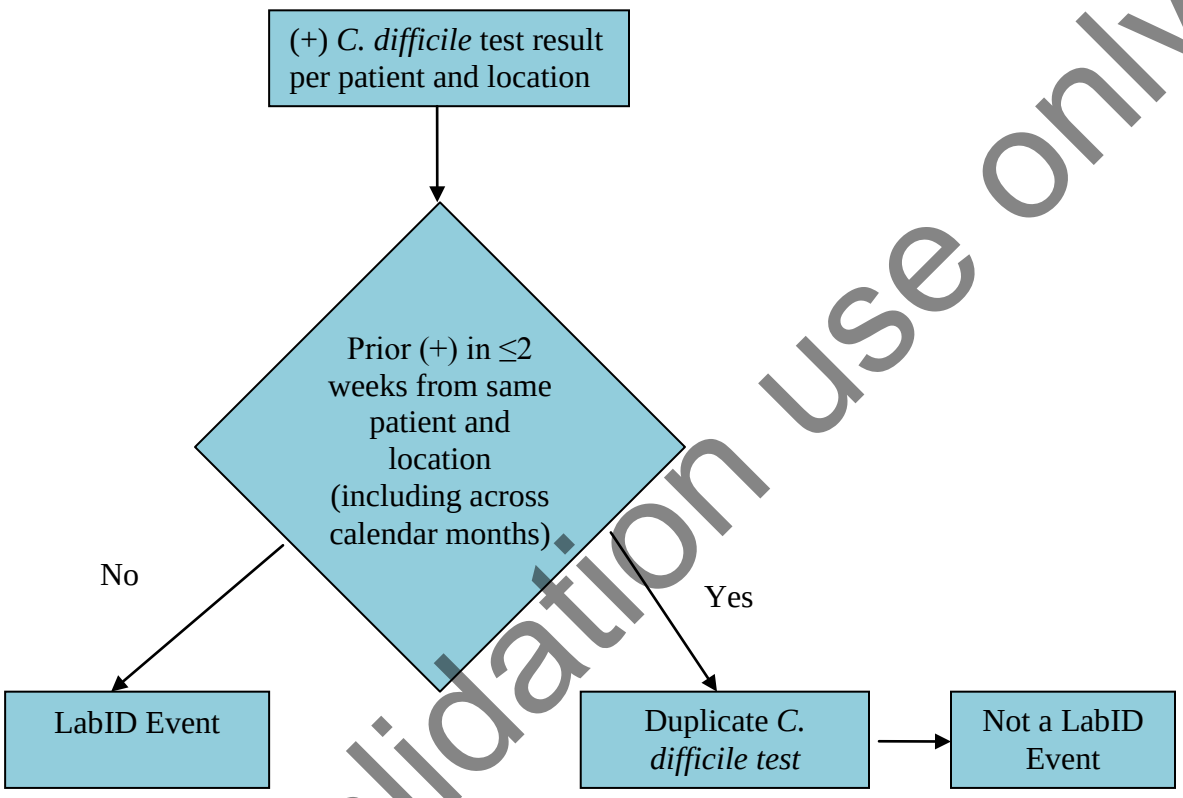


Figure 3. ***C. difficile Test Result Algorithm for Laboratory Identified (LabID) Events***



Option 2: Infection Surveillance Reporting

Introduction: The Infection Surveillance reporting option for MDRO and *C. difficile* infections enables users to utilize the CDC/NHSN healthcare-associated infections definitions for identifying and reporting infections associated with MDROs and/or *C. difficile*. Surveillance must occur from at least one patient care area and requires active, patient-based, prospective surveillance of the chosen MDRO(s) and/or *C. difficile* infections (CDIs) by a trained Infection Preventionists (IP). This means that the IP shall seek to confirm and classify infections caused by the chosen MDRO(s) and/or *C. difficile* for monitoring during a patient's stay in at least one patient care location during the surveillance period. These data will enhance the ability of NHSN to aggregate national data on MDROs and CDIs.

A. MDRO Infection Surveillance Reporting

Methodology: Facilities may choose to monitor one or more of the following MDROs: MRSA, MRSA and MSSA, VRE, CephR- *Klebsiella* spp., CRE-*Klebsiella* spp., CRE-*E. coli*, and multidrug-resistant *Acinetobacter* spp. (See definitions in Section I, Option 1A). For *S. aureus*, both the resistant (MRSA) and the susceptible (MSSA) phenotypes can be tracked to provide concurrent measures of the susceptible pathogens as a comparison to those of the resistant pathogens in a setting of active MRSA prevention efforts. REMEMBER: No Active Surveillance Culture/Testing (ASC/AST) results are to be included in this reporting of individual results.

Settings: Infection Surveillance can occur in any inpatient location where such infections may be identified and where denominator data can be collected, which may include critical/intensive care units (ICU), specialty care areas (SCA), neonatal units, step-down units, wards, and chronic care units. In Labor, Delivery, Recovery, & Post-partum (LDRP) locations, where mom and babies are housed together, users must count both mom and baby in the denominator. If moms only are being counted, then multiply moms times two to include both mom and baby in denominators.

Requirements: Surveillance for all types of NHSN-defined healthcare-associated infections (HAIs), regardless if HAI is included in "in-plan" or "off- plan" surveillance, of the MDRO selected for monitoring in at least one location in the healthcare facility as indicated in the *Patient Safety Monthly Reporting Plan* (CDC 57.106).

Definitions: MDROs included in this module are defined in Section I, Option 1A. Refer to *CDC/NHSN Surveillance Definitions for Specific Types of Infections* for infection site criteria. Refer to Key Terms chapter for assistance with variable definitions.

Location of Attribution and Transfer Rule applies – See Key Terms chapter.

Reporting Instructions: If participating in MDRO/CDI Infection Surveillance and/or LabID Event Reporting, along with the reporting of HAIs through the Device-Associated and/or Procedure-Associated Modules, see *Appendix 1: Guidance for Handling MDRO/CDI Module Infection Surveillance and LabID Event Reporting When Also Following Other NHSN Modules*, for instructions on unique reporting scenarios.

Numerator Data: Number of healthcare-associated infections, by MDRO type. Infections are reported on the appropriate NHSN forms: *Primary Bloodstream Infection, Pneumonia, Ventilator-Associated Event, Urinary Tract Infection, Surgical Site Infection, or MDRO or CDI Infection Event (CDC 57.108, 57.111, 57.112, 57.114, 57.120, and 57.126, respectively.).* See the *Tables of Instructions*, located in each of the applicable chapters, for completion instructions.

Denominator Data: Number of patient days and admissions. Patient days and admissions are reported by location using the *MDRO and CDI Prevention Process and Outcome Measures Monthly Monitoring* form (CDC 57.127). See *Tables of Instructions* for completion instructions.

Data Analysis: Data are stratified by time (e.g., month, quarter, etc.) and patient care location.
MDRO Infection Incidence Rate = Number of HAIs by MDRO type/ Number of patient days x 1000

B. *Clostridium difficile* Infection Surveillance Reporting

Methodology: *C. difficile* Infection (CDI) Surveillance, reporting on all NHSN-defined healthcare-associated CDIs from at least one patient care area, is one reporting option for *C. difficile* (i.e., part of your facility's Monthly Reporting Plan). These data will enhance the ability of NHSN to aggregate national data on CDIs.

Settings: Infection Surveillance will occur in any inpatient location where denominator data can be collected, which may include critical/intensive care units (ICU), specialty care areas (SCA), step-down units, wards, and chronic care units. Surveillance will NOT be performed in Neonatal Intensive Care Units (NICU), Specialty Care Nurseries (SCN), babies in LDRP, or well-baby nurseries. If LDRP locations are being monitored, baby counts must be removed.

Requirements: Surveillance for CDI must be performed in at least one location in the healthcare institution as indicated in the *Patient Safety Monthly Reporting Plan* (CDC 57.106).

Definitions: Report all healthcare-associated infections where *C. difficile*, identified by a positive toxin result, including toxin producing gene [PCR]), is the associated pathogen. Refer to specific definitions in *CDC/NHSN Surveillance Definitions for Specific Types of Infections* chapter for gastroenteritis (GI-GE), and gastrointestinal tract (GI-GIT) infections criteria.

HAI cases of CDI (i.e., *C. difficile* pathogen identified with a positive toxin result, including toxin producing gene [PCR]) that meet criteria for a healthcare-associated infection should be reported as gastroenteritis (GI-GE) or gastrointestinal tract (GI-GIT) infections, whichever is appropriate. Report the pathogen as C. *difficile* on the *MDRO or CDI Infection Event* form (CDC 57.126). If the patient develops both GI-GE and GI-GIT CDI, report only GI-GIT using the date of Event as that of GI-GE CDI. **NOTE:** Recurrent CDI assay, incident CDI assay, healthcare facility-onset, community-onset, and community-onset healthcare facility-associated categorizations utilized in CDI LabID Event surveillance do **NOT** apply to HAI surveillance of *C. difficile* associated gastroenteritis. Therefore, if a patients' diarrhea resolves and then recurs, and the patient has a new CDI-positive laboratory assay, a new HAI must be considered. This includes new episodes during the same admission. See **Note** following HAI definition in Chapter 2.

CDI Complications: CDI in a case patient within 30 days after CDI symptom onset with at least one of the following:

1. Admission to an intensive care unit for complications associated with CDI (e.g., for shock that requires vasopressor therapy);
2. Surgery (e.g., colectomy) for toxic megacolon, perforation, or refractory colitis

AND/OR

3. Death caused by CDI within 30 days after symptom onset and occurring during the hospital admission.

Location of Attribution and Transfer Rule applies – See Key Terms chapter.

Numerator Data: Number of healthcare-associated *C. difficile* infections. Infections are reported on the *MDRO or CDI Infection Event* form (CDC 57.126). See *Tables of Instructions* for completion instructions.

Denominator Data: Number of patient days and admissions by location are reported using the *MDRO and CDI and Outcome Measures Monthly Monitoring* form (CDC 57.127). See *Tables of Instructions* for completion instructions.

C. difficile Infections:

Numerator: The total number of HAI CDI cases identified during the surveillance month for a location.

Denominator: The total number of patient days and admissions during the surveillance month for a location.

Data Analysis: Data are stratified by time (e.g., month, quarter, etc.) and by patient care location.

C. difficile Infection Incidence Rate = Number of HAI CDI cases / Number of patient days x 10,000

II. Supplemental Reporting

1. Prevention Process Measures Surveillance

a. Monitoring Adherence to Hand Hygiene

Introduction: This option will allow facilities to monitor adherence to hand hygiene after a healthcare worker (HCW) has contact with a patient or inanimate objects in the immediate vicinity of the patient. Research studies have reported data suggesting that improved after-contact hand hygiene is associated with reduced MDRO transmission. While there are multiple opportunities for hand hygiene during patient care, for the purpose of this option, only hand hygiene after contact with a patient or inanimate objects in the immediate vicinity of the patient will be observed and reported. (http://www.cdc.gov/handhygiene/)

Settings: Surveillance will occur in any location: inpatient or outpatient.

Requirements: Surveillance for adherence to hand hygiene in at least one location in the healthcare institution for at least one calendar month as indicated in the *Patient Safety Monthly Reporting Plan* (CDC 57.106). This should be done in patient care locations also selected for Infection Surveillance or LabID Event reporting.

In participating patient care locations, perform at least 30 different unannounced observations after contact with patients for as many individual HCWs as possible. For example, try to observe all types of HCWs performing a variety of patient care tasks during the course of the month, not only nurses, or not only during catheter or wound care. No personal identifiers will be collected or reported.

Definitions:

Antiseptic handwash: Washing hands with water and soap or other detergents containing an antiseptic agent.

Antiseptic hand-rub: Applying an antiseptic hand-rub product to all surfaces of the hands to reduce the number of microorganisms present.

Hand hygiene: A general term that applies to either: handwashing, antiseptic hand wash, antiseptic hand rub, or surgical hand antisepsis.

Handwashing: Washing hands with plain (i.e., non-antimicrobial) soap and water.

Numerator: Hand Hygiene Performed = Total number of observed contacts during which a HCW touched either the patient or inanimate objects in the immediate vicinity of the patient and appropriate hand hygiene was performed.

Denominator: Hand Hygiene Indicated = Total number of observed contacts during which a HCW touched either the patient or inanimate objects in the immediate vicinity of the patient and therefore, appropriate hand hygiene was indicated.

Hand hygiene process measure data are reported using the *MDRO and CDI Prevention Process and Outcome Measures Monthly Monitoring* form (CDC 57. 127). See Tables of Instructions for completion instructions.

Data Analysis: Data are stratified by time (e.g., month, quarter, etc.) and patient care location.

Hand Hygiene Percent Adherence = Number of contacts for which hand hygiene was performed / Number of contacts for which hand hygiene was indicated x 100

b. Monitoring Adherence to Gown and Gloves Use as Part of Contact Precautions

Introduction: This option will allow facilities to monitor adherence to gown and gloves use when a HCW has contact with a patient or inanimate objects in the immediate vicinity of the patient, when that patient is on Transmission-based Contact Precautions. While numerous aspects of adherence to Contact Precautions could be monitored, this surveillance option is only focused on the use of gown and gloves. (http://www.cdc.gov/ncidod/dhqp/gl_isolation_contact.html)

Settings: Surveillance can occur in any of 4 types of inpatient locations: (1) intensive care units (ICU), (2) specialty care areas, (3) neonatal intensive care units (NICU), and (4) any other inpatient care location in the institution (e.g., surgical wards).

Requirements: Surveillance for adherence to gown and gloves use in at least one location in the healthcare institution for at least 1 calendar month as indicated in the *Patient Safety Monthly Reporting Plan* (CDC 57.106). Ideally, this should be done in patient care locations also selected for Infection Surveillance or LabID Event reporting.

Among patients on Transmission-based Contact Precautions in participating patient care locations, perform at least 30 unannounced observations. A total of thirty different contacts must be observed monthly among HCWs of varied occupation types. For example, try to observe all types of HCWs performing a variety of patient care tasks during the course of the month, not only nurses, or not only during catheter or wound care. Both gown and gloves must be donned appropriately prior to contact for compliance. No personal identifiers will be collected or reported.

Definitions:

Gown and gloves use**:** In the context of Transmission-based Contact Precautions, the donning of both a gown and gloves prior to contact with a patient or inanimate objects in the immediate vicinity of the patient. Both a gown and gloves must be donned appropriately prior to contact for compliance.

Numerator: Gown and Gloves Used = Total number of observed contacts between a HCW and a patient or inanimate objects in the immediate vicinity of a patient on Transmission-based Contact Precautions for which gown and gloves had been donned appropriately prior to the contact.

Denominator: Gown and Gloves Indicated = Total number of observed contacts between a HCW and a patient on Transmission-based Contact Precautions or inanimate objects in the immediate vicinity of the patient and therefore, gown and gloves were indicated.

Gown and gloves use process measure data are reported using the *MDRO and CDI Prevention Process and Outcome Measures Monthly Monitoring* form (CDC 57.127). See *Tables of Instructions* for completion instructions.

Data Analysis: Data are stratified by time (e.g., month, quarter, etc.) and patient care location.
Gown and Glove Use Percent Adherence = Number of contacts for which gown and gloves were used appropriately / Number of contacts for which gown and gloves were indicated x 100

c. Monitoring Adherence to Active Surveillance Testing

Introduction: This option will allow facilities to monitor adherence to active surveillance testing (AST) of MRSA and/or VRE, using culturing or other methods.

Settings: Surveillance will occur in any of 4 types of inpatient locations: (1) intensive care units (ICU), (2) specialty care areas, (3) neonatal intensive care units (NICU), and (4) any other inpatient care location in the institution (e.g., surgical wards).

Requirements: Surveillance of AST adherence in at least one location in the healthcare facility for at least one calendar month as indicated in the *Patient Safety Monthly Reporting Plan* (CDC 57.106). A facility may choose to report AST for MRSA and/or VRE in one or multiple patient care locations, as the facility deems appropriate. Ideally, this should be done in patient care locations also selected for Infection Surveillance or LabID Event reporting. To improve standardization of timing rules for AST specimen collection, classify admission specimens as those obtained on day 1 (admission date), day 2, or day 3 (i.e., ≤3 days). Classify discharge/transfer AST specimens as those collected on or after day 4 (i.e., >3 days).

Definitions:

AST Eligible Patients: Choose one of two methods for identifying patients that are eligible for AST:

All = All patients in the selected patient care area regardless of history of MRSA or VRE infection or colonization.

OR

NHx = All patients in the selected patient care area who have NO documented positive MRSA or VRE infection or colonization during the previous 12 months (as ascertained by either a facility's laboratory records or information provided by referring facilities); and no evidence of MRSA or VRE during stay in the patient care location (i.e., they are not in Contact Precautions).

Timing of AST: Choose one of two methods for reporting the timing of AST:

Adm = Specimens for AST obtained ≤3 days after admission,

OR

Both = Specimens for AST obtained ≤3 days after admission and, for patients' stays of >3 days, at the time of discharge/transfer. Discharge/transfer AST should include all discharges (including

discharges from the facility or to other wards or deaths) and can include the most recent weekly AST if performed >3 days after admission to the patient care location. Discharge/transfer AST should not be performed on patients who tested positive on AST admission.

Numerator and Denominator Data: Use the *MDRO and CDI Prevention Process and Outcome Measures Monthly Monitoring* form (CDC 57.127) to indicate: 1) AST was performed during the month for MRSA and/or VRE, 2) AST-eligible patients, and 3) the timing of AST. No personal identifiers will be collected or reported. See Tables of Instructions for completion instructions.

Numerator: For each month during which AST is performed:

Admission AST Performed = Number of patients eligible for admission AST who had a specimen obtained for testing ≤3 days after admission,
AND/OR
Discharge/Transfer AST Performed = For patients' stays >3 days, the number of discharged or transferred patients eligible for AST who had a specimen obtained for testing prior to discharge, not including the admission AST.

Denominator: For each month during which AST is performed:

Admission AST Eligible = Number of patients eligible for admission AST (All or NHx),
AND/OR
Discharge/Transfer AST Eligible = Number of patients eligible for discharge/transfer AST (All or NHx) AND in the facility location >3 days AND negative if tested on admission.

Data Analysis: Data are stratified by patient care location and time (e.g., month, quarter, etc.), according to AST-eligible patients monitored and the timing of AST.

Admission AST Percent Adherence = Number of patients with admission AST Performed / Number of patients admission AST eligible x 100

Discharge/transfer AST Percent Adherence = Number of patients with discharge/transfer AST performed / Number of patients discharge/transfer AST eligible x 100

2. Active Surveillance Testing Outcome Measures

Introduction: This option will allow facilities to use the results of AST to monitor the prevalent and incident rates of MRSA and/or VRE colonization or infection. This information will assist facilities in assessing the impact of intervention programs on MRSA or VRE transmission.

Settings: Surveillance will occur in any of 4 types of inpatient locations: (1) intensive care units (ICU), (2) specialty care, (3) neonatal intensive care units (NICU), and (4) any other inpatient care location in the institution (e.g., surgical wards).

Requirements: Surveillance for prevalent and/or incident MRSA or VRE cases in at least one location in the healthcare facility for at least one calendar month as indicated in the *Patient Safety Monthly Reporting*

Plan (CDC 57.106). This can be done ONLY in locations where AST adherence is being performed. A minimum AST adherence level will be required for the system to calculate prevalence and incidence. A facility may choose to report AST for MRSA and/or VRE in one or multiple patient care locations, as the facility deems appropriate. Ideally, this should be done in patient care locations also selected for Infection Surveillance or LabID Event reporting. To improve standardization of timing rules for AST specimen collection, classify admission specimens as those obtained on day 1 (admission date), day 2, or day 3 (i.e., ≤3 days). Classify discharge/transfer AST specimens as those collected on or after day 4 (i.e., >3 days). Only the first specimen positive for MRSA or VRE from a given patient in the patient care location is counted, whether obtained for AST or as part of clinical care. If an Admission AST specimen is not collected from an eligible patient, assume the patient has no MRSA or VRE colonization.

Definitions:

AST Admission Prevalent case:

Known Positive = A patient with documentation on admission of MRSA or VRE colonization or infection in the previous 12 months (i.e., patient is known to be colonized or infected as ascertained by either a facility's laboratory records or information provided by referring facilities). (All MRSA or VRE colonized patients currently in a location during the month of surveillance should be considered "Known Positive"),

OR

Admission AST or Clinical Positive = A patient with MRSA or VRE isolated from a specimen collected for AST ≤3 days after admission or from clinical specimen obtained ≤3 days after admission (i.e., MRSA or VRE cannot be attributed to this patient care location).

AST Incident case: A patient with a stay >3 days:

With no documentation on admission of MRSA or VRE colonization or infection during the previous 12 months (as ascertained either by the facility's laboratory records or information provided by referring facilities); including admission AST or clinical culture obtained ≤3 days after admission (i.e., patient without positive specimen),

AND

With MRSA or VRE isolated from a specimen collected for AST or clinical reasons > 3 days after admission to the patient care location or at the time of discharge/transfer from the patient care location (including discharges from the facility or to other locations or deaths).

MRSA colonization: Carriage of MRSA without evidence of infection (e.g., nasal swab test positive for MRSA, without signs or symptoms of infection).

AST Eligible Patients: Choose one of two methods for identifying patients' eligible for AST:

All = All patients in the selected patient care area regardless of history of MRSA or VRE infection or colonization,

OR

NHx = All patients in the selected patient care area who have NO documented positive MRSA or VRE infection or colonization during the previous 12 months (as ascertained either by the facility's laboratory records or information provided by referring facilities); and no evidence of MRSA or VRE during stay in the patient care location.

Timing of AST: Choose one of two methods for reporting the timing of AST:

Adm = Specimens for AST obtained ≤3 days after admission,

OR

Both = Specimens for AST obtained ≤3 days after admission and, for patients' stays of >3 days, at the time of discharge/transfer. Discharge/transfer AST should include all discharges (including discharges from the facility or to other wards or deaths) and can include the most recent weekly AST if performed >3 days after admission to the patient care location. Discharge/transfer AST should not be performed on patients who tested positive on AST admission.

Numerator and Denominator Data: Use the *MDRO and CDI Prevention Process and Outcome Measures Monthly Monitoring* form (CDC 57.127) to indicate: 1) AST outcomes monitoring and adherence was performed during the month for MRSA and/or VRE, 2) AST eligible patients, and 3) the timing of AST. No personal identifiers will be collected or reported. *See Tables of Instructions* for completion instructions.

If only admission AST is performed, only prevalent cases of MRSA or VRE can be detected in that patient care location. If both admission and discharge/transfer AST are performed, both prevalent and incident cases can be detected. No personal identifiers will be collected or reported.

Admission Prevalent Case:
Numerator Sources: (1) Known Positive; (2) Admission AST or Clinical Positive = Cases ≤3 days after admission
Denominator Source: Total number of admissions

Incident Case:
Numerator: Discharge/transfer AST or Clinical Positive = Cases >3 days after admission and without positive test result(s) on admission

Denominator: Total number of patient days

NOTE: For research purposes calculating patient-days at risk (i.e., excluding patient-days in which patients were known to be MRSA or VRE colonized or infected) may be a preferable denominator, but for surveillance purposes and ease of aggregating, total number of patient days is required for this module.

Data Analysis: Data are stratified by patient care location and time (e.g., month, quarter, etc.) according to the eligible patients monitored and timing of AST.

AST Admission Prevalence rate =
For Eligible patients = All:
Number of admission AST or clinical positive / Number of admissions x 100

For Eligible patients = NHx:
Number of admission AST or clinical positive + Number of known positive / Number of admissions x 100

AST Incidence rate = Number of discharge/transfer AST or clinical positive / Number of patient days x 1000

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[1]HICPAC, Management of Multidrug-Resistant Organisms in Healthcare Settings. <http://www.cdc.gov/NCIDOD/DHQP/hicpac_pubs.html>.

[2]Cohen AL, et al. *Infection Control and Hospital Epidemiology*. Oct 2008;29:901-913.

[3]McDonald LC, et al. *Infect Control Hosp Epidemiol* 2007; 28:140-145.

[4]Duduck MA, Weiner LM, Malpiedi PJ, et al. Risk Adjustment for Healthcare Facility-Onset C. *difficile* and MRSA Bacteremia Laboratory-identified Event Reporting in NHSN. Published March 12, 2013. Available at: http://www.cdc.gov/nhsn/pdfs/mrsa-cdi/RiskAdjustment-MRSA-CDI.pdf.

Table 2. Rates and Measures Derived from Various MDRO and CDI Protocol Surveillance Methods

Surveillance Method	Forms	Rate	Measures
MDRO Laboratory-Identified Event	Numerator: *Laboratory-Identified MDRO or CDI Event* Denominator: *MDRO and CDI Prevention Process & Outcome Measures Monthly Monitoring*	**MRSA Bloodstream Infection Standardized Infection Ratio (SIR):** Facility MRSA Bloodstream Infection Incidence SIR = Number of all unique blood source LabID Events identified >3 days after admission to the facility (i.e., HO events, when monitoring by overall facility-wide inpatient = FacWideIN) / Number of expected HO MRSA blood LabID Events **NOTE: The SIR will be calculated only if the number of expected events (numExp) is ≥1.**	MRSA Blood HO FacWideIN Standardized Infection Ratio (SIR)
		Inpatient Reporting: Admission Prevalence Rate = Number of 1st LabID Events per patient per month identified ≤3 days after admission to the location (if monitoring by inpatient location), or the facility (if monitoring by overall facility-wide inpatient=FacWideIN) / Number of patient admissions to the location or facility x 100 Location Percent Admission Prevalence that is Community-Onset = Number of Admission Prevalent LabID Events to a location that are CO / Total number Admission Prevalent LabID Events x 100 Location Percent Admission Prevalence that is Healthcare Facility-Onset = Number of Admission Prevalent LabID Events to a location that are HO / Total number of Admission Prevalent LabID Events x 100	Proxy Measures for MDRO Exposure Burden

Surveillance Method	Forms	Rate	Measures
		Overall Patient Prevalence Rate = Number of 1st LabID Events per patient per month regardless of time spent in location (i.e., prevalent + incident, if monitoring by inpatient location), or facility (i.e., CO + HO, if monitoring by overall facility-wide inpatient=FacWideIN) / Number of patient admissions to the location or facility x 100 **Outpatient Reporting:** Outpatient Prevalence Rate = Number of 1st LabID Events per patient per month for the location (if monitoring by outpatient location), or the facility (if monitoring by overall facility-wide outpatient = FacWideOUT) / Number of patient encounters for the location or facility x 100	
		Inpatient Reporting: MDRO Bloodstream Infection Admission Prevalence Rate = Number of all unique blood source LabID Events per patient per month identified ≤3 days after admission to the location (if monitoring by inpatient location), or facility (if monitoring by overall facility-wide inpatient=FacWideIN) / Number of patient admissions to the location or facility x 100 MDRO Bloodstream Infection Incidence Rate = Number of all unique blood source LabID Events per patient per month identified >3 days after admission to the location (if monitoring by inpatient location), or facility (if monitoring by overall facility-wide inpatient = FacWideIN) / Number of patient days for the location or facility x 1,000	Measures for MDRO Bloodstream Infection Admission Prevalence and Incidence

Surveillance Method	Forms	Rate	Measures
		MDRO Bloodstream Infection Overall Patient Prevalence Rate = Number of 1st Blood LabID Events per patient per month regardless of time spent in location (i.e., prevalent + incident, if monitoring by inpatient location), or facility (i.e., CO + HO, if monitoring by overall facility-wide inpatient=FacWideIN) / Number of patient admissions to the location or facility x 100 **Outpatient Reporting:** MDRO Bloodstream Infection Outpatient Prevalence Rate = Number of all unique blood source LabID Events per patient per month for the location (if monitoring by outpatient location), or the facility (if monitoring by overall facility-wide outpatient=FacWideOUT) / Number of patient encounters for the location or facility x 100	
		•Overall MDRO Infection/Colonization Incidence Rate = Number of 1st LabID Events per patient per month among those with no documented prior evidence of previous infection or colonization with this specific organism type from a previously reported LabID Event, and identified >3 days after admission to the location (if monitoring by inpatient location), or facility (if monitoring by overall facility-wide inpatient=FacWideIN) / Number of patient admissions to the location or facility x 100 (will be removed from NHSN analysis in July 2013) •Overall MDRO Infection/Colonization Incidence Density Rate = Number of 1st LabID Events per patient per month among those with no documented prior evidence of previous infection or colonization with this	Proxy Measures for MDRO Healthcare Acquisition

Surveillance Method	Forms	Rate	Measures
		specific organism type from a previously reported LabID Event, and identified >3 days after admission to the location (if monitoring by inpatient location), or facility (if monitoring by overall facility-wide inpatient=FacWideIN) / Number of patient days for the location or facility x 1,000 (will be referred to in NHSN analysis as Incidence Rate after July 2013)	
CDI Laboratory Identified Event	*Monthly Monitoring* Numerator: *Laboratory-Identified MDRO or CDI Event* Denominator: *MDRO and CDI Prevention Process & Outcome Measures Monthly Monitoring*	**CDI Standardized Infection Ratio (SIR):** Facility CDI Incidence SIR = Number of all Incident CDI LabID Events identified >3 days after admission to the facility (i.e., HO events when monitoring by overall facility-wide inpatient = FacWideIN) / Number of expected Incident HO CDI LabID Events **NOTE: The SIR will be calculated only if the number of expected events (numExp) is ≥1.** **Inpatient Reporting:** Admission Prevalence Rate = Number of non-duplicate CDI LabID Events per patient per month identified ≤3 days after admission to the location (if monitoring by inpatient location), or facility (if monitoring by overall facility-wide inpatient = FacWideIN) (includes CO and CO-HCFA events) / Number of patient admissions to the location or facility x 100 CO Admission Prevalence Rate = Number of CDI LabID events that are CO, per month, in the facility / Number of patient admissions to the facility x 100 (this calculation is only accurate for Overall Facility-wide Inpatient reporting)	CDI HO FacWideIN Standardized Infection Ratio (SIR) Proxy Measures for CDI Exposure Burden

Surveillance Method	Forms	Rate	Measures
		Location Percent Admission Prevalence that is Community-Onset = Number of Admission Prevalent LabID Events to a location that are CO only / Total number Admission Prevalent LabID Events x 100 Location Percent Admission Prevalence that is Community-Onset Healthcare Facility-Associated = Number of Admission Prevalent LabID Events to a location that are CO-HCFA / Total number Admission Prevalent LabID Events x 100 Location Percent Admission Prevalence that is Healthcare Facility-Onset = Number of Admission Prevalent LabID Events to a location that are HO / Total number of Admission Prevalent LabID Events x 100 Overall Patient Prevalence Rate = Number of 1st CDI LabID Events per patient per month regardless of time spent in location (i.e., prevalent + incident, if monitoring by inpatient location), or facility (i.e., CO + CO-HCFA + HO, if monitoring by overall facility-wide inpatient=FacWideIN) / Number of patient admissions to the location or facility x 100 **Outpatient Reporting:** Outpatient Prevalence Rate = Number of all non-duplicate CDI LabID Events per patient per month for the location (if monitoring by outpatient location), or the facility (if monitoring by overall facility-wide outpatient=FacWideOUT) / Number of patient encounters for the location or facility x 100	

Surveillance Method	Forms	Rate	Measures
		Location CDI Incidence Rate = Number of Incident CDI LabID Events per month identified >3 days after admission to the location / Number of patient days for the location x 10,000 Facility CDI Healthcare Facility-Onset Incidence Rate = Number of all Incident HO CDI LabID Events per month in the facility/ Number of patient days for the facility x 10,000 (this calculation is only accurate for Overall Facility-wide Inpatient reporting) Facility CDI Combined Incidence Rate = Number of all Incident HO and CO-HCFA CDI LabID Events per month in the facility / Number of patient days for the facility x 10,000 (this calculation is only accurate for Overall Facility-wide Inpatient reporting)	Measures for CDI Healthcare Acquisition
MDRO Infection Surveillance	Numerator: *1)Primary Bloodstream Infection* *2) Pneumonia* *3) Ventilator-Associated Event* *4) Urinary Tract Infection* *5) Surgical Site Infection* *6) MDRO Infection Event* Denominator: *MDRO and CDI Prevention Process & Outcome Measures Monthly Monitoring*	Data are stratified by time (e.g., month, year) and patient care location. MDRO Infection Incidence Rate = Number of healthcare-associated infections by MDRO type/ Number of patient days x 1000	HAI MDRO Incidence Rate

Surveillance Method	Forms	Rate	Measures
CDI Infection Surveillance	Numerator: *CDI Infection Event* Denominator: *MDRO and CDI Prevention Process & Outcome Measures Monthly Monitoring*	<u>*C. Difficile* Infection Incidence Rate</u> = Number of *C. difficile* healthcare-associated infections/ Number of patient days x 10,000	HAI CDI Incidence Rate
<u>Prevention Process Measures:</u> Hand Hygiene	Numerator & Denominator: *MDRO and CDI Prevention Process & Outcome Measures Monthly Monitoring*	<u>Hand Hygiene Percent Adherence</u> = Number of contacts for which hand hygiene was performed / Number of contacts for which hand hygiene was indicated x100	Adherence Percent: Hand Hygiene
Gown & Gloves Use		<u>Gown & Glove Use Percent Adherence</u> = Number of contacts during which gown and gloves were used /Number of contacts for which gown and gloves were indicated x100.	Gown & Gloves Use
Active Surveillance Testing (AST) (MRSA & VRE only)		<u>Admission AST Percent Adherence</u> = Number of patients with admission AST performed / Number of patients admission AST eligible x100 <u>Discharge/transfer AST Percent Adherence</u> = Number of patients with discharge/transfer AST performed / Number of patients discharge/transfer AST eligible x100.	Admission AST Discharge/Transfer AST
Active Surveillance Testing Outcome Measures (MRSA & VRE Only)	Numerator & Denominator: *MDRO and CDI Prevention Process & Outcome Measures Monthly Monitoring*	Eligible patients = All (All patients regardless of history of MDRO) <u>AST Admission Prevalence rate</u> = Number of admission AST or clinical positive / Number of admissions x100	Eligible patients = NHx (No history) <u>AST Admission Prevalence rate</u> = Number of admission AST or clinical positive + Number of known positive / Number of admissions x100.	Admission Prevalence Rates of MDRO by AST Eligibility

Surveillance Method	Forms	Rate	Measures
		AST Incidence Rate = Number of discharge/transfer AST or clinical positive cases / Number of patient days x 1,000	MDRO Healthcare Acquisition

Appendix 1. Guidance for Handling MDRO and CDI Module Infection Surveillance and LabID Event Reporting When Also Following Other NHSN Modules

If a facility is monitoring CLABSIs, CAUTIs, VAPs, or VAEs within the Device-Associated Module and/or SSIs within the Procedure-Associated Module and is also monitoring MDROs (e.g., MRSA) in the MDRO and CDI Module, then there are a few situations where reporting the infection or LabID event may be confusing. The following scenarios provide guidance to keep the counts and rates consistent throughout your facility and between all of the NHSN Modules. *These rules apply to the reporting of "Big 4" infections (BSI, UTI, PNEU, VAE, and SSI) caused by an MDRO selected for monitoring.*

Device-Associated Module with MDRO and CDI Module

Scenario 1: Facility is following CLABSI, CAUTI, VAP, or VAE along with MDRO Infection Surveillance and possibly LabID Event Reporting in the same location:
Healthcare-associated Infection identified for this location.

