STANDARD OPERATIVE PROCEDURES

SURVEILLANCE FOR HEALTHCARE-ASSOCIATED INFECTIONS (HAI) IN INTENSIVE CARE UNITS

Prepared by:

All India Institute of Medical Sciences, New Delhi, India
Centers for Disease Control and Prevention, India
Indian Council of Medical Research, New Delhi, India

As part of the Global Health Security Agenda project entitled

"Capacity Building and Strengthening of Hospital Infection Control to detect and prevent antimicrobial resistance in India"

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Surveillance for Healthcare-Associated Infections (HAI) in Intensive Care Units

November 2018

List of Abbreviations

BSI: Bloodstream Infection

CDC: United States Centers for Disease Control and Prevention

CLABSI: Central-line Associated Bloodstream Infection

CAUTI: Catheter- Associated Urinary Tract Infection

DHQP: Division of Healthcare Quality Promotion

DUR: Device Utilization Ratio

ECDC: European Centre for Disease Prevention and Control

HAI: Healthcare-Associated Infection

HAI-Net: Healthcare-Associated Infections Surveillance Network

ICU: Intensive Care Unit

MDRO: Multi-Drug Resistant Organism

NHSN: National Healthcare Safety Network

NICU: Neonatal Intensive Care Unit

PICU: Pediatric Intensive Care Unit

SSI: Surgical Site Infection

UTI: Urinary Tract Infection

VAP: Ventilator Associated Pneumonia

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1 BACKGROUND

Healthcare-associated infections (HAIs) lead to substantial morbidity and mortality in middle and lower-income countries; at least 5-10% of patient admissions are complicated by an HAI. The available literature shows that HAI incidence rates in developing countries are at least three times higher than incidence rates in the United States [1].

HAIs can be caused by bacteria, viruses, or fungi. The most common types of infections, bloodstream infections (BSI), pneumonia (e.g., ventilator-associated pneumonia [VAP]), urinary tract infections (UTI), and surgical site infections (SSI), are primarily caused by bacteria. These bacteria are often resistant to multiple antibiotics, which can severely limit treatment options, complicate medical management, and prolong hospital stays. In low and middle income countries, the burden, severity, and economic impact of HAIs is believed to be underestimated, although existing data are limited [2].

2 INTRODUCTION

This document describes the methods used in conducting HAI surveillance in intensive care units (ICUs). All hospitals participating in the HAI surveillance network must adhere to the surveillance case definitions and data collection and reporting procedures described to ensure that data is comparable across sites.

Infection control practitioners and surveillance officers should use this protocol to set up and perform HAI surveillance in their hospital s ICUs. Other stakeholders and end users of surveillanc e data can use this protocol as a way to understand how the data are collected and how infection rates are generated.

Surveillance will be performed for BSIs, including central -line associated BSIs (CLABSI), and UTIs, including catheter-associated UTIs (CAUTI). The HAI surveillance network will provide baseline data on rates of these HAIs and can serve as a platform for measuring the impact of prevention strategies on HAI rates and patient outcomes.

3 SURVEILLANCE SETTINGS

Surveillance will occur in ICU locations, which may include adult, pediatric, and neonatal critical/intensive care units (ICUs/PICUs/NICUs), due to the relative ease of case finding and collection of denominator data, and the high rates of device utilization.

4 SURVEILLANCE EVENTS

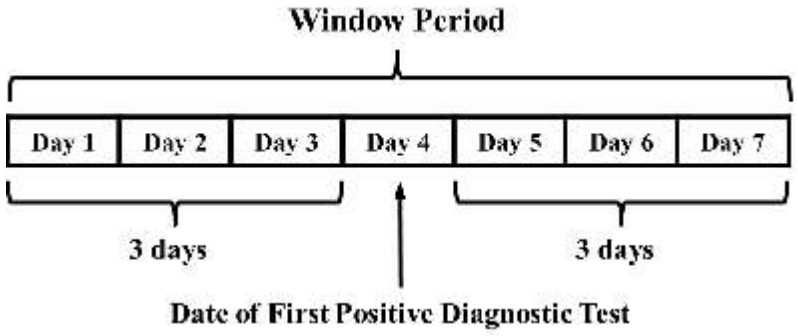
This protocol includes modules for the following types of HAI events:

- **Bloodstream Infections (BSI)** - includes central-line associated BSI (CLABSI);
- **Urinary Tract Infections (UTI)** - includes catheter-associated UTI (CAUTI).

The surveillance definitions in the modules have been adopted from the European Centre for Disease Prevention and Control s (ECDC) HAI-Net [3] and the United States Centers for Disease Control and Prevention s (CDC) National Healthcare Safety Network (NHSN) [4]. The case definitions are for the purpose of surveillance only and are not meant to serve as clinical definitions for use in diagnosis and treatment.

4.1 KEY TERMS

Window Period: the 7-day timeframe in which all criteria of the case definition must be met. It includes the date of the first positive diagnostic test used to meet case definition criteria (defined as the laboratory specimen collection date), and the 3 calendar days before and the 3 calendar days after.



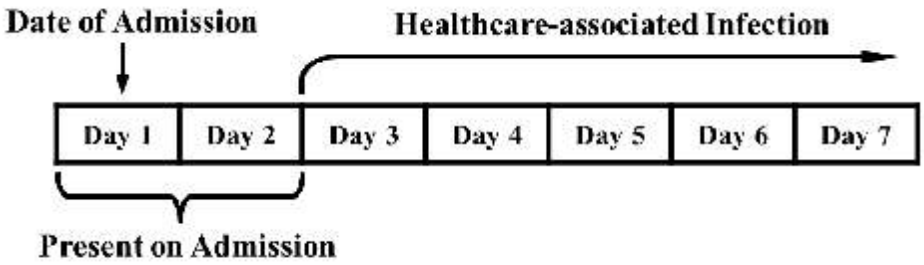
Date of Event: the date when the first criteria used to meet the case definition occurs for the first time within the window period.

Note: If the first element used to meet the case definition is a laboratory diagnostic test, the date of the test (defined as the laboratory specimen collection date) should be reported as the date of event. The date that the test results were obtained should not be reported.

Healthcare -associated Infection (HAI): an infection with a Date of Event > 2 calendar days after the hospital admission date (where the date of hospital admission is Day 1) is classified as an HAI.

Present on Admission : an infection with a date of event ≤ 2 calendar days after the hospital admission date (where the date of hospital admission is Day 1) is classified as present on admission.

Note: Infections that are classified as present on admission should not be reported as part of this surveillance system. Only report healthcare-associated infections per the case reporting rules described in section 5.3 below.



Event Timeframe : a 14 calendar day timeframe (where the date of event = Day 1) during which a primary HAI event is considered to be ongoing and no new infections of that same primary HAI type are reported. Additional organisms isolated within this timeframe from the same body site (e.g., blood for BSI or urine for UTI) are considered part of the same infection for surveillance purposes and added to the original event.

Examples of Applying the Event Timeframe:

- A blood culture collected from a patient in the ICU on July 1 grows *Staphylococcus aureus*. No positive cultures from other body sites are identified, but a blood culture collected on July 10 grows *Streptococcus pneumoniae.* Based on the BSI protocol, this episode is classified as a Primary BSI with a date of event of July 1. The Event Timeframe for this Primary BSI runs from July 1-14. No new BSIs can be reported for this patient during this time period. The positive blood culture with *S. pneumoniae* would be considered part of the initial BSI event and added to the event's case report form.

- A blood culture collected from the patient in the example above on July 20 grows *Klebsiella pneumoniae* . Since this is after the end of Event Timeframe of the patient's previous BSI (July 1-14), it should be investigated as a potential new BSI and reported as a new event if all criteria are met.

NOTE: an Event Timeframe is only created for BSIs that are classified as Primary BSIs. An Event Timeframe is not created for Secondary BSIs since they are associated with primary HAIs at other body sites.

Example:

- A blood culture collected from a patient in the ICU on September 15 grows *Acinetobacter baumanii*. A urine culture collected from the patient on September 10 also grows *A. baumanii*. This episode is classified as a Secondary BSI. An Event Timeframe is not created for this Secondary BSI event.
- A blood culture collected from this patient on September 20 grows *S. aureus* . Because no Event Timeframe was created for the previous Secondary BSI, this positive blood culture should be investigated as a potential new BSI and reported if all criteria are met.

Surveillance Unit : the ICU in which surveillance is being performed.