1. Report the infection (BSI, UTI, PNEU, or VAE).
2. Answer "Yes" to the MDRO infection question.

This fulfills the infection reporting requirements of both modules in one entry and lets the NHSN reporting tool know that this infection should be included in both the Device-Associated and the MDRO infection datasets and rates.

3. If following LabID event reporting in the same location, report also (separately) as a LabID Event (if meets the MDRO protocol criteria for LabID event).

Scenario 2: Facility is following CLABSI, CAUTI, VAP, or VAE along with MDRO Infection Surveillance and possibly LabID Event Reporting in multiple locations:
All healthcare-associated infection criteria first fully present together the day of patient transfer from one location (the transferring location) to another location (the new location), or the next day.

1. Report the infection (BSI, UTI, PNEU and VAE) and attribute to the transferring location, if transferring location was following that Event Type (BSI, UTI, PNEU, VAE) on the day of Event, which occurred on the date of transfer, or the following day.
2. Answer "Yes" to the MDRO infection question, if the transferring location was following that MDRO on the day of Event, which occurred on the date of transfer, or the following day.
3. If, on the date of culture collection, the new location is following LabID event reporting, report also (separately) as a LabID Event and attribute to the new location (if meets the MDRO protocol criteria for LabID event).

Procedure-Associated Module with MDRO and CDI Module

Note: SSIs are associated with a procedure and not a patient location, but MDROs are connected with the patient location.

Scenario 3: Facility is following SSI along with MDRO Infection Surveillance and possibly LabID Event Reporting:

Patient has surgery, is transferred to a single unit for the remainder of the stay, and during the current stay acquires an SSI.

1. Report the infection (SSI) and attribute to the post-op location.
2. Answer "Yes" to the MDRO infection question, if the post-op location is following that MDRO during the month of the date of event.
3. If following LabID event reporting in the post-op location, report also (separately) as a LabID Event (if meets the MDRO protocol criteria for LabID event).

Scenario 4: Facility is following SSI along with MDRO Infection Surveillance and possibly LabID Event Reporting:

Patient has surgery, is either discharged immediately (outpatient) or transferred to a unit (inpatient), is discharged, and subsequently is readmitted with an SSI.

1. Report the infection (SSI) and attribute to the discharging (post-op) location (not the readmission location).
2. Answer "Yes" to the MDRO infection question, if the discharging (post-op) location was following that MDRO during the Date of Event*.
3. If following LabID event reporting in the readmitting location or outpatient clinic where the specimen was collected, report also (separately) as a LabID Event (if meets the MDRO protocol criteria for LabID event).

* This change corrects the guidance addressing the need to utilize a single event for different surveillance purposes, i.e., that the entry of one event (SSI) may fulfill reporting requirements in another module (MDRO Infection Surveillance option) and because of cross-over in calendar months, may result in conflicting reporting requirements for location.

Appendix 2: Determining Patient Days for Summary Data Collection: Observation vs. Inpatients

In response to questions regarding how to count patient days for "observation" patients, the following guidance is offered.

The NHSN instructions for recording the number of patients in an inpatient unit state that for each day of the month selected, at the same time each day, the number of patients on the unit should be recorded. This procedure should be followed regardless of the patient's status as an observation patient or an inpatient.

1. Observation patients in observation locations: An "observation" location (e.g., 24-hour observation area) is considered an outpatient unit, so time spent in this type of unit does not ever contribute to any inpatient counts (i.e., patient days, device days, admissions). Admissions to such outpatient units represent "encounters" for the purposes of outpatient surveillance for LabID Event monitoring in the MDRO/CDI module.
2. Observation patients in inpatient locations:
    a. a. If an observation patient is transferred from an observation location and admitted to an inpatient location, then only patient days beginning with the date of admission to the inpatient location are to be included in patient day counts (for the location or facility-wide inpatient). In this same way, device days accrue beginning when the patient arrives in any location where device-associated surveillance is occurring and in accordance with the location's device-count methods.
    b. If an observation patient is sent to an inpatient location for monitoring, the patient should be included for all patient and device day counts. The facility assignment of the patient as an observation patient or an inpatient has no bearing in this instance for counting purposes, since the patient is being housed, monitored, and cared for in an inpatient location.

Below is an example of attributing patient days to a patient admitted to an inpatient location, regardless of whether the facility considers the patient an observation patient or an inpatient.

The examples show counts taken at: A) 12:00 am and B) 11:00 pm.

A. Count at 12:00 am (midnight):

Date	Mr X Pt Day	Mr Y Pt Day
01/01	Mr X admitted at 8:00 pm Mr X not counted because the count for 01/01/10 was taken at 12:00 am on 01/01 10 and he was not yet admitted X	Mr Y admitted at 12:00 am Mr Y is counted because the count for 01/01 was taken at 12:00 am and that is when he was admitted 1
01/02	1	1
01/03	2	2
01/04	3	3
01/05	Mr X discharged at 5:00 pm 4 Counted for 01/05 because he was in the hospital at 12:00 am on 01/05 when the count for that day was taken	Mr Y discharged at 12:01 am 5 Counted for 01/05 because he was in the hospital at 12:00 am on 01/05 when the count for that day was taken
Total	**4 patient days**	**5 patient days**

If we use the same admission dates and times for Mr X, but a different time is selected for the patient day count, say 11:00 pm, the total number of days in the count will be the same; they will simply be coming from different dates.

B. Count at 11:00 pm:

Date	Mr X	Pt Day
01/01	Mr X admitted at 8:00 am	Counted because the count for 01/01 is taken at 11:00 pm on 01/01 and he is in the hospital at that time 1
01/02		2
01/03		3
01/04		4
01/05	MR X discharged at 5:00 pm	Not counted for 01/05 because he was not in the hospital at 11:00 pm on 01/05 when the count for that day was taken X
Total		**4 patient days**

Determining Admission Counts for Summary Data Collection:

In response to questions regarding how to count number of admissions, the following guidance is offered.

We understand that there are a variety of ways in which patient day and admission counts are obtained for a facility and for specific locations. We offer this guidance to assist with standardization within and across facilities. It is most important that whatever method is utilized, it should be used each and every month for consistency of data and metrics. How you operationalize this guidance will depend on how you are obtaining the data for your counts. Any patient who meets criteria for new inclusion should be counted, regardless of whether they are coded by the facility as an inpatient or as an observation patient. See below for specific examples. If admissions are calculated electronically for you, then you must check those data to be sure that all appropriate patients are included or excluded from those counts and that your electronic data are within +/- 5% of the number obtained if doing the calculations manually. If these counts are more than 5% discrepant, then you will need to evaluate and discuss with your IT staff to determine the cause of the discrepancies and methods to address them. The main goal is to accurately count patients in the denominators that are at risk for potentially contributing to the numerator.

1. Facility-Wide Inpatient Admission Count: Include any new patients that are assigned to a bed in any inpatient location within the facility. Qualification as a new patient means that the patient was not present on the previous calendar day. The daily admission counts are summed at the end of the calendar month for a monthly facility-wide inpatient admission count.

2. Inpatient Location-Specific Admission Count: Include any new patients that are assigned to a bed in the specific inpatient location. Qualification as a new patient means that the patient was not present on the specific inpatient location on the previous calendar day. The daily admission counts are summed at the end of the calendar month for a monthly inpatient location-specific admission count.

Appendix 3: Differentiating Between LabID Event and Infection Surveillance

	LabID Event	Infection Surveillance (using HAI surveillance definitions)
Protocol	LabID Event protocol in Chapter 12 of NHSN manual	Infection Surveillance protocol in Chapter 12 of NHSN manual and HAI site-specific definitions in NHSN manual (i.e., CLABSI, CAUTI, SSI, VAE, HAI definitions)
Signs & Symptoms	NONE. Laboratory and admission data, without clinical evaluation of patient	Combination of laboratory data and clinical evaluation of patient (signs/symptoms)
Surveillance Rules	• HAI and POA do **NOT** apply • Transfer Rule does **NOT** apply • Location = location of patient at time of specimen collection • Event date = specimen collection date	• HAI and POA **do** apply • Transfer Rule applies • See NHSN protocol for details regarding location and date of event
Denominator Reporting	• Number of patient days and admissions • Can be reported by specific location or facility-wide, depending on reporting option(s) selected • Inpatient and/or outpatient	• Device days and patient days must be collected separately for each monitored location • Inpatient reporting only
Categorization of Infections	• Events categorized based on inpatient or outpatient and admission and specimen collection dates • Healthcare Facility Onset (HO) or Community Onset (CO) • Community Onset Healthcare Facility-Associated (CO-HCFA) for *C. difficile* only • HO and CO LabID Events must be reported to NHSN • Additional categorizations are applied to *C. difficile*, which include Incident CDI Assay and Recurrent CDI Assay	• HAI protocols used • Events are either HAI or not, therefore LabID Event categorizations **do not** apply • Only HAIs are reported to NHSN

Vaccination Module

Important Note

The NHSN Patient Vaccination module was **not** updated for the 2013-2014 influenza season. The module will be available for use through summer 2014 as a means for facilities to track the success of capitalizing on influenza vaccination opportunities. Two options are available related to patient susceptibility and adherence to vaccination recommendations. The module is slated to be removed in summer 2014; therefore, NHSN user support will not be available.

Background

Influenza infections are associated with increased medical costs, hospitalizations, lost productivity, and thousands of deaths every year in the United States. The majority of deaths from seasonal influenza occur in adults aged ≥65 years.[1-4] Annual influenza vaccination is the best way to reduce the risk for complications from influenza infections and in the United States is now recommended for all persons aged ≥6 months.

Annual epidemics of seasonal influenza usually occur during the late fall through early spring each year. During these times, rates of infection with influenza are highest among persons aged ≥65 years of age, in children <2 years and persons of any age who have medical conditions placing them at increased risk for the complications of influenza.[5-7] Occasionally, a variant strain of influenza will emerge that is distinct from the expected seasonal strain and requires a separate vaccination for prevention. In 2009-10, this non-seasonal strain was novel Influenza A (H1N1) 2009. Annual influenza vaccination is the most effective way to prevent influenza virus infection and its complications.

Methodology

The Vaccination Module targets the healthcare facility's inpatient population, who are greater than 6 months of age. Two separate approaches (Summary Method or Patient-Level Method) are used to report data for the Vaccination Module. The module can be completed using either retrospective medical record review (Summary Method or Patient-Level Method) *or* prospective surveillance (Patient-Level Method). Either method may be used during the influenza season. When vaccinations for more than one subtype are recommended during a season, use a single method and report data separately for each vaccination subtype. For example, report a Summary Method record for seasonal vaccination and one for the non-seasonal subtype. Multiple admissions by the same patient during the same month should be evaluated as separate encounters for this module.

A trained individual shall initially seek to identify all inpatient admissions as meeting criteria for seasonal vaccination during the review period, and determine if influenza vaccination was

offered, and then either accepted or declined during the course of the patient's admission. Personnel other than the IP may be trained to perform these observations.

The CDC forms 57.130, 57.131, 57.133 are used to collect all required data for this module depending on whether Summary Method or Patient-Level Method is the selected surveillance approach. The minimum requirement to participate in this module is one month during the influenza season (September through April), but maximal benefit is obtained by completing the module for each month of the entire influenza season. An optional tool, *Influenza Vaccination Standing Orders* form (CDC 57.134), is also available to provide a chart document that will allow for the capture of needed data elements to complete this module.

Summary Method

Introduction: The Summary Method requires the use of a single form, the *Vaccination Monthly Monitoring Form – Summary Method* (CDC 57.130) to collect all data for the period of surveillance. A Summary form is completed for each month the facility is following influenza vaccination for the influenza season. This retrospective method consists of determining the total number of patients in eight separate categories during the surveillance month(s). The value of this type of surveillance is the simplicity of data collection requirements.

Settings: This is a facility-wide surveillance in which all NHSN inpatients are monitored during the selected month(s).

Requirements: Surveillance consists of a review of all NHSN inpatients facility-wide to determine 1) whether they meet criteria for seasonal influenza vaccination (refer to the current season's recommendations for details), 2) how many were previously vaccinated, and 3) the number meeting criteria who are offered and receive influenza vaccination during their admission. Ideally, the facility should conduct the surveillance during each month of the influenza season (September through April). Each month in which surveillance is conducted must be included in the *Patient Safety Monthly Reporting Plan* (CDC 57.106).

Definitions: All box numbers refer to boxes on the *Vaccination Monthly Monitoring Form–Summary Method* (CDC 57.130).

NHSN inpatient: A patient whose date of admission to the healthcare facility and the date of discharge are different calendar days.

Total number of patient admissions (Box 1): The count of all NHSN inpatients admitted to the facility.
Total number of patients aged 6 months and older meeting criteria for influenza vaccination (Box 2): The count of NHSN inpatients meeting criteria for vaccination. Include in this count any patients who have been previously vaccinated during the current influenza season.

Total number of patients previously vaccinated during current influenza season (Box 3): During the month selected for surveillance, the count of all NHSN inpatients who had previously received influenza vaccination during the current influenza season by either history or documentation. Patients requiring a second vaccine should not be included in the count of those previously vaccinated.

Total number of patients meeting criteria not previously vaccinated during the current influenza season (Box 4): During the month selected for surveillance, the count of NHSN inpatients meeting criteria (Box 2) minus the count of NHSN inpatients meeting criteria previously vaccinated during the current influenza season (Box 3).

Patients meeting criteria offered vaccination but declining for reasons other than medical contraindication (Box 5): The count of NHSN inpatients meeting criteria offered vaccination but who declined for reasons other than medical contraindication. Refer to Table 1 for examples of personal (non-medical) reasons for declining vaccination.

Patients meeting criteria offered vaccination but having medical contraindication (Box 6): The count of NHSN inpatients offered vaccination but who declined because of medical contraindication(s). Refer to Table 1 for examples of medical contraindication.

Patients meeting criteria receiving vaccination during admission (Box 7): The count of patients with documentation in the medical record of receiving influenza vaccination during the course of their hospital admission prior to being discharged.

Total number of patients offered vaccination (Box 8): The sum of the count of all NHSN inpatients offered vaccination but who declined for reasons other than medical contraindication (Box 5) plus all patients offered vaccination but who declined because of medical contraindication (Box 6) plus all NHSN inpatients with documentation in the medical record of receiving influenza vaccination during the course of their hospital admission prior to being discharged (Box 7). The number in this box should be less than or equal to the number in Box 4.

Refer also to the *Key Terms* chapter for other definitions.

Numerator and Denominator Data: The numerator and denominator data are reported on the *Vaccination Monthly Monitoring Form–Summary Method* (CDC 57.130) in boxes 1-8 for the month(s) selected for surveillance (refer to the instructions for completion for details).

Data Analysis: Data aggregated across the entire facility are stratified by time (e.g., month, influenza subtype, influenza season). Table 2 shows the formulas for metrics that can be calculated from the Summary Method.

Table 1: Formulas for Metrics: Summary Method
All data come from Boxes 1-8 of the Vaccination Monthly Monitoring Form–Summary Method (CDC 57.130)

Metric		Summary Formula (x 100)
1	Prevalence rate for inpatients not previously vaccinated among all inpatient admissions	Box 4 / Box 1
2	Adherence rate for offering influenza vaccination to inpatients among all eligible inpatients	Box 8 / Box 4
3	Adherence rate for receiving influenza vaccination by inpatients among all inpatients	Box 7 / Box 4

Table 1: Formulas for Metrics: Summary Method
All data come from Boxes 1-8 of the Vaccination Monthly Monitoring Form–Summary Method (CDC 57.130)

Metric		Summary Formula (x 100)
4	Adherence rate for receiving influenza vaccination by inpatients among all medically eligible inpatients	Box 7 / Box 4 – Box 6
5	Adherence rate for receiving influenza vaccination by inpatients among all medically eligible, willing inpatients	Box 7 / (Box 4 – Box 6) + Box 5
6	Declination rate for inpatients eligible for influenza vaccination among all inpatients offered vaccine	Box 5 + Box 6 / Box 8
7	Declination rate due to personal (non-medical) reasons for inpatients eligible for influenza vaccination among all inpatients offered vaccine	Box 5 / Box 8
8	Declination rate due to medical contraindications for inpatients eligible for influenza vaccination among all inpatients offered vaccine	Box 6 / Box 8
9	Failure rate for offering vaccine to inpatients medically eligible for influenza vaccination among all medically eligible inpatients	Box 4 – Box 8 / Box 4 – Box 6
10	Prevalence rate of all inpatients previously vaccinated during the current influenza season among all inpatient admissions	Box 3 / Box 1

Patient-Level Method

Introduction: The Patient-Level Method requires the use of two forms, the *Vaccination Monthly Monitoring Form–Patient-Level Method* (CDC 57.131), and the *Patient Vaccination* form (CDC 57.133) to collect all data for the period of surveillance. The patient vaccination forms must be completed when the facility is following influenza vaccination for inpatients. The value of this method is that the information collected will assist facilities in identifying whether NHSN inpatients meeting criteria for influenza vaccination during an admission are actually receiving vaccination, and the details of those vaccinations. Additionally, IPs will be able to identify specific gaps in adherence and recommend changes in practices to ensure that eligible patients are being vaccinated.

Settings: This is a facility-wide surveillance in which all NHSN inpatients are monitored during the selected month(s).

Requirements: Surveillance consists of a review of all NHSN inpatients facility-wide to determine whether they meet criteria for influenza vaccination who are offered and receive influenza vaccination during the course of their admission. Surveillance must be conducted for at least one calendar month during the influenza season as indicated in the *Patient Safety Monthly Reporting Plan* (CDC 57.106). During seasons when seasonal and non-seasonal subtype vaccinations are recommended, such as 2009-10, monitoring is required for all influenza vaccinations, unless both doses have been received. Patients requiring a second vaccine shouldn't be included in the count of those previously vaccinated. A *Vaccination Monthly Monitoring form–Patient-Level Method* (CDC 57.131) and a *Patient Vaccination* form (CDC 57.133) need to be completed for each of the 2 doses given. (See latest CDC/ACIP recommendations for current season details). Ideally the facility should conduct the surveillance during each month of the influenza season (September through April).

The Patient-Level Method requires determination of the number of NHSN inpatients in the following categories for the month selected for review. (All box numbers refer to the boxes found on the *Vaccination Monthly Monitoring Form–Patient-Level Method* [CDC 57.131]):

- Total number of NHSN patient admissions (Box 1).
- Total number of NHSN patients previously vaccinated during the current influenza season (Box 2).

In addition, all NHSN inpatient admissions found to meet criteria for influenza vaccination but not previously vaccinated during the current influenza season will need to have a *Patient Vaccination* form (CDC 57.133) completed as indicated. For those patients who decline influenza vaccination, reasons for declination (medical contraindications and personal) are captured (Table 2).

Table 2: Examples of Medical Contraindications to Influenza Vaccination and of Personal Reasons for Declining Influenza Vaccinations	
Medical Contraindications	Allergy to vaccine components History of Guillain-Barré syndrome within 6 weeks of previous influenza vaccination Current febrile illness (Temp >101.5°)
Personal (non-medical) reasons for declining vaccination	Fear of needles/injections Fear of side effects Perceived ineffectiveness of vaccine Religious or philosophical objections Concern for transmitting vaccine virus to contacts

Review all NHSN inpatient admissions and determine whether they meet the criteria for influenza vaccination. Note that all NHSN inpatients that meet criteria but have previously been vaccinated during the current influenza season do not require a *Patient Vaccination* form (CDC 57.133) to be completed, but should be totaled and entered on the *Vaccination Monthly Monitoring Form–Patient-Level Method* (CDC 57.131) in Box 2.

Definitions: All box numbers refer to the boxes found on the *Vaccination Monthly Monitoring Form–Patient-Level Method* (CDC 57.131).

NHSN Inpatient: A patient whose date of admission to the healthcare facility and the date of discharge are different calendar days.

Total number of patient admissions (Box 1): The count of all NHSN inpatients admitted to the facility.

Total number of patients previously vaccinated during the current influenza season (Box 2): The count of all NHSN inpatients who had previously received influenza vaccination during the current influenza season by either history or documentation. Patients requiring a second vaccine should not be included in the count of those previously vaccinated, unless both doses have been received.

Refer also to the NHSN Key Terms chapter, for other definitions.

Numerator and Denominator Data: Numerator data are reported on the *Patient Vaccination* form (CDC 57.133) (refer to the instructions for completion for details). In addition, some numerator and all denominator data are reported on the *Vaccination Monthly Monitoring Form–Patient-Level Method (*CDC 57.131) (refer to the instructions for completion for details).

Data Analysis: Data aggregated across the entire facility are stratified by time (e.g., month, influenza subtype, influenza season). Table 3 shows the formulas for metrics that can be calculated from the Patient-Level Method.

Table 3: Formulas for Metrics: *Patient-Level Method*
Data come from two CDC forms:
Boxes 1 - 4 of the *Vaccination Monthly Monitoring Form–Patient-Level Method (*CDC 57.131*)*
Patient Vaccination (PV) form (CDC 57.133)

Metric		Patient Vaccination Formula (x 100)
1	Prevalence rate for inpatients not previously vaccinated among all inpatient admissions	Box 4 / Box 1
2	Adherence rate for offering influenza vaccination to inpatients among all eligible inpatients	Total # PV Forms "Vaccine offered" = "Yes" / Box 4
3	Adherence rate for receiving influenza vaccination inpatients among all inpatients	Total # PV Forms "Vaccine administered" = "Yes" / Box 4
4	Adherence rate for receiving influenza vaccination by inpatients among all medically eligible inpatients	Total # PV Forms) "Vaccine administered" = "Yes" / Box 4 – Total # PV Forms "Vaccine declined" = "Yes" due to medical contraindications
5	Adherence rate for receiving influenza vaccination by inpatients among all medically eligible, willing inpatients	Total # PV Forms "Vaccine administered" = "Yes" / (Box 4 –Total # PV Forms "Vaccine declined = "Yes" due to medical contraindication) + "Vaccine declined" = "Yes" due to personal reasons
6	Declination rate for inpatients eligible for influenza vaccination among all inpatients offered vaccine	Total # PV Forms "Vaccine declined" = "Yes" / Total # PV Forms "Vaccine offered = "Yes"
7	Declination rate due to personal (non-medical) reasons for inpatients eligible for influenza vaccination among all inpatients offered vaccine	Total # PV Forms / "Vaccine declined" = "Yes" due to personal reasons / Total # PV Forms "Vaccine offered" = "Yes"
8	Declination rate due to medical contraindications for inpatients eligible for influenza vaccination among all inpatients offered vaccine	Total # PV Forms / "Vaccine declined" = "Yes" due to medical contraindications / Total # PV Forms "Vaccine offered"= "Yes"

Table 3: Formulas for Metrics: *Patient-Level Method* Data come from two CDC forms: Boxes 1 - 4 of the *Vaccination Monthly Monitoring Form–Patient-Level Method (*CDC 57.131*)* *Patient Vaccination (PV)* form (CDC 57.133)		
Metric		**Patient Vaccination Formula (x 100)**
9	Failure rate for offering vaccine to inpatients medically eligible for influenza vaccination among all medically eligible inpatients	Box 4 – Total # PV Forms "Vaccine offered" = "Yes" "Vaccine declined" = "Yes" due to medical contraindications Box 3 Box 1
10	Prevalence rate of all inpatients previously vaccinated among all inpatient admissions	

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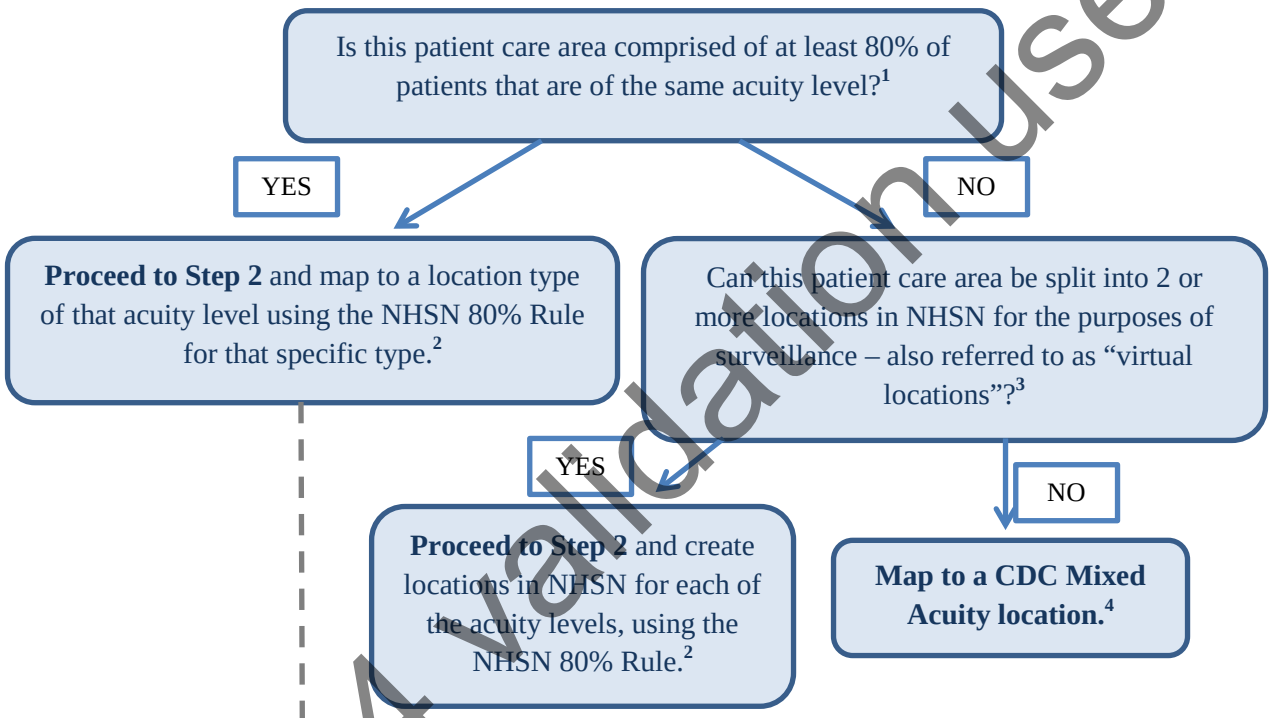
Instructions for Mapping Patient Care Locations in NHSN

NHSN requires that facilities map each patient care area in their facility to one or more locations as defined by NHSN in order to report surveillance data collected from these areas. This document functions as a decision-making tool when determining the appropriate CDC location for NHSN surveillance, as defined in the NHSN Manual. This process should be followed when adding any new unit to NHSN for surveillance and should be repeated for any unit when there has been a significant change in patient mix (e.g., merging of units, taking on a new service).