5 SURVEILLANCE METHODS

The process of conducting surveillance requires active, patient -based, prospective identification of cases and collection of denominator data by staff trained in this HAI surveillance protocol. Each HAI event module includes corresponding case definitions and additional event -specific methods for case reporting and data analysis. Appendix 1 outlines the broad steps involved in case finding and denominator collection. Each surveillance site should adapt these steps to reflect institutional realities and share with surveillance staff prior to the initiation of surveillance.

5.1 CASE FINDING

Surveillance staff shall evaluate all patients and seek out possible cases in the ICUs under surveillance by screening a variety of patient data sources, such as admission, discharge, or transfer records, laboratory records, and patient charts, including history and physical exam notes, nurses/physicians notes, temperature charts, etc.

Laboratory

Surveillance staff will engage with the clinical laboratory serving their facility to review microbiology records in order to identify positive cultures relevant to the HAI under surveillance (e.g., blood cultures

for BSI). For each positive culture, staff will collect additional clinical data to determine if the case definitions are met.

Surveillance Unit

While positive cultures are often the initiating event for detection of an HAI event, laboratory-based surveillance should not be used alone. Medical records and patient charts should be reviewed to gather surveillance data and identify patients who demonstrate clinical signs and symptoms suggestive of HAIs that merit microbiological evaluation for laboratory confirmation. It is recommended that surveillance staff review the census of participating ICUs, or communicate with clinical staff on a daily basis to evaluate patients who may meet the case definition. If any are identified, the surveillance staff should verify that the case definition is met and that all criteria occurred within the window period.

ICU clinical staff should be familiar with the case definitions of the HAI(s) under surveillance, assist in identifying patients that potentially meet the definitions, and notify surveillance personnel for further confirmation. ICU staff may also be used to collect denominator data.

5.2 CASE REPORTING

Once surveillance staff have evaluated all patients in the ICUs under surveillance and identified cases meeting the HAI event case definition, a standardized case report form will be used to collect all required data. Each HAI event module includes corresponding case report forms and instructions for their completion. Case report forms should not be submitted until the end of the event timeframe in order to allow for the collection of required laboratory and patient outcome data.

Case Reporting Rules

All cases meeting all of the following must be reported:

- Date of event > 2 calendar days from hospital admission (where date of hospital admission is Day 1)
- Date of event >2 calendar days from date of surveillance unit admission (where date of surveillance unit admission is Day 1)
- Date of event does not occur within the Event Timeframe of a previously identified case of the same HAI type

If the case does not meet all of the above, **do not report** .

Interpretation and Reporting of Laboratory Results

- Only genus and species identification should be used to determine the sameness of organisms (i.e., matching organisms). No additional comparative methods (e.g., morphology or resistance profile) should be used.

- Assume that the organisms are the same if the organism from one culture is identified to both genus and species level and the companion culture identifies only the genus with or without other level.

Culture Report	Companion Culture Report	Report as…
K. pneumoniae	*K. oxytoca*	*K. pneumoniae, K. oxytoca*
S. epidermidis	Coagulase-negative staphylococci	*S. epidermidis*
Enterococcus spp.	*E. faecium*	*E. faecium*
Bacillus spp. (not *anthracis*)	*B. cereus*	*B. cereus*
S. salivarius	Viridans group streptococci	*S. salivarius*

- For isolated organisms of the same genus and species level, report the resistance profile of the more resistant organism

  Example: Methicillin-resistant *Staphylococcus aureus* (MRSA) and Methicillin-sensitive *Staphylococcus aureus* (MSSA) are isolated. *Staphylococcus aureus* and the MRSA resistance profile are reported.

Denominator Data

Denominator data are collected for the purposes of calculating the incidence rates of HAI events. These include patient-days (a count of the total number of patients per day that were located in the surveillance unit) and, for certain modules, device-days (a count of the total number of patients per day that had a specific invasive device). Denominator data should be collected at the same time, every day for each participating unit under surveillance. This module contains forms for BSI and UTI denomination data collection in both ICUs and NICUs as Appendix 2. Total Number Of Admission In A Particular ICU Should Be Mentioned And Reported Monthly

Surveillance on Multiple HAI Modules

If surveillance is being conducted on both BSI and UTI, and both HAI event case definitions are met, the BSI and UTI case report forms should both be completed, regardless of whether or not the urine and blood culture isolates match. A single form for collecting denominator data for both BSI and UTI modules can be found in Appendix 2 along with instructions for its completion.

Case ID and Patient Register

To protect patient privacy, patient names will not be collected on the case report forms. Rather, a unique Case ID will be used for each reportable event. The Case ID consists of the hospital number, surveillance unit number, event number, and the HAI event being reported. For example, if the first HAI event ever reported to surveillance is a BSI event that occurred in Unit 2 of Hospital 1, the Case ID for that event would be "1.2.000001.BSI." The hospital number represents the hospital at which a case is identified. Each hospital in the surveillance system is assigned a different number. The surveillance unit number represents the specific surveillance unit or ward within a hospital where the case is identified (e.g., NICU or ICU). This prevents duplication of the same Case ID within two or more hospital units. The event number represents the sequential numbering of events within a surveillance unit. The HAI event is differentiated by the corresponding acronym (e.g., BSI, UTI). As more HAI modules are added to the surveillance system, additional HAI event acronyms will be added. There should be a different Case ID for each event reported. To allow for the surveillance staff on duty to assign or match Case IDs with patients, the Case ID and Patient Register table in Appendix 3 is provided. Each surveillance unit should have its own Case ID and Patient Register table with the hospital number and surveillance number columns pre-populated to reduce chance for error. The table should be accessible for surveillance staff, but stored in a secure location (i.e. in a locked drawer) to protect patient privacy.

5.3 Role of the Laboratory

The microbiology laboratory will play an essential role in surveillance. Much of the case finding will be conducted by reviewing microbiology records. In order for improved comparability of results across sites, laboratories should provide documentation of the thresholds they are using for antimicrobial susceptibility testing. Therefore, ongoing communication and collaboration with the lab is essential.

5.4 Data Management and Analysis

Organizing the flow of surveillance data from the primary sources (e.g. medical or laboratory records) through analysis and report dissemination is a key component of an HAI surveillance system. All participating sites should 1) identify person(s) responsible for data management (including data collection, data entry, data validation and analysis) and 2) develop detailed plans that outline how data should flow within the system.

Participating hospitals will report surveillance data (both case and denominator data) to the project investigators at Jai Prakash Narayan Apex Trauma Center, All India Institute for Medical Sciences (JPNATC) on a monthly basis. Initially, scanned or paper copies of data collection forms can be sent to JPNATC by email or postal service. Eventually, surveillance data will be submitted to JPNATC via a specially designed password -protected database from secure computers or tablets by designated hospital surveillance staff. The project investigators at JPNATC, in conjunction with CDC India, will perform data cleaning, validation, and analysis and disseminate feedback reports to each participating hospital on a regular basis. Any data entry errors identified during cleaning will be sent to hospitals for review and correction.

Feedback reports will include HAI incidence rates stratified by hospital and unit. As surveillance will be conducted for HAI events potentially associated with invasive devices, the device utilization ratio (DUR) should be calculated to contextualize the HAI incidence. The DUR can be used to assess the proportion of days in which patients were exposed to devices that put them at risk for a device-associated infection. This is important because facilities that use invasive devices will likely have higher HAI rates. Each HAI event module includes instructions for the calculation of incidence rates and DURs.

5.5 Monitoring and Evaluation of Surveillance

Data validation is a necessary element to assure quality, accuracy, and reliability of reported public health surveillance information. Validation activities should include: 1) review of data collected in case report forms against primary data sources (e.g. medical chart) to ensure the completeness of data collection; 2) review of events entered into surveillance database to determine if they meet the HAI surveillance definitions, 3) review of microbiology results and comparison with reported cases to ensure sensitivity of the system, and 4) monitoring trends of patient-days and central line-days to ensure accurate denominator collection and avoid internal errors (for example, the number of central line-days does not exceed patient-days). These can be done periodically and reports on errors or misclassified cases should be distributed to and discussed with the appropriate personnel. The overall purpose of data validation is to monitor use of HAI definitions and the accuracy of data submitted by hospitals to the project investigators at JPNATC,

assess reporting hospital surveillance system capacity, and identify opportunities to improve future data collection and reporting.