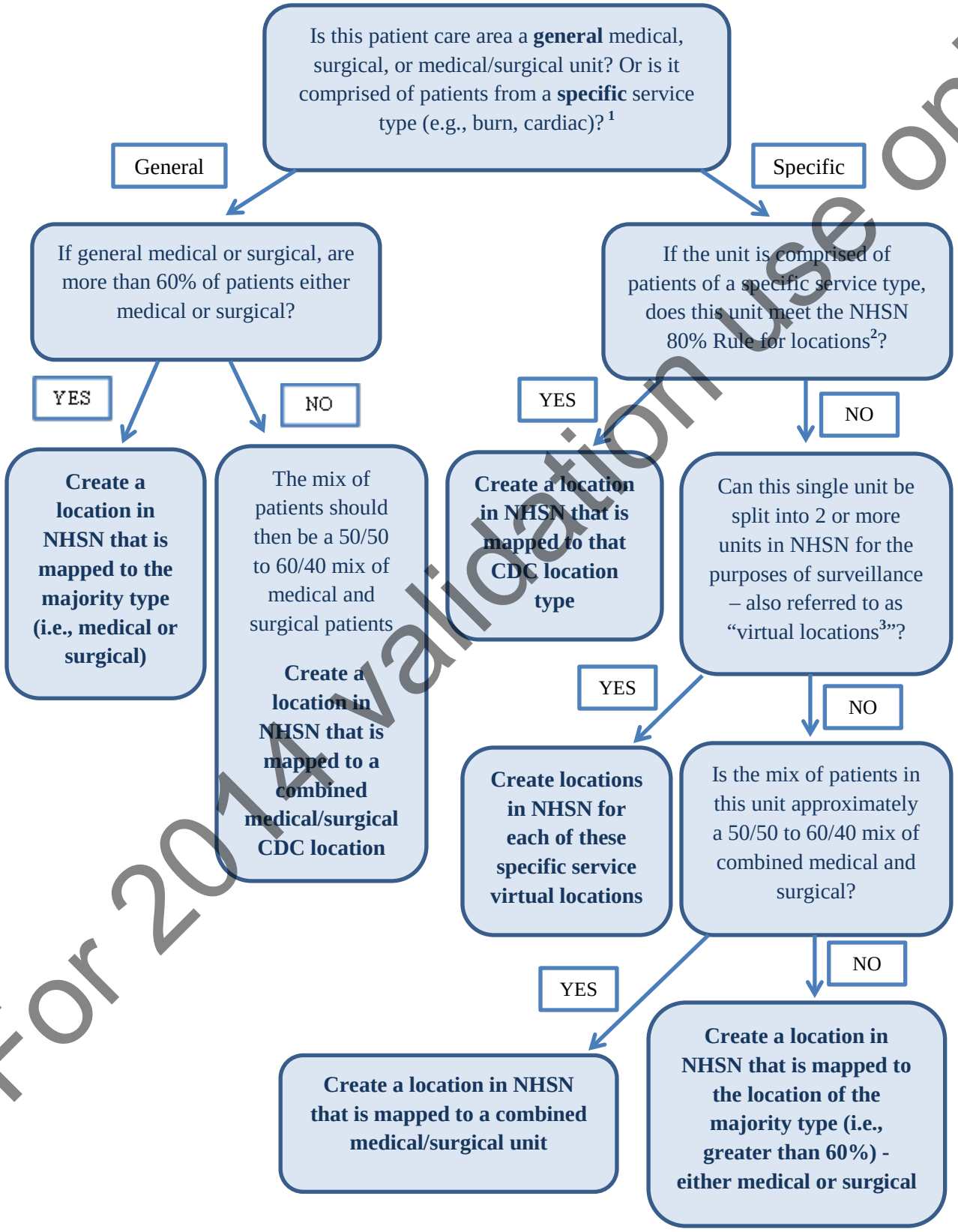
Step 1: Define the acuity level for the location



List of Acuity Levels:

Adult Critical Care Units	Mixed Acuity Units
Pediatric Critical Care Units	Operating Rooms
Neonatal Critical Care Units	Chronic Care
Specialty Care Areas (SCA)/Oncology	Long Term Acute Care
Adult Wards	Rehabilitation
Pediatric Wards	Outpatient (ACUTE) Locations
Neonatal Wards	Clinic (Nonacute) Settings
Step Down Units	

Step 2: Define the type of service for the location



Please see the CDC Location descriptions for definitions of each CDC Location used for NHSN surveillance in this chapter.

1. Patient mix: When determining the appropriate CDC Location mapping for a unit, facilities should review the patient mix in that unit for the last full calendar year. If a full year is not available, facilities should review patient mix based on the data they have available for that unit.

2. NHSN 80% Rule: Each patient care area in a facility that is monitored in NHSN is "mapped" to one or more CDC Locations. The specific CDC Location code is determined by the type of patients cared for in that area according to the 80% Rule. That is, if 80% of patients are of a certain type (e.g., pediatric patients with orthopedic problems) then that area is designated as that type of location (in this case, an Inpatient Pediatric Orthopedic Ward).

3. Virtual locations: Virtual locations are created in NHSN when a facility is unable to meet the 80% rule for location designation in a single physical unit but would like to report their NHSN surveillance data for each of the major, specific patient types in that unit. The use of virtual locations is recommended only for those physical units that are geographically split by patient service or those in which beds are designated by service. For example, a facility has an ICU – called 5 West – that is comprised of approximately 50% neurology patients and 50% neurosurgery patients. Additionally, the neurology patients are housed in beds 1 thru 10 and the neurosurgery patients are housed in beds 11 thru 20. Rather than map as a medical/surgical critical care unit, the facility decides to create 2 new locations in NHSN:

5WEST_N: Neurologic Critical Care (10 beds)
5WEST_NS: Neurosurgical Critical Care (10 beds)

This facility will collect and enter data for 5WEST_N and 5WEST_NS separately. The facility will also be able to obtain rates and standardized infection ratios (SIRs) for each location separately. Note that the data collected and reported for each virtual location will be limited to the designated 10 beds assigned (i.e., overflow from 5WEST_N into 5WEST_NS will be counted with **5WEST_NS**). For those facilities that use an electronic source for collecting their data, we recommend that you discuss compatibility of virtual locations in NHSN with your facility's EHR contact prior to reporting data for these locations.

4. Mixed Acuity Unit: This location is intended for those units comprised of patients with varying levels of acuity. Because of the varying range of risk in mixed acuity units, CDC does not have plans to publish national pooled mean rates for this location type. Therefore, if your facility chooses to use this location designation for reporting, you will not be able to compare your mixed acuity unit rates to an NHSN pooled mean, nor will these data be included in any SIR analyses.

NOTE: Mapping a location in NHSN to the CDC "Mixed Acuity" designation may have implications on data that your facility reports for the CMS Hospital Inpatient Quality Reporting Program and/or your state's reporting mandate(s). Although a Mixed Acuity location may have ICU beds and ICU patients, it is not considered an ICU location type for the purposes of NHSN reporting and therefore, would not be included in any ICU-specific reporting requirements. For information about how this location designation may impact your facility's compliance with CMS HAI reporting measures, please contact your Quality Improvement Organization (QIO). For information about how this location designation may impact your facility's compliance with your state mandate (if applicable), please contact your state HAI coordinator: http://www.cdc.gov/HAI/state-based/index.html.

Examples

Example 1: An ICU that is 85% Burn patients, 15% Trauma

CDC Location: Burn Critical Care (IN:ACUTE:CC:B)

Why? Meets 80% rule for critical care acuity level and 80% rule for specific service (burn)

Example 2: An ICU that is 55% medical and 45% Surgical

CDC Location: Medical/Surgical Critical Care (IN:ACUTE:CC:MS)

Why? Meets 80% rule for critical care acuity level and does not meet the 60% rule for designation as either medical or surgical service level alone, therefore, use combined medical/surgical designation

Example 3: An ICU that is 40% Neurosurgical, 40% Surgical, and 20% Medical

Option 1 - Single CDC Location: Surgical Critical Care

Why? Meets 80% rule for critical care acuity level and does not meet the 80% rule for a specific service level alone, but when surgical patients are combined, that total does equal 80%.

Option 2 - Multiple CDC Virtual Locations: Neurosurgical Critical Care and Surgical Critical Care, with the medical patients reported with the Surgical Critical Care location since the general surgical designation is the least specific of the two

Why? By splitting this unit into 2 virtual locations, each meets the 80% rule for critical care acuity level and one meets the 80% rule for designation as Neurosurgical Critical Care, while the other meets the 60% rule as general surgical service (when combining surgical and medical patients).

Example 4: A unit that is comprised of 60% Medical ICU and 40% Step-Down patients

Option 1 - Single CDC Location: Mixed Acuity Unit

Why? This location is <u>not</u> comprised of at least 80% of the patients of the same acuity level and therefore meets the single location definition of a mixed acuity unit. Note that this location is <u>not</u> considered an ICU location type for the purposes of NHSN reporting and therefore, would not be included in any ICU-specific reporting requirements.

Option 2 - Multiple CDC Virtual Locations: Medical Critical Care and Step-Down Unit

Why? By splitting this unit into 2 virtual locations, each meets the 80% rule for the appropriate acuity level and each meets the 80% rule for type of service.

Example 5: A pediatric ward that is comprised of 70% neurosurgical patients and 30% orthopedic patients

Option 1 - Single CDC Location: Pediatric Surgical Ward

Why? Meets 80% rule for ward-level acuity and does not meet the 80% rule for a specific service level alone, but meets the 60% rule for general surgical service.

Option 2 - Multiple CDC Virtual Locations: Pediatric Neurosurgical Ward and Pediatric Orthopedic Ward

Why? By splitting this unit into 2 virtual locations, each meets the 80% rule for the appropriate acuity level and each meets the 80% rule for type of service.

Appendix: Creation and Management of Locations in NHSN

Create New Locations:

If there are any operational locations in your hospital that are not already set-up in NHSN, you will need to create these locations for the purposes of NHSN surveillance and reporting.

Locations can be set up by following these steps:

1. Go to Facility > Locations.
2. On the Locations screen, enter a location code ("Your Code") and location label ("Your Label").
3. Select a CDC Location Description from the drop-down menu. NOTE: When selecting a CDC Location Description, your location must meet the 80% Rule in order to be assigned as that CDC Location Description.
4. Make sure the Status is set to "Active" and then enter the number of beds that are set up and staffed in that location.
5. Once all information for this new location is entered, click 'Add'.

Manage Existing Locations:

Facilities should make sure that the only locations with an "active" status in NHSN are those that are operational units within the facility. The number of beds indicated for each location should also be checked for accuracy and, if necessary, updated to reflect the current number of beds set up and staffed.

Location information can be updated by following these steps:

1. Go to Facility > Locations.
2. On the Locations screen, click 'Find'.
3. Review the information that appears in the Location Table at the bottom of the screen. Review the Status of each location, as well as Bed size.
4. If a location's information needs to be updated, click the location code under the "Your Code" column; the location's information will auto-fill in the fields above the Location Table.
5. Make any modifications to the Status and/or Bed size, then click 'Save'.

Inaccurate CDC Location Description

If you believe that the CDC Location Description assigned to your existing location is incorrect, there are additional steps you will need to follow, depending on the scenario:

Scenario 1: The patient population in this unit has changed such that the current CDC Location Description, using the 80% rule, is inaccurate.

> Solution: Because the patient population has changed, a new location should be created in NHSN and should be mapped to a CDC Location Description that most accurately reflects the type of patients receiving care in that location, using the 80% rule. The old location should be put into "Inactive" status. Note that data which have been reported from inactive locations can continue to be analyzed within NHSN, however these locations will not be linked to new, active locations.

Scenario 2: The CDC Location Description initially assigned has been inaccurate for much, if not all, of the reporting to NHSN, based on the updated location guidance for 2013.

> Solution: Users cannot change the CDC Location Description on existing locations within NHSN. Facilities should ensure that the locations set up in NHSN are accurate for 2013 reporting per the updated guidance. If a new CDC Location Description is needed, users must create a new location in NHSN and inactivate the old location, per the instructions above. Note that data for the old location can still be analyzed, but these data will not be connected to data reported under the new location.

Master CDC Locations and Descriptions

CDC Location Label	NHSN Healthcare Service Location Code	CDC Location Code	Location Description
INPATIENT LOCATIONS			
ACUTE CARE FACILITIES GENERAL			
Adult Critical Care Units			
Burn Critical Care	1026-4	IN:ACUTE:CC:B	Critical care area specializing in the care of patients with significant/major burns.
Medical Cardiac Critical Care	1028-0	IN:ACUTE:CC:C	Critical care area specializing in the care of patients with serious heart problems that do not require heart surgery.
Medical Critical Care	1027-2	IN:ACUTE:CC:M	Critical care area for patients who are being treated for nonsurgical conditions.
Medical/Surgical Critical Care	1029-8	IN:ACUTE:CC:MS	An area where critically ill patients with medical and/or surgical conditions are managed.
Neurologic Critical Care	1035-5	IN:ACUTE:CC:N	Critical care area for the care of patients with life-threatening neurologic diseases.
Neurosurgical Critical Care	1031-4	IN:ACUTE:CC:NS	Critical care area for the surgical management of patients with severe neurologic diseases or those at risk for neurologic injury as a result of surgery.

ONC Medical Critical Care	1223-7	IN:ACUTE:CC:ONC_M	Critical care area for the care of oncology patients who are being treated for nonsurgical conditions related to their malignancy.
ONC Surgical Critical Care	1224-5	IN:ACUTE:CC:ONC_S	Critical care area for the evaluation and management of oncology patients with serious illness before and/or after cancer-related surgery.
ONC Medical-Surgical Critical Care	1225-2	IN:ACUTE:CC:ONC_MS	Critical care area for the care of oncology patients with medical and/or surgical conditions related to their malignancy.
Prenatal Critical Care	1034-8	IN:ACUTE:CC:PNATL	Critical care area for the care of pregnant patients with complex medical or obstetric problems requiring a high level of care to prevent the loss of the fetus and to protect the life of the mother.
Respiratory Critical Care	1033-0	IN:ACUTE:CC:R	Critical care area for the evaluation and treatment of patients with severe respiratory conditions.
Surgical Cardiothoracic Critical Care	1032-2	IN:ACUTE:CC:CT	Critical care area specializing in the care of patients following cardiac and thoracic surgery.
Surgical Critical Care	1030-6	IN:ACUTE:CC:S	Critical care area for the evaluation and management of patients with serious illness before and/or after surgery.
Trauma Critical Care	1025-6	IN:ACUTE:CC:T	Critical care area specializing in the care of patients who require a high level of monitoring and/or intervention following trauma or during critical illness related to trauma.

Pediatric Critical Care Units			
ONC Pediatric Critical Care	1233-6	IN:ACUTE:CC:ONC_PED	Critical care area for the care of oncology patients ≤18 years old who are being treated for surgical or nonsurgical conditions related to their malignancy.
Pediatric Burn Critical Care	1042-1	IN:ACUTE:CC:B_PED	Critical care area specializing in the care of patients ≤18 years old with significant/major burns.
Pediatric Cardiothoracic Critical Care	1043-9	IN:ACUTE:CC:CT_PED	Critical care area specializing in the care of patients ≤18 years old following cardiac and thoracic surgery.
Pediatric Medical Critical Care	1044-7	IN:ACUTE:CC:M_PED	Critical care area for patients ≤18 years old who are being treated for nonsurgical conditions. In the NNIS system, this was called Pediatric ICU (PICU).
Pediatric Medical/Surgical Critical Care	1045-4	IN:ACUTE:CC:MS_PED	An area where critically ill patients ≤18 years old with medical and/or surgical conditions are managed.
Pediatric Neurosurgical Critical Care	1046-2	IN:ACUTE:NS_PED	Critical care area specializing in the surgical management of patients ≤18 years old with severe neurological diseases or those at risk for neurological injury as a result of surgery.
Pediatric Respiratory Critical Care	1047-0	IN:ACUTE:CC:R_PED	Critical care area for the evaluation and treatment of the patients ≤18 years old with severe respiratory conditions.
Pediatric Surgical Critical Care	1048-8	IN:ACUTE:CC:S_PED	Critical care area for the evaluation and management of patients ≤18 years old with serious illness before and/or after surgery.

Pediatric Trauma Critical Care	1049-6	IN:ACUTECC:T_PED	Critical care area specializing in the care of patients ≤18 years old who require a high level of monitoring and/or intervention following trauma or during critical illness related to trauma.
Neonatal Units			
Well Baby Nursery (Level I)	1038-9	IN:ACUTE:WARD:NURS	Hospital area for evaluation and postnatal care of healthy newborns. May include neonatal resuscitation and stabilization of ill newborns until transfer to a facility at which specialty neonatal care is provided.
Step down Neonatal Nursery* (Level II) *Location will be listed as 'Step down Neonatal ICU' within NHSN until NHSN Release 7.2 slated for late summer 2013.	1041-3	IN:ACUTE:STEP:NURS	The capabilities of Level II, listed below, are from the American Academy of Pediatrics definitions of levels of neonatal care.[1] Level II special care nursery Level I capabilities plus: • Provide care for infants born ≥32 wk gestation and weighing ≥1500 g who have physiologic immaturity or who are moderately ill with problems that are expected to resolve rapidly and are not anticipated to need subspecialty services on an urgent basis • Provide care for infants convalescing after intensive care • Provide mechanical ventilation for brief duration (<24 h) or continuous positive airway pressure or both

			• Stabilize infants born before 32 wk gestation and weighing less than 1500 g until transfer to a neonatal intensive care facility
Neonatal Critical Care (Level II/III)	1039-7	IN:ACUTE:CC_STEP: NURS	Combined nursery housing both Level II and III newborns and infants.
Neonatal Critical Care (Level III)	1040-5	IN:ACUTE:CC:NURS	A hospital neonatal intensive care unit (NICU) organized with personnel and equipment to provide continuous life support and comprehensive care for extremely high-risk newborn infants and those with complex and critical illness. The capabilities of Level III and Level IV, listed below, are from the American Academy of Pediatrics definitions of levels of neonatal care.[1] **NOTE: These classifications are <u>all</u> considered Level III NICUs in NHSN.** <u>Level III NICU</u> Level II capabilities plus: • Provide sustained life support • Provide comprehensive care for infants born < 32 wks gestation and weighing <1500 g and infants born at all gestational ages and birth weights with critical illness • Provide prompt and readily available access to a full range of pediatric medical

			subspecialists, pediatric surgical specialists, pediatric anesthesiologists, and pediatric opthalmologists • Provide a full range of respiratory support that may include conventional and/or high-frequency ventilation and inhaled nitric oxide • Perform advanced imaging, with interpretation on an urgent basis, including computed tomography, MRI, and echocardiography <u>Level IV Regional NICU</u> Level III capabilities plus: • Located within an institution with the capability to provide surgical repair of complex congenital or acquired conditions • Maintain a full range of pediatric medical subspecialists, pediatric surgical subspecialists, and pediatric subspecialists at the site • Facilitate transport and provide outreach education

Specialty Care Areas (SCA)			
Inpatient Dialysis SCA	1198-1	IN:ACUTE:SCA:DIAL	Hospital specialty care area for patients who require dialysis as part of their care. These patients may be chronic or acute dialysis patients.
Pediatric Dialysis SCA	1091-8	IN:ACUTE:SCA:DIAL_PED	Hospital specialty care area for patients ≤18 years old who require acute dialysis as part of their care. These patients may be chronic or acute dialysis patients.
Pediatric Solid Organ Transplant SCA	1093-4	IN:ACUTE:SCA:SOTP_PED	Hospital specialty area for the postoperative care of patients ≤18 years old who have had a solid organ transplant (e.g., heart/lung, kidney, liver, pancreas).
Solid Organ Transplant SCA	1092-6	IN:ACUTE:SCA:SOTP	Hospital specialty area for the postoperative care of patients who have had a solid organ transplant (e.g., heart/lung, kidney, liver, pancreas).
Adult Wards			
Antenatal Care Ward	1205-4	IN:ACUTE:WARD: ANTENAT	Hospital area for observation, evaluation, treatment or surgery of high risk pregnancy patients.
Behavioral Health /Psych Ward	1051-2	IN:ACUTE:WARD:BHV	Area for the evaluation and treatment of patients with acute psychiatric or behavioral disorders.
Burn Ward	1052-0	IN:ACUTE:WARD:B	Hospital area for evaluation and treatment of patients who have burns.
Ear/Nose/Throat Ward	1053-8	IN:ACUTE:WARD:ENT	Hospital area for the evaluation, treatment, or surgery of patients with ear, nose, or throat disorders.

Gastrointestinal Ward	1054-6	IN:ACUTE:WARD:GI	Hospital area for evaluation, treatment or surgery of patients with disorders of the gastrointestinal tract.
Genitourinary Ward	1055-3	IN:ACUTE:WARD:GU	Hospital area for the evaluation, treatment or surgery of patients with disorders of the genitourinary system.
Gerontology Ward	1056-1	IN:ACUTE:WARD:GNT	Hospital area for the evaluation, treatment or surgery of patients with age-related diseases.
Gynecology Ward	1057-9	IN:ACUTE:WARD:GYN	Hospital area for the evaluation, treatment, or surgery of female patients with reproductive tract disorders.
Jail Unit	1171-8	IN:ACUTE:WARD:JAL	Overnight stay patient care area of a hospital or correctional facility used only for those who are in custody of law enforcement during their treatment.
Labor and Delivery Ward	1058-7	IN:ACUTE:WARD:LD	Hospital area where women labor and give birth.
Labor, Delivery, Recovery, Postpartum Suite (LDRP)	1059-5	IN:ACUTE:WARD:LD_PP	Hospital suite used for labor, delivery, recovery and post-partum (LDRP) -- all within the same suite.
Medical Ward	1060-3	IN:ACUTE:WARD:M	Hospital area for the evaluation and treatment of patients with medical conditions or disorders.
Medical/Surgical Ward	1061-1	IN:ACUTE:WARD:MS	Hospital area for the evaluation of patients with medical and/or surgical conditions.
Neurology Ward	1062-9	IN:ACUTE:WARD:N	Hospital area where patients with neurological disorders are evaluated and treated.

Neurosurgical Ward	1063-7	IN:ACUTE:WARD:NS	Hospital area for care of patients whose primary reason for admission is to have neurosurgery or to be cared for by a neurosurgeon after head or spinal trauma.
ONC Leukemia Ward	1226-0	IN:ACUTE:WARD: ONC_LEUK	Area for the evaluation and treatment of patients with leukemia.
ONC Lymphoma Ward	1228-6	IN:ACUTE:WARD:ONC: LYMPH	Area for the evaluation and treatment of patients with lymphoma.
ONC Leukemia/Lymphoma Ward	1229-4	IN:ACUTE:WARD: ONC_LL	Area for the evaluation and treatment of patients with leukemia and/or lymphoma.
ONC Solid Tumor Ward	1230-2	IN:ACUTE:WARD:ONC_ST	Area for the evaluation and treatment of oncology patients with solid tumors.
ONC Hematopoietic Stem Cell Transplant Ward	1231-0	IN:ACUTE:WARD: ONC_HSCT	Area for the care of patients who undergo stem cell transplant for the treatment of cancers and/or blood or immune system disorders.
ONC General Hematology/Oncology Ward	1232-8	IN:ACUTE:WARD: ONC_HONC	Area for the evaluation and treatment of patients with cancer and/or blood disorders.
Ophthalmology Ward	1064-5	IN:ACUTE:WARD:OPH	Hospital area for care of patients whose primary reason for admission is to have eye surgery or to be cared for by an ophthalmologist after eye trauma.
Orthopedic Ward	1065-2	IN:ACUTE:WARD:ORT	Hospital area for evaluation, treatment or surgery on bones, joints, and associated structures by an orthopedist.

Orthopedic Trauma Ward	1066-0	IN:ACUTE:WARD_ORT	Hospital area where patients with orthopedic injuries or disorders are evaluated and treated.
Plastic Surgery Ward	1067-8	IN:ACUTE:WARD:PLS	Hospital area for the care of patients who have reconstructive surgery performed by a plastic surgeon.
Postpartum Ward	1068-6	IN:ACUTE:WARD:PP	Hospital area for the patient who is recovering from childbirth.
Pulmonary Ward	1069-4	IN:ACUTE:WARD:PULM	Hospital area where patients with respiratory system conditions or disorders are evaluated and treated.
Rehabilitation Ward	1070-2	IN:ACUTE:WARD:REHAB	Hospital area for evaluation and restoration of function to patients who have lost function due to acute or chronic pain, musculoskeletal problems, stroke, or catastrophic events resulting in complete or partial paralysis.
School Infirmary	1172-6	IN:ACUTE:WARD:IFM	Overnight stay patient care area of a school infirmary or health center (e.g., private residential school or college campus).
Stroke (Acute) Ward	1071-0	IN:ACUTE:WARD:STRK	Hospital area for evaluation, stabilization and treatment of patients who have experienced an acute stroke.
Surgical Ward	1072-8	IN:ACUTE:WARD:S	Hospital area for evaluation and treatment of patients who have undergone a surgical procedure.
Telemetry Ward	1208-8	IN:ACUTE:WARD:TEL	Hospital area dedicated to providing evaluation and treatment of patients requiring continuous cardiac monitoring.

Vascular Surgery Ward	1073-6	IN:ACUTE:WARD:VS	Hospital area for evaluation and treatment of patients who have undergone vascular surgery.
Pediatric Wards			
Adolescent Behavioral Health Ward	1075-1	IN:ACUTE:WARD: BHV_ADOL	Hospital area for evaluation and treatment of patients between the ages of 13 and 18 with acute psychiatric or behavioral disorders.
ONC Pediatric Hematopoietic Stem Cell Transplant Ward	1234-4	IN:ACUTE:WARD: ONC_HSCT_PED	Area for the care of patients ≤18 years old who undergo stem cell transplant for the treatment of cancers and/or blood or immune system disorders.
ONC Pediatric General Hematology/Oncology Ward	1235-1	IN:ACUTE:WARD: ONC_HONC_PED	Area for the evaluation and treatment of patients ≤18 years old with cancer and/or blood disorders.
Pediatric Behavioral Health Ward	1077-7	IN:ACUTE:WARD:BHV_PED	Hospital area for evaluation and management of patients ≤18 years old with acute psychiatric or behavioral disorders.
Pediatric Burn Ward	1078-5	IN:ACUTE:WARD:B_PED	Hospital area specializing in the evaluation and treatment of patients ≤18 years old who have tissue injury caused by burns.
Pediatric Ear, Nose, Throat Ward	1079-3	IN:ACUTE:WARD: ENT_PED	Hospital area for evaluation and management of patients ≤18 years old with disorders of the ear, nose and/or throat.
Pediatric Genitourinary Ward	1080-1	IN:ACUTE:WARD: GU_PED	Hospital area where patients ≤18 years old with disorders of the genitourinary system are evaluated and treated.

Pediatric Medical Ward	1076-9	IN:ACUTE:WARD:M_PED	Area for the evaluation and treatment of patients ≤18 years of old with medical conditions or disorders.
Pediatric Medical/Surgical Ward	1081-9	IN:ACUTE:WARD: MS_PED	Hospital area where patients ≤18 years old with medical and/or surgical conditions are managed.
Pediatric Neurology Ward	1082-7	IN:ACUTE:WARD:N_PED	Area for the evaluation and treatment of patients ≤18 years old with neurologic disorders.
Pediatric Neurosurgical Ward	1083-5	IN:ACUTE:WARD:NS_PED	Hospital area for care of patients ≤18 years old whose primary reason for admission is to have neurosurgery or to be cared for by a neurosurgeon after head or spinal trauma.
Pediatric Orthopedic Ward	1084-3	IN:ACUTE:WARD: ORT_PED	Hospital area where patients ≤18 years old with orthopedic injuries or disorders are evaluated and treated.
Pediatric Rehabilitation Ward	1085-0	IN:ACUTE:WARD: REHAB_PED	Hospital area for evaluation and restoration of function to patients ≤18 years old who have lost function due to acute or chronic pain, musculoskeletal problems, stroke, or catastrophic events resulting in complete or partial paralysis.
Pediatric Surgical Ward	1086-8	IN:ACUTE:WARD:S_PED	Hospital area for evaluation and treatment of patients ≤18 years old that have undergone a surgical procedure.

Step Down Units			
Adult Step Down Unit (e.g., post-critical care)	1099-1	IN:ACUTE:STEP	Hospital area for adult patients that are hemodynamically stable who can benefit from close supervision and monitoring, such as frequent pulmonary toilet, vital signs, and/or neurological and neurovascular checks.
ONC Step Down Unit (all ages) (e.g., post-critical care)	1227-8	IN:ACUTE:STEP:ONC	Area for oncology patients who are hemodynamically stable and can benefit from close supervision and monitoring, such as frequent pulmonary toilet, vital signs, and/or neurologic and neurovascular checks.
Pediatric Step Down Unit (e.g., post-critical care)	1100-7	IN:ACUTE:STEP:PED	Patients ≤18 years old that are hemodynamically stable who can benefit from close supervision and monitoring, such as frequent pulmonary toilet, vital signs, and/or neurological and neurovascular checks.
Mixed Acuity Units			
Adult Mixed Acuity Unit	1210-4	IN:ACUTE:MIXED: ALL_ADULT	Hospital area for the evaluation and treatment of adult patients whose conditions are varying levels of acuity (e.g., critical care, ward-level care, step-down type care, etc.). Such a care area may be comprised of patients followed by different hospital services (e.g., coronary, medical, surgical, etc.). This care area may or may not include “acuity adaptable” or “universal” beds (i.e., this model of patient care allows a patient to stay in the same bed during all phases of his care, from critical care through lower levels of care).

Pediatric Mixed Acuity Unit	1211-2	IN:ACUTE:MIXED: ALL_PEDS	Hospital area for the evaluation and treatment of pediatric patients (≤18 years old) whose conditions are of varying levels of acuity (e.g., critical care, etc.). Such a care area may be comprised of patients followed by different hospital services (e.g., coronary, medical, surgical, etc.). This care area may or may not include "acuity adaptable" or "universal" beds (i.e., this model of patient care allows a patient to stay in the same bed during all phases of his care, from critical care through lower levels of care).
Mixed Age Mixed Acuity Unit	1212-0	IN:ACUTE:MIXED:ALL	Hospital area for the evaluation and treatment of a mixture of adult and pediatric patients whose conditions are of varying levels of acuity (e.g., critical care, ward-level care, step-down type care, etc.). Such a care area may be comprised of patients followed by different hospital services (e.g., coronary, medical, surgical, etc.). This care area may or may not include "acuity adaptable" or "universal" beds (i.e., this model of patient care allows a patient to stay in the same bed during all phases of his care, from critical care through lower levels of care).

ONC Mixed Acuity Unit (all ages)	1236-9	IN:ACUTE:MIXED:ONC	Area for the evaluation and treatment of a mixture of adult and pediatric oncology patients whose conditions are of varying levels of acuity (e.g., critical care, ward-level care, step-down type care, etc.). This care area may or may not include "acuity adaptable" or "universal" beds (i.e., this model of patient care allows a patient to stay in same bed during all phases of care, from critical care through lower levels of care).
Operating Rooms			
Cardiac Catheterization Room/Suite	1005-8	IN:ACUTE:OR:CATH	A room or rooms in a hospital equipped for the performance of heart catheterizations for diagnostic or therapeutic purposes. Operating Room requirements for air changes, temperature, humidity and surfaces must be met.
Cesarean Section Room/Suite	1095-9	IN:ACUTE:OR:LD	A room or suite in a hospital equipped for the performance of obstetric and gynecologic surgeries and for the care of the neonate immediately after birth. Operating Room requirements for air changes, temperature, humidity and surfaces must be met.
Interventional Radiology	1203-9	IN:ACUTE:OR:RAD	A room or suite in a hospital where diagnostic or therapeutic radiologic procedures on outpatients and/or inpatients occurs. Operating Room requirements for air changes, temperature, humidity and surfaces must be met.

Operating Room/Suite	1096-7	IN:ACUTE:OR	A room or suite in a hospital equipped for the performance of surgical operations. Requirements for air changes, temperature, humidity and surfaces must be met. (For outpatient operating room, use Ambulatory Surgery Center designation or other specialty OR shown in Outpatient Locations section of this chapter).
Post Anesthesia Care Unit/Recovery Room	1097-5	IN:ACUTE:OR_STEP	Hospital area designated for monitoring patients for immediate effects of anesthesia before either going home or on to an in-patient care area.
Chronic Care Units (Previously named Long-Term Care)			
Inpatient Hospice	1165-0	IN:NONACUTE:LTC:HSP	Area where palliative care is provided to the dying patient.
Chronic Alzheimer's Unit*	1103-1	IN:NONACUTE:LTC:ALZ	Area where care is provided to patients diagnosed with Alzheimer's syndrome for extended periods of time. Formerly called Long Term Care Alzheimer's Unit.
Chronic Behavioral Health/Psych Unit*	1104-9	IN:NONACUTE:LTC:BHV	Area where care is provided to patients with psychiatric or behavioral-disorder diagnoses for extended periods of time. Formerly called Long Term Care Behavioral Health/Psych Unit.
Chronic Rehabilitation Unit*	1105-6	IN:NONACUTE:LTC: REHAB	Area where evaluation and restoration of function is provided to patients who have lost function due to acute or chronic pain, musculoskeletal problems, stroke, or catastrophic events resulting in complete or partial paralysis. Formerly called Long Term Care Rehabilitation Unit.