Team members from JPNATC and CDC India will conduct periodic surveillance support visits that will include discussions of the completeness and timeliness of HAI event and denominator data reporting and reviews of HAI surveillance data to validate the accur acy of reported data.

Standardized medical record review procedures to ensure that the HAI surveillance is sufficiently sensitive to detect HAI events are another potential tool to monitor the performance of the surveillance system. Consideration should be given to having periodic independent evaluations by outside experts for assessment of critical HAI surveillance parameters like sensitivity and positive predictive value of the surveillance program, in conjunction with questionnaires or key informant interviews to evaluate the knowledge, attitudes and practices of the surveillance personnel.

5.6 DATA USAGE AND OWNERSHIP

Data generated as part of this surveillance are intended for internal use within the specified country to define the scope and magnitude of HAIs. Facility-level data may be used to implement infection control quality improvement measures at an individual facility. Data ownership will reside with the Jai Prakash Narayan Apex Trauma Center, All India Institute for Medical Sciences. The project investigators and CDC India staff may discuss the data and its analysis and presentation with subject matter experts at CDC Atlanta's Division of Healthcare Quality Promotion (DHQP), but ownership is Ministry of Health-based and led as appropriate in-country.

6 ROLES & RESPONSIBILITIES

Participating Hospitals

Participating hospitals will need to identify the staff members that will oversee the surveillance system, collect and enter surveillance data and clearly lay out expected roles and responsibilities for these staff members. Tools/resources needed to complete their assigned job should be provided. At minimum, each hospital must identify a surveillance coordinator and a team of surveillance staff.

Additionally, though not dedicated surveillance system personnel, the clinical staff in the ICUs under surveillance also have roles in HAI surveillance implementation. Details on the roles and responsibilities of all aforementioned personnel are provided below.

Hospital Coordinator

The hospital coordinator is the person responsible for overseeing HAI surveillance at a participating facility. This individual ensures that the surveillance staff at their facility are conducting regular reporting of HAI events and denominator data from all intensive care units (ICUs) under surveillance. Additional responsibilities might include following up with surveillance staff to reconcile missing or conflicting data identified by the data manager, disseminating HAI reports to relevant stakeholders at the hospital, and facilitating monitoring and evaluation visits.

Surveillance Staff

The surveillance staff carry out the day-to-day activities of HAI surveillance. In general these activities will include case finding, data collection, case determination, and recording surveillance data (e.g. on case report forms). In order to seek out possible cases in the ICUs under surveillance these persons shall evaluate a variety of patient data sources daily. These data sources may differ between sites, but will likely include patient medical records (e.g. discharge paperwork, nursing notes, ICU patient care flowsheets), laboratory results, and discussion with the clinical care team. All surveillance staff must be familiar with the HAI surveillance protocol, case finding flowcharts, and case definitions. Sample SOPs summarizing these activities can be found in Appendix 1.

ICU Clinical Staff

Nurses and physicians staffing the ICU should be aware of the surveillance that is ongoing. These staff should be familiar with the case definitions of the HAI(s) under surveillance in order to assist in identifying patients that potentially meet the case definition and notifying surveillance staff for further assessment and confirmation. Clinical staff may be tasked with collection of denominator data, especially on weekends or holidays when surveillance staff may not be in the hospital.

CDC India Staff: CDC India staff will provide technical assistance to the team in charge of the surveillance system with all aspects of the surveillance project. This may include initial facility assessments related to infection control practices, training of hospital staff, preparation of necessary project materials including case report forms, database management and analysis, and creation of bi-monthly reports and summary reports for internal use and publication. CDC India staff may also participate in initial hospital practices assessment and regular monitoring, evaluation, and data validation activities to ensure

completeness and accuracy of data collected during surveillance. Additionally, they can provide access to subject matter expertise on HAI surveillance and prevention at the Division of Healthcare Quality Promotion (DHQP) at CDC Headquarters in Atlanta.

7 ETHICAL CONSIDERATION AND REVIEW

This protocol describes a public health surveillance activity, which is considered public health practice and not research. Individual patient consent will not be collected as a prerequisite of collecting necessary data to monitor HAI incidence. Patient consent could potentially involve all patients housed in the ICU at any given time as patient level data (e.g. laboratory results, symptoms) are required to determine whether a patient is a case and further data collection needed. Requiring this broad consent would result in a substantial burden and render the surveillance system unable to complete basic case finding functions. Every reasonable effort will be made to protect patient privacy during this surveillance. Individual patients or their families will not be contacted. Electronic and physical security measures will be taken to ensure protection of potentially identifiable data. Electronic data will be stored in a database housed on a certified secure server and will be accessed via password protected computers or tablets.

This generic protocol and associated modules have been evaluated by the ethical liaison at the CDC s National Center for Emerging and Zoonotic Diseases (NCEZID) and determined not to be research. This determination received concurrence through CDC's Center for Global Health. Subsequent local amendments and adaptations must be vetted by CDC India and submitted to NCEZID for review to ensure the research determination does not merit a change.

8 REFERENCES

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3. European Centre for Disease Prevention and Control. Healthcareassociated Infections Surveillance Network (HAI-Net): European surveillance of healthcare associated infections in intensive care units; Available from: http://ecdc.europa.eu/en/publications/Publications/healthcareassociated-infections-HAI-ICU-protocol.pdf.

4. Centers for Disease Control and Prevention. National Healthcare Safety Network: Acute Care Hospital Surveillance Protocols; Available from: http://www.cdc.gov/nhsn/acute-care-hospital/index.html.

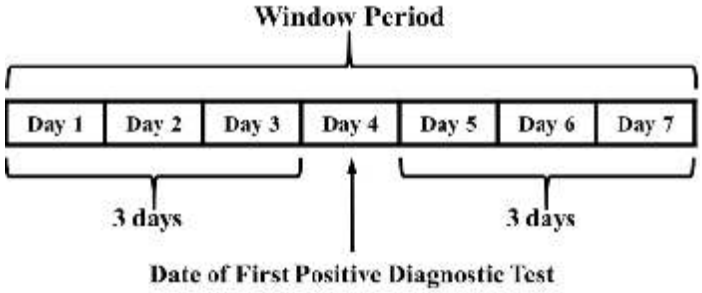
APPENDICES

Appendix 1 – Case Finding and Denominator Data Collection

Collection of case (numerator) data

Although surveillance implementation will likely differ from facility to facility depending on clinical information systems, level of staff support, and the type of HAI(s) under surveillance, the following general steps will be necessary to collect case (numerator) data:

1. Review the latest microbiology records on a daily basis in order to identify positive cultures or diagnostic tests of specimens relevant to the HAI(s) under surveillance.
2. For each positive result, identify the corresponding patient and ensure they were residing in the surveillance unit at the time when the specimen was collected.
3. Review the clinical and laboratory data of each identified patient to determine if the positive result is the first positive diagnostic test.
4. Once the first positive diagnostic test is identified, use the date of specimen collection for that test to create the window period (3 calendar days before and the 3 calendar days after the specimen collection date).



5. Once the window period has been created, use the patient's clinical information to identify the date of event (when the first criteria used to meet the case definition occurs for the first time within the window period). The first criteria used to meet the case definition may be a symptom or may be the positive laboratory result.

6. Use the date of event to determine if the infection is healthcare-associated (date of event occurs > 2 calendar days after hospital admission, with date of hospital admission as Day 1). If the infection is not healthcare-associated, the infection should not be included in surveillance, **do not continue**.
7. If the infection is healthcare-associated, determine if the date of event falls within the event timeframe of a previous event of the same type. If it does, the infection should not be included in the surveillance, **do not continue.**
8. Confirm the date that the patient was admitted to the surveillance unit. A patient s date of event must occur >2 calendar days from their admission to the surveillance unit (where date of surveillance unit admission = Day 1) in order to be included in the surveillance. If a patient's date of event occurs ≤ 2 calendar days from their admission to the surveillance unit, **do not continue**.
9. Review the patient s clinical data to verify that all criteria of the surveillance definition are met within the window period. If all criteria of the surveillance definition are not met within the window period, the infection should not be included in surveillance, **do not continue.**
10. If all criteria of the surveillance definition are met within the window period, assign the infection a Case ID, add the infection to the Case ID and Patient Register, and begin a case report form.
11. Construct an event timeframe for each case (a 14 day calendar day timeframe, with date of event as Day 1). During this time the HAI event for which the case definition was met is considered to be occurring and no new infections of that same type can be reported.
    NOTE: In BSI surveillance, an event timeframe is not constructed for Secondary BSIs.
12. Follow up on each patient meeting the case definition. During this time:
    a. Identify additional organisms isolated from the same source that was used to meet the case definition (e.g., blood for BSI or urine for UTI) during the Event Timeframe for primary BSIs and UTIs and add these to the case report form.
    b. At the end of the patient s hospital stay, record the patient's outcome on the case report form. Is the outcome is unknown, select "Unknown".
13. Once patient outcome is recorded and the case report form is complete, submit the completed case report form to the appropriate personnel for data entry and safekeeping.