Chronic Care Unit*	1102-3	IN:NONACUTE:LTC	Area where care provided for patients with chronic disease or disabilities for extended periods of time. Formerly called Long Term Care Unit.
Ventilator Dependent Unit	1164-3	IN:NONACUTE:LTC:R	Area where care is provided to patients whose respirations depend on the use of a ventilator for extended periods of time.
LONG TERM CARE FACILITIES			
LTCF Inpatient Hospice Unit	1254-2	IN:NONACUTE:LTCF:HSP	A unit or designed area which provides palliative and supportive care services to individuals diagnosed with life limiting (terminal) conditions.
LTCF Dementia Unit	1255-9	IN:NONACUTE:LTCF:DEM	A unit or designed area which provides specialized care for individuals diagnosed with dementia or related conditions, including Alzheimer's disease.
LTCF Psychiatric Unit	1256-7	IN:NONACUTE:LTCF:PSY	Unit or designated area which provides specialized care for individuals diagnosed with psychiatric or behavioral disorders.
LTCF Skilled Nursing/Short Term Rehabilitation	1257-5	IN:NONACUTE:LTCF: REHAB	A unit or designated area which primarily provides short term (<90 days), medical, skilled nursing or rehabilitation services to individuals requiring restorative care following recent hospitalization.
LTCF General Nursing Unit	1258-3	IN:NONACUTE:LTCF:GEN	A unit or designated area which primarily provides nursing, rehabilitative or custodial services to individuals with varying levels of chronic conditions or disability requiring long term (>90 days) support.

LTCF Ventilator Dependent Unit	1259-1	IN:NONACUTE:LTCF:VEN	A unit or designated area which provides nursing and respiratory care to individuals who require mechanical ventilation.
LTCF Bariatric Unit	1260-9	IN:NONACUTE:LTCF:BAR	A unit or designated area which provides specializing care for individuals who are preparing for or have undergone bariatric surgery.
LONG TERM ACUTE CARE FACILITIES			
LTAC ICU	1220-3	IN:ACUTE:CC:LTAC	Critical care area specializing in the evaluation, treatment, and management of patients that require high observance/acuity and/or special care that are suffering medically complex conditions or who have suffered recent catastrophic illness or injury and require and extended stay in an acute care environment.
LTAC Ward	1221-1	IN:ACUTE:WARD:LTAC	Hospital area for the evaluation and treatment of patients suffering medically complex conditions or who have suffered recent catastrophic illness or injury, and require an extended stay in an acute care environment.
LTAC Pediatric ICU	1222-9	IN:ACUTE:CC:LTAC_PED	Critical care area specializing in the evaluation, treatment, and management of patients ≤18 years old, that require high observation/acuity and/or special care that are suffering medically complex conditions or who have suffered recent catastrophic illness or injury, and require an extended stay in an acute care environment.

LTAC Pediatric Ward	1214-6	IN:ACUTE:WARD: LTAC_PED	Hospital area for the evaluation and treatment of patients ≤18 years old, suffering medically complex conditions or who have suffered recent catastrophic illness or injury, and require an extended stay in an acute care environment.
INPATIENT REHABILITATION FACILITIES			
Rehabilitation Ward	1217-9	IN:ACUTE:IRF	Hospital area for evaluation, treatment, and restoration of function to patients have lost function due to acute or chronic pain, musculoskeletal problems, stroke, brain or spinal cord dysfunction, or catastrophic events resulting in complete or partial paralysis.
Rehabilitation Pediatric Ward	1218-7	IN:ACUTE:IRF:PED	Hospital area for evaluation, treatment, and restoration of function to patients ≤18 years old who have lost function due to acute or chronic pain, musculoskeletal problems, stroke, brain or spinal cord dysfunction, or catastrophic events results in complete or partial paralysis.
ONCOLOGY FACILITIES			
ONC Medical Critical Care	1223-7	IN:ACUTE:CC:ONC_M	Critical care area for the care of oncology patients who are being treated for nonsurgical conditions related to their malignancy.
ONC Surgical Critical Care	1224-5	IN:ACUTE:CC:ONC_S	Critical care area for the evaluation and management of oncology patients with serious illness before and/or after cancer-related surgery.

ONC Medical-Surgical Critical Care	1225-2	IN:ACUTE:CC:ONC_MS	Critical care area for the care of oncology patients with medical and/or surgical conditions related to their malignancy.
ONC Pediatric Critical Care	1233-6	IN:ACUTE:CC:ONC_PED	Critical care area for the care of oncology patients ≤18 years old who are being treated for surgical or nonsurgical conditions related to their malignancy.
ONC Leukemia Ward	1226-0	IN:ACUTE:WARD: ONC_LEUK	Area for the evaluation and treatment of patients with leukemia.
ONC Lymphoma Ward	1228-6	IN:ACUTE:WARD:ONC: LYMPH	Area for the evaluation and treatment of patients with lymphoma.
ONC Leukemia/Lymphoma Ward	1229-4	IN:ACUTE:WARD: ONC_LL	Area for the evaluation and treatment of patients with leukemia and/or lymphoma.
ONC Solid Tumor Ward	1230-2	IN:ACUTE:WARD:ONC_ST	Area for the evaluation and treatment of oncology patients with solid tumors.
ONC Hematopoietic Stem Cell Transplant Ward	1231-0	IN:ACUTE:WARD: ONC_HSCT	Area for the care of patients who undergo stem cell transplant for the treatment of cancers and/or blood or immune system disorders.
ONC General Hematology/Oncology Ward	1232-8	IN:ACUTE:WARD: ONC_HONC	Area for the evaluation and treatment of patients with cancer and/or blood disorders.
ONC Pediatric Hematopoietic Stem Cell Transplant Ward	1234-4	IN:ACUTE:WARD: ONC_HSCT_PED	Area for the care of patients ≤18 years old who undergo stem cell transplant for the treatment of cancers and/or blood or immune system disorders.

ONC Pediatric General Hematology/Oncology Ward	1235-1	IN:ACUTE:WARD: ONC_HONC_PED	Area for the evaluation and treatment of patients ≤18 years old with cancer and/or blood disorders.
ONC Step Down Unit	1227-8	IN:ACUTE:STEP:ONC	Area for oncology patients who are hemodynamically stable and can benefit from close supervision and monitoring, such as frequent pulmonary toilet, vital signs, and/or neurologic and neurovascular checks.
ONC Mixed Acuity Unit (all ages)	1236-9	IN:ACUTE:MIXED:ONC	Area for the evaluation and treatment of a mixture of adult and pediatric oncology patients whose conditions are of varying levels of acuity (e.g., critical care, ward-level care, step-down type care, etc.). This care area may or may not include "acuity adaptable" or "universal" beds (i.e., this model of patient care allows a patient to stay in same bed during all phases of care, from critical care through lower levels of care).

In addition to the 14 ONC specific locations, HOSP-ONC facilities can also use the following locations within NHSN (Location codes and descriptions can be found in the appropriate section of the master location table):

Inpatient Locations

- Operating Rooms:
  - Cardiac Catheterization Room/Suite
  - Interventional Radiology
  - Inpatient Operating Room/Suite
  - Post-Anesthesia Care Unit/Recovery Room
- Facility-wide Areas:
  - FACWIDEIN
- Miscellaneous Areas:
  - Pulmonary Function Testing
  - Treatment Room
  - Transport Service

- Float

Outpatient Locations

- Acute Care
  - 24-Hour Observation Area
  - Ambulatory Surgery Center
  - Emergency Department
  - Outpatient Pediatric Surgery Center
  - Outpatient Plastic Surgery Center
  - Outpatient Surgery Recovery Room/Post-Anesthesia Care Unit
  - Pediatric Emergency Department
- Clinic (Nonacute) Settings
  - Infusion Center
  - Occupational Health Clinic
  - Outpatient Hematology/Oncology Clinic
  - Pediatric Hematology/Oncology Clinic
  - Radiology (includes Nuclear Medicine)
  - Specimen Collection Area (Healthcare)
- Community Locations
  - Home Care
  - Home-based Hospice
  - Location outside facility
- All Non-Patient Care Locations as designated on page 41 in the location table

OUTPATIENT LOCATIONS

ACUTE CARE FACILITIES GENERAL

Acute Settings

24-Hour Observation Area	1162-7	OUT:ACUTE:WARD	Area where patients are monitored for suspected or non-life threatening conditions for 24 hours or less.

Ambulatory Surgery Center	1166-8	OUT:ACUTE:OR	Area that is equipped for the performance of surgical operations; may be free-standing or part of a hospital. Operating Room requirements for air changes, temperature, humidity and surfaces must be met. Patients do not stay overnight.
Emergency Department	1108-0	OUT:ACUTE:ED	Area that provides emergency medical services; top priority is given to those with life-threatening illness or injury.
Mobile Emergency Services/EMS	1174-2	OUT:ACUTE:MOBILE:UE	Mobile unit that provides clinical and emergency medical services to patients who require them in the pre-hospital setting.
Ambulatory Pediatric Surgery Center	1167-6	OUT:ACUTE:OR:PED	Area that is equipped for the performance of surgical operations for patients ≤18 years old may be free-standing or part of a hospital. Operating Room requirements for air changes, temperature, humidity and surfaces must be met. Patients do not stay overnight.
Ambulatory Plastic Surgery Center	1168-4	OUT:ACUTE:OR:PLS	Area that is equipped for the performance of plastic surgery operations may be free-standing or part of a hospital. Operating Room requirements for air changes, temperature, humidity and surfaces must be met. Patients do not stay overnight.
Ambulatory Surgery Recovery Room/Post Anesthesia Care Unit	1169-2	OUT:ACUTE:OR_STEP	Area designated for monitoring patients for the immediate effects of anesthesia before being sent home.

Pediatric Emergency Department	1109-8	OUT:ACUTE:ED:PED	Area that provides emergency medical services to patients ≤18 years old; top priority is given to those with life-threatening illness or injury.
Urgent Care Center	1160-1	OUT:ACUTE:CLINIC:UE	Area that provides medical care services for illnesses and injuries that are not life-threatening.
Clinic (non-acute) Settings			
Allergy Clinic	1110-6	OUT:NONACUTE:CLINIC:ALRG	An outpatient setting for the purpose of providing services to patients with allergies.
Behavioral Health Clinic	1145-2	OUT:NONACUTE:CLINIC:BHV	An outpatient setting for the purpose of providing services to patients with psychiatric or behavior-disorders.
Blood Collection Center	1147-8	OUT:NONACUTE:CLINIC:BLOOD	An outpatient setting where blood is collected from donors. This does not include donation centers that are temporarily set up in non-clinical settings (e.g., schools, churches) or mobile blood collection centers.
Cardiac Rehabilitation Center	1112-2	OUT:NONACUTE:CLINIC:C_REHAB	An outpatient setting where patients with cardiac disease, in partnership with a multidisciplinary team of health professionals, are encouraged and supported to achieve and maintain optimal physical health through exercise, nutritional and psychological counseling.
Cardiology Clinic	1113-0	OUT:NONACUTE:CLINIC:C	An outpatient setting for the evaluation and management of patients with cardiac problems.
Continence Clinic	1148-6	OUT:NONACUTE:CLINIC:CON	An outpatient setting for the evaluation and management of patients with incontinence problems.

Dermatology Clinic	1115-5	OUT:NONACUTE:CLINIC: DERM	An outpatient setting for the evaluation and management of dermatologic conditions by a dermatologist.
Diabetes/Endocrinology Clinic	1116-3	OUT:NONACUTE:CLINIC: DIAB	An outpatient setting for the evaluation, education and management of patients with diabetes.
Ear, Nose, Throat Clinic	1126-2	OUT:NONACUTE:CLINIC: ENT	An outpatient setting for the evaluation and management of conditions related to the ear, nose and/or throat.
Endoscopy Suite	1007-4	OUT:NONACUTE:DIAG:GI	An area where endoscopic procedures (e.g., upper gastrointestinal endoscopies, bronchoscopy) are performed on outpatients and/or inpatients. Patient care and processing of equipment may take place in this location.
Family Medicine Clinic	1117-1	OUT:NONACUTE:CLINIC: FAM	An outpatient setting for patients who are managed by a family practice physician or group of physicians. Does not include private physician practice.
Genetics Clinic	1122-1	OUT:NONACUTE:CLINIC: GEN	An outpatient setting for testing and counseling of patients may have genetic or hereditary disorders.
Gynecology Clinic	1121-3	OUT:NONACUTE:CLINIC: GYN	An outpatient setting for women for the evaluation and management of female reproductive tract conditions.
Holistic Medicine Center	1161-9	OUT:NONACUTE:CLINIC: HOL	An outpatient setting where alternative healthcare practices are used, focusing on the physical, mental, emotional, social and spiritual aspects of health.

Hyperbaric Oxygen Center	1017-3	OUT:NONACUTE:CLINIC:HBO	An outpatient setting where therapeutic hyperbaric oxygen is administered.
Infusion Center	1018-1	OUT:NONACUTE:CLINIC:FUS	An outpatient setting for the administration of fluids, blood products and medications.
Mobile Blood Collection Center	1176-7	OUT:NONACUTE:MOBILE:BLOOD	A self-contained mobile unit such as a bus or trailer that is specifically designed and equipped for the collection of blood and blood products from public donors. This unit typically moves from location to location.
Mobile MRI/CT	1175-9	OUT:NONACUTE:MOBILE_DIAG:RAD	A self-contained mobile unit such as a bus or trailer that is equipped with MRI or CT radiologic equipment and that may be moved between healthcare locations (e.g., hospitals, clinics).
Neurology Clinic	1123-9	OUT:NONACUTE:CLINIC:N	An outpatient setting for the diagnosis, evaluation, and treatment of patients with neurologic disorders.
Occupational Health Clinic	1151-0	OUT:NONACUTE:CLINIC:OCC	An outpatient setting where workplace physicals, workplace injury management and immunological evaluations take place
Occupational Therapy Clinic	1152-8	OUT:NONACUTE:CLINIC:OT_REHAB	An outpatient setting where patients with injury or disability are helped to resume activities of daily living with exercise, massage and other therapies.
Ophthalmology Clinic	1124-7	OUT:NONACUTE:CLINIC:OPH	An outpatient setting for the diagnosis, evaluation and treatment of ophthalmologic disorders.

Orthopedic Clinic	1125-4	OUT:NONACUTE:CLINIC:ORT	An outpatient setting for the diagnosis, evaluation and treatment of orthopedic disorders.
Ostomy Clinic	1149-4	OUT:NONACUTE:CLINIC:OST	An outpatient setting for the management of patients who have had surgical procedure for removing normal bodily wastes through a surgical opening (stoma) on the abdominal wall.
Dental Clinic	1150-2	OUT:NONACUTE:CLINIC:DENT	An outpatient setting that provides dental services, including preventive teeth cleaning, emergency treatment, and comprehensive oral care. This may be a private or group practice or a teaching facility for dentists and/or dental hygienists.
Gastrointestinal (GI) Clinic	1118-9	OUT:NONACUTE:CLINIC:GI	An outpatient setting for the diagnosis, evaluation and management of conditions related to the gastrointestinal tract. Usually includes an endoscopy suite.
Hematology/Oncology Clinic	1200-5	OUT:NONACUTE:CLINIC:HONC	An outpatient setting for the diagnosis, evaluation and treatment of patients with hematologic and/or oncologic disorders. This may include chemotherapy or blood/blood products infusion services.
Hemodialysis Clinic	1153-6	OUT:NONACUTE:CLINIC:HD	An outpatient setting for chronic maintenance hemodialysis patients where they are evaluated and dialyzed. (Available only for use in the Biovigilance Component)

HIV Clinic	1154-4	OUT:NONACUTE:CLINIC:HIV	An outpatient setting for the diagnosis, evaluation and treatment of patients who are HIV positive or who have AIDS.
Medical Clinic	1120-5	OUT:NONACUTE:CLINIC:M	An outpatient setting for the diagnosis, evaluation and treatment of medical disorders.
Rehabilitation Clinic	1151-1	OUT:NONACUTE:CLINIC:REHAB	An outpatient setting where patients with injury or disability are evaluated and treated to resume activities of daily living, speech and language skills and maximum physical function. This may include social and psychological evaluation and treatment.
Pain Clinic	1127-0	OUT:NONACUTE:CLINIC:PAIN	An outpatient setting for the evaluation and treatment of patients with chronic or intractable pain.
Pediatric Behavioral Health Clinic	1146-0	OUT:NONACUTE:CLINIC:BHV_PED	An outpatient setting for the evaluation and management of patients ≤18 years old with psychiatric or behavior disorders.
Pediatric Cardiology Center	1129-6	OUT:NONACUTE:CLINIC:PED_C	An outpatient setting for the evaluation and management of patients ≤18 years old with cardiac disorders.
Pediatric Clinic	1128-8	OUT:NONACUTE:CLINIC:PED	An outpatient setting for the evaluation and treatment of patients ≤18 years old.

Pediatric Dental Clinic	1130-4	OUT:NONACUTE:CLINIC: DENT_PED	An outpatient setting that provides dental services, including preventive teeth cleaning, emergency treatment, and comprehensive oral care to patients ≤18 years old. This may be a private or group practice or a teaching facility for dentists and/or dental hygienists.
Pediatric Dermatology Clinic	1131-2	OUT:NONACUTE:CLINIC: DERM_PED	An outpatient setting for the evaluation and management of patients ≤18 years old with dermatologic disorders.
Pediatric Diabetes/Endocrinology Clinic	1132-0	OUT:NONACUTE:CLINIC: DIAB_PED	An outpatient setting for the evaluation and management of patients ≤18 years old with diabetes or other endocrine disorders.
Pediatric Gastrointestinal Clinic	1119-7	OUT:NONACUTE:CLINIC: GI_PED	An outpatient setting for the evaluation and treatment of patients ≤18 years old with gastrointestinal disorders.
Pediatric Hematology/Oncology Clinic	1136-1	OUT:NONACUTE:CLINIC: HONC_PED	An outpatient setting for the evaluation and treatment of patients ≤18 years old with cancer and/or blood disorders.
Pediatric Nephrology Clinic	1137-9	OUT:NONACUTE:CLINIC: PGU_PED	An outpatient setting for the evaluation and treatment of patients ≤18 years old with disorders of the genitourinary tract.
Pediatric Orthopedic Clinic	1133-8	OUT:NONACUTE:CLINIC: ORT_PED	An outpatient setting for the evaluation and treatment of patients ≤18 years old with fractures or other orthopedic disorders.

Pediatric Rheumatology Clinic	1138-7	OUT:NONACUTE:CLINIC:RHEUM_PED	An outpatient setting for the evaluation and treatment of patients ≤18 years old with rheumatology disorders.
Pediatric Scoliosis Clinic	1134-6	OUT:NONACUTE:CLINIC:SCOL_PED	An outpatient setting for the evaluation and treatment of patients ≤18 years old with scoliosis or other growth disorders of the spine.
Physical Therapy Clinic	1202-1	OUT:NONACUTE:CLINIC:PT_REHAB	An outpatient setting where patients with injury or disability are helped to obtain maximum physical function.
Physician's Office	1141-1	OUT:NONACUTE:CLINIC	A physician's office practice.
Podiatry Clinic	1140-3	OUT:NONACUTE:CLINIC:POD	An outpatient setting for the evaluation and treatment of patients with conditions or disorders of the feet.
Prenatal Clinic	1156-9	OUT:NONACUTE:CLINIC:PNATL	An outpatient setting for the evaluation and treatment of pregnant women.
Pulmonary Clinic	1157-7	OUT:NONACUTE:CLINIC:PULM	An outpatient setting for the evaluation and treatment of patients with disorders of the respiratory tract.
Pulmonary Function Testing	1009-0	OUT:NONACUTE:DIAG:PULM	Area where the evaluation of a patient's respiratory status takes place.
Radiology (includes Nuclear Medicine)	1008-2	OUT:NONACUTE:DIAG:RAD	An area where diagnostic or therapeutic radiologic procedures are done on outpatients and/or inpatients. Operating room requirements for air changes, temperature, humidity, and surfaces are NOT met.

Rheumatology Clinic	1142-9	OUT:NONACUTE:CLINIC:RHEUM	An outpatient setting for the evaluation and treatment of patients with autoimmune disorders, primarily rheumatoid arthritis.
School or Prison Infirmary	1170-0	OUT:NONCUTE:CLINIC:IFM	Area in a school or correctional facility that provides medical care to students/inmates. This area is not staffed or equipped for overnight stay patients.
Speech Therapy Clinic	1158-5	OUT:NONACUTE:CLINIC:ST_REHAB	An outpatient setting for the evaluation and treatment of patients with brain injury to maximize their speech, swallow and language functions.
Surgical Services Clinic	1143-7	OUT:NONACUTE:CLINIC:S	An outpatient setting for the pre-operative evaluation and the postoperative management of patients undergoing a surgical procedure.
Well Baby Clinic	1139-5	OUT:NONACUTE:CLINC:NURS	An outpatient setting for the examination and treatment of normal newborns.
Wound Center	1144-5	OUT:NONACUTE:CLINIC:WND	An outpatient setting for the evaluation and treatment of patients with acute or chronic wounds.
Wound Ostomy Continence Clinic	1159-3	OUT:NONACUTE:CLINIC:WND_OST_CONT	An outpatient area which provides acute and rehabilitative care for patients with selective disorders of the gastrointestinal, genitourinary and integumentary (skin) systems.
Therapeutic Apheresis Clinic	1207-0	OUT:NONACUTE:CLINIC:THERAPHERSIS	Outpatient setting where blood is collected from patients and therapeutic apheresis procedures are performed.

Miscellaneous Outpatient Settings			
Specimen Collection Area	1019-9	OUT:NA:LAB:SPEC	An area within a healthcare facility where procedures are performed to collect blood, tissue, or other specimens for diagnostic purposes.
Transport Service	1178-3	OUT:NONACUTE:MOBILE	Mobile unit used to transport patients to their home or from one healthcare setting to another non-emergently.
OUTPATIENT DIALYSIS FACILITIES **(Available for use in outpatient ambulatory hemodialysis facilities only)**			
Outpatient Hemodialysis Clinic	1153-6	OUT:NONACUTE:CLINIC:DIAL	An outpatient setting for chronic maintenance hemodialysis patients where they are evaluated and dialyzed in-center.
Home Hemodialysis	1262-1	COMM:NONACUTE:HOME:DIAL	Hemodialysis performed by a patient (and the patient's caregiver) and at home.
MISCELLANEOUS AREAS **(Mainly used for Healthcare Personnel Safety component)**			
All Inpatient Beds Combined	1021-5	IN	This location represents all beds. It is used for reporting optional off-plan facility-wide summary data (e.g., CLABSI rate for facility).
Float	1206-2	IN:ACUTE:FLOAT	For HCWs who do not work at least 75% of the time at a single location, the work location code for 'float' should be entered. (This location is available only for Healthcare Personnel Safety Component use only.)
Morgue/Autopsy Room	1189-0	NONPTC:NA:LAB:PATH_MORG	An area within a facility that is used for the storage and/or postmortem examination of deceased persons.

Sleep Studies (for in and out patients)	1020-7	IN:NONACUTE:CLINIC: SLEEP	Area where patients stay overnight and are evaluated for sleep disorders.
Treatment Room	1209-6	IN:ACUTE:SUPPORT: TREAT* *Will be listed as 'IN:ACUTE:WARD:TREAT' within NHSN until NHSN Release 7.2 slated for late summer 2013.	A room in a patient care unit, in which various treatments or procedures requiring special equipment are performed, such as removing sutures, draining a hematoma, packing a wound, or performing an examination.
FACILITY-WIDE LOCATIONS **(Available only for Laboratory Identified Event Reporting [LABID] and Antibiotic Use and Resistance [AUR] module)**			
Facility-wide Inpatient FacWideIN	1250-0	FACWIDEIN	This location represents all inpatient locations for the facility, where appropriate numerator and denominator counts can be collected. All of the facility's inpatient locations with an overnight stay must be represented for full inpatient facility coverage, where denominators can be accurately collected and there is the possibility of the MDRO to present, transmitted, and identified in that specific location. Currently, it is available for use in the MDRO/CDI Module for LabID Event reporting and in the AUR Module.

Facility-wide Outpatient FacWideOUT	1251-8	FACWIDEOUT	This location represents all outpatient locations for the facility, where appropriate numerator and accurate denominator counts can be collected. All of the facility's outpatient locations must be represented for full outpatient facility coverage, where denominators can be accurately collected and there is the possibility of the MDRO to be present, transmitted, and identified in that specific location. Currently, it is available for use in the MDRO/CDI Module for LabID Event reporting.
COMMUNITY LOCATIONS			
Blood Collection (Blood Drive Campaign)	1195-7	COMM:NONACUTE:CLINIC: BLOOD	A location not designated or equipped to perform healthcare functions (e.g., school gym or shopping mall) that have been set up specifically to collect donations of blood and blood products from the public.
Home Care	1192-4	COMM:NONACUTE: HOME	A patient's home location where medical services including routine noninvasive and other noninvasive procedures (e.g., insertion of indwelling urinary catheter, insertion of IV line) are performed by healthcare workers and family members under the supervision of a licensed independent practitioner (e.g., MD, CNP, PA).
Home-based Hospice	1194-0	COMM:NONACUTE:HOME: HSP	A patient's home location where end-of-life services are performed by healthcare workers, family members, and volunteers.

Location outside facility	1204-7	COMM:NOTFAC	A location outside this facility, including unknown outside location.
Specimen Collection Area (Community)	1196-5	COMM:NA:LAB:SPEC	A location not designated or equipped to perform healthcare functions (e.g., school gym or shopping mall) that have been set up specifically to collect body fluids for healthcare testing. Examples would be blood sugar or cholesterol screening clinics.
NON-PATIENT CARE LOCATIONS **(Non-Patient Care Areas available for use in Biovigilance or Healthcare Personnel Safety components only)**			
Administrative Areas	1184-1	NONPTC:NA:SUPPORT: ADMIN	Areas within a healthcare facility where administrative functions take place. No patient care takes place in these areas.
Assisted Living Area	1106-4	NONPTC:NA:HOME	A location where persons live and have available to them housekeeping, meal preparation, transportation, and other non-medical services. Patient care is not done in this area.
Blood Bank	1185-8	NONPTC:NA:LAB:BLOOD	An area within a healthcare facility that may collect, store, and distribute blood and blood products, and performs diagnostic tests on blood/components to determine compatibilities.
Central Sterile Supply	1186-6	NONPTC:NA:SUPPORT: CSS	An area within a healthcare facility where durable medical equipment is cleaned/decontaminated, wrapped, sterilized, and stored in preparation for transport to a landfill or incineration.

Central Trash Area	1187-4	NONPTC:NA:SUPPORT: SOILED *Will be listed as 'NONPTC:NA:SUPPORT: TRASH' within NHSN until NHSN Release 7.2 slated for late summer 2013.	An area adjacent to a healthcare facility where bio-hazardous and non-bio-hazardous wastes are collected in preparation for transport to a landfill or incineration.
Centralized Transfusion Service	1261-7	NONPTC:NA:LAB:CTS	A location outside the facility that stores, manipulates, issues, and/or performs compatibility testing on blood and blood products (e.g., a contracted transfusion service or a separate hospital that provides transfusion services for your facility).
Clinical Chemistry Laboratory	1011-6	NONPTC:NA:LAB:CHEM	An area within a diagnostic laboratory that performs general clinical chemistry analysis (clinical biochemistry), endocrinology, therapeutic substance monitoring, toxicology, blood pH and blood gas analysis, urinalysis and urine pregnancy testing.
Facility Grounds	118-2	NONPTC:NA:SUPPORT: GRNDS	Any outdoor area adjacent to a healthcare facility that belongs to the facility (e.g., sidewalks, parking ramps, lawns).
General Laboratory	1010-8	NONPTC:NA:LAB	An area that encompasses all clinical divisions within a diagnostic laboratory.
Hematology Laboratory	1012-4	NONPTC:NA:LAB:H	An area within a diagnostic laboratory that determines the specific properties of blood (e.g., CBC, white blood count).

Histology/Surgical Pathology Laboratory	1013-2	NONPTC:NA:LAB: HIST_PATH	An area within a diagnostic laboratory that uses high-power microscopy to evaluate cells and tissues for the presence or absence of disease.
Housekeeping/Environmental Services	1182-5	NONPTC:NA:SUPPORT: HSKP	An area within a healthcare facility where the activities of housekeeping/environmental services staff are coordinated and supplies are stored.
Laundry Room	1183-3	NONPTC:NA:SUPPORT: LAUN	An area within a healthcare facility where laundry is sorted, washed, dried, and prepared for transport and use.
Microbiology Laboratory	1014-0	NONPTC:NA:LAB:MICRO	An area within a laboratory that performs diagnostic tests to determine the presence or absence of bacteria and their related properties.
Pharmacy	1179-1	NONPTC:NA:SUPPORT: PHARM	An area within a healthcare facility where medications are prepared and labeled for patient use.
Physical Plant Operations Center	1181-7	NONPTC:NA:SUPPORT: ENG	An area within a healthcare facility where construction, renovation, and maintenance staff activities and supplies are coordinated. They may also include areas of machinery and equipment.
Public Area in Facility	1180-9	NONPTC:NA:SUPPORT: PUB	Any indoor area within a healthcare facility that is not used for patient care and that is available to the public (e.g., waiting rooms, cafeterias, hallways).
Serology Laboratory	1015-7	NONPTC:NA:LAB:SER	An area within a diagnostic laboratory that performs blood tests to determine the presence or absence of certain diseases or the levels of immunity.

Soiled Utility Area	1190-8	IN:NA:SUPPORT:TRASH	Area where used and/or soiled disposable or durable medical equipment is stored and/or cleaned in preparation for disposal or reprocessing/reuse.
Virology Laboratory	1016-5	NONPTC:NA:LAB:VIR	An area within a diagnostic laboratory that performs tests and/or culturing to determine the presence or absence of specific viruses.

References

1. American Academy of Pediatrics. Policy Statement Levels of Neonatal Care. Pediatrics 2012;130 (3): 587-597.

Key Terms

80% rule

See CDC location.

Adjacent elements

The term "adjacent" refers to the sequence of elements. In the example below, when considering the CAUTI definition, fever and positive urinalysis are adjacent elements as are positive urinalysis and positive urine culture. Fever and positive urine culture are NOT adjacent elements in this example.

Example:

8/1/13 Admit to ICU following surgery; Foley inserted in OR
8/2/13 in ICU; Foley
8/3/13 in ICU; Foley; Fever 38.2 C
8/4/13 in ICU; Foley; Afebrile
8/5/13 in ICU; Foley; Positive urinalysis; afebrile
8/6/13 in ICU; Foley: Afebrile
8/7/13 in ICU; Foley discontinued; Afebrile; Urine culture collected: 10,000 CFU/ml E. coli

In this example there could be more than a single day between fever and positive culture (which are not adjacent) and still meet criterion as long as all adjacent elements have no more than a single day without any elements between.

ASA score

ASA physical status: Assessment by the anesthesiologist of the patient's preoperative physical condition using the American Society of Anesthesiologists' (ASA) Classification of Physical Status.10 Patient is assigned one of the following:
A normally healthy patient
A patient with mild systemic disease
A patient with severe systemic disease
A patient with severe systemic disease that is a constant threat to life
A moribund patient who is not expected to survive without the operation.

NOTE: Do NOT report procedures with an ASA physical status of 6 (a declared brain-dead patient whose organs are being removed for donor purposes) to NHSN.

Aseptically obtained

Obtained in a manner to prevent introduction of organisms from the surrounding tissues into the specimen being collected.

Birthweight

Birthweight is the weight of the infant at the time of birth and should not be changed as the infant gains weight. The birthweight categories are as follows: A = ≤750 g; B = 751-1000 g; C = 1001-1500 g; D = 1501-2500 g; E = >2500 g.

CDC location

A CDC-defined designation given to a patient care area housing patients who have similar disease conditions or who are receiving care for similar medical or surgical specialties. Each facility location that is monitored is "mapped" to one CDC Location. The specific CDC Location code is determined by the type of patients cared for in that area according to the **80% Rule**. That is, if 80% of patients are of a certain type (e.g., pediatric patients with orthopedic problems) then that area is designated as that type of location (in this case, an Inpatient Pediatric Orthopedic Ward). See also Virtual location.

For detailed instructions on how to map locations, see "Instructions for Mapping Patient Care Locations in NHSN" in the Locations and Descriptions chapter.

Clean (Wound class)

See Wound class.

Clean Contaminated (Wound class)

See Wound class.

Contaminated (Wound class)

See Wound class.

Date of event

For an HAI (excludes VAE), the date of event is the date when the last element used to meet the CDC/NHSN site-specific infection criterion occurred. Synonyms: infection date, date of infection. In the case of a process of care event, the date the process or intervention was done (e.g., the day a central line was inserted is the date of CLIP event). See also Date of event (for VAE only) and Transfer rule.

Date of event (VAE)

For a VAE, the date of event is the date of onset of worsening oxygenation. This is defined as the first calendar day in which the daily minimum PEEP or FiO_2 increased above the thresholds outlined in the VAE algorithm.

Device-associated infection

An infection meeting the HAI definition is considered a device-associated (e.g., associated with the use of a ventilator, central line or indwelling urinary catheter) HAI if the device was in place for >2 calendar days on the date of event. An HAI occurring on the day of device discontinuation or the following calendar day is considered a device-associated HAI if the device had already been in place for >2 calendar days. For a patient who has a central line in place on hospital admission, day of first access is considered device Day 1. See also Healthcare-associated infection. See Table 1 at the end of this chapter for examples of new key terms for 2013.

Device days

A daily count of the number of patients with a specific device in the patient care location during a time period. To calculate device days, for each day of the month, at the same time each day, record the number of patients who have the specific device (e.g., central line, ventilator, or indwelling urinary catheter). At the end of the month sum the daily counts and enter into NHSN the total for each type of device.

When denominator data are available from electronic databases (e.g., ventilator days from respiratory therapy), these sources may be used as long as the counts are not substantially different (+/- 5%) from manually-collected counts, pre-validated for a minimum of 3 months.

Diabetes

The NHSN, SSI surveillance definition of diabetes indicates that the patient has a diagnosis of diabetes requiring chronic, long-term management (>2 weeks prior to admission) with insulin or a non-insulin anti-diabetic agent. This includes patients with "insulin resistance" who are on chronic management with anti-diabetic agents. This also includes patients with a diagnosis of diabetes who are noncompliant with their diabetes medications. The NHSN definition excludes patients with no diagnosis of diabetes, or a diagnosis of diabetes that is controlled by diet alone. The definition excludes patients who receive insulin for perioperative control of hyperglycemia but have no diagnosis of diabetes.

Died

The patient died during this facility admission.

Dirty or Infected (Wound class)

See Wound class.

Duplicate isolate (in AUR protocol)

An isolate of the same species of bacteria, regardless of antimicrobial susceptibility pattern, in the same patient, regardless of specimen site, during a given reporting period (i.e., calendar month).

Duplicate isolate (in MDRO/CDI protocol - LabID Event option)

Any MDRO isolate from the same patient and location after an initial isolation of the specific MDRO during a calendar month, regardless of specimen source, except unique blood source.

Duration of operative procedure

The interval in hours and minutes between skin incision and primary skin closure. See also definition of primary closure and the Denominator Data reporting instructions in this chapter. The Procedure/Surgery Start Time, and the Procedure/Surgery Finish Time, as defined by the Association of Anesthesia Clinical Directors (AACD):

- Procedure/Surgery Start Time (PST): Time when the procedure is begun (e.g., incision for a surgical procedure).
- Procedure/Surgery Finish (PF): Time when all instrument and sponge counts are completed and verified as correct, all postoperative radiologic studies to be done in the OR are completed, all dressings and drains are secured, and the physicians/surgeons have completed all procedure-related activities on the patient.

Emergency operative procedure

A non-elective, unscheduled operative procedure on a patient whose condition did not allow time for the standard preoperative preparations normally done prior to a scheduled operation (e.g., stable vital signs, adequate antiseptic skin preparation, colon decontamination in advance of colon surgery, etc.). See also NHSN operative procedure.

Episode of mechanical ventilation

Defined as a period of days during which the patient was mechanically ventilated for some portion of each consecutive day.

Event contributed to death

The event either directly caused death or exacerbated an existing disease condition which then led to death.

Event date

See Date of event.

Fever

See Vital signs.

Fistula

A surgically created direct connection between an artery and a vein to provide vascular access for hemodialysis.

Fraction of Inspired Oxygen FiO_2

The proportion of oxygen in air that is inspired.

Gap Day

A calendar day during which no infection criterion elements are present.

General anesthesia

General anesthesia is defined as the administration of drugs or gases that enter the general circulation and affect the central nervous system to render the patient pain free, amnesic, unconscious, and often paralyzed with relaxed muscles.

Graft A surgically created connection between an artery and a vein using implanted material (typically synthetic tubing) to provide a permanent vascular access for hemodialysis.

In-plan surveillance Facility has indicated in their monthly reporting plan that the NHSN surveillance protocol(s) will be utilized, in its entirety, for that particular event. Data that are entered into NHSN "in-plan" are included in NSHN annual reports or other NHSN publications.

Healthcare-associated infection (HAI) A localized or systemic condition resulting from an adverse reaction to the presence of an infectious agent(s) or its toxin(s) that was not present on admission (POA) to the acute care facility. The HAI definition is not to be used in the SSI, VAE, or LabID Event protocols. An infection is considered an HAI if all elements of a CDC/NHSN site-specific infection criterion were not present during the POA time period but were all present on or after the 3rd calendar day of admission to the facility (the day of hospital admission is calendar day 1). All elements used to meet the CDC/NHSN site-specific infection criterion must occur within a timeframe that does not exceed a gap of 1 calendar day between any two adjacent elements. The definition of a gap day is a calendar day during which no infection criterion elements are present. If all elements of a CDC/NHSN site-specific infection criterion are present on the day of transfer or the next day from one inpatient location to another in the same facility or a new facility, the infection is attributed to the transferring location or facility. Likewise, if all elements of a CDC/NHSN site-specific infection criterion are present on the day of discharge or the next day, the infection is attributed to the discharging location. Surveillance Definitions chapter contains the site-specific criteria for HAI and examples of how to apply the HAI definition.

See also Table 1 at the end of this chapter for examples of HAI, infections that are POA and the Transfer Rule.

Hypotension See Vital signs.

Indwelling urinary catheter A drainage tube that is inserted into the urinary bladder through the urethra, is left in place, and is connected to a drainage bag (including leg bags). These devices are also called Foley catheters. Condom or straight in-and-out catheters are not included nor are nephrostomy tubes or suprapubic catheters unless a Foley catheter is also present. Indwelling urethral catheters that are used for intermittent or continuous irrigation are included in CAUTI surveillance.

Infant A patient who is ≤ 1 year (≤ 365 days) of age.

Infection date See Date of event.

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 or IV antimicrobial administration, or blood, in the case of transfusion or hemodialysis.

Inpatient See NHSN inpatient.

Inpatient location See Location.

Intensive care unit (ICU) A nursing care area that provides intensive observation, diagnosis, and therapeutic procedures for adults and/or children who are critically ill. An ICU excludes nursing areas that provide step-down, intermediate care or telemetry only. Specialty care areas are also excluded (see definition). The type of ICU is determined by the kind of patients cared for in that unit according to the 80% rule. That is, if 80% of patients are of a certain type (e.g., patients with trauma), then that ICU is designated as that type of unit (in this case, trauma ICU). When an ICU houses roughly equal populations of medical and surgical patients (a 50/50 to 60/40 mix), it is called a medical/surgical ICU.

Location The patient care area to which a patient is assigned while receiving care in the healthcare facility. NOTE: Only locations where patients are housed overnight (i.e., inpatient locations) and where denominator data are collected can be used for reporting infection events when the Device-associated Module is included on a Monthly Reporting Plan (except for Dialysis Event surveillance). Operating rooms (including cardiac cath labs, C-section rooms, and interventional radiology) and outpatient locations are not valid locations for these types of surveillance. See also CDC location.

Location of attribution The location to which the event is being attributed. See also Location, Date of event, Transfer rule and Table 1 at the end of this chapter containing examples of locations of attribution.

Location of attribution (VAE) The location where the patient was assigned on the date of the VAE, which is further defined as the date of onset of worsening oxygenation.

Neonatal intensive care unit (NICU)

A hospital unit organized with personnel and equipment to provide continuous life support and comprehensive care for extremely high-risk newborn infants and those with complex and critical illness. There are two types of NICU in NHSN: combined Level II/III NICU and Level III NICU.

NOTES:

1. In NHSN, a Level II nursery is considered a Step Down Neonatal Nursery ward (not a NICU).
2. The capabilities of Level II, listed below, are from the American Academy of Pediatrics definitions of levels of neonatal care.[2]

   Level II special care nursery

   Level I capabilities plus:

   - Provide care for infants born ≥32 wk. gestation and weighing ≥1500 g who have physiologic immaturity or who are moderately ill with problems that are expected to resolve rapidly and are not anticipated to need subspecialty services on an urgent basis
   - Provide care for infants convalescing after intensive care
   - Provide mechanical ventilation for brief duration (<24 h) or continuous positive airway pressure or both
   - Stabilize infants born before 32 wk. gestation and weighing less than 1500 g until transfer to a neonatal intensive care facility

3. The capabilities of Level III and Level IV, listed below, are from the American Academy of Pediatrics definitions of levels of neonatal care.[2] These classifications are all considered Level III NICUs in NHSN.

   Level III NICU

   Level II capabilities plus:

   - Provide sustained life support
   - Provide comprehensive care for infants born < 32 wks. gestation and weighing <1500 g and infants born at all gestational ages and birth weights with critical illness
   - Provide prompt and readily available access to a full range of pediatric medical subspecialists, pediatric surgical specialists, pediatric anesthesiologists, and pediatric ophthalmologists
   - Provide a full range of respiratory support that may include conventional and/or high-frequency ventilation and inhaled nitric oxide
   - Perform advanced imaging, with interpretation on an urgent basis, including computed tomography, MRI, and echocardiography

Level IV Regional NICU

Level III capabilities plus:

- Located within an institution with the capability to provide surgical repair of complex congenital or acquired conditions
- Maintain a full range of pediatric medical subspecialists, pediatric surgical subspecialists, and pediatric subspecialists at the site
- Facilitate transport and provide outreach education

Neonate A patient who is ≤ 30 days of age.

NHSN inpatient A patient whose date of admission to the healthcare facility and the date of discharge are different calendar days. NOTE: A patient who is admitted to an inpatient location as an "observation" patient is identified as an inpatient on the first and subsequent days for the purposes of surveillance and for counting a location's total patient days and device days.

NHSN operative procedure An NHSN operative procedure is a procedure

- that is included in Table 1
  and
- takes place during an operation where at least one incision (including laparoscopic approach) is made through the skin or mucous membrane, or reoperation via an incision that was left open during a prior operative procedure
  and
- takes place in an operating room [OR], defined as a patient care area that met the Facilities Guidelines Institute's (FGI) or American Institute of Architects' (AIA) criteria for an operating room when it was constructed or renovated.[9] This may include an operating room, C-section room, interventional radiology room, or a cardiac catheterization lab.

Exclusions: Otherwise eligible procedures that are assigned an ASA score of 6 are not eligible for NHSN SSI surveillance

NOTE: As of 2014, incisional closure is NO LONGER a part of the NHSN operative procedure definition; all otherwise eligible procedures are included, regardless of closure type.

NHSN outpatient A patient whose date of admission to the healthcare facility and the date of discharge are the same calendar day.

Non-primary closure Closure that is other than primary and includes surgeries in which the superficial layers are left completely open during the original surgery and therefore cannot be classified as having primary closure. For surgeries with non-primary closure, the deep tissue layers may be closed by some means (with the superficial layers left open), or the deep and superficial layers may both be left completely open. In such cases, any subsequent infection would not be considered an SSI, although it may be an HAI if it meets criteria for another specific infection site (e.g., skin or soft tissue infection). An example of a surgery with non-primary closure would be a laparotomy in which the incision was closed to the level of the deep tissue layers, sometimes called "fascial layers" or "deep fascia," but the superficial layers are left open. Another example would be an "open abdomen" case in which the abdomen is left completely open after the surgery. Wounds that are "closed secondarily" at some later date, or described as "healing by secondary intention" should also be classified as having non-primary closure. Wounds with non-primary closure may or may not be described as "packed" with gauze or other material, and may or may not be covered with plastic, "wound vacs," or other synthetic devices or materials.

Nontunneled central line A central venous catheter that travels directly from the skin entry site to a blood vessel and terminates close to the heart or one of the great vessels, typically intended for short term use.

Off-Plan surveillance Facility has NOT indicated in their monthly reporting plan that the particular event will be followed and therefore the facility makes no commitment to follow the NHSN surveillance protocol(s) for data entered into the NHSN application related to that particular event. Data that are entered into NHSN "off-plan" are NOT included in NSHN annual reports or other NHSN publications.

Operating room (OR) A patient care area that meets met the Facilities Guidelines Institute's (FGI) or American Institute of Architects' (AIA) criteria for an operating room when it was constructed or renovated.[9] This may include an operating room, C-section room, interventional radiology room, or a cardiac catheterization lab..

Operation See NHSN operative procedure.

Operative procedure See NHSN operative procedure.

Outpatient See NHSN outpatient.

Patient days A daily count of the number of patients in the patient care location during a time period. To calculate patient days, for each day of the month, at the same time each day, record the number of patients. At the end of the month, sum the daily counts and enter the total into NHSN.

	When patient days are available from electronic databases these sources may be used as long as the counts are not substantially different (+/- 5%) from manually-collected counts, pre-validated for a minimum of 3 months.
Positive End Expiratory Pressure (PEEP)	A technique used in respiratory therapy in which airway pressure greater than atmospheric pressure is achieved at the end of exhalation by the introduction of a mechanical impedance to exhalation.[5]
Permanent central line	A central line that is a tunneled or implanted catheter, including certain dialysis catheters, or ports.
Present on Admission (POA)	If all of the elements of an infection definition are present during the two calendar days before the day of admission, the first day of admission (day 1) and/or the day after admission (day 2) and are documented in the medical chart, the infection would be considered POA. Infections that are POA should not be reported as HAIs. Acceptable documentation does not include self-reported symptoms by the patient (e.g., patient reporting having a fever prior to arrival to the hospital). Instead, symptoms must be documented in the chart by a healthcare professional during the POA time frame (e.g., nursing home documents fever prior to arrival to the hospital). Physician diagnosis can be accepted as evidence of an infection that is POA only when physician diagnosis is an element of the specific infection definition. NOTE: This should not be applied to SSI, VAE, or LabID Events.
Primary closure	Closure of all tissue levels during the original surgery, regardless of the presence of wires, wicks, drains, or other devices or objects extruding through the incision. This category includes surgeries where the skin is closed by some means, including incisions that are described as being "loosely closed" at the skin level. Thus, if any portion of the incision is closed at the skin level, by any manner, a designation of primary closure should be assigned to the surgery NOTE: Assign the surgical wound closure that applies when the patient leaves the OR from the principal operative procedure. This instruction should be followed in scenarios where a patient leaves the OR with non-primary closure, but returns to the OR for a subsequent procedure that results in primary closure of the procedure.
Procedure	See NHSN operative procedure.
Qualifying Antimicrobial Day (QAD)	For purposes of the VAE surveillance protocol, a day on which a patient is administered an antimicrobial agent that was determined to be "new" within the VAE Window Period (see VAE protocol in Chapter 10).

Scope

An instrument used to visualize the interior of a body cavity or organ. In the context of an NHSN operative procedure, use of a scope involves creation of several small incisions to perform or assist in the performance of an operation rather than use of a traditional larger incision (i.e., open approach). Robotic assistance is considered equivalent to use of a scope for NHSN SSI surveillance. See also Instructions for Completion of *Denominator for Procedure* form and both Numerator Data and Denominator Data reporting instructions of the SSI chapter of this manual.

Secondary bloodstream infection (BSI)

See Appendix 1 of the CLABSI chapter.

Specialty care area (SCA)

Hospital location in which specialized care of the following types is provided:

- Solid organ transplant
- Inpatient acute dialysis

See also the CDC Locations and Descriptions chapter.

Standardized Infection Ratio (SIR)

Summary measure used to track HAIs over time. It compares the number of reported HAIs to the number of predicted HAIs, based on NHSN baseline data. The SIR adjusts for several factors that may impact the risk of acquiring an HAI. See the SIR Newsletter for more information.

SSI risk index

A score used to predict a surgical patient's risk of acquiring a surgical site infection. The risk index score, ranging from 0 to 3, is the sum of the number of risk factors present among the following:

- a patient with an American Society of Anesthesiologists' physical status classification score[1] of 3, 4, or 5,
- an operation classified as contaminated or dirty/infected[4] and
- an operation lasting longer than the duration cut point in minutes, where the duration cut point varies by the type of operative procedure performed.

NOTE: As of 2010, NHSN began using standardized infection ratios (SIR) based on operative procedure category-specific multivariate risk models rather than risk index-stratified SSI rates. For duration cut point values and risk index-stratified SSI rates, see NHSN Report: Data summary for 2006 through 2008, issued December 2009 found at http://www.cdc.gov/nhsn/dataStat.html. See also ASA score and Wound class.

Surveillance cultures	Those cultures reported as part of infection prevention and control surveillance such as stool cultures for vancomycin-resistant *enterococci* (VRE) and/or nasal swabs for methicillin-resistant *Staphylococcus aureus* (MRSA) surveillance, not for use in patient diagnosis. Also called active surveillance cultures or testing (ASC/AST).
Teaching hospital	There are 3 types of teaching hospital defined in NHSN: • **Major:** Facility has a program for medical students and post-graduate medical training. • **Graduate:** Facility has a program for post-graduate medical training (i.e., residency and/or fellowships). • **Undergraduate:** Facility has a program for medical students only.
Temperature	See Vital signs.
Temporary central line	A central line that is non-tunneled and non-implanted.
Transfer rule	If all elements of an HAI are present on the day of transfer or the next day, in the same facility or a new facility the infection is attributed to the transferring location or facility. Receiving facilities should share information about such HAIs with the transferring facility to enable reporting. See also Table 1 at the end of this chapter for examples of new key terms for 2013.
Trauma	Blunt or penetrating injury.
Tunneled central line	A central venous catheter that travels a distance under the skin from the point of insertion before entering a blood vessel and terminating close to the heart or one of the great vessels (e.g., Hickman® or Broviac® catheters).
Umbilical catheter	A central vascular device inserted through the umbilical artery or vein in a neonate.
VAE Window Period	This is the period of days around the event date (i.e., the day of onset of worsening oxygenation) within which other VAE criteria must be met. It is usually a 5-day period and includes the 2 days before, the day of, and the 2 days after the VAE event date (i.e., the first day of worsening oxygenation, the day of VAE onset). In cases where the VAE event date corresponds to MV day 3 or day 4, the window period may only be a 3-day or a 4-day window, because it can NOT include any days before the 3rd day of mechanical ventilation.

Ventilator A device to assist or control respiration continuously, inclusive of the weaning period, through a tracheostomy or by endotracheal intubation.
NOTE: Lung expansion devices such as intermittent positive pressure breathing (IPPB); nasal positive end-expiratory pressure (PEEP); continuous nasal positive airway pressure (CPAP, hypoCPAP) are not considered ventilators unless delivered via tracheostomy or endotracheal intubation (e.g., ET-CPAP).

Virtual location A location created in NHSN for a patient care area that does not meet the 80% Rule. These locations are created to allow for NHSN surveillance for the major, specific patient types that are housed within the unit. Surveillance in virtual locations can be accomplished when a unit is geographically split by patient service (i.e. designated beds for each service).

Vital signs If a specific value for a vital sign is not stated in a CDC/NHSN HAI definition criterion, the facility should use the vital sign parameters as stated in its policies and procedures for clinical practices. For example, if a facility has a policy to adjust axillary temperature readings to reflect core temperatures, then the adjusted temperature value used for clinical decision making should be used for its HAI surveillance as well.

Weight The patient's most recent weight documented in the medical record in pounds (lbs) or kilograms (kg)

Wound class An assessment of the degree of contamination of a surgical wound at the time of the operation. Wound class should be assigned by a person involved in the surgical procedure, e.g., surgeon, circulating nurse, etc. The wound class system used in NHSN is an adaptation of the American College of Surgeons wound classification schema8.

Wounds are divided into four classes:

Clean: An uninfected operative wound in which no inflammation is encountered and the respiratory, alimentary, genital, or uninfected urinary tracts are not entered. In addition, clean wounds are primarily closed and, if necessary, drained with closed drainage. Operative incisional wounds that follow nonpenetrating (blunt) trauma should be included in this category if they meet the criteria.
NOTE: The following NHSN operative procedure categories are NEVER considered to have a clean wound classification: APPY, BILI, CHOL, COLO, REC, SB, and VHYS and this option will not be available to enter into the denominator data.

Clean-Contaminated: Operative wounds in which the respiratory, alimentary, genital*, or urinary tracts are entered under controlled conditions and without unusual contamination. Specifically, operations involving the biliary tract, appendix, vagina, and oropharynx are included in this category, provided no

evidence of infection or major break in technique is encountered.*Includes female and male reproductive tracts.

Contaminated: Open, fresh, accidental wounds. In addition, operations with major breaks in sterile technique (e.g., open cardiac massage) or gross spillage from the gastrointestinal tract, and incisions in which acute, nonpurulent inflammation is encountered including necrotic tissue without evidence of purulent drainage (e.g., dry gangrene) are included in this category.

Dirty or Infected: Includes old traumatic wounds with retained devitalized tissue and those that involve existing clinical infection or perforated viscera. This definition suggests that the organisms causing postoperative infection were present in the operative field before the operation.

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[1]Anonymous. New classification of physical status. Anesthesiology 1963;24:111.

[2]American Academy of Pediatrics, Policy Statement: Levels of neonatal care. Pediatrics 2012;130 (3): 587-597.

[3]Facilities Guidelines Institute. Guidelines for design and construction of health care facilities. American Society for Healthcare Engineering; Chicago IL; 2010.

[4]Mangram AJ, Horan TC, Pearson ML, Silver LC, Jarvis WR, and the Hospital Infection Control Practices Advisory Committee. Guideline for prevention of surgical site infection, 1999. Infect Control Hosp Epidemiol 1999;20:247-80.

[5]Stedman's medical dictionary. (28th ed). (2005). Philadelphia: Lippincott, Williams, & Wilkins.

Table 1: ***Examples of new key terms for 2013: Healthcare-associated infection (HAI), device-associated HAI, and transfer rule***

Key Terms	Day 1 Day of admit	Day2	Day 3	Day 4	Day 5	Day 6	Day 7	
POA	ED to ICU	ICU Fever >38 (+) UC >100K						POA, UTI
POA	LTC to ICU Documented fever in LTC day prior to admission	(+) UC >100K						POA, UTI
HAI	ED to ICU Asymptomatic	ICU Asymptomatic	ICU (+) *S. aureus* in blood culture					HAI, LCBI attributable to ICU
HAI	ED to ICU	ICU Fever >38	(+) UC >100K	Asymptomatic	Asymptomatic	Asymptomatic		Neither an HAI nor a POA
HAI	ICU	ICU Fever >38	ICU Fever >38	(+) UC >100K				HAI, UTI
GAP DAY	ICU	ICU Fever >38	Fever >38	Asymptomatic, no (+) culture GAP DAY	(+) UA	GAP Day	(+) UC 10,000	HAI meets criteria for a SUTI 2a on day 7
GAP DAY	ICU	ICU Fever >38	(+) UC >100K	Asymptomatic, no (+) culture GAP DAY	Asymptomatic GAP DAY	Fever >38	Asymptomatic	NOT an HAI: 2 gap days between fever and (+) UC (adjacent elements)
Device Associated	Device inserted	Device (Foley) in place	Device in place Date of event for a UTI					Device associated UTI (CAUTI)

Key Terms	Day 1 Day of admit	Day2	Day 3	Day 4	Day 5	Day 6	Day 7	
Device Associated	5W	5W	Device (Foley) inserted	Device removed	Date of event for a UTI			Non-catheter associated UTI
Device Associated	Device (Foley) inserted	Device in place Fever	Device in place Fever >38 (+) UC >100K					Device Associated (CAUTI) *
Device Associated	ICU	ICU	Device inserted Fever	Device in place GAP DAY	Device in place (+) UC >100K Date of event for the SUTI	Device in place asymptomatic	Device in place asymptomatic	Device associated (CAUTI)
Device Associated	Device Foley) inserted	Device in place	Device in place	Device removed	Date of event for a SUTI			Device associated (CAUTI)
Device Associated	Device (Foley) inserted	Device in place	Device in place	Device removed	Device reinserted	Date of event for a SUTI		Device associated (CAUTI)
Device Associated	Device (Foley) inserted	Device in place	Device in place	Device removed	No device in place	Date of event for a SUTI		Non-catheter associated UTI
Transfer Rule	ICU	ICU	ICU →5W	5W Date of event for an HAI	5W			HAI is attributable to the ICU
Transfer Rule	ICU	ICU	ICU →5W	5W	5W Date of event for an HAI			HAI is attributable to the 5W
Transfer Rule	5W	5W	5W	5W →Discharged Home	Admit to ED with *S. aureus* in blood (LCBI 1 criteria met)			Attributable to 5W
Multi - transfer Rule	ICU	ICU	ICU →5W→CCU	CCU Date of event for an HAI	CCU			HAI is attributable to the ICU

*All device-associated infections are healthcare-associated infections
ED= Emergency Department
UC= urinary culture
LTC= Long Term Care Facility
5W= patient care unit 5W

CDC/NHSN Surveillance Definitions for Specific Types of Infections

INTRODUCTION

This chapter contains the CDC/NHSN surveillance definitions and criteria for all specific types of infections. Comments and reporting instructions that follow the site-specific criteria provide further explanation and are integral to the correct application of the criteria. This chapter also provides further required criteria for the specific infection types that constitute organ/space surgical site infections (SSI) (e.g., mediastinitis [MED] that may follow a coronary artery bypass graft, intra-abdominal abscess [IAB] after colon surgery).

Additionally, it is necessary to refer to the criteria in this chapter when determining whether a positive blood culture represents a primary bloodstream infection (BSI) or is secondary to a different type of HAI (see Appendix 1 Secondary Bloodstream Infection (BSI) Guide). A BSI that is identified as secondary to another site of HAI must meet one of the criteria of HAI detailed in this chapter. Secondary BSIs are not reported as separate events in NHSN, nor can they be associated with the use of a central line.

Also included in this chapter are the criteria for Ventilator-Associated Events (VAEs). It should be noted that Ventilator-Associated Condition (VAC), the first definition within the VAE surveillance definition algorithm and the foundation for the other definitions within the algorithm (IVAC, Possible VAP, Probable VAP) may or may not be infection-related.

CDC/NHSN SURVEILLANCE DEFINITIONS OF HEALTHCARE–ASSOCIATED INFECTION

Present on Admission (POA) Infections

To standardize the classification of an infection as present on admission (POA) or a healthcare-associated infection (HAI), the following objective surveillance criteria have been adopted by NHSN. NOTE: This classification should not be applied to SSI, VAE, or LabID Events.

If all of the elements used to meet a CDC/NHSN site-specific infection criterion are present during the two calendar days before the day of admission, the first day of admission (day 1) and/or the day after admission (day 2) and are documented in the medical record, the infection is considered POA. Infections that are POA should not be reported as HAIs. Acceptable documentation does not include patient-reported signs and/or symptoms (e.g., patient reporting having a fever prior to arrival to the hospital). Instead, symptoms must be documented in the chart by a healthcare professional during the POA time frame (e.g., nursing home documents fever prior to arrival to the hospital). Physician diagnosis can be accepted as evidence of an infection that is POA only when physician diagnosis is an element of the specific infection definition.

For example, the admission history could indicate that the physician suspects a UTI. The patient was documented to have a fever in the nursing home the day before admission to the hospital, and upon admission to the hospital (day 1) a urine sample was collected and cultured yielding >100,000 cfu/ml of a pathogen. This infection would be considered a POA because the required elements of the CDC/NHSN site-specific infection criterion (for symptomatic urinary tract infection [SUTI]) were present during the two calendar days before admission, the day of admission, or the day after admission. In this example, items 1 and 2 are elements of SUTI criterion 1:

1. Fever, documented by history received from nursing home
2. Positive urine culture >100,000 CFU/ml

Illustration of present on admission (POA) time frame			
2 calendar days before admission	1 calendar day before admission	Day 1 (Day of facility admission)	Day 2 (Day after facility admission)
October 27	October 28	October 29	October 30

NOTES:

- For POA, the temperature value does not need to be known to establish the presence of a fever.
- Physician diagnosis of a UTI does not contribute to satisfying POA definition since physician diagnosis is not an element used to meet SUTI criteria.

Healthcare-associated infections (HAI)

For the purposes of NHSN surveillance in the acute care setting, a healthcare-associated infection (HAI) is a localized or systemic condition resulting from an adverse reaction to the presence of an infectious agent(s) or its toxin(s) that was not present on admission to the acute care facility. The HAI definition is not to be used in the SSI, VAE, or LabID Event protocols. An infection is considered an HAI if all elements of a CDC/NHSN site-specific infection criterion were not present during the POA time period but were all present on or after the 3rd calendar day of admission to the facility (the day of hospital admission is calendar day 1). All elements used to meet the CDC/NHSN site-specific infection criterion must occur within a timeframe that does not exceed a gap of 1 calendar day between any two adjacent elements. The definition of a gap day is a calendar day during which no infection criterion elements are present. Three examples of how to apply the HAI definition are shown in Table 1 utilizing the NHSN urinary tract infection (UTI) criteria. If all elements of a CDC/NHSN site-specific infection criterion are present on the day of transfer or the next day from one inpatient location to another in the same facility or a new facility, the infection is attributed to the transferring location or facility. Likewise, if all elements of a CDC/NHSN site-specific infection criterion are present on the day of discharge or the next day, the infection is attributed to the discharging location.

NOTE: At present time NHSN does not have a set time period during which only 1 infection of the same event type may be reported for the same patient. (VAE and LabID Event reporting is

the exception, for which there is a 14-day window [see individual protocols for VAE and LabID Events].) Following an infection, which is either POA or an HAI, clinical information must be utilized to determine that the original infection had resolved before reporting a second infection at the same site. If the original infection had not resolved before subsequent positive cultures are collected from the same site, add the pathogens recovered from the subsequent cultures to those reported for the first infection, if it was an HAI. Depending on the infection type, information which may be useful to consider in determining if the infection has resolved includes signs and symptoms, results from diagnostic testing, as well as completion of antimicrobial therapy. For example, a change in blood culture in a patient with extended treatment for endocarditis may represent a new laboratory confirmed bloodstream infection (LCBI).