Collection of denominator data

Denominator data allows for the calculation of incidence rates from surveillance data. Several different denominators are collected in this surveillance, as described in the BSI and UTI modules. Denominator data can be collected by surveillance staff or clinical staff working in surveillance units. Units participating in HAI surveillance must make a plan for how to collect denominator data correctly. This includes the following:

1. In each surveillance unit, collect denominator data at the same time every day, **including weekends and holidays** , using the denominator data collection forms included in this module as Appendix 2.
2. If multiple wards are under surveillance, maintain a separate denominator form for each unit.
3. Submit completed denominator data collection forms to the appropriate personnel for data entry and safekeeping.

Appendix 2 - Denominator Data Collection Forms

Denominators for HAI Surveillance in Intensive Care Units
(BSI and UTI)

Instructions for filling out this form: This form should be completed at the same time every day for each participating ICU. Count the total number of patients in the ICU and record the number under "Number of Patients." For BSI surveillance, count the number of patients with a central line and record the number under "Number of patients with ≥1 central line." For UTI surveillance, count the number of patients with an indwelling urinary catheter and record the number under "Number of patients with urinary catheter". All relevant counts should be performed at the same time by visiting each patient and checking for the presence of any central lines or urinary catheter before moving on to the next patient.

Hospital Name: Surveillance Unit Number: Month: Year:

Date	Number of Patients	Number of patients with ≥1 central line	Number of patients with urinary catheter
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
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19			
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21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
Totals			
	Patient-days:	Central-line days:	Urinary Catheter days:

Totals No Of Admissions In This ICU:

Denominators for HAI Surveillance in Neonatal Intensive Care Units (BSI and UTI)

Instructions for filling out this form: This form should be completed at the same time every day for each participating NICU. Count the total number of neonates in the NICU and record the number under "Pt" according to the neonate's birthweight. (Note: this is not the neonate's current weight). For BSI surveillance, count the number of neonates with one or more central line, including umbilical catheter, and record the number under "CL." For UTI surveillance, count the number of neonates with a urinary catheter and reord the number under "UC." All relevant counts should be performed at the same time by visiting each neonate and checking the birthweight and the presence of any central lines or urinary catheter before moving on to the next neonate.

Hospital Name:				Surveillance Unit Number:				Month				Year:		
Birth Weight Categories														
Date	**A = ≤750 g**			**B = 751-1000 g**			**C =1001-1500 g**			**D = 1501-2500 g**			**E= >2500 g**		
	Pt	CL	UC	Pt	CL	UC	Pt	CL	UC	Pt	CL	UC	Pt	CL	UC
1															
2															
3															
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30															
31															
Total															

Appendix 3 - Case ID and Patient Register

Instructions for filling out this table: This register matches patient name to Case ID. Each surveillance unit should have its own copy of the register, which should be pre-populated with the numbers that the hospital and surveillance units were assigned in the surveillance system. Each surveill ance unit must have its own patient register and in order to minimize error, the register should be pre-populated with the hospital and surveillance units assigned numbers in the surveillance system. Specify HAI type for each case; BSI or UTI. Fill in patient name and medical record number to allow for linking case report forms to patients. Any related Case IDs, Case IDs which were assigned to the patient since their hospital admission should be listed in the column on the far right. Store the register in a secure location to protect patient privacy.

Hospital Name:		Surveillance Unit Number:					Year:		
Date of Hospital Admission *(dd/mm/yyyy)*	**Date of Event** *(dd/mm/yyyy)*	**Case ID**					**Patient Name**	**Medical Record Number**	**Related Case IDs** *(All Case IDs assigned to this patient since admission)*
		Hospital Number	Surveillance Unit Number	Event Number	BSI	UTI			
01/01/2016	01/07/2016	1	1	000000	9		Example	12345678	
				000001					
				000002					
				000003					
				000004					
				000005					
				000006					
				000007					
				000008					
				000009					
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Surveillance for Healthcare-Associated Infections (HAI) in Intensive Care Units:

BSI Module

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1 INTRODUCTION

This module describes the methods to conduct surveillance for healthcare-associated bloodstream infections (BSI) in intensive care unit (ICU) settings to ensure standardized application of case definitions, data collection, and reporting procedures. This module should be used in conjunction with the overview protocol *Surveillance for Healthcare-Associated Infections (HAI) in Intensive Care Units* by infection control practitioners and others involved in surveillance of healthcare-associated BSIs. This module may also be used by stakeholders and end users of surveillance data as a way to understand how BSI data are collected and how rates are generated.

2 SURVEILLANCE SETTINGS

Surveillance will occur in ICU locations, which may include adult, pediatric intensive care units (PICU), and neonatal critical/intensive care units (NICU), due to the relative ease of case finding and collection of denominator data, and the high rates of device utilization.

3 DEFINITIONS

The following definitions have been adopted from the United States Centers for Disease Control and Prevention's (CDC) National Healthcare Safety Network (NHSN) [1]. The case definitions are for the purpose of surveillance only and are not meant to serve as clinical definitions for use in diagnosis and treatment.

3.1 KEY TERMS

Key terms that apply to this module are included in Section 4.1 (Key Terms) of the *Surveillance for Healthcare-Associated Infections (HAI) in Intensive Care Units* protocol. Additional key terms relevant for BSI surveillance follow below.

Recognized Pathogen: An organism recognized as a cause of BSIs. See Appendix 1 for an abbreviated list of recognized pathogens.

Common Commensal: An organism that can commonly exist on body surfaces without causing disease. It is often referred to as a "contaminant" when isolated in blood culture, but can also be associated with true BSIs, especially when isolated from patients with significant healthcare exposure or found in repeated blood cultures. See Appendix 1 for an abbreviated list of common commensal organisms.

3.2 BSI SURVEILLANCE DEFINITIONS

The case definition for BSI is limited to healthcare-associated laboratory-confirmed bloodstream infection (BSI).

Bloodstream Infection (BSI)

- **BSI for Recognized Pathogens:**

  A patient with one or more positive blood cultures for a recognized pathogen known to cause BSIs

- **BSI for Common Commensals:**

  Patients > 12 months of age

  - A patient with ≥ 2 matching positive blood cultures for a common commensal

    AND
  - At least one of the following signs or symptoms:
    - fever (>38 °C)
    - hypotension

  Patients ≤ 12 months of age

  - A patient with ≥ 2 matching positive blood cultures for a common commensal

    AND
  - At least one of the following signs or symptoms:
    - fever (>38 °C)
    - hypotension
    - hypothermia (<36°C)
    - apnea
    - bradycardia

Rules for two matching blood cultures:

- Samples taken at the same time:
  - Should be from different sites (e.g., one from right arm and other from left arm) using a separate sterile needle and syringe for each blood draw

    OR
  - If samples taken from the same site, there must be:
    - Two separate blood draws, each using a separate sterile needle and syringe
    - Site disinfection between draws

- Samples taken at different times:
    - Second sample collection must be on the same day or next day (consecutive days)

Note: One or both blood samples may be drawn from a central line at the same time or at different times. If both samples are taken from a central line with multiple lumens at the same time, they can be taken from the same lumen or different lumens. Lumens must be disinfected between draws.

3.3 Additional Definitions

BSIs may be considered a primary infection (originating in the bloodstream) or a result of dissemination from an infection occurring at another body site. Thus, BSI events can be classified as either primary or secondary. Primary BSIs can be further classified by device association, either as central line-associated BSI (CLABSI) or non-central line associated primary BSI. Secondary BSIs cannot be classified as central-line associated, as an infection at another body site argues against a primary BSI due to the catheter's presence. In this surveillance, identified BSIs will be classified using the following definitions: primary BSI, central line-associated BSI (CLABSI) and secondary BSI.

Primary BSI: a BSI without a matching positive culture taken from another body site (e.g. sputum, pus, urine, etc.) within the Secondary BSI Attribution Period. The **Secondary BSI Attribution Period** is defined as a timeframe that includes the 14 calendar days before the date of event and the 7 days after the date of event (where the date of event = Day 1).

Central line-associated BSI (CLABSI): a Primary BSI that meets the following criteria:

- A temporary central line in place for >2 calendar days on the date of event, with day of device placement being Day 1,

  OR
- A temporary central line in place for >2 calendar days that had been removed on the date of event or the day before the date of event

Note: If a central line is removed and reinserted on the same or following day, in the same or different site, it is considered as one continuous central line.

A **central line** is 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. Central lines can be:

- **Temporary central line:** A non-tunneled, non-implanted catheter (e.g., short term lines put in commonly in ICUs for acute management, peripherally-inserted central catheters [PICClines]).
- **Permanent central line:** Includes:
    - Tunneled catheters (including certain long-term dialysis catheters)
    - Implanted catheters (including ports such as port-a-cath)

Note: 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.

The following are considered great vessels for the purpose of reporting central line association and counting central-line (device) days:

- Aorta
- Pulmonary artery
- Superior or inferior vena cava
- Brachiocephalic vein
- Internal jugular vein
- Subclavian vein
- External and common iliac vein
- Femoral vein
- Umbilical artery/vein (in neonates)

The following devices are not considered central lines:

- Extracorporeal membrane oxygenation (ECMO)catheters
- Femoral arterial catheters
- Intra-aortic balloon pump (IABP) devices
- Hemodialysis reliable outflow (HeRO) dialysis catheters
- Impella heart devices

Secondary BSI: a BSI with a matching positive culture taken from another body site (e.g., sputum, urine, pus, etc.) within the Secondary BSI Attribution Period. The **Secondary BSI Attribution Period** is defined as a timeframe that includes the 14 calendar days before the date of event and the 7 days after the date of event (where the date of event = Day 1).

NOTE: an Event Timeframe is only created for primary BSIs. An Event Timeframe is not created for secondary BSIs since they are associated with primary HAIs at other body sites.

Example 1: Applying the Recognized Pathogen BSI Case Definition

Surveillance Unit Day	Clinical / Laboratory Criteria	Window Period	Event Timeframe	Secondary BSI Attribution Period
1				
2				14 days before DOE
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15	(+) blood culture *S. aureus*	1st (+) blood culture	Date of Event	
16				
17				
18				
19				
20				
21				7 days after DOE
22			(runs through Day 28)	

Explanation:

- The window period is constructed around Day 15. The first positive diagnostic test, the positive blood culture with *S. aureus* , occurred on Day 15.
- Because *S. aureus* is a recognized pathogen, only a single culture is required to meet the BSI case definition. The Date of Event is Day 15, since that is the day the positive blood culture was collected.
- Case reporting rules for minimum time in the hospital and the surveillance unit (>2 calendar days) are met, since the Date of Event is Day 15 of surveillance unit admission. A case report form should be started for this patient.
- This BSI is classified as a primary BSI since no matching cultures from another site were identified during the Secondary BSI Attribution Period, defined as the 14 days before the Date of Event and the 7 days after the Date of Event (where Date of Event =Day 1).
- This BSI will be further classified as central line-associated or not central line-associated based on presence or absence of a central line as described in the protocol.
- Since this is a primary BSI, an Event Timeframe is created as the 14-day period following the Date of Event (where Date of Event = Day 1). The Event Timeframe runs from Day 15 to Day 28. No other BSIs can be reported for this patient during the EventTimeframe.

Example 2: Applying the Common Commensal BSI Case Definition

Surveillance Unit Day	Clinical / Laboratory Criteria	Window Period	Event Timeframe	Secondary BSI Attribution Period
5				
6				14 days before DOE
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19	Fever 39.2°C		First case def. criteria: Date of Event	
20	(+) blood culture *Streptococcus viridans*	First (+) diagnostic test		
21	(+) blood culture *Streptococcus viridans*			
22				
23				
24				
25				7 days after DOE
26			(runs through Day 32)	

Explanation:

- The window period is constructed around Day 20. The first positive diagnostic test, the initial positive blood culture with *S. viridans*, occurred on Day 20.
- All of the elements of the common commensal BSI case definition were met during the window period. The patient had a fever on Day 19. A second positive blood culture with *S. viridans* was collected on Day 21.
- Day 19 is the Date of Event, since the patient's fever was the first element of the case definition that appeared during the window period.
- Case reporting rules for minimum time in the hospital and the surveillance unit (>2 calendar days) are met, since the Date of Event is Day 19 of surveillance unit admission. A case report form should be started.
- This BSI is classified as a primary BSI since no matching cultures from another site were identified during the Secondary BSI Attribution Period.
- This BSI will be further classified as central line-associated or not central line-associated based on presence or absence of a central line as described in the protocol.
- Since this is a primary BSI, an Event Timeframe is created as the 14-day period following the Date of Event (where Date of Event = Day 1). The Event Timeframe runs from Day 19 to Day 32. No other BSIs can be reported for this patient during the Event Timeframe.

Example 3: Applying the Recognized Pathogen BSI Case Definition with Multiple Pathogens

Surveillance Unit Day	Clinical / Laboratory Criteria	Window Period	Event Timeframe	Secondary BSI Attribution Period
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15	(+) blood culture *E. coli*	1st (+) blood culture	Date of Event	
16				
17				
18				
19	(+) blood culture *S. aureus*		In Event Timeframe– Add to *E. coli* CRF	
20				
21				
22			Runs through Day 28	

Explanation:

- The window period is constructed around Day 15. The first positive diagnostic test, the positive blood culture with *E. coli* , occurred on Day 15.
- Because *E. coli* is a recognized pathogen, only a single culture is required to meet the BSI case definition. The Date of Event is Day 15, since that is the day the positive blood culture was collected.
- Case reporting rules for minimum time in the hospital and the surveillance unit (>2 calendar days) are met, since the Date of Event is Day 15 of surveillance unit admission. A case report form should be started.
- This BSI is classified as a primary BSI since no matching cultures from another site were identified during the Secondary BSI Attribution Period.
- This BSI will be further classified as central line -associated or not central line-associated based on presence or absence of a central line as described in the protocol.
- Since this is a primary BSI, an Event Timeframe is created as the 14-day period following the Date of Event (where Date of Event = Day 1). The Event Timeframe runs from Day 15 to Day 28.
- The positive blood culture with *S. aureus* is added to the case report form for the BSI event. It would not be reported as a new BSI event since the culture was collected during the Event Timeframe

Example 4: Applying the Secondary BSI Attribution Period

Surveillance Unit Day	Clinical / Laboratory Criteria	Window Period	Event Timeframe	Secondary BSI Attribution Period
3				
4				
5				
6				
7	(+) BAL culture *Klebsiella pneumoniae*			Matching (+) culture from other body site
8				
9				
10				
11				
12				
13				
14				
15				
16				
17	(+) blood culture *Klebsiella pneumoniae*	1st (+) blood culture	Secondary BSI. Event Timeframe is not created.	
18				
19				
20				
21				
22				
23				
24				
25				
26	(+) blood culture *S. aureus*			

Explanation:

The window period is constructed around Day 17. The first positive diagnostic test, the positive blood culture with *K. pneumoniae* , occurred on Day 17.

- Day 17 is the Date of Event since the positive blood culture was collected on Day 17.
- Case reporting rules for minimum time in the hospital and the surveillance unit (>2 calendar days) are met, since the Date of Event is Day 17 of surveillance unit admission. A case report form should be started for this patient.
- The BAL culture collected on Day 7 grew *K. pneumoniae* – the same organism that grew from the positive blood culture on Day 17. Since the BAL culture with the matching organism was collected within the Secondary BSI Attribution Period, this BSI episode is classified as a secondary BSI.
- Because this BSI event is classified as a secondary BSI, no Event Timeframe is created around the BSI. The positive blood culture collected on Day 26 that grew *S. aureus* should be investigated as a possible new BSI event.

4 SURVEILLANCE METHODS

The process of conducting BSI surveillance in this protocol requires active, patient-based, prospective identification of cases and collection of denominator data by staff trained in HAI surveillance.

4.1 CASE FINDING

Section 5.1 (Case Finding) of the *Surveillance for Healthcare-Associated Infections (HAI) in Intensive Care Units* protocol provides expectations for case finding strategies to be used in BSI surveillance.

Appendix 2 of this BSI module protocol provides a flow chart that summarizes the steps in finding BSI cases.