Table 1. ***Examples of Application of HAI Definition***

Day 1	Day 2	Day 3	Day 4	Day 5	Infection is …
50-year-old admitted to ICU • No UTI elements	ICU • No UTI elements	ICU • Suprapubic tenderness • Fever >38.0° • Urine culture collected, >100,000 cfu/ml *E. coli*			HAI attributable to ICU Rationale: • UTI criteria not fully met in first 2 hospital calendar days • All UTI elements present on or after hospital calendar day 3
50-year-old admitted to ICU • No UTI elements	ICU • Fever >38.0° C	ICU • Fever >38.0° C	ICU • Urine culture collected, > 100,000 cfu/ml *E. coli*		HAI attributable to ICU Rationale: • UTI criteria not fully met in first 2 hospital calendar days • All UTI elements present on or after hospital calendar day 3
50-year-old admitted to ICU • No UTI elements	ICU • No UTI elements	ICU • Fever >38.0° C	ICU • No UTI elements – *GAP day*	ICU • Urine culture collected, > 100,000 cfu/ml *E. coli*	HAI attributable to ICU Rationale: • UTI criteria not fully met in first 2 hospital calendar days • All UTI elements present on or after hospital calendar day 3. No more than a single gap day between adjacent elements

HAIs may be caused by infectious agents from endogenous or exogenous sources:

- Endogenous sources are body sites, such as the skin, nose, mouth, gastrointestinal (GI) tract, or vagina that are normally inhabited by microorganisms.
- Exogenous sources are those external to the patient, such as patient care personnel, visitors, patient care equipment, medical devices, or the healthcare environment.

Other important considerations include the following:

- Clinical evidence may be derived from direct observation of the infection site (e.g., a wound) or review of information in the patient chart or other clinical records.
- For certain types of infection, a physician or surgeon diagnosis of infection derived from direct observation during an invasive procedure, endoscopic examination, or other diagnostic studies or from clinical judgment may be an acceptable criterion for an HAI, unless there is compelling evidence to the contrary. For example, one of the criteria for SSI is ‘‘surgeon or attending physician or other designee diagnosis.’’ Unless stated explicitly, physician diagnosis alone is not an acceptable criterion for any specific type of HAI.
- Infections occurring in infants that result from passage through the birth canal are considered HAIs if they meet the definition of HAI above.

The following infections are not considered healthcare associated:

- Infections associated with complications or extensions of infections already present on admission (see POA definition), unless a change in pathogen or symptoms strongly suggests the acquisition of a new infection. This statement does not apply to SSIs, VAE, or LabID Events.
- Infections in infants that have been acquired transplacentally (e.g., herpes simplex, toxoplasmosis, rubella, cytomegalovirus, or syphilis) and become evident on the day of birth or the next day.
- Reactivation of a latent infection (e.g., herpes zoster [shingles], herpes simplex, syphilis, or tuberculosis).

The following conditions are not infections:

- Colonization, which means the presence of microorganisms on skin, on mucous membranes, in open wounds, or in excretions or secretions but are not causing adverse clinical signs or symptoms.
- Inflammation that results from tissue response to injury or stimulation by noninfectious agents, such as chemicals.

CRITERIA FOR SPECIFIC TYPES OF INFECTION

Once an infection is deemed to be healthcare associated according to the definition shown above, the specific type of infection should be determined based on the criteria detailed in the following pages. These have been grouped into 14 major type categories to facilitate data analysis. For example, there are 3 specific types of urinary tract infections (symptomatic urinary tract infection, asymptomatic bacteremic urinary tract infection, and other infections of the urinary tract) that are grouped under the major type of Urinary Tract Infection. The specific and major types or sites of infection used in NHSN and their abbreviated codes are listed in Table 2, in alphabetical order by major type code and the criteria for each of the specific types of infection follow it.

Table 1. CDC/NHSN Major and Specific Types of Healthcare-Associated Infections

BJ-BONE AND JOINT INFECTION

BONE-Osteomyelitis

Osteomyelitis must meet at least *1* of the following criteria:

1. Patient has organisms cultured from bone.
2. Patient has evidence of osteomyelitis on direct examination of the bone during an invasive procedure or histopathologic examination.
3. Patient has at least *2* of the following signs or symptoms: fever (>38°C), localized swelling*, tenderness*, heat*, or drainage at suspected site of bone infection*
   and
   at least 1 of the following:
   a. organisms cultured from blood
   b. positive laboratory test on blood (e.g., antigen tests for *H influenzae* or *S pneumoniae*)
   c. imaging test evidence of infection (e.g., abnormal findings on x-ray, CT scan, MRI, radiolabel scan [gallium, technetium, etc.]).
   * With no other recognized cause

Reporting instruction

- Report mediastinitis following cardiac surgery that is accompanied by osteomyelitis as SSI-MED rather than SSI-BONE.

DISC-Disc space infection

Vertebral disc space infection must meet at least *1* of the following criteria:

1. Patient has organisms cultured from vertebral disc space tissue obtained during an invasive procedure.
2. Patient has evidence of vertebral disc space infection seen during an invasive procedure or histopathologic examination.
3. Patient has fever (>38°C) or pain at the involved vertebral disc space*
   and
   imaging test evidence of infection, (e.g., abnormal findings on x-ray, CT scan, MRI, radiolabel scan [gallium, technetium, etc.]).
   * With no other recognized cause
4. Patient has fever (>38°C) and pain at the involved vertebral disc space*
   and
   positive laboratory test on blood or urine (e.g., antigen tests for *H influenzae*, *S pneumoniae*, *N meningitidis*, or Group B *Streptococcus*).
   * With no other recognized cause

JNT-Joint or bursa infection

Joint or bursa infections must meet at least *1* of the following criteria:

1. Patient has organisms cultured from joint fluid or synovial biopsy.
2. Patient has evidence of joint or bursa infection seen during an invasive procedure or histopathologic examination.
3. Patient has at least *2* of the following signs or symptoms with no other recognized cause: joint pain, swelling, tenderness, heat, evidence of effusion or limitation of motion
   and
   at least *1* of the following:
   a. organisms and white blood cells seen on Gram's stain of joint fluid
   b. positive laboratory test on blood culture or appropriate antigen test on blood, urine, or joint fluid.
   c. cellular profile and chemistries of joint fluid compatible with infection and not explained by an underlying rheumatologic disorder
   d. imaging test evidence of infection (e.g., abnormal findings on x-ray, CT scan, MRI, radiolabel scan [gallium, technetium, etc.]).

PJI – Periprosthetic Joint Infection (following HPRO and KPRO only)

Joint or bursa infections must meet at least *1* of the following criteria:

1. Two positive periprosthetic (*tissue or fluid*) cultures with identical organisms
2. A sinus tract communicating with the joint
3. Having <u>three</u> of the following minor criteria:
   a. Elevated serum C-reactive protein (CRP; >100 mg/L) *AND* erythrocyte sedimentation rate (ESR; >30 mm/hr).
   b. Elevated synovial fluid white blood cell (WBC; >10,000 cells/µL) count *OR* ++ (*or greater)* change on leukocyte esterase test strip of synovial fluid.
   c. Elevated synovial fluid polymorphonuclear neutrophil percentage (PMN% >90%).
   d. Positive histological analysis of periprosthetic tissue (>5 neutrophils (PMNs) per high power field).
   e. A single positive periprosthetic (*tissue or fluid*) culture.

COMMENTS

- Identical organisms mean matching at genus and species level but they do not have to have matching antibiograms.
- A sinus tract is defined as a narrow opening or passageway underneath the skin that can extend in any direction through soft tissue and results in dead space with potential for abscess formation
- The NHSN definition of PJI is closely adapted from the Musculoskeletal Infection Society's (MSIS's) definition of PJI (*Proceedings of the International Consensus Meeting on Periprosthetic Joint Infection. 2013*). However, the standard laboratory cutoff values in criteria 3a to 3d are provided by NHSN for HPRO and KPRO SSI surveillance purposes only. The NHSN laboratory cutoffs are not intended to guide clinicians in the actual clinical diagnosis and management of acute or chronic PJI. Clinicians should refer to the MSIS consensus definition for clinical use.

BSI-BLOODSTREAM INFECTION

Table 2. Laboratory-Confirmed Bloodstream Infection Criteria

Criterion	Laboratory-Confirmed Bloodstream Infection (LCBI) *Comments and reporting instructions that follow the site-specific criteria provide further explanation and are integral to the correct application of the criteria.* Must meet one of the following criteria:
LCBI 1	Patient 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. (See Appendix 1 Secondary BSI Guide)
LCBI 2	Patient has at least one of the following signs or symptoms: fever (>38°C), chills, or hypotension *and* positive laboratory results are 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 a timeframe that does not exceed a gap of 1 calendar day between two adjacent elements. (See complete list of common commensals 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.

6/1/2013	6/2/2013	6/3/2103	6/4/2013	Date of LCBI Event = 6/3/2013
Fever >38°C	No LCBI elements	*S. epidermidis* (1 of 2)	*S. epidermidis* (1 of 2)	

<table>
<tr>
<td>LCBI 3</td>
<td>
Patient ≤ 1 year of age has at least one of the following signs or symptoms: fever (>38°C core), hypothermia (<36°C core), apnea, or bradycardia

and

positive laboratory results are 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 the same or consecutive days and separate occasions (see Comment 3a below). Criterion elements must occur within a timeframe that does not exceed a gap of 1 calendar day between two adjacent elements. (See complete list of common commensals at http://www.cdc.gov/nhsn/XLS/master-organism-Com-Commensals-Lists.xlsx#common)

NOTE: The matching common commensals represent a single element; therefore, the collection date of the first common commensal is the date of the element.
<table>
<tr><td>6/1/2013</td><td>6/2/2013</td><td>6/3/2103</td><td>6/4/2013</td><td rowspan="2">Date of LCBI Event = 6/3/2013</td></tr>
<tr><td>Fever >38°C</td><td>No LCBI elements</td><td>S. epidermidis (1 of 2)</td><td>S. epidermidis (1 of 2)</td></tr>
</table>
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Criterion	**Mucosal Barrier Injury Laboratory-Confirmed Bloodstream Infection (MBI-LCBI)** *In 2014 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 if CLABSI is part of your Monthly Reporting Plan.* Must meet one of the following criteria:
MBI-LCBI 1	Patient of any age meets criterion 1 for LCBI with at least one blood culture growing any of the following intestinal organisms with no other organisms isolated (See Comment #5): *Bacteroides* spp., *Candida* spp., *Clostridium* spp., *Enterococcus* spp., *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] (See Comment #6) 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 6 for example) *See Table 5 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] (See Comment #6)

	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 6 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 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] (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 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 6 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 or Supporting Material section at http://www.cdc.gov/nhsn/XLS/master-organism-Com-Commensals-Lists.xlsx#common for the list of common commensals). 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 4 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 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". b. A blood culture may consist of a single bottle for a pediatric blood draw due to volume constraints. Therefore, to meet this part of the criterion, each bottle from two or 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 [3, 4] 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. 6. Grade III/IV GI GVHD is defined as follows: a. In adults: ≥1 L diarrhea/day or ileus with abdominal pain b. In pediatric patients: ≥20 cc/kg/day of diarrhea
REPORTING INSTRUCTIONS	1. Report organisms cultured from blood as BSI–LCBI when no other site of infection is evident (see Appendix 1. Secondary Bloodstream Infection [BSI] Guide). 2. Catheter tip cultures are not used to determine whether a patient has a primary BSI. 3. 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.

	4. Purulent phlebitis confirmed with a positive semiquantitative culture of a catheter tip, but with either negative or no blood culture is considered a CVS-VASC, not a BSI, SST-SKIN, or a ST infection. 5. 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 NHSN application. You should, however, include the patient's central line days in the summary denominator count. 6. If your state or facility requires that you report healthcare-associated BSIs that are not central line-associated, enter "Central Line = No" in the NHSN application when reporting these BSIs. You should, however, include all of the patient's central line days in the summary denominator count.

Table 4. 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*

Table 5. Partial List of Criterion 1 MBI-LCBI Eligible Enterobacteriaceae Genera

Citrobacter
Enterobacter
Escherichia
Klebsiella
Proteus
Providencia
Salmonella
Serratia
Shigella
Yersina

Table 3. 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/mm3 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/mm3 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/mm3 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 4value = 400]).

CNS-CENTRAL NERVOUS SYSTEM INFECTION

IC-Intracranial infection (brain abscess, subdural or epidural infection, encephalitis)

Intracranial infection must meet at least *1* of the following criteria:

1. Patient has organisms cultured from brain tissue or dura.
2. Patient has an abscess or evidence of intracranial infection seen during an invasive procedure or histopathologic examination.
3. Patient has at least *2* of the following signs or symptoms: headache*, dizziness*, fever (>38°C), localizing neurologic signs*, changing level of consciousness*, or confusion*
   and
   at least *1* of the following:
   a. organisms seen on microscopic examination of brain or abscess tissue obtained by needle aspiration or by biopsy during an invasive procedure or autopsy
   b. positive laboratory test on blood or urine
   c. imaging test evidence of infection, (e.g., abnormal findings on ultrasound, CT scan, MRI, radionuclide brain scan, or arteriogram)
   d. diagnostic single antibody titer (IgM) or 4-fold increase in paired sera (IgG) for pathogen
   and
   if diagnosis is made antemortem, physician institutes appropriate antimicrobial therapy.
   * With no other recognized cause
4. Patient ≤1 year of age has at least *2* of the following signs or symptoms: fever (>38°C core), hypothermia (<37°C core), apnea*, bradycardia*, localizing neurologic signs*, or changing level of consciousness*
   and
   at least *1* of the following:
   a. organisms seen on microscopic examination of brain or abscess tissue obtained by needle aspiration or by biopsy during an invasive procedure or autopsy
   b. positive laboratory test on blood or urine
   c. imaging test evidence of infection, (e.g., abnormal findings on ultrasound, CT scan, MRI, radionuclide brain scan, or arteriogram)
   d. diagnostic single antibody titer (IgM) or 4-fold increase in paired sera (IgG) for pathogen
   and
   if diagnosis is made antemortem, physician institutes appropriate antimicrobial therapy.

   * With no other recognized cause

Reporting instruction

- If meningitis (MEN) and a brain abscess (IC) are present together after operation, report as SSI-IC. Similarly, if meningitis and spinal abscess (SA) are present together after an operation, report as SSI-SA.

MEN-Meningitis or ventriculitis

Meningitis or ventriculitis must meet at least *1* of the following criteria:

1. Patient has organisms cultured from cerebrospinal fluid (CSF).
2. Patient has at least *1* of the following signs or symptoms: fever (>38°C), headache*, stiff neck*, meningeal signs*, cranial nerve signs*, or irritability*
   and
   at least *1* of the following:
   a. increased white cells, elevated protein, and decreased glucose in CSF
   b. organisms seen on Gram's stain of CSF
   c. organisms cultured from blood
   d. positive laboratory test of CSF, blood, or urine
   e. diagnostic single antibody titer (IgM) or 4-fold increase in paired sera (IgG) for pathogen
   and
   if diagnosis is made antemortem, physician institutes appropriate antimicrobial therapy.
   * With no other recognized cause
3. Patient ≤1 year of age has at least *1* of the following signs or symptoms: fever (>38°C core), hypothermia (<37°C core), apnea*, bradycardia*, stiff neck*, meningeal signs*, cranial nerve signs*, or irritability*
   and
   at least *1* of the following:
   a. increased white cells, elevated protein, and decreased glucose in CSF
   b. organisms seen on Gram's stain of CSF
   c. organisms cultured from blood
   d. positive laboratory test of CSF, blood, or urine
   e. diagnostic single antibody titer (IgM) or 4-fold increase in paired sera (IgG) for pathogen
   and
   if diagnosis is made antemortem, physician institutes appropriate antimicrobial therapy.
   * With no other recognized cause

Reporting instructions

- Report meningitis in the newborn as healthcare associated unless there is compelling evidence indicating the meningitis was acquired transplacentally (i.e., unless it was apparent on the day of birth or the next day).
- Report CSF shunt infection as SSI-MEN if it occurs within 90 days of placement; if later or after manipulation/access, it is considered CNS-MEN and is not reportable under this module.
- Report meningoencephalitis as MEN.
- If meningitis (MEN) and a brain abscess (IC) are present together after operation, report as SSI-IC. Similarly, if meningitis and spinal abscess (SA) are present together after an operation, report as SSI-SA.

SA-Spinal abscess without meningitis

An abscess of the spinal epidural or subdural space, without involvement of the cerebrospinal fluid or adjacent bone structures, must meet at least *1* of the following criteria:

1. Patient has organisms cultured from abscess in the spinal epidural or subdural space.
2. Patient has an abscess in the spinal epidural or subdural space seen during an invasive procedure or at autopsy or evidence of an abscess seen during a histopathologic examination.
3. Patient has at least *1* of the following signs or symptoms: fever (>38°C), back pain*, focal tenderness*, radiculitis*, paraparesis*, or paraplegia*
   and
   at least *1* of the following:
   a. organisms cultured from blood
   b. imaging test evidence of a spinal abscess (e.g., abnormal findings on myelography, ultrasound, CT scan, MRI, or other scans [gallium, technetium, etc.]).
   and
   if diagnosis is made antemortem, physician institutes appropriate antimicrobial therapy.
   * With no other recognized cause

Reporting instruction

- If meningitis (MEN) and a brain abscess (IC) are present together after operation, report as SSI-IC. Similarly, if meningitis and spinal abscess (SA) are present together after an operation, report as SSI-SA.

CVS-CARDIOVASCULAR SYSTEM INFECTION

CARD-Myocarditis or pericarditis

Myocarditis or pericarditis must meet at least *1* of the following criteria:

1. Patient has organisms cultured from pericardial tissue or fluid obtained during an invasive procedure.
2. Patient has at least 2 of the following signs or symptoms: fever (>38°C), chest pain*, paradoxical pulse*, or increased heart size*
   and
   at least *1* of the following:
   a. abnormal EKG consistent with myocarditis or pericarditis
   b. positive laboratory test on blood (e.g., antigen tests for *H influenzae* or *S pneumoniae*)
   c. evidence of myocarditis or pericarditis on histologic examination of heart tissue
   d. 4-fold rise in type-specific antibody with or without isolation of virus from pharynx or feces
   e. pericardial effusion identified by echocardiogram, CT scan, MRI, or angiography.
   * With no other recognized cause
3. Patient ≤1 year of age has at least *2* of the following signs or symptoms: fever (>38°C core), hypothermia (<37°C core), apnea*, bradycardia*, paradoxical pulse*, or increased heart size*
   and
   at least *1* of the following:
   a. abnormal EKG consistent with myocarditis or pericarditis
   b. positive laboratory test on blood (e.g., Antigen tests for *H influenza* or *S pneumoniae*)

c. histologic examination of heart tissue shows evidence of myocarditis or pericarditis
d. 4-fold rise in type-specific antibody with or without isolation of virus from pharynx or feces
e. pericardial effusion identified by echocardiogram, CT scan, MRI, or angiography.

*With no other recognized cause

Comment

- Most cases of post cardiac surgery or post myocardial infarction pericarditis are not infectious.

ENDO-Endocarditis

Endocarditis of a natural or prosthetic heart valve must meet at least *1* of the following criteria:

1. Patient has organisms cultured from valve or vegetation.
2. Patient has 2 or more of the following signs or symptoms: fever (>38°C), new or changing murmur*, embolic phenomena*, skin manifestations* (i.e., petechiae, splinter hemorrhages, painful subcutaneous nodules), congestive heart failure*, or cardiac conduction abnormality*
   and
   at least *1* of the following:
   a. organisms cultured from 2 or more blood cultures
   b. organisms seen on Gram's stain of valve when culture is negative or not done
   c. valvular vegetation seen during an invasive procedure or autopsy
   d. positive laboratory test on blood or urine (e.g., antigen tests for *H influenzae*, *S pneumoniae*, *N meningitidis*, or Group B *Streptococcus*)
   e. evidence of new vegetation seen on echocardiogram
   and
   if diagnosis is made antemortem, physician institutes appropriate antimicrobial therapy.
   * With no other recognized cause
3. Patient ≤1 year of age has 2 or more of the following signs or symptoms: fever (>38°C core), hypothermia (<37°C core), apnea*, bradycardia*, new or changing murmur*, embolic phenomena*, skin manifestations* (i.e., petechiae, splinter hemorrhages, painful subcutaneous nodules), congestive heart failure*, or cardiac conduction abnormality*
   and
   at least *1* of the following:
   a. organisms cultured from 2 or more blood cultures
   b. organisms seen on Gram's stain of valve when culture is negative or not done
   c. valvular vegetation seen during an invasive procedure or autopsy
   d. positive laboratory test on blood or urine (e.g., antigen tests for *H influenzae*, *S pneumoniae*, *N meningitidis*, or Group B *Streptococcus*)
   e. evidence of new vegetation seen on echocardiogram
   and
   if diagnosis is made antemortem, physician institutes appropriate antimicrobial therapy.
   * With no other recognized cause

MED-Mediastinitis

Mediastinitis must meet at least *1* of the following criteria:

1. Patient has organisms cultured from mediastinal tissue or fluid obtained during an invasive procedure.
2. Patient has evidence of mediastinitis seen during an invasive procedure or histopathologic examination.
3. Patient has at least *1* of the following signs or symptoms: fever (>38°C), chest pain*, or sternal instability*
   and
   at least *1* of the following:
   a. purulent discharge from mediastinal area
   b. organisms cultured from blood or discharge from mediastinal area
   c. mediastinal widening on imaging test.
   * With no other recognized cause
4. Patient ≤1 year of age has at least *1* of the following signs or symptoms: fever (>38°C core), hypothermia (<37°C core), apnea*, bradycardia*, or sternal instability*
   and
   at least *1* of the following:
   a. purulent discharge from mediastinal area
   b. organisms cultured from blood or discharge from mediastinal area
   c. mediastinal widening on imaging test.
   * With no other recognized cause

Reporting instruction

- Report mediastinitis following cardiac surgery that is accompanied by osteomyelitis as SSI-MED rather than SSI-BONE.

VASC-Arterial or venous infection

Arterial or venous infection must meet at least *1* of the following criteria:

1. Patient has organisms cultured from arteries or veins removed during an invasive procedure
   and
   blood culture not done or no organisms cultured from blood.
2. Patient has evidence of arterial or venous infection seen during an invasive procedure or histopathologic examination.
3. Patient has at least *1* of the following signs or symptoms: fever (>38°C), pain*, erythema*, or heat at involved vascular site*
   and
   more than 15 colonies cultured from intravascular cannula tip using semiquantitative culture method
   and
   blood culture not done or no organisms cultured from blood.
   * With no other recognized cause
4. Patient has purulent drainage at involved vascular site
   and
   blood culture not done or no organisms cultured from blood.

5. Patient ≤1 year of age has at least *1* of the following signs or symptoms: fever (>38°C core), hypothermia (<37°C core), apnea*, bradycardia*, lethargy*, or pain*, erythema*, or heat at involved vascular site*
   and
   more than 15 colonies cultured from intravascular cannula tip using semiquantitative culture method
   and
   blood culture not done or no organisms cultured from blood.
   * With no other recognized cause

Reporting instructions

- Report infections of an arteriovenous graft, shunt, or fistula or intravascular cannulation site without organisms cultured from blood as CVS-VASC.
- Report intravascular infections with organisms cultured from the blood as BSI-LCBI.

EENT-EYE, EAR, NOSE, THROAT, OR MOUTH INFECTION

CONJ-Conjunctivitis

Conjunctivitis must meet at least *1* of the following criteria:

1. Patient has pathogens cultured from purulent exudate obtained from the conjunctiva or contiguous tissues, such as eyelid, cornea, meibomian glands, or lacrimal glands.
2. Patient has pain or redness of conjunctiva or around eye
   and
   at least *1* of the following:
   a. WBCs and organisms seen on Gram's stain of exudate
   b. purulent exudate
   c. positive laboratory test (e.g., antigen tests such as ELISA or IF for Chlamydia trachomatis, herpes simplex virus, adenovirus) on exudate or conjunctival scraping
   d. multinucleated giant cells seen on microscopic examination of conjunctival exudate or scrapings
   e. positive viral culture
   f. diagnostic single antibody titer (IgM) or 4-fold increase in paired sera (IgG) for pathogen.

Reporting instructions

- Report other infections of the eye as EYE.
- Do not report chemical conjunctivitis caused by silver nitrate ($AgNO_3$) as a healthcare–associated infection.
- Do not report conjunctivitis that occurs as a part of a more widely disseminated viral illness (such as measles, chickenpox, or a URI).

EAR-Ear, mastoid infection

Ear and mastoid infections must meet at least *1* of the following criteria:

Otitis externa must meet at least *1* of the following criteria:
1. Patient has pathogens cultured from purulent drainage from ear canal.
2. Patient has at least *1* of the following signs or symptoms: fever (>38°C), pain*, redness*, or drainage from ear canal*
   and
   organisms seen on Gram's stain of purulent drainage.
   * With no other recognized cause

Otitis media must meet at least *1* of the following criteria:
1. Patient has organisms cultured from fluid from middle ear obtained by tympanocentesis or at invasive procedure.
2. Patient has at least *2* of the following signs or symptoms: fever (>38°C), pain in the eardrum*, inflammation*, retraction* or decreased mobility of eardrum*, or fluid behind eardrum*.
   * With no other recognized cause

Otitis interna must meet at least *1* of the following criteria:
1. Patient has organisms cultured from fluid from inner ear obtained at invasive procedure.
2. Patient has a physician diagnosis of inner ear infection.

Mastoiditis must meet at least *1* of the following criteria:
1. Patient has organisms cultured from purulent drainage from mastoid.
2. Patient has at least *2* of the following signs or symptoms: fever (>38°C), pain*, tenderness*, erythema*, headache*, or facial paralysis*
   and
   at least *1* of the following:
   a. organisms seen on Gram's stain of purulent material from mastoid
   b. positive laboratory test on blood.
   * With no other recognized cause

EYE-Eye infection, other than conjunctivitis

An infection of the eye, other than conjunctivitis, must meet at least *1* of the following criteria:

1. Patient has organisms cultured from anterior or posterior chamber or vitreous fluid.
2. Patient has at least *2* of the following signs or symptoms with no other recognized cause: eye pain, visual disturbance, or hypopyon
   and
   at least *1* of the following:
   a. physician diagnosis of an eye infection
   b. positive laboratory test on blood (e.g., antigen tests for *H influenzae* or *S pneumoniae*)
   c. organisms cultured from blood.

ORAL-Oral cavity infection (mouth, tongue, or gums)

Oral cavity infections must meet at least *1* of the following criteria:

1. Patient has organisms cultured from purulent material from tissues of oral cavity.
2. Patient has an abscess or other evidence of oral cavity infection seen on direct examination, during an invasive procedure, or during a histopathologic examination.
3. Patient has at least *1* of the following signs or symptoms with no other recognized cause: abscess, ulceration, or raised white patches on inflamed mucosa, or plaques on oral mucosa
   and
   at least *1* of the following:
   a. positive laboratory test of mucosal scrapings, oral secretions, or blood (e.g., Gram's stain, KOH stain, mucosal scrapings with multinucleated giant cells, antigen test on oral secretions, antibody titers)
   b. physician diagnosis of infection and treatment with appropriate antifungal therapy.

Reporting instruction

- Report healthcare–associated primary herpes simplex infections of the oral cavity as ORAL; recurrent herpes infections are not healthcare associated.

SINU-Sinusitis

Sinusitis must meet at least *1* of the following criteria:

1. Patient has organisms cultured from purulent material obtained from sinus cavity.
2. Patient has at least *1* of the following signs or symptoms: fever (>38°C), pain or tenderness over the involved sinus*, headache*, purulent exudate*, or nasal obstruction*
   and
   at least *1* of the following:
   a. positive transillumination
   b. positive imaging test

   * With no other recognized cause

UR-Upper respiratory tract infection, pharyngitis, laryngitis, epiglottitis

Upper respiratory tract infections must meet at least *1* of the following criteria:

1. Patient has at least *2* of the following signs or symptoms: fever (>38°C), erythema of pharynx*, sore throat*, cough*, hoarseness*, or purulent exudate in throat*
   and
   at least *1* of the following:
   a. organisms cultured from the specific site
   b. organisms cultured from blood
   c. positive laboratory test on blood or respiratory secretions
   d. diagnostic single antibody titer (IgM) or 4-fold increase in paired sera (IgG) for pathogen
   e. physician diagnosis of an upper respiratory infection.

* With no other recognized cause

2. Patient has an abscess seen on direct examination, during an invasive procedure, or during a histopathologic examination.
3. Patient ≤1 year of age has at least *2* of the following signs or symptoms: fever (>38°C core), hypothermia (<37°C core), apnea*, bradycardia*, nasal discharge*, or purulent exudate in throat*
   and
   at least *1* of the following:
   a. organisms cultured from the specific site
   b. organisms cultured from blood
   c. positive laboratory test on blood or respiratory secretions
   d. diagnostic single antibody titer (IgM) or 4-fold increase in paired sera (IgG) for pathogen
   e. physician diagnosis of an upper respiratory infection.

   * With no other recognized cause

GI-GASTROINTESTINAL SYSTEM INFECTION

GE-Gastroenteritis

Gastroenteritis must meet at least *1* of the following criteria:

1. Patient has an acute onset of diarrhea (liquid stools for more than 12 hours) with or without vomiting or fever (>38°C) and no likely noninfectious cause (e.g., diagnostic tests, therapeutic regimen other than antimicrobial agents, acute exacerbation of a chronic condition, or psychological stress). **NOTE:** GE criterion 1 is the only criterion that can be used for *C. difficile* associated gastroenteritis since GE 2 does not include diarrhea as a symptom. See **Reporting Instructions** below for additional information.
2. Patient has at least *2* of the following signs or symptoms in the absence of diarrhea: nausea*, vomiting*, abdominal pain*, fever (>38°C), or headache*
   and
   at least *1* of the following:
   a. an enteric pathogen is cultured from stool or rectal swab
   b. an enteric pathogen is detected by routine or electron microscopy
   c. an enteric pathogen is detected by antigen or antibody assay on blood or feces
   d. evidence of an enteric pathogen is detected by cytopathic changes in tissue culture (toxin assay)
   e. diagnostic single antibody titer (IgM) or 4-fold increase in paired sera (IgG) for pathogen.

* With no other recognized cause

Reporting Instructions:

- HAI cases of CDI (i.e., *C. difficile* pathogen identified with a positive toxin result, including toxin producing gene [PCR]) that meet criteria for a healthcare-associated infection should be reported as gastroenteritis (GI-GE criterion 1) or gastrointestinal tract (GI-GIT) infections, whichever is appropriate. Report the pathogen as *C. difficile*. If the patient develops both GI-GE and GI-GIT CDI, report only GI-GIT using the date of Event as that of GI-GE CDI.
- If using GI-GE criterion #1 to meet *C. difficile* associated gastroenteritis; in addition to having liquid stools, patient must have a *C. difficile* pathogen identified with a positive toxin result, including toxin producing gene [PCR] that was tested on a loose/liquid stool specimen (specimen

must conform to the shape of the specimen container). See MDRO and CDI protocol (Chapter 12) for additional reporting information.

- If GE criterion #1 is met on day 1 or day 2 of admission, indicating a present on admission gastroenteritis, but a *C. difficile* toxin test was not sent on day 1 or day 2, and patient continues to have **unresolved diarrhea**, a subsequent CDI toxin positive test result on a liquid stool specimen is not considered a new infection with *C. difficile.*
- CDI LabID Event categorizations (e.g., recurrent CDI assay, incident CDI assay, healthcare facility-onset, community-onset, community-onset healthcare facility-associated) do not apply to HAIs, including *C. difficile* associated gastroenteritis. Therefore, a new HAI must be considered if a patients' diarrhea resolves and then reoccurs, and the patient has a new CDI-positive laboratory assay. This includes new episodes during the same admission.

GIT-Gastrointestinal tract infection (esophagus, stomach, small and large bowel, and rectum) excluding gastroenteritis and appendicitis

Gastrointestinal tract infections, excluding gastroenteritis and appendicitis, must meet at least *1* of the following criteria:

1. Patient has an abscess or other evidence of infection seen during an invasive procedure or histopathologic examination.
2. Patient has at least *2* of the following signs or symptoms compatible with infection of the organ or tissue involved: fever (>38°C), nausea*, vomiting*, abdominal pain*or tenderness*, or diarrhea*
   and
   at least *1* of the following:
   a. organisms cultured from drainage or tissue obtained during an invasive procedure or endoscopy or from an aseptically-placed drain
   b. organisms seen on Gram's or KOH stain or multinucleated giant cells seen on microscopic examination of drainage or tissue obtained during an invasive procedure or endoscopy or from an aseptically-placed drain
   c. organisms cultured from blood
   d. evidence of pathologic findings on imaging test
   e. evidence of pathologic findings on endoscopic examination (e.g., *Candida esophagitis, proctitis, or toxic megacolon*).

*With no other recognized cause

Reporting Instructions:

- HAI cases of CDI (i.e., *C. difficile* pathogen identified with a positive toxin result, including toxin producing gene [PCR]) that meet criteria for a healthcare-associated infection should be reported as gastroenteritis (GI-GE criterion 1) or gastrointestinal tract (GI-GIT) infections, whichever is appropriate. Report the pathogen as *C. difficile*. If the patient develops both GI-GE and GI-GIT CDI, report only GI-GIT using the date of Event as that of GI-GE CDI.

HEP-Hepatitis

Hepatitis must meet the following criterion:

Patient has at least *2* of the following signs or symptoms: fever (>38°C), anorexia*, nausea*, vomiting*, abdominal pain*, jaundice*, or history of transfusion within the previous 3 months
and
at least *1* of the following:

a. positive laboratory test for acute hepatitis A, hepatitis B, hepatitis C, or delta hepatitis and duration of hospital stay consistent with healthcare acquisition
b. abnormal liver function tests (e.g., elevated ALT/AST, bilirubin)
c. cytomegalovirus (CMV) detected in urine or oropharyngeal secretions.

* With no other recognized cause

Reporting instructions

- Do not report hepatitis or jaundice of noninfectious origin (alpha-1 antitrypsin deficiency, etc.).
- Do not report hepatitis or jaundice that result from exposure to hepatotoxins (alcoholic or acetaminophen- induced hepatitis, etc.).
- Do not report hepatitis or jaundice that result from biliary obstruction (cholecystitis).

IAB-Intraabdominal infection, not specified elsewhere including gallbladder, bile ducts, liver (excluding viral hepatitis), spleen, pancreas, peritoneum, subphrenic or subdiaphragmatic space, or other intraabdominal tissue or area not specified elsewhere

Intraabdominal infections must meet at least *1* of the following criteria:

1. Patient has organisms cultured from abscess and/or purulent material from intraabdominal space obtained during an invasive procedure.
2. Patient has abscess or other evidence of intraabdominal infection seen during an invasive procedure or histopathologic examination.
3. Patient has at least *2* of the following signs or symptoms: fever (>38°C), nausea*, vomiting*, abdominal pain*, or jaundice*
   and
   at least *1* of the following:
   a. organisms cultured from drainage from an aseptically-placed drain (e.g., closed suction drainage system, open drain, T-tube drain, CT guided drainage)
   b. organisms seen on Gram's stain of drainage or tissue obtained during invasive procedure or from an aseptically-placed drain
   c. organisms cultured from blood and imaging test evidence of infection (e.g., abnormal findings on ultrasound, CT scan, MRI, or radiolabel scans [gallium, technetium, etc.] or on abdominal x-ray).

   * With no other recognized cause

Reporting instruction

- Do not report pancreatitis (an inflammatory syndrome characterized by abdominal pain, nausea, and vomiting associated with high serum levels of pancreatic enzymes) unless it is determined to be infectious in origin.

NEC-Necrotizing enterocolitis

Necrotizing enterocolitis in infants **(**≤1 year of age) must meet the following criterion:

1. Infant has at least 1 of the clinical and 1 of the imaging test findings from the lists below:
   At least 1 clinical sign:
   a. Bilious aspirate*
   b. Vomiting
   c. Abdominal distention
   d. Occult or gross blood in stools (with no rectal fissure)
   and
   at least 1 imaging test finding:
   a. Pneumatosis intestinalis
   b. Portal venous gas (Hepatobiliary gas)
   c. Pneumoperitoneum
   * Bilious aspirate as a result of a transpyloric placement of a nasogastric tube should be excluded
2. Surgical NEC: Infant has at least 1 of the following surgical findings:
   a. Surgical evidence of extensive bowel necrosis (>2 cm of bowel affected)
   b. Surgical evidence of pneumatosis intestinalis with or without intestinal perforation

LRI-LOWER RESPIRATORY TRACT INFECTION, OTHER THAN PNEUMONIA

BRON-Bronchitis, tracheobronchitis, bronchiolitis, tracheitis, without evidence of pneumonia

Tracheobronchial infections must meet at least *1* of the following criteria:

1. Patient has no clinical or imaging test evidence of pneumonia
   and
   patient has at least *2* of the following signs or symptoms: fever (>38°C), cough*, new or increased sputum production*, rhonchi*, wheezing*
   and
   at least *1* of the following:
   a. positive culture obtained by deep tracheal aspirate or bronchoscopy
   b. positive laboratory test on respiratory secretions.
   * With no other recognized cause
2. Patient ≤1 year of age has no clinical or imaging test evidence of pneumonia
   and
   patient has at least *2* of the following signs or symptoms: fever (>38°C core), cough*, new or increased sputum production*, rhonchi*, wheezing*, respiratory distress*, apnea*, or bradycardia*
   and
   at least *1* of the following:
   a. organisms cultured from material obtained by deep tracheal aspirate or bronchoscopy
   b. positive laboratory test on respiratory secretions
   c. diagnostic single antibody titer (IgM) or 4-fold increase in paired sera (IgG) for pathogen.
   * With no other recognized cause

Reporting instruction

- Do not report chronic bronchitis in a patient with chronic lung disease as an infection unless there is evidence of an acute secondary infection, manifested by change in organism.

LUNG-Other infection of the lower respiratory tract

Other infections of the lower respiratory tract must meet at least *1* of the following criteria:

1. Patient has organisms seen on smear or cultured from lung tissue or fluid, including pleural fluid.
2. Patient has a lung abscess or empyema seen during an invasive procedure or histopathologic examination.
3. Patient has an abscess cavity seen on radiographic examination of lung.

Reporting instructions

- Report concurrent lower respiratory tract infection and pneumonia with the same organism(s) as PNEU.
- Report lung abscess or empyema without pneumonia as LUNG.

PNEU-Pneumonia

There are 3 specific types of pneumonia: clinically-defined pneumonia (PNU1), pneumonia with specific laboratory findings (PNU2), and pneumonia in immunocompromised patients (PNU3). Listed below are general comments applicable to all specific types of pneumonia, along with abbreviations used in the algorithms and reporting instructions.

Table 11 shows threshold values for cultured specimens used in the surveillance diagnosis of pneumonia.

General comments

1. Physician diagnosis of pneumonia alone is not an acceptable criterion for healthcare-associated pneumonia.
2. Although specific criteria are included for infants and children, pediatric patients may meet any of the other pneumonia specific site criteria.
3. When assessing a patient for presence of pneumonia, it is important to distinguish between changes in clinical status due to other conditions such as myocardial infarction, pulmonary embolism, respiratory distress syndrome, atelectasis, malignancy, chronic obstructive pulmonary disease, hyaline membrane disease, bronchopulmonary dysplasia, etc. Also, care must be taken when assessing intubated patients to distinguish between tracheal colonization, upper respiratory tract infections (e.g., tracheobronchitis), and early onset pneumonia. Finally, it should be recognized that it may be difficult to determine healthcare-associated pneumonia in the elderly, infants, and immunocompromised patients since such conditions may mask typical signs or symptoms associated with pneumonia. Alternate specific criteria for the elderly, infants, and immunocompromised patients have been included in this definition of healthcare-associated pneumonia.
4. Healthcare–associated pneumonia can be characterized by its onset: early or late. Early-onset pneumonia occurs during the first 4 days of hospitalization and is often caused by *Moraxella catarrhalis*, *H influenzae*, and *S pneumoniae*. Causative agents of late-onset pneumonia are frequently Gram-negative bacilli or *S aureus*, including methicillin-resistant *S aureus*. Viruses (e.g., influenza A and B or respiratory syncytial virus) can cause early- and late-onset nosocomial pneumonia, whereas yeasts, fungi, legionellae, and *Pneumocystis carinii* are usually pathogens of late-onset pneumonia.
5. Pneumonia due to gross aspiration (for example, in the setting of intubation in the emergency room or operating room) is considered healthcare associated if it meets any specific criteria and the infection itself was not clearly present at the time of admission to the hospital.
6. Multiple episodes of healthcare-associated pneumonia may occur in critically ill patients with lengthy hospital stays. When determining whether to report multiple episodes of healthcare–associated pneumonia in a single patient, look for evidence of resolution of the initial infection. See Note following HAI definition in Chapter 2. The addition of or change in pathogen alone is not indicative of a new episode of pneumonia.
7. Positive Gram's stain for bacteria and positive KOH (potassium hydroxide) mount for elastin fibers and/or fungal hyphae from appropriately collected sputum specimens are important clues that point toward the etiology of the infection. However, sputum samples are frequently contaminated with airway colonizers and therefore must be interpreted cautiously. In particular, *Candida* is commonly seen on strain, but infrequently causes healthcare-associated pneumonia, especially in immunocompetent patients.

Abbreviations

BAL–bronchoalveolar lavage
EIA–enzyme immunoassay
FAMA–fluorescent-antibody staining of membrane antigen
IFA–immunofluorescent antibody
LRT–lower respiratory tract
PCR–polymerase chain reaction
PMN–polymorphonuclear leukocyte
RIA–radioimmunoassay

Reporting instructions

- There is a hierarchy of specific categories within the major type pneumonia (PNEU). Even if a patient meets criteria for more than 1 specific site, report only 1:
    - If a patient meets criteria for both PNU1 and PNU2, report PNU2.
    - If a patient meets criteria for both PNU2 and PNU3, report PNU3.
    - If a patient meets criteria for both PNU1 and PNU3, report PNU3.
- Report concurrent lower respiratory tract infection (e.g., abscess or empyema) and pneumonia with the same organism(s) as PNEU.
- Lung abscess or empyema without pneumonia is classified as LUNG.
- Bronchitis, tracheitis, tracheobronchitis, or bronchiolitis without pneumonia are classified as BRON.

Table 4. Specific Site Algorithms for Clinically-Defined Pneumonia (PNU1)

<table>
<tr><th>Radiology</th><th>Signs/Symptoms/Laboratory</th></tr>
<tr><td rowspan="3">Two or more serial chest radiographs with at least <u>one</u> of the following[1,2]:

• New or progressive <u>and</u> persistent infiltrate

• Consolidation

• Cavitation

• Pneumatoceles, in infants ≤1 year old

NOTE: In patients without underlying pulmonary or cardiac disease (e.g., respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary edema, or chronic obstructive pulmonary disease), <u>one</u> <u>definitive</u> chest radiograph is acceptable.[1]</td><td>FOR ANY PATIENT, at least <u>one</u> of the following:

• Fever (>38°C or >100.4°F)
• Leukopenia (<4000 WBC/mm^3) or leukocytosis (≥12,000 WBC/mm^3)
• For adults ≥70 years old, altered mental status with no other recognized cause
and
at least <u>two</u> of the following:
• New onset of purulent sputum[3], or change in character of sputum[4], or increased respiratory secretions, or increased suctioning requirements
• New onset or worsening cough, or dyspnea, or tachypnea[5]
• Rales[6] or bronchial breath sounds
• Worsening gas exchange (e.g., O_2 desaturations (e.g., PaO_2/FiO_2 ≤240)[7], increased oxygen requirements, or increased ventilator demand)</td></tr>
<tr><td>ALTERNATE CRITERIA, for infants ≤1 year old:

Worsening gas exchange (e.g., O_2 desaturations [e.g., pulse oximetry <94%], increased oxygen requirements, or increased ventilator demand)
and
at least <u>three</u> of the following:
• Temperature instability
• Leukopenia (<4000 WBC/mm^3) <u>or</u> leukocytosis (≥15,000 WBC/mm^3) and left shift (≥10% band forms)
• New onset of purulent sputum[3] or change in character of sputum[4], or increased respiratory secretions or increased suctioning requirements
• Apnea, tachypnea[5], nasal flaring with retraction of chest wall or grunting
• Wheezing, rales[6], or rhonchi
• Cough
• Bradycardia (<100 beats/min) or tachycardia (>170 beats/min)</td></tr>
<tr><td>ALTERNATE CRITERIA, for child >1 year old or ≤12 years old, at least <u>three</u> of the following:

• Fever (>38.4°C or >101.1°F) or hypothermia (<36.5°C or <97.7°F)
• Leukopenia (<4000 WBC/mm^3) or leukocytosis (≥15,000 WBC/mm^3)
• New onset of purulent sputum[3], or change in character of sputum[4], or increased respiratory secretions, or increased suctioning requirements
• New onset or worsening cough, or dyspnea, apnea, or tachypnea[5].
• Rales[6] or bronchial breath sounds
• Worsening gas exchange (e.g., O_2 desaturations [e.g., pulse oximetry <94%], increased oxygen requirements, or increased ventilator demand)</td></tr>
</table>

Table 5. Specific Site Algorithms for Pneumonia with Common Bacterial or Filamentous Fungal Pathogens and Specific Laboratory Findings (PNU2)

Radiology	Signs/Symptoms	Laboratory
Two or more serial chest radiographs with at least **one** of the following[1,2]: • New or progressive and persistent infiltrate • Consolidation • Cavitation • Pneumatoceles, in infants ≤1 year old NOTE: In patients **without** underlying pulmonary or cardiac disease (e.g., respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary edema, or chronic obstructive pulmonary disease), one definitive chest radiograph is acceptable.[1]	At least **one** of the following: • Fever (>38°C or >100.4°F) • Leukopenia (<4000 WBC/mm^3) or leukocytosis (≥12,000 WBC/mm^3) • For adults ≥70 years old, altered mental status with no other recognized cause *and* at least **one** of the following: • New onset of purulent sputum[3], or change in character of sputum[4], or increased respiratory secretions, or increased suctioning requirements • New onset or worsening cough, or dyspnea or tachypnea[5] • Rales[6] or bronchial breath sounds • Worsening gas exchange (e.g., O_2 desaturations [e.g., PaO_2/FiO_2 ≤240][7], increased oxygen requirements, or increased ventilator demand)	At least **one** of the following: • Positive growth in blood culture[8] not related to another source of infection • Positive growth in culture of pleural fluid • Positive quantitative culture[9] from minimally contaminated LRT specimen (e.g., BAL or protected specimen brushing) • ≥5% BAL-obtained cells contain intracellular bacteria on direct microscopic exam (e.g., Gram's stain) • Histopathologic exam shows at least **one** of the following evidences of pneumonia: o Abscess formation or foci of consolidation with intense PMN accumulation in bronchioles and alveoli o Positive quantitative culture[9] of lung parenchyma o Evidence of lung parenchyma invasion by fungal hyphae or pseudohyphae

Table 6. Specific Site Algorithms for Viral, Legionella, and other Bacterial Pneumonias with Definitive Laboratory Findings (PNU2)

Radiology	Signs/Symptoms	Laboratory
Two or more serial chest radiographs with at least **one** of the following[1,2]: • New or progressive and persistent infiltrate • Consolidation • Cavitation • Pneumatoceles, in infants ≤1 year old NOTE: In patients **without** underlying pulmonary or cardiac disease (e.g., respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary edema, or chronic obstructive pulmonary disease), one definitive chest radiograph is acceptable.[1]	At least **one** of the following: • Fever (>38°C or >100.4°F) • Leukopenia (<4000 WBC/mm^3) or leukocytosis (≥12,000 WBC/mm^3) • For adults ≥70 years old, altered mental status with no other recognized cause *and* at least one of the following: • New onset of purulent sputum[3], or change in character of sputum[4], or increased respiratory secretions, or increased suctioning requirements • New onset or worsening cough or dyspnea, or tachypnea[5] • Rales[6] or bronchial breath sounds • Worsening gas exchange (e.g., O_2 desaturations [e.g., PaO_2/FiO_2 ≤240][7], increased oxygen requirements, or increased ventilator demand)	At least **one** of the following[10-12]: • Positive culture of virus or *Chlamydia* from respiratory secretions • Positive detection of viral antigen or antibody from respiratory secretions (e.g., EIA, FAMA, shell vial assay, PCR) • Fourfold rise in paired sera (IgG) for pathogen (e.g., influenza viruses, *Chlamydia*) • Positive PCR for *Chlamydia* or *Mycoplasma* • Positive micro-IF test for *Chlamydia* • Positive culture or visualization by micro-IF of *Legionella* spp, from respiratory secretions or tissue. • Detection of *Legionella pneumophila* serogroup 1 antigens in urine by RIA or EIA • Fourfold rise in *L. pneumo*phila serogroup 1 antibody titer to ≥1:128 in paired acute and convalescent sera by indirect IFA.

Table 7. Specific Site Algorithm for Pneumonia in Immunocompromised Patients (PNU3)

Radiology	Signs/Symptoms	Laboratory
Two or more serial chest radiographs with at least **one** of the following[1,2]: • New or progressive and persistent infiltrate • Consolidation • Cavitation • Pneumatoceles, in infants ≤1 year old NOTE: In patients **without** underlying pulmonary or cardiac disease (e.g., respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary edema, or chronic obstructive pulmonary disease), one definitive chest radiograph is acceptable.[1]	Patient who is immunocompromised[13] has at least **one** of the following: • Fever (>38°C or >100.4°F) • For adults ≥70 years old, altered mental status with no other recognized cause • New onset of purulent sputum[3], or change in character of sputum[4], or increased respiratory secretions, or increased suctioning requirements • New onset or worsening cough, or dyspnea, or tachypnea[5] • Rales[6] or bronchial breath sounds • Worsening gas exchange (e.g., O_2 desaturations [e.g., PaO_2/FiO_2 ≤240][7], increased oxygen requirements, or increased ventilator demand) • Hemoptysis • Pleuritic chest pain	At least **one** of the following: • Matching positive blood and sputum cultures with *Candida* spp.[14,15] • Evidence of fungi or *Pneumocystis carinii* from minimally contaminated LRT specimen (e.g., BAL or protected specimen brushing) from one of the following: o Direct microscopic exam o Positive culture of fungi Any of the following from: **LABORATORY CRITERIA DEFINED UNDER PNU2**

Footnotes to Algorithms:

1. Occasionally, in nonventilated patients, the diagnosis of healthcare-associated pneumonia may be quite clear on the basis of symptoms, signs, and a single definitive chest radiograph. However, in patients with pulmonary or cardiac disease (for example, interstitial lung disease or congestive heart failure), the diagnosis of pneumonia may be particularly difficult. Other noninfectious conditions (for example, pulmonary edema from decompensated congestive heart failure) may simulate the presentation of pneumonia. In these more difficult cases, serial chest radiographs must be examined to help separate infectious from noninfectious pulmonary processes. To help confirm difficult cases, it may be useful to review radiographs on the day of diagnosis, 3 days prior to the diagnosis and on days 2 and 7 after the diagnosis. Pneumonia may have rapid onset and progression, but does not resolve quickly. Radiographic changes of pneumonia persist for several weeks. As a result, rapid radiographic resolution suggests that the patient does not have pneumonia but rather a noninfectious process such as atelectasis or congestive heart failure.

2. Note that there are many ways of describing the radiographic appearance of pneumonia. Examples include, but are not limited to, "air-space disease," "focal opacification," "patchy areas of increased density." Although perhaps not specifically delineated as pneumonia by the radiologist, in the appropriate clinical setting these alternative descriptive wordings should be seriously considered as potentially positive findings.
3. Purulent sputum is defined as secretions from the lungs, bronchi, or trachea that contain ≥25 neutrophils and ≤10 squamous epithelial cells per low power field (x100). If your laboratory reports these data qualitatively (e.g., "many WBCs" or "few squames"), be sure their descriptors match this definition of purulent sputum. This laboratory confirmation is required because written clinical descriptions of purulence are highly variable.
4. A single notation of either purulent sputum or change in character of the sputum is not meaningful; repeated notations over a 24-hour period would be more indicative of the onset of an infectious process. Change in character of sputum refers to the color, consistency, odor, and quantity.
5. In adults, tachypnea is defined as respiration rate >25 breaths per minute. Tachypnea is defined as >75 breaths per minute in premature infants born at <37 weeks gestation and until the 40th week; >60 breaths per minute in infants <2 months old; >50 breaths per minute in infants 2 to 12 months old; and >30 breaths per minute in children >1 year old.
6. Rales may be described as "crackles".
7. This measure of arterial oxygenation is defined as the ratio of the arterial tension (PaO_2) to the inspiratory fraction of oxygen (FiO_2).
8. Care must be taken to determine the etiology of pneumonia in a patient with positive blood cultures and radiographic evidence of pneumonia, especially if the patient has invasive devices in place such as intravascular lines or an indwelling urinary catheter. In general, in an immunocompetent patient, blood cultures positive for coagulase-negative staphylococci, common skin contaminants, and yeasts will not be the etiologic agent of the pneumonia.
9. Refer to threshold values for cultured specimens (Table 11). An endotracheal aspirate is not a minimally-contaminated specimen. Therefore, an endotracheal aspirate does not meet the laboratory criteria for PNU2 or PNU3.
10. Once laboratory-confirmed due to pneumonia because of respiratory syncytial virus (RSV), adenovirus, or influenza virus have been identified in a hospital, a clinician's presumptive diagnosis of these pathogens in subsequent cases with similar clinical signs and symptoms is an acceptable criterion for presence of healthcare-associated infection.
11. Scant or watery sputum is commonly seen in adults with pneumonia due to viruses and Mycoplasma although sometimes the sputum may be mucopurulent. In infants, pneumonia due to RSV or influenza yields copious sputum. Patients, except premature infants, with viral or mycoplasmal pneumonia may exhibit few signs or symptoms, even when significant infiltrates are present on radiographic exam.
12. Few bacteria may be seen on stains of respiratory secretions from patients with pneumonia due to Legionella spp, mycoplasma, or viruses.
13. Immunocompromised patients include those with neutropenia (absolute neutrophil count <500/mm^3), leukemia, lymphoma, HIV with CD4 count <200, or splenectomy; those who are early posttransplantation, are on cytotoxic chemotherapy, or are on high-dose steroids (e.g., >40mg of prednisone or its equivalent [>160mg hydrocortisone, >32mg methylprednisolone, >6mg dexamethasone, >200mg cortisone] daily for >2 weeks).
14. Blood and sputum specimens must be collected within 48 hours of each other.
15. Semiquantitative or nonquantitative cultures of sputum obtained by deep cough, induction, aspiration, or lavage are acceptable. If quantitative culture results are available, refer to algorithms that include such specific laboratory findings.

Table 8. Threshold values for cultured specimens used in the pneumonia criteria

Specimen collection/technique	Values
Lung parenchyma*	$\geq 10^4$ CFU/g tissue
Bronchoscopically (B) obtained specimens	
Bronchoalveolar lavage (B-BAL)	$\geq 10^4$ CFU/ml
Protected BAL (B-PBAL)	$\geq 10^4$ CFU/ml
Protected specimen brushing (B-PSB)	$\geq 10^3$ CFU/ml
Nonbronchoscopically (NB) obtained (blind) specimens	
NB-BAL	$>10^4$ CFU/ml
NB-PSB	$\geq 10^3$ CFU/ml

CFU = colony forming units
g = gram
ml = milliliter
* Open-lung biopsy specimens and immediate post-mortem specimens obtained by transthoracic or transbronchial biopsy

REPR-REPRODUCTIVE TRACT INFECTION

EMET-Endometritis

Endometritis must meet at least *1* of the following criteria:

1. Patient has organisms cultured from fluid (including amniotic fluid) or tissue from endometrium obtained during an invasive procedure or biopsy.
2. Patient has at least *2* of the following signs or symptoms: fever (>38°C), abdominal pain*, uterine tenderness*, or purulent drainage from uterus*.
   * With no other recognized cause

Reporting instruction

- Report postpartum endometritis as a healthcare-associated infection unless the amniotic fluid is infected at the time of admission or the patient was admitted more than 2 days after rupture of the membrane. (Day 1 = rupture day)

EPIS-Episiotomy infection

Episiotomy infections must meet at least *1* of the following criteria:

1. Postvaginal delivery patient has purulent drainage from the episiotomy.
2. Postvaginal delivery patient has an episiotomy abscess.

Comment

- Episiotomy is not considered an operative procedure in NHSN.

OREP-Other infection of the male or female reproductive tract (epididymis, testes, prostate, vagina, ovaries, uterus, or other deep pelvic tissues, excluding endometritis or vaginal cuff infections)

Other infections of the male or female reproductive tract must meet at least *1* of the following criteria:

1. Patient has organisms cultured from tissue or fluid from affected site.
2. Patient has an abscess or other evidence of infection of affected site seen during an invasive procedure or histopathologic examination.
3. Patient has *2* of the following signs or symptoms: fever (>38°C), nausea*, vomiting*, pain*, tenderness*, or dysuria*
   and
   at least *1* of the following:
   a. organisms cultured from blood
   b. physician diagnosis.
   * With no other recognized cause

Reporting instructions

- Report endometritis as EMET.
- Report vaginal cuff infections as VCUF.

VCUF-Vaginal cuff infection

Vaginal cuff infections must meet at least *1* of the following criteria:

1. Posthysterectomy patient has purulent drainage from the vaginal cuff.
2. Posthysterectomy patient has an abscess at the vaginal cuff.
3. Posthysterectomy patient has pathogens cultured from fluid or tissue obtained from the vaginal cuff.

Reporting instruction

- Report vaginal cuff infections as SSI-VCUF.

SSI-SURGICAL SITE INFECTION

DIP/DIS-Deep incisional surgical site infection

Deep incisional SSI must meet the following criterion:
Infection occurs within 30 or 90 days after the NHSN operative procedure (where day 1 = the procedure date) according to the list in Table 12
and
involves deep soft tissues of the incision (e.g., fascial and muscle layers)
and
patient has at least one of the following:

a. purulent drainage from the deep incision
b. a deep incision that spontaneously dehisces or is deliberately opened by a surgeon, attending physician** or other designee and is culture-positive or not cultured
   and
   patient has at least one of the following signs or symptoms: fever (>38°C); localized pain or tenderness. A culture-negative finding does not meet this criterion.
c. an abscess or other evidence of infection involving the deep incision that is detected on direct examination, during invasive procedure, or by histopathologic examination or imaging test.

** The term attending physician for the purposes of application of the NHSN SSI criteria may be interpreted to mean the surgeon(s), infectious disease, other physician on the case, emergency physician or physician's designee (nurse practitioner or physician's assistant).

Comments
There are two specific types of deep incisional SSIs:

1. Deep Incisional Primary (DIP) – a deep incisional SSI that is identified in a primary incision in a patient that has had an operation with one or more incisions (e.g., C-section incision or chest incision for CBGB)
2. Deep Incisional Secondary (DIS) – a deep incisional SSI that is identified in the secondary incision in a patient that has had an operation with more than one incision (e.g., donor site [leg] incision for CBGB)

Reporting instructions

- The type of SSI (superficial incisional, deep incisional, or organ/space) reported should reflect the deepest tissue layer involved in the infection:
  - Report infection that involves the organ/space as an organ/space SSI, whether or not it also involves the superficial or deep incision sites.
  - Report infection that involves the superficial and deep incisional sites as a deep incisional SSI.

Organ/space surgical site infection

Organ/Space SSI must meet the following criterion:

Infection occurs within 30 or 90 days after the NHSN operative procedure (where day 1 = the procedure date) according to the list in Table 9
and
infection involves any part of the body, excluding the skin incision, fascia, or muscle layers, that is opened or manipulated during the operative procedure
and
patient has at least 1 of the following:

a. purulent drainage from a drain that is placed into the organ/space
b. organisms isolated from an aseptically-obtained culture of fluid or tissue in the organ/space
c. an abscess or other evidence of infection involving the organ/space that is detected on direct examination, during invasive procedure, or by histopathologic examination or imaging test

and
meets at least one criterion for a specific organ/space infection site listed in Table10.

Comments
Because an organ/space SSI involves any part of the body, excluding the skin incision, fascia, or muscle layers, that is opened or manipulated during the operative procedure, the criterion for infection at these body sites must be met in addition to the organ/space SSI criteria. For example, an appendectomy with subsequent subdiaphragmatic abscess would be reported as an organ/space SSI at the intraabdominal specific site (SSI-IAB) when both organ/space SSI and IAB criteria are met. Table 11 lists the specific sites that must be used to differentiate organ/space SSI.

Reporting instructions

- If a patient has an infection in the organ/space being operated on, subsequent continuation of this infection type during the remainder of the surveillance period is considered an organ/space SSI, if organ/space SSI and site-specific infection criteria are met.
- Report mediastinitis following cardiac surgery that is accompanied by osteomyelitis as SSI-MED rather than SSI-BONE.
- If meningitis (MEN) and a brain abscess (IC) are present together after operation, report as SSI-IC. Similarly, if meningitis and spinal abscess (SA) are present together after an operation, report as SSI-SA.
- Report CSF shunt infection as SSI-MEN if it occurs within 90 days of placement; if later or after manipulation/access, it is considered CNS-MEN and is not reportable under this module.
- The term attending physician for the purposes of application of the NHSN SSI criteria may be interpreted to mean the surgeon(s), infectious disease, other physician on the case, emergency physician or physician's designee (nurse practitioner or physician's assistant).

SIP/SIS-Superficial incisional surgical site infection

Superficial incisional SSI must meet the following criterion:

Infection occurs within 30 days after any NHSN operative procedure (where day 1 = the procedure date), including those coded as 'OTH'*****
a*nd*
involves only skin and subcutaneous tissue of the incision
and
patient has at least 1 of the following:

a. purulent drainage from the superficial incision
b. organisms isolated from an aseptically-obtained culture of fluid or tissue from the superficial incision
c. superficial incision that is deliberately opened by a surgeon, attending physician** or other designee and is culture-positive or not cultured
   and
   patient has at least one of the following signs or symptoms of infection: pain or tenderness; localized swelling; redness; or heat. A culture negative finding does not meet this criterion
d. diagnosis of superficial incisional SSI by the surgeon or attending physician** or other designee (see reporting instructions).

*****http://www.cdc.gov/nhsn/XLS/ICD-9-cmCODEScurrent.xlsx

** The term attending physician for the purposes of application of the NHSN SSI criteria may be interpreted to mean the surgeon(s), infectious disease, other physician on the case, emergency physician or physician's designee (nurse practitioner or physician's assistant).

Comments

There are two specific types of superficial incisional SSIs:

1. Superficial Incisional Primary (SIP) – a superficial incisional SSI that is identified in the primary incision in a patient that has had an operation with one or more incisions (e.g., C-section incision or chest incision for CBGB)
2. Superficial Incisional Secondary (SIS) – a superficial incisional SSI that is identified in the secondary incision in a patient that has had an operation with more than one incision (e.g., donor site [leg] incision for CBGB)

Reporting instructions

- The following do not qualify as criteria for meeting the NHSN definition of superficial SSI:
  - A stitch abscess alone (minimal inflammation and discharge confined to the points of suture penetration)
  - A localized stab wound or pin site infection. While it would be considered either a skin (SKIN) or soft tissue (ST) infection, depending on its depth, it is not reportable under this module.
  - Diagnosis of "cellulitis", by itself, does not meet criterion d for superficial incisional SSI.
  - Circumcision is not an NHSN operative procedure. An infected circumcision site in newborns is classified as CIRC and is not reportable under this module.
  - An infected burn wound is classified as BURN and is not reportable under this module.