4.2 CASE REPORTING FOR BSI

Once surveillance staff have evaluated all patients in the ICUs under surveillance and identified cases meeting the BSI case definition, they will complete the BSI case report form (Appendix 3) for each case. The case report form includes basic information about the patient's BSI episode and lists the isolated organism(s) and antimicrobial susceptibility testing results. Instructions for completion of the BSI case report form can be found in Appendix 4.

Additional case reporting rules, including details on interpretation and reporting of laboratory results, are described in Section 5.2 (Case Reporting) in the *Surveillance for Healthcare -Associated Infections (HAI) in Intensive Care Units* protocol.

Additional Reporting Rules Specific to BSI:

- Matching common commensals represent a single criteria. If the matching common commensals came from blood cultures collected on consecutive days (See: Rules for two matching blood cultures), then the collection date of the first culture is the date assigned to the criteria.
- If only one blood sample is culture positive for a common commensal (a second blood sample was negative or never collected), this sample should not be used for purposes of BSI surveillance.
- Catheter tip cultures should not be used to determine whether a patient meets the BSI case definition.

4.3 DENOMINATORS (FOR CALCULATION OF INCIDENCE RATES)

Central line days and patient days are the denominators used to calculate BSI and CLABSI incidence rates. Denominator data should be **collected at the same time every day** for each participating unit or ward under surveillance, including weekends and holidays. The denominator forms for collection of patient days and central line days can be found as Appendix 2 of the *Surveillance for Healthcare - Associated Infections (HAI) in Intensive Care Units* protocol.

- **Central line day** : denominator data is calculated as the number of patients with one or more temporary central lines on each unit under surveillance, each day. Surveillance staff should *record the number of patients in the surveillance unit who have at least one central line in place*. If a patient has more than one central line in place, they still only count as one central line day.
- **Patient day** : denominator data is calculated as the total number of patients per day in the unit under surveillance. Patient days should be collected at the same time as central line-days.
    - **NICU patient days:** If feasible, participating hospitals conducting surveillance in NICUs may choose to collect the denominator data stratified by birth weight categories using the NICU denominator data collection form, or they may choose to use the regular/non-

stratified denominator data collection form. NICUs collecting the denominator data by birth weight category will be able to stratify HAI rates by five birth weight categories.

4.4 Analysis Plan

Data will be analyzed for all BSIs combined and stratified by BSI type (primary non-central line-associated, CLABSI, or secondary). Incidence rates will be calculated for total BSI, total CLABSI, and the primary subsets of each, as described below.

Calculation of Incidence

- **Total BSI rate:** BSI per 1000 patient days. Divide the total number of reported BSI by the number of patient days and then multiply by 1000.
- **Primary BSI rate** : Primary BSI per 1000 patient days. Divide the number of primary BSI by the number of patient days and then multiply by 1000.
- **CLABSI rate:** CLABSI per 1000 central line days. Divide the total number of reported CLABSI by the number of central line days and then multiply by 1000.

Device Utilization Ratio (DUR)

The device utilization ratio (DUR) is used during reporting to contextualize the BSI incidence. This is important because facilities that have high rates of central line usage (the most important risk factor for BSI in ICUs) will likely have higher BSI and CLABSI rates. The DUR can be calculated by dividing the number of central line days by the number of patient days as shown in the formula below.

$$DUR = \frac{\text{\# of central line days}}{\text{\# of patient days for the days where central line days are also collected}}$$

5 REFERENCES

1. Centers for Disease Control and Prevention. National Healthcare Safety Network: Acute Care Hospital Surveillance for Central Line-associated Bloodstream Infections; Available from: http://www.cdc.gov/nhsn/acute-care-hospital/clabsi/index.html.

6 APPENDICES

Appendix 1 – Abbreviated Organism Lists

Abbreviated List of Recognized Pathogens

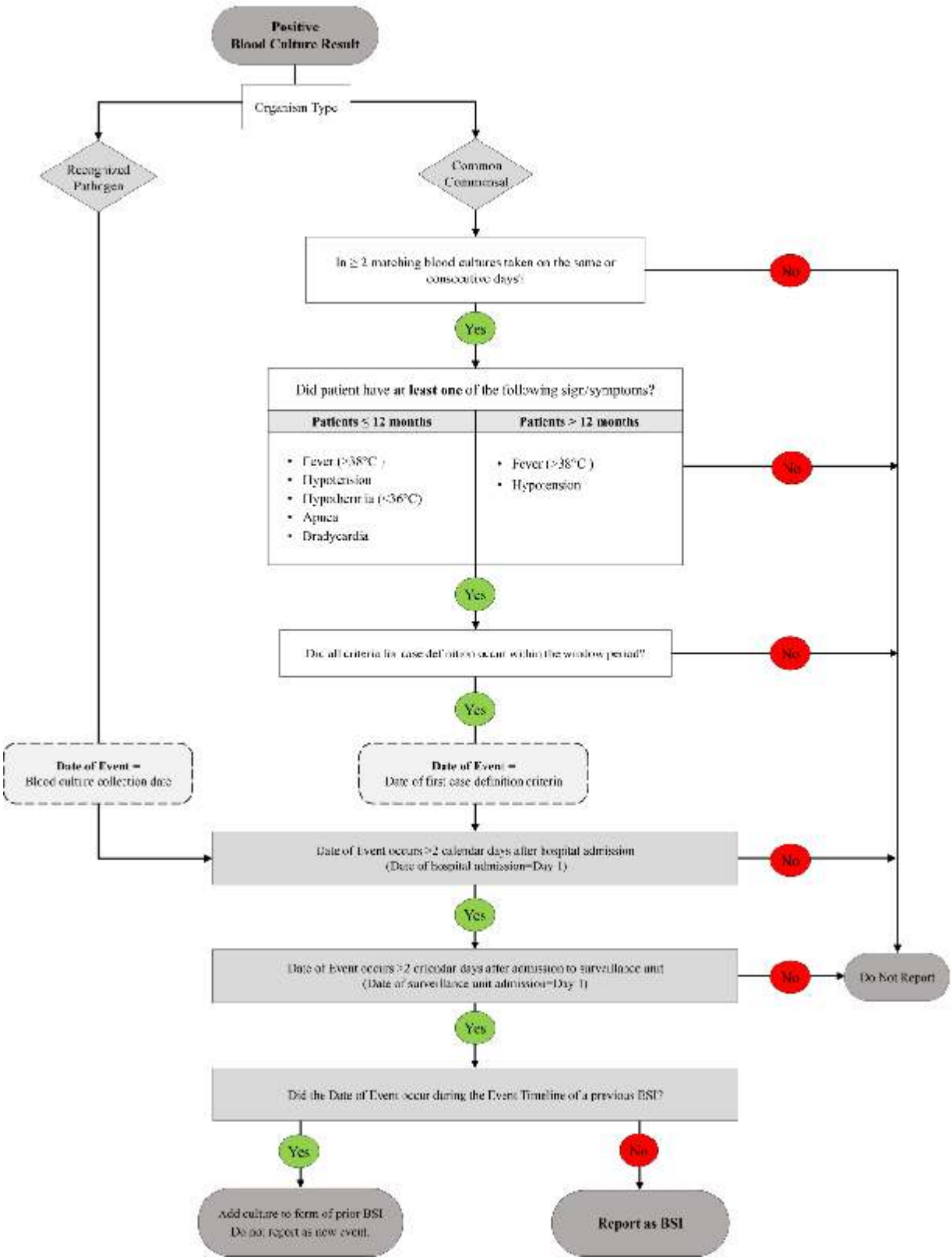
Acinetobacter baumanii	*Escherichia coli*	*Staphylococcus aureus*
Burkholderia cepacia	*Klebsiella oxytoca*	*Candida albicans*
Citrobacter freundii	*Klebsiella pneumoniae*	*Candida* spp.
Citrobacter koseri	*Moraxella catarrhalis*	
Enterobacter aerogenes	*Proteus* spp.	
Enterobacter cloacae	*Pseudomonas aeruginosa*	
Enterococcus faecalis	*Serratia marcescens*	
Enterococcus faecium	*Streptococcus agalactiae*	

Abbreviated List of Common Commensals

Actinomyces species	Propionibacterium species	*Streptococcus salivarius*
Aerococcus species	Staphylococcus species, not *S. aureus*	*Streptococcus sanguis*
Bacillus species , not *B. anthracis*	*Streptococcus anginosis*	*Streptococcus viridians*
Corynebactrium species, not *C. diphtheriae*	*Streptococcus constellatus*	
Diphtheriods species	*Streptococcus milleri*	
Micrococcus species	*Streptococcus mitis*	
Pediococcus urinaeequi	*Streptococcus mutans*	
Peptococcus saccharolyticus	*Streptococcus oralis*	

A complete list of common commensals available at: http://www.cdc.gov/nhsn/XLS/master-organism-Com-Commensals-Lists.xlsx . If an organism is not included on the complete list of common commensals, it must be treated as a recognized pathogen.

Appendix 2 – BSI Case Finding Flowchart



Appendix 3- BSI Case Rep ort Form

Surveillance unit Number _____ Case Type _____ Patient Name _____ Medical record Number: _____		Case ID: _____
Hospital Name:		
Sex: ☐ Male ☐ Female	Date of Birth (DD/MM/YYYY): ___/___/___ Age (Years): _____ ☐ Age/DOB (Unknown)	Birth weight: _____ grams (NICU only)
Date of hospital admission: _____/_____/_____	Date of admission to surveillance unit: _____/_____/_____	
Location prior to hospital admission: ☐ Home / Community ☐ Another hospital ☐ Unknown		
Linked Case ID **(autogenerated)** do not fill on Hard copy. **Only to be filled on software**		
1. BSI Details		
Type of laboratory-confirmed BSI	☐ Recognized Pathogen ☐ Common Commensal (from ≥ 2 bloodcultures)	
Date of event *(dd/mm/yyyy)*:	_____/_____/_____	
Fill out culture results in Section 5, Organisms and Antibiotic Susceptibility		
2. Invasive Devices: Central Lines		
Did the patient have a central line in place at any time on • The date of event **or** • The day before the date of event?	☐ Yes ☐ No *(skip to 3, Infections at Other Body Sites)*	
If **YES,** was the central line in place for >2 calendar days?	☐ Yes ☐ No *(skip to 3, Infections at Other Body Sites)*	
If **YES,** type(s) of central line(s) in place *(check all that apply)* Date of central line insertion (dd/mm/yyyy): ___/___/___	☐ Non-tunneled short-term catheter (e.g., double or triple lumen) ☐ Peripherally inserted central catheter (PICC) ☐ Port-a-cath ☐ Hemodialysis catheter ☐ Tunneled catheter ☐ Umbilical catheter ☐ Other, specify: _____	
Location(s) of central line(s) in place *(check all that apply)*	☐ Jugular ☐ Brachial ☐ Subclavian ☐ Umbilical ☐ Femoral ☐ Other, specify: _____	

3. Infections at Other Body Sites			
Was a positive, matching culture obtained from another body site(s) during the Secondary BSI Attribution Period?	☐ Yes ☐ No *(skip to 4, Outcome)* ☐ Unknown		
If **YES**, specify specimen(s) collected, date(s) of culture, and organism(s).	Specimen Collected	Date of Collection	Organism
	1.		
	2.		
	3.		
	4.		
	5.		

4. Outcome	
Patient status at end of 14 days after DOE (Where DOE = Day 1) Date Of Discharge From ICU (dd/mm/yyyy): _____/_____/_____	☐ Still in surveillance unit ☐ Transferred to other hospital ☐ Transferred to other ward/unit within the hospital ☐ Discharged ☐ LAMA ☐ Died ☐ Unknown Date of discharge, transfer, or death: _____/_____/_____
Patient outcome at end of hospitalization	☐ Discharged ☐ Transferred to other hospital ☐ LAMA ☐ Died ☐ Unknown Date of discharge, transfer, or death: _____/_____/_____

5. Organisms and Antibiotic Susceptibility						
Date of sample collection	**Organism**	**Drugs**				
_____	*Staphylococcus epidermidis*	OX S I R N	CEFOX S I R N	METH S I R N	CLIND S I R N	DAPTO S I R N
		VANC S I R N	OTHER DRUG 1 S I R N	OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N	OTHER DRUG 4 S I R N
		OTHER DRUG 5 S I R N				
_____	*Staphylococcus haemolyticus*	OX S I R N	CEFOX S I R N	METH S I R N	CLIND S I R N	DAPTO S I R N
		VANC S I R N	OTHER DRUG 1 S I R N	OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N	OTHER DRUG 4 S I R N
		OTHER DRUG 5 S I R N				

_____	*Staphylococcus hominis*	OX S I R N VANC S I R N OTHER DRUG 5 S I R N	CEFOX S I R N OTHER DRUG 1 S I R N	METH S I R N OTHER DRUG 2 S I R N	CLIND S I R N OTHER DRUG 3 S I R N	DAPTO S I R N OTHER DRUG 4 S I R N
_____	*Staphylococcus, other* coagulase -	OX S I R N VANC S I R N OTHER DRUG 5 S I R N	CEFOX S I R N OTHER DRUG 1 S I R N	METH S I R N OTHER DRUG 2 S I R N	CLIND S I R N OTHER DRUG 3 S I R N	DAPTO S I R N OTHER DRUG 4 S I R N
_____	*Enterococcus Faecium*	AMP S I R N TEICO S I R N OTHER DRUG 4 S I R N	DAPTO S I R N VANC S I R N OTHER DRUG 5 S I R N	GENTHL§ S I R N OTHER DRUG 1 S I R N	CIPRO S I R N OTHER DRUG 2 S I R N	LNZ S I R N OTHER DRUG 3 S I R N
_____	*Enterococcus faecalis*	AMP S I R N TEICO S I R N OTHER DRUG 4 S I R N	DAPTO S I R N VANC S I R N OTHER DRUG 5 S I R N	GENTHL§ S I R N OTHER DRUG 1 S I R N	CIPRO S I R N OTHER DRUG 2 S I R N	LNZ S I R N OTHER DRUG 3 S I R N
_____	*Enterococcus Sp.* Please Specify Species: ____	AMP S I R N TEICO S I R N OTHER DRUG 4 S I R N	DAPTO S I R N VANC S I R N OTHER DRUG 5 S I R N	GENTHL§ S I R N OTHER DRUG 1 S I R N	CIPRO S I R N OTHER DRUG 2 S I R N	LNZ S I R N OTHER DRUG 3 S I R N
_____	*Staphylococcus aureus*	LEVO S I R N MINO S I R N OTHER DRUG 2 S I R N	MOXI S I R N ERYTH S I R N OTHER DRUG 3 S I R N	CLIND S I R N GENT S I R N OTHER DRUG 4 S I R N	DAPTO S I R N LNZ S I R N OTHER DRUG 5 S I R N	DOXY S I R N OTHER DRUG 1 S I R N
_____	*Acinetobacter baumannii*	AMK S I R N LEVO S I R N TICLAV S I R N	AMPSUL S I R N COL S I R N MERO S I R N	CEFTAZ S I R N PB S I R N DORI S I R N	CEFOT S I R N GENT S I R N NET S I R N	CIPRO S I R N IMI S I R N PIP S I R N

		PIPTAZ S I R N	TETRA S I R N	DOXY S I R N	MINO S I R N	TMZ S I R N
		TOBRA S I R N	OTHER DRUG 1 S I R N	OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N	OTHER DRUG 4 S I R N
		OTHER DRUG 5 S I R N				
_____	*Acinetobacter baumannii complex*	AMK S I R N	AMPSUL S I R N	CEFTAZ S I R N	CEFOT S I R N	CIPRO S I R N
		LEVO S I R N	COL S I R N	PB S I R N	GENT S I R N	IMI S I R N
		TICLAV S I R N	MERO S I R N	DORI S I R N	NET S I R N	PIP S I R N
		PIPTAZ S I R N	TETRA S I R N	DOXY S I R N	MINO S I R N	TMZ S I R N
		TOBRA S I R N	OTHER DRUG 1 S I R N	OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N	OTHER DRUG 4 S I R N
		OTHER DRUG 5 S I R N				
_____	*Acinetobacter lwoffii*	AMK S I R N	AMPSUL S I R N	CEFTAZ S I R N	CEFOT S I R N	CIPRO S I R N
		LEVO S I R N	COL S I R N	PB S I R N	GENT S I R N	IMI S I R N
		TICLAV S I R N	MERO S I R N	DORI S I R N	NET S I R N	PIP S I R N
		PIPTAZ S I R N	TETRA S I R N	DOXY S I R N	MINO S I R N	TMZ S I R N
		TOBRA S I R N	OTHER DRUG 1 S I R N	OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N	OTHER DRUG 4 S I R N
		OTHER DRUG 5 S I R N				
_____	*Acinetobacter sp.* Please Specify Species: ____	AMK S I R N	AMPSUL S I R N	CEFTAZ S I R N	CEFOT S I R N	CIPRO S I R N
		LEVO S I R N	COL S I R N	PB S I R N	GENT S I R N	IMI S I R N
		TICLAV S I R N	MERO S I R N	DORI S I R N	NET S I R N	PIP S I R N
		PIPTAZ S I R N	TETRA S I R N	DOXY S I R N	MINO S I R N	TMZ S I R N
		TOBRA S I R N	OTHER DRUG 1 S I R N	OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N	OTHER DRUG 4 S I R N
		OTHER DRUG 5 S I R N				