- Report infection that involves the organ/space as an organ/space SSI, whether or not it also involves the superficial or deep incision sites.
- Report infection that involves the superficial and deep incisional sites as a deep incisional SSI.
- The term attending physician for the purposes of application of the NHSN SSI criteria may be interpreted to mean the surgeon(s), infectious disease, other physician on the case, emergency physician or physician's designee (nurse practitioner or physician's assistant).

Table 12. Surveillance Period for Deep Incisional or Organ/Space SSI Following Selected NHSN Operative Procedure Categories. Day 1 = the date of the procedure

30-day Surveillance			
Code	**Operative Procedure**	**Code**	**Operative Procedure**
AAA	Abdominal aortic aneurysm repair	LAM	Laminectomy
AMP	Limb amputation	LTP	Liver transplant
APPY	Appendix surgery	NECK	Neck surgery
AVSD	Shunt for dialysis	NEPH	Kidney surgery
BILI	Bile duct, liver or pancreatic surgery	OVRY	Ovarian surgery
CEA	Carotid endarterectomy	PRST	Prostate surgery
CHOL	Gallbladder surgery	REC	Rectal surgery
COLO	Colon surgery	SB	Small bowel surgery
CSEC	Cesarean section	SPLE	Spleen surgery
GAST	Gastric surgery	THOR	Thoracic surgery
HTP	Heart transplant	THYR	Thyroid and/or parathyroid surgery
HYST	Abdominal hysterectomy	VHYS	Vaginal hysterectomy
KTP	Kidney transplant	XLAP	Exploratory laparotomy
		OTH	Other operative procedures not included in the NHSN categories
90-day Surveillance			
Code	**Operative Procedure**		
BRST	Breast surgery		
CARD	Cardiac surgery		
CBGB	Coronary artery bypass graft with both chest and donor site incisions		
CBGC	Coronary artery bypass graft with chest incision only		
CRAN	Craniotomy		
FUSN	Spinal fusion		
FX	Open reduction of fracture		
HER	Herniorrhaphy		
HPRO	Hip prosthesis		
KPRO	Knee prosthesis		
PACE	Pacemaker surgery		
PVBY	Peripheral vascular bypass surgery		
RFUSN	Refusion of spine		
VSHN	Ventricular shunt		

NOTE: Superficial incisional SSIs are only followed for a 30-day period for all procedure types.

Table 13. Specific Sites of an Organ/Space SSI

Code	Site	Code	Site
BONE	Osteomyelitis	LUNG	Other infections of the respiratory tract
BRST	Breast abscess or mastitis	MED	Mediastinitis
CARD	Myocarditis or pericarditis	MEN	Meningitis or ventriculitis
DISC	Disc space	ORAL	Oral cavity (mouth, tongue, or gums)
EAR	Ear, mastoid	OREP	Other infections of the male or female reproductive tract
EMET	Endometritis	OUTI	Other infections of the urinary tract
ENDO	Endocarditis	PJI	Periprosthetic Joint Infection
EYE	Eye, other than conjunctivitis	SA	Spinal abscess without meningitis
GIT	GI tract	SINU	Sinusitis
HEP	Hepatitis	UR	Upper respiratory tract
IAB	Intraabdominal, not specified	VASC	Arterial or venous infection
IC	Intracranial, brain abscess or dura	VCUF	Vaginal cuff
JNT	Joint or bursa		

SST-SKIN AND SOFT TISSUE INFECTION

BRST-Breast abscess or mastitis

A breast abscess or mastitis must meet at least *1* of the following criteria:

1. Patient has a positive culture of affected breast tissue or fluid obtained by invasive procedure.
2. Patient has a breast abscess or other evidence of infection seen during an invasive procedure or histopathologic examination.
3. Patient has fever (>38°C) and local inflammation of the breast
   and
   physician diagnosis of breast abscess.

BURN-Burn infection

Burn infections must meet at least *1* of the following criteria:

1. Patient has a change in burn wound appearance or character, such as rapid eschar separation, or dark brown, black, or violaceous discoloration of the eschar, or edema at wound margin
   and
   histologic examination of burn biopsy shows invasion of organisms into adjacent viable tissue.
2. Patient has a change in burn wound appearance or character, such as rapid eschar separation, or dark brown, black, or violaceous discoloration of the eschar, or edema at wound margin
   and
   at least *1* of the following:
   a. organisms cultured from blood in the absence of other identifiable infection

   b. isolation of herpes simplex virus, histologic identification of inclusions by light or electron microscopy, or visualization of viral particles by electron microscopy in biopsies or lesion scrapings.

3. Patient with a burn has at least *2* of the following signs or symptoms: fever (>38°C) or hypothermia (<36°C), hypotension*, oliguria* (<20 cc/hr), hyperglycemia at previously tolerated level of dietary carbohydrate*, or mental confusion*
   and
   at least *1* of the following:
   a. histologic examination of burn biopsy shows invasion of organisms into adjacent viable tissue
   b. organisms cultured from blood
   c. isolation of herpes simplex virus, histologic identification of inclusions by light or electron microscopy, or visualization of viral particles by electron microscopy in biopsies or lesion scrapings.

   * With no other recognized cause

Comments

- Purulence alone at the burn wound site is not adequate for the diagnosis of burn infection; such purulence may reflect incomplete wound care.
- Fever alone in a burn patient is *not* adequate for the diagnosis of a burn infection because fever may be the result of tissue trauma or the patient may have an infection at another site.
- Surgeons in Regional Burn Centers who take care of burn patients exclusively may require Criterion 1 for diagnosis of burn infection.
- Hospitals with Regional Burn Centers may further divide burn infections into the following: burn wound site, burn graft site, burn donor site, burn donor site-cadaver; NHSN, however, will code all of these as BURN.

CIRC-Newborn circumcision infection

Circumcision infection in a newborn (≤30 days old) must meet at least *1* of the following criteria:

1. Newborn has purulent drainage from circumcision site.
2. Newborn has at least *1* of the following signs or symptoms with no other recognized cause at circumcision site: erythema, swelling, or tenderness
   and
   pathogen cultured from circumcision site.
3. Newborn has at least 1 of the following signs or symptoms with no other recognized cause at circumcision site: erythema, swelling, or tenderness
   and
   skin contaminant (i.e., diphtheroids [*Corynebacterium* spp], *Bacillus* [not *B anthracis*] spp, *Propionibacterium* spp, coagulase-negative staphylococci [including *S epidermidis*], viridans group streptococci, *Aerococcus* spp, *Micrococcus* spp) is cultured from circumcision site
   and
   physician diagnosis of infection or physician institutes appropriate therapy.

DECU-Decubitus ulcer infection, including both superficial and deep infections

Decubitus ulcer infections must meet the following criterion:

Patient has at least *2* of the following signs or symptoms with no other recognized cause: redness, tenderness, or swelling of decubitus wound edges
and
at least *1* of the following:

a. organisms cultured from properly collected fluid or tissue (see Comments)
b. organisms cultured from blood.

Comments

- Purulent drainage alone is not sufficient evidence of an infection.
- Organisms cultured from the surface of a decubitus ulcer are not sufficient evidence that the ulcer is infected. A properly collected specimen from a decubitus ulcer involves needle aspiration of fluid or biopsy of tissue from the ulcer margin.

PUST-Infant pustulosis

Pustulosis in an infant (≤1 year old) must meet at least *1* of the following criteria:

1. Infant has *1* or more pustules
   and
   physician diagnosis of skin infection.
2. Infant has *1* or more pustules
   and
   physician institutes appropriate antimicrobial therapy.

Reporting instructions

- Do not report erythema toxicum and noninfectious causes of pustulosis.

SKIN-Skin infection

Skin infections must meet at least *1* of the following criteria:

1. Patient has purulent drainage, pustules, vesicles, or boils.
2. Patient has at least *2* of the following signs or symptoms with no other recognized cause: pain or tenderness, localized swelling, redness, or heat
   and
   at least *1* of the following:
   a. organisms cultured from aspirate or drainage from affected site; if organisms are normal skin flora (i.e., diphtheroids [*Corynebacterium* spp], *Bacillus* [not *B anthracis*] spp, *Propionibacterium* spp, coagulase-negative staphylococci [including *S epidermidis*], viridans group streptococci, *Aerococcus* spp, *Micrococcus* spp), they must be a pure culture
   b. organisms cultured from blood
   c. positive laboratory test performed on infected tissue or blood (e.g., antigen tests for herpes simplex, varicella zoster, *H influenzae*, or *N meningitidis*)
   d. multinucleated giant cells seen on microscopic examination of affected tissue
   e. diagnostic single antibody titer (IgM) or 4-fold increase in paired sera (IgG) for pathogen.

Reporting instructions

- Report omphalitis in infants as UMB.
- Report infections of the circumcision site in newborns as CIRC.
- Report pustules in infants as PUST.
- Report infected decubitus ulcers as DECU.
- Report infected burns as BURN.
- Report breast abscesses or mastitis as BRST.
- Even if there are 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.

ST-Soft tissue infection (necrotizing fascitis, infectious gangrene, necrotizing cellulitis, infectious myositis, lymphadenitis, or lymphangitis)

Soft tissue infections must meet at least *1* of the following criteria:

1. Patient has organisms cultured from tissue or drainage from affected site.
2. Patient has purulent drainage at affected site.
3. Patient has an abscess or other evidence of infection seen during an invasive procedure or histopathologic examination.
4. Patient has at least *2* of the following signs or symptoms at the affected site with no other recognized cause: localized pain or tenderness, redness, swelling, or heat
   and
   at least *1* of the following:
   a. organisms cultured from blood
   b. positive laboratory test performed on blood or urine (e.g., antigen tests for *H influenzae*, *S pneumoniae*, *N meningitidis*, Group B *Streptococcus*, or *Candida* spp)
   c. diagnostic single antibody titer (IgM) or 4-fold increase in paired sera (IgG) for pathogen.

Reporting instructions

- Report infected decubitus ulcers as DECU.
- Report infection of deep pelvic tissues as OREP.
- Even if there are 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.

UMB-Oomphalitis

Omphalitis in a newborn (≤30 days old) must meet at least *1* of the following criteria:

1. Patient has erythema and/or serous drainage from umbilicus
   and
   at least *1* of the following:
   a. organisms cultured from drainage or needle aspirate
   b. organisms cultured from blood.
2. Patient has both erythema and purulence at the umbilicus.

Reporting instructions

- Report infection of the umbilical artery or vein related to umbilical catheterization as VASC if there is no accompanying blood culture or a blood culture is negative.

SYS-SYSTEMIC INFECTION

DI-Disseminated infection

Disseminated infection is infection involving multiple organs or systems, without an apparent single site of infection, usually of viral origin, and with signs or symptoms with no other recognized cause and compatible with infectious involvement of multiple organs or systems.

Reporting instructions

- Use this code for viral infections involving multiple organ systems (e.g., measles, mumps, rubella, varicella, erythema infectiosum). These infections often can be identified by clinical criteria alone. Do *not* use this code for healthcare–associated infections with multiple metastatic sites, such as with bacterial endocarditis; only the primary site of these infections should be reported.
- Do not report fever of unknown origin (FUO) as DI.
- Report viral exanthems or rash illness as DI.

UTI-URINARY TRACT INFECTION

Table 14. Urinary Tract Infection Criteria

Criterion	Urinary Tract Infection (UTI)
	Asymptomatic Bacteremic Urinary Tract Infection (ABUTI)
	Patient with***** or without an indwelling urinary catheter has no signs or symptoms (i.e., for any age patient, no fever (>38°C); urgency; frequency; dysuria; suprapubic tenderness; costovertebral angle pain or tenderness OR for a patient ≤1 year of age; no fever (>38°C core); hypothermia (<36°C core); apnea; bradycardia; dysuria; lethargy; or vomiting) *and* a positive urine culture of $\geq 10^5$ CFU/ml with no more than 2 species of uropathogen microorganisms****** (see Comments section below). *and* a positive blood culture with at least 1 matching uropathogen microorganism to the urine culture, or at least 2 matching blood cultures drawn on separate occasions if the matching pathogen is a common skin commensal. Elements of the criterion must occur within a timeframe that does not exceed a gap of 1 calendar day between two adjacent elements. *****Patient had an indwelling urinary catheter in place for >2 calendar days, with day of device placement being Day 1, and catheter was in place on the date of event. ******Uropathogen microorganisms are: Gram-negative bacilli, *Staphylococcus* spp., yeasts, beta-hemolytic *Streptococcus* spp., *Enterococcus* spp., *G. vaginalis*, *Aerococcus urinae*, and *Corynebacterium* (urease positive)[+]. [+]Report *Corynebacterium* (urease positive) as either *Corynebacterium* species unspecified (COS) or as *C. urealyticum* (CORUR) if so speciated. (See complete list of uropathogen microorganisms.)

	Other Urinary Tract Infection (OUTI) (kidney, ureter, bladder, urethra, or tissue surrounding the retroperitoneal or perinephric space) Other infections of the urinary tract must meet at least *1* of the following criteria:
	1. Patient has microorganisms isolated from culture of fluid (other than urine) or tissue from affected site.
	2. Patient has an abscess or other evidence of infection seen on direct examination, during an invasive procedure, or during a histopathologic examination.
	3. Patient has at least 2 of the following signs or symptoms: fever (>38°C), localized pain*, or localized tenderness at the involved site* *and* at least 1 of the following: a. purulent drainage from affected site b. microorganisms cultured from blood that are compatible with suspected site of infection c. imaging test evidence of infection (e.g., abnormal ultrasound, CT scan, magnetic resonance imaging [MRI], or radiolabel scan [gallium, technetium]). * With no other recognized cause
	4. Patient ≤1 year of age has at least 1 of the following signs or symptoms: fever (>38°C core), hypothermia (<36°C core), apnea*, bradycardia*, lethargy*, or vomiting* *and* at least 1 of the following: a. purulent drainage from affected site b. microorganisms cultured from blood that are compatible with suspected site of infection c. imaging test evidence of infection, (e.g., abnormal ultrasound, CT scans, magnetic resonance imaging [MRI], or radiolabel scan [gallium, technetium]). * With no other recognized cause
Comment	• Report infections following circumcision in newborns as SST-CIRC.

	Symptomatic Urinary Tract Infection (SUTI) Must meet at least *1* of the following criteria:
1a	Patient had an indwelling urinary catheter in place for >2 calendar days, with day of device placement being Day 1, and catheter was in place on the date of event *and* at least 1 of the following signs or symptoms: fever (>38°C); suprapubic tenderness*****; costovertebral angle pain or tenderness***** *and* a positive urine culture of $\geq 10^5$ colony-forming units (CFU)/ml with no more than 2 species of microorganisms. Elements of the criterion must occur within a timeframe that does not exceed a gap of 1 calendar day between two adjacent elements. ----------OR---------- Patient had an indwelling urinary catheter in place for >2 calendar days and had it removed the day of or the day before the date of event *and* at least 1 of the following signs or symptoms: fever (>38°C); urgency*****; frequency*****; dysuria*****; suprapubic tenderness*****; costovertebral angle pain or tenderness***** *and* a positive urine culture of $\geq 10^5$ colony-forming units (CFU)/ml with no more than 2 species of microorganisms. Elements of the criterion must occur within a timeframe that does not exceed a gap of 1 calendar day between two adjacent elements. *****With no other recognized cause
1b	Patient did not have an indwelling urinary catheter that had been in place for >2 calendar days and in place at the time of or the day before the date of event *and* has at least 1 of the following signs or symptoms: fever (>38°C) in a patient that is ≤65 years of age; urgency*****; frequency*****; dysuria*****; suprapubic tenderness*****; costovertebral angle pain or tenderness***** *and* a positive urine culture of $\geq 10^5$ CFU/ml with no more than 2 species of microorganisms. Elements of the criterion must occur within a timeframe that does not exceed a gap of 1 calendar day between elements two adjacent elements. *****With no other recognized cause

2a	Patient had an indwelling urinary catheter in place for >2 calendar days, with day of device placement being Day 1, and catheter was in place on the date of event *and* at least 1 of the following signs or symptoms: fever (>38°C); suprapubic tenderness*****; costovertebral angle pain or tenderness***** *and* at least 1 of the following findings: a. positive dipstick for leukocyte esterase and/or nitrite b. pyuria (urine specimen with ≥10 white blood cells [WBC]/mm^3 of unspun urine or >5 WBC/high power field of spun urine) c. microorganisms seen on Gram's stain of unspun urine *and* a positive urine culture of ≥10^3 and <10^5 CFU/ml with no more than 2 species of microorganisms. Elements of the criterion must occur within a timeframe that does not exceed a gap of 1 calendar day between two adjacent elements. ----------OR---------- Patient with an indwelling urinary catheter in place for >2 calendar days and had it removed the day of or the day before the date of event *and* at least 1 of the following signs or symptoms: fever (>38°C); urgency*****; frequency*****; dysuria*****; suprapubic tenderness*****; costovertebral angle pain or tenderness***** *and* at least 1 of the following findings: a. positive dipstick for leukocyte esterase and/or nitrite b. pyuria (urine specimen with ≥10 WBC/mm^3 of unspun urine or >5 WBC/high power field of spun urine c. microorganisms seen on Gram's stain of unspun urine *and* a positive urine culture of ≥10^3 and <10^5 CFU/ml with no more than 2 species of microorganisms. Elements of the criterion must occur within a timeframe that does not exceed a gap of 1 calendar day between two adjacent elements. *****With no other recognized cause

2b	Patient did <u>not</u> have an indwelling urinary catheter, that had been in place for >2 calendar days and in place at the time of, or the day before the date of event *and* has at least 1 of the following signs or symptoms: fever (>38°C) in a patient that is ≤65 years of age; urgency*****; frequency*****; dysuria*****; suprapubic tenderness*****; costovertebral angle pain or tenderness* *and* at least 1 of the following findings: a. positive dipstick for leukocyte esterase and/or nitrite b. pyuria (urine specimen with ≥10 WBC/mm^3 of unspun urine or >5 WBC/high power field of spun urine c. microorganisms seen on Gram's stain of unspun urine *and* a positive urine culture of ≥10^3 and <10^5 CFU/ml with no more than 2 species of microorganisms. Elements of the criterion must occur within a timeframe that does not exceed a gap of 1 calendar day between two adjacent elements. *****With no other recognized cause
3	Patient ≤1 year of age with****** or without an indwelling urinary catheter has at least 1 of the following signs or symptoms: fever (>38°C core); hypothermia (<36°C core); apnea*****; bradycardia*****; dysuria*****; lethargy*****; vomiting* *and* a positive urine culture of ≥10^5 CFU/ml with no more than 2 species of microorganisms. Elements of the criterion must occur within a timeframe that does not exceed a gap of 1 calendar day between two adjacent elements. *****With no other recognized cause ****** Patient had an indwelling urinary catheter in place for >2 calendar days, with day of device placement being Day 1, and catheter was in place on the date of event.
4	Patient ≤1 year of age with****** or without an indwelling urinary catheter has at least 1 of the following signs or symptoms: fever (>38°C core); hypothermia (<36°C core); apnea*****; bradycardia*****; dysuria*****; lethargy*****; vomiting***** *and* at least 1 of the following findings: a. positive dipstick for leukocyte esterase and/or nitrite b. pyuria (urine specimen with ≥10 WBC/mm^3 of unspun urine or >5 WBC/high power field of spun urine c. microorganisms seen on Gram's stain of unspun urine *and* a positive urine culture of between ≥10^3 and <10^5 CFU/ml with no more than two species of microorganisms. Elements of the criterion must occur within a timeframe that does not exceed a gap of 1 calendar day between two adjacent elements. *****With no other recognized cause ****** Patient had an indwelling urinary catheter in place for >2 calendar days, with day of device placement being Day 1, and catheter was in place on the date of event.

Comments	• Laboratory cultures reported as "mixed flora" represent at least 2 species of organisms. Therefore an additional organism recovered from the same culture, would represent >2 species of microorganisms. Such a specimen cannot be used to meet the UTI criteria. • Urinary catheter tips should not be cultured and are not acceptable for the diagnosis of a urinary tract infection. • Urine cultures must be obtained using appropriate technique, such as clean catch collection or catheterization. Specimens from indwelling catheters should be aspirated through the disinfected sampling ports. • In infants, urine cultures should be obtained by bladder catheterization or suprapubic aspiration; positive urine cultures from bag specimens are unreliable and should be confirmed by specimens aseptically obtained by catheterization or suprapubic aspiration. • Urine specimens for culture should be processed as soon as possible, preferably within 1 to 2 hours. If urine specimens cannot be processed within 30 minutes of collection, they should be refrigerated, or inoculated into primary isolation medium before transport, or transported in an appropriate urine preservative. Refrigerated specimens should be cultured within 24 hours. • Urine specimen labels should indicate whether or not the patient is symptomatic. • Report only pathogens in both blood and urine specimens for ABUTI. • Report *Corynebacterium* (urease positive) as either *Corynebacterium species* unspecified (COS) or as *C. urealyticum* (CORUR) if speciated.

VAE – VENTILATOR-ASSOCIATED EVENT

VAC – Ventilator-Associated Condition

Patient has a baseline period of stability or improvement on the ventilator, defined by ≥ 2 calendar days of stable or decreasing daily minimum FiO2 or PEEP values. The baseline period is defined as the two calendar days immediately preceding the first day of increased daily minimum PEEP or FiO2.
and
After a period of stability or improvement on the ventilator, the patient has at least one of the following indicators of worsening oxygenation:

1. Increase in daily minimum* FiO2 of ≥ 0.20 (20 points) over the daily minimum FiO2 in the baseline period, sustained for ≥ 2 calendar days.

2. Increase in daily minimum* PEEP values of ≥ 3 cmH2O over the daily minimum PEEP in the baseline period†, sustained for ≥ 2 calendar days.

*Daily minimum defined by lowest value of FiO2 or PEEP during a calendar day that is maintained for at least 1 hour.

†Daily minimum PEEP values of 0-5 cmH2O are considered equivalent for the purposes of VAE surveillance.

IVAC – Infection-related Ventilator-Associated Complication

Patient meets criteria for VAC
and
on or after calendar day 3 of mechanical ventilation and within 2 calendar days before or after the onset of worsening oxygenation, the patient meets both of the following criteria:

1. Temperature > 38 °C or < 36°C, OR white blood cell count ≥ 12,000 cells/mm3 or ≤ 4,000 cells/mm3.
   and
2. A new antimicrobial agent(s)* is started, and is continued for ≥ 4 calendar days.

*See Table 15 for eligible agents.

Possible VAP – Possible Ventilator-Associated Pneumonia

Patient meets criteria for VAC and IVAC
and
on or after calendar day 3 of mechanical ventilation and within 2 calendar days before or after the onset of worsening oxygenation, ONE of the following criteria is met:

1) Purulent respiratory secretions (from one or more specimen collections)
   - Defined as secretions from the lungs, bronchi, or trachea that contains ≥ 25 neutrophils and ≤ 10 squamous epithelial cells per low power field [lpf, x100].
   - If the laboratory reports semi-quantitative results, those results must be equivalent to the above quantitative thresholds.
   - See additional instructions for using the purulent respiratory secretions criterion in the VAE Protocol.

   OR

2) Positive culture (qualitative, semi-quantitative or quantitative) of sputum*, endotracheal aspirate*, bronchoalveolar lavage*, lung tissue, or protected specimen brushing*

**Excludes the following:*
- Normal respiratory/oral flora, mixed respiratory/oral flora or equivalent
- *Candida* species or yeast not otherwise specified
- Coagulase-negative *Staphylococcus* species
- *Enterococcus* species

Probable VAP – Probable Ventilator-Associated Pneumonia

Patient meets criteria for VAC and IVAC
and
On or after calendar day 3 of mechanical ventilation and within 2 calendar days before or after the onset of worsening oxygenation, ONE of the following criteria is met:

1) Purulent respiratory secretions (from one or more specimen collections—and defined as for possible VAP)
and
one of the following:
- Positive culture of endotracheal aspirate*, $\geq 10^5$ CFU/ml or equivalent semi-quantitative result
- Positive culture of bronchoalveolar lavage*, $\geq 10^4$ CFU/ml or equivalent semi-quantitative result
- Positive culture of lung tissue, $\geq 10^4$ CFU/g or equivalent semi-quantitative result
- Positive culture of protected specimen brush*, $\geq 10^3$ CFU/ml or equivalent semi-quantitative result

**Same organism exclusions as noted for Possible VAP.*

OR

2) One of the following (without requirement for purulent respiratory secretions):
- Positive pleural fluid culture (where specimen was obtained during thoracentesis or initial placement of chest tube and NOT from an indwelling chest tube)
- Positive lung histopathology
- Positive diagnostic test for *Legionella* spp.
- Positive diagnostic test on respiratory secretions for influenza virus, respiratory syncytial virus, adenovirus, parainfluenza virus, rhinovirus, human metapneumovirus, coronavirus

Table 15. List of Antimicrobials Agents Eligible for IVAC, Possible and Probable VAP

Antimicrobial Agent
AMIKACIN
AMPHOTERICIN B
AMPHOTERICIN B LIPOSOMAL
AMPICILLIN
AMPICILLIN/SULBACTAM
ANIDULAFUNGIN
AZITHROMYCIN
AZTREONAM
CASPOFUNGIN
CEFAZOLIN
CEFEPIME
CEFOTAXIME
CEFOTETAN
CEFOXITIN
CEFTAROLINE
CEFTAZIDIME
CEFTIZOXIME
CEFTRIAXONE
CEFUROXIME
CIPROFLOXACIN
CLARITHROMYCIN
CLINDAMYCIN
COLISTIMETHATE
DORIPENEM
DOXYCYCLINE
ERTAPENEM
FLUCONAZOLE
FOSFOMYCIN
GEMIFLOXACIN
GENTAMICIN
IMIPENEM/CILASTATIN
ITRACONAZOLE

LEVOFLOXACIN
LINEZOLID
MEROPENEM
METRONIDAZOLE
MICAFUNGIN
MINOCYCLINE
MOXIFLOXACIN
NAFCILLIN
OSELTAMIVIR
OXACILLIN
PENICILLIN G
PIPERACILLIN
PIPERACILLIN/TAZOBACTAM
POLYMYXIN B
POSACONAZOLE
QUINUPRISTIN/DALFOPRISTIN
RIFAMPIN
SULFAMETHOXAZOLE/TRIMETHOPRIM
SULFISOXAZOLE
TELAVANCIN
TELITHROMYCIN
TETRACYCLINE
TICARCILLIN/CLAVULANATE
TIGECYCLINE
TOBRAMYCIN
VANCOMYIN, intravenous only
VORICONAZOLE
ZANAMIVIR

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

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 locations participating in in-plan VAE surveillance, refer to the VAE chapter for specific guidance on assigning a secondary BSI to a VAE.

Below are listed several scenarios that may occur with guidance on how to distinguish between the primary or secondary nature of a BSI, along with the definition of "matching organisms", and important notes and reporting instructions.

1. **Blood and site-specific specimen cultures match for at least one organism**: In a patient suspected of having an infection, blood and a site-specific specimen are collected for culture and both are positive for at least one matching organism. If the site-specific culture is an element used to meet the infection site criterion, then 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 from the same date grows *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 from the same date 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 *P. aeruginosa* is a logical pathogen for this site of infection.
    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 from the same date grows *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.

2. **Blood and site-specific specimen cultures do <u>not</u> 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 site-specific culture is an element used to meet the infection site criterion and the blood isolate is also an element used to meet another criterion at the same infection site, then the BSI is considered secondary to that site-specific infection.
        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 purulent drainage specimen but the blood grows *Bacteroides fragilis*. Because the patient meets

IAB criteria 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 3c), 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.

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.

i. Example: Postoperative patient has an intraabdominal 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.

ii. 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 uropathogen organism in urine and blood in an asymptomatic patient.

3. **No site-specific specimen culture, only a positive blood culture**: In a patient suspected of having an infection, if the only specimen cultured is blood and it grows a logical pathogen for the suspected body site of infection, and a site-specific infection criterion is met, an element of which may or may not include a positive blood culture, the BSI is considered secondary to that site-specific infection.
   a. Example: Postoperative patient has an abscess in the small bowel noted during reoperation. The only specimen cultured is blood which grows *B. fragilis*. Because gastrointestinal tract infection (GIT) criterion 1 is met with the surgically-identified abscess alone and because *B. fragilis* is a logical pathogen for this site of infection, the BSI is considered secondary to a GIT and *B. fragilis* is listed as the GIT infection pathogen.
   b. Example: Patient has a positive blood culture with *E. coli* proximal in time with fever, abdominal pain, and CT scan evidence of intraabdominal abscess (IAB). This patient meets IAB criterion 3c, which includes a positive blood culture as one of its elements. The BSI is considered secondary to the IAB and *E. coli* is listed as the IAB infection pathogen.

4. **Negative site-specific specimen culture with positive blood culture**: In a patient suspected of having an infection, if a specimen from the suspected site of infection is cultured and yields no growth, but a blood specimen collected as part of the infection work-up is positive, that BSI is only considered a secondary BSI if another of the site-specific criteria that includes positive blood culture as an element is met. Otherwise, the BSI is considered a primary BSI, even if another criterion for that site is met and the blood isolate is a logical pathogen for the infection.
   a. Example: Patient has purulent material from the IAB space cultured and it yields no growth. The patient also has fever, abdominal pain, a positive blood culture with *Pseudomonas*

aeruginosa, and radiographic evidence of IAB infection. This patient does not meet IAB criterion 1 (positive culture from purulent material) but does meet IAB criterion 3c, an element of which is a positive blood culture (signs/symptoms plus positive blood culture plus radiographic evidence). This BSI is considered secondary to the IAB and *P. aeruginosa* is listed as the IAB infection pathogen.

b. Example: Postoperative knee replacement patient with a central line spikes a fever; blood and knee joint fluid are cultured. Only the blood cultures from at least two separate blood draws are positive for *S. epidermidis*. No other JNT infection criteria are met. This BSI should be reported as a CLABSI.

c. Example: Patient has a central line in place for 10 days. Patient complains of knee joint tenderness and limited range of motion. CT scan findings suggest joint (JNT) infection but culture of a needle-aspirated joint fluid is negative. However, a blood culture from the same time period grows *S. aureus*. While this patient does not meet JNT criterion 1 (positive joint fluid culture), he does meet JNT criterion 3d (signs/symptoms plus positive laboratory test on blood [blood culture]). Since a positive blood culture is part of the criterion met for JNT infection, this BSI is considered secondary to the JNT infection and not reported as a CLABSI. *S. aureus* is reported as the pathogen for the JNT infection.

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 urine culture reported as yeast are considered to have matching organisms because the organisms are complementary, i.e. Candida is a type of yeast.

Notes:
1. 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 example 1c).
2. Antibiograms of the blood and potential primary site isolates do not have to match.
3. Blood and site-specific specimens do not have to be collected on the same day but there must be evidence of infection at the specific site at the time of blood culture collection.

Reporting Instructions:
1. For reporting secondary BSI for possible and probable VAP, see Chapter 10.
2. Do not report secondary bloodstream infection for vascular (VASC) infections, clinically-defined pneumonia (PNU1), Ventilator-Associated Conditions (VAC), or Infection-related Ventilator-Associated Complications (IVAC).

3. If a site-specific criterion requiring positive culture results is met, be sure to check the positive culture box when specifying the criteria used when adding the event, even if another criterion that does not include culture results is also met. For example, using the scenario in 2.a.i above, the following boxes for criteria used would be checked when entering the SSI into the NHSN application: fever, nausea, pain or tenderness, positive culture, positive blood culture, imaging test evidence of infection.