_____	*Escherichia coli*	AMK S I R N	CEFAZ S I R N	CEFEP S I R N	CEFOT S I R N	CEFTRX S I R N
		CEFTAZ S I R N	CEFUR S I R N	CEFOX S I R N	CTET S I R N	CIPRO S I R N
		EVO S I R N	MOXI S I R N	COL S I R N	PB S I R N	ERTA S I R N
		GENT S I R N	IMI S I R N	MERO S I R N	DORI S I R N	PIPTAZ S I R N
		TETRA S I R N	DOXY S I R N	MINO S I R N	TIG S I R N	OTHER DRUG 1 S I R N
		OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N	OTHER DRUG 4 S I R N	OTHER DRUG 5 S I R N	
_____	*Enterobacter aerogenes*	AMK S I R N	CEFAZ S I R N	CEFEP S I R N	CEFOT S I R N	CEFTRX S I R N
		CEFTAZ S I R N	CEFUR S I R N	CEFOX S I R N	CTET S I R N	CIPRO S I R N
		LEVO S I R N	MOXI S I R N	COL S I R N	PB S I R N	ERTA S I R N
		GENT S I R N	IMI S I R N	MERO S I R N	DORI S I R N	PIPTAZ S I R N
		TETRA S I R N	DOXY S I R N	MINO S I R N	TIG S I R N	OTHER DRUG 1 S I R N
		OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N	OTHER DRUG 4 S I R N	OTHER DRUG 5 S I R N	
_____	*Enterobacter cloacae*	AMK S I R N	CEFAZ S I R N	CEFEP S I R N	CEFOT S I R N	CEFTRX S I R N
		CEFTAZ S I R N	CEFUR S I R N	CEFOX S I R N	CTET S I R N	CIPRO S I R N
		LEVO S I R N	MOXI S I R N	COL S I R N	PB S I R N	ERTA S I R N
		GENT S I R N	IMI S I R N	MERO S I R N	DORI S I R N	PIPTAZ S I R N
		TETRA S I R N	DOXY S I R N	MINO S I R N	TIG S I R N	OTHER DRUG 1 S I R N
		OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N	OTHER DRUG 4 S I R N	OTHER DRUG 5 S I R N	
_____	*Klebsiella oxytoca*	AMK S I R N	CEFAZ S I R N	CEFEP S I R N	CEFOT S I R N	CEFTRX S I R N
		CEFTAZ S I R N	CEFUR S I R N	CEFOX S I R N	CTET S I R N	CIPRO S I R N
		LEVO S I R N	MOXI S I R N	COL S I R N	PB S I R N	ERTA S I R N

		GENT S I R N	IMI S I R N	MERO S I R N	DORI S I R N	PIPTAZ S I R N
		TETRA S I R N	DOXY S I R N	MINO S I R N	TIG S I R N	OTHER DRUG 1 S I R N
		OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N	OTHER DRUG 4 S I R N	OTHER DRUG 5 S I R N	
_____	*Klebsiella pneumoniae*	AMK S I R N	CEFAZ S I R N	CEFEP S I R N	CEFOT S I R N	CEFTRX S I R N
		CEFTAZ S I R N	CEFUR S I R N	CEFOX S I R N	CTET S I R N	CIPRO S I R N
		LEVO S I R N	MOXI S I R N	COL S I R N	PB S I R N	ERTA S I R N
		GENT S I R N	IMI S I R N	MERO S I R N	DORI S I R N	PIPTAZ S I R N
		TETRA S I R N	DOXY S I R N	MINO S I R N	TIG S I R N	OTHER DRUG 1 S I R N
		OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N	OTHER DRUG 4 S I R N	OTHER DRUG 5 S I R N	
_____	*Klebsiella spp.* Please Specify Species: ____	AMK S I R N	CEFAZ S I R N	CEFEP S I R N	CEFOT S I R N	CEFTRX S I R N
		CEFTAZ S I R N	CEFUR S I R N	CEFOX S I R N	CTET S I R N	CIPRO S I R N
		LEVO S I R N	MOXI S I R N	COL S I R N	PB S I R N	ERTA S I R N
		GENT S I R N	IMI S I R N	MERO S I R N	DORI S I R N	PIPTAZ S I R N
		TETRA S I R N	DOXY S I R N	MINO S I R N	TIG S I R N	OTHER DRUG 1 S I R N
		OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N	OTHER DRUG 4 S I R N	OTHER DRUG 5 S I R N	
_____	*Pseudomonas aeruginosa*	AMK S I R N	AZT S I R N	CEFEP S I R N	CEFTAZ S I R N	CIPRO S I R N
		LEVO S I R N	COL S I R N	PB S I R N	GENT S I R N	IMI S I R N
		MERO S I R N	DORI S I R N	NET S I R N	PIPTAZ S I R N	TOBRA S I R N
		OTHER DRUG 1 S I R N	OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N	OTHER DRUG 4 S I R N	OTHER DRUG 5 S I R N
_____	*Pseudomonas putida*	AMK S I R N	AZT S I R N	CEFEP S I R N	CEFTAZ S I R N	CIPRO S I R N
		LEVO S I R N	COL S I R N	PB S I R N	GENT S I R N	IMI S I R N

		MERO S I R N	DORI S I R N	NET S I R N	PIPTAZ S I R N	TOBRA S I R N
		OTHER DRUG 1 S I R N	OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N	OTHER DRUG 4 S I R N	OTHER DRUG 5 S I R N
_____	*Pseudomonas sp.* Please Specify Species: ____	AMK S I R N	AZT S I R N	CEFEP S I R N	CEFTAZ S I R N	CIPRO S I R N
		LEVO S I R N	COL S I R N	PB S I R N	GENT S I R N	IMI S I R N
		MERO S I R N	DORI S I R N	NET S I R N	PIPTAZ S I R N	TOBRA S I R N
		OTHER DRUG 1 S I R N	OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N	OTHER DRUG 4 S I R N	OTHER DRUG 5 S I R N
_____	*Candida albicans*	ANID S I R N	CASPO S I R N	FLUCO S I R N	FLUCY S I R N	ITRA S I R N
		MICA S I R N	VORI S I R N	OTHER DRUG 1 S I R N	OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N
		OTHER DRUG 4 S I R N	OTHER DRUG 5 S I R N			
_____	*Candida glabrate*	ANID S I R N	CASPO S I R N	FLUCO S I R N	FLUCY S I R N	ITRA S I R N
		MICA S I R N	VORI S I R N	OTHER DRUG 1 S I R N	OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N
		OTHER DRUG 4 S I R N	OTHER DRUG 5 S I R N			
_____	*Candida tropicalis*	ANID S I R N	CASPO S I R N	FLUCO S I R N	FLUCY S I R N	ITRA S I R N
		MICA S I R N	VORI S I R N	OTHER DRUG 1 S I R N	OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N
		OTHER DRUG 4 S I R N	OTHER DRUG 5 S I R N			
_____	*Candida spp .* Please Specify Species: ____	ANID S I R N	CASPO S I R N	FLUCO S I R N	FLUCY S I R N	ITRA S I R N
		MICA S I R N	VORI S I R N	OTHER DRUG 1 S I R N	OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N
		OTHER DRUG 4 S I R N	OTHER DRUG 5 S I R N			
Date of sample collection	**Other Organisms**	**Drugs**				
_____	Organism 1 _____ Specify:	**Drug 1** S I R N	**Drug 2** S I R N	**Drug 3** S I R N	**Drug 4** S I R N	**Drug 5** S I R N
		Drug 6 S I R N	**Drug 7** S I R N	**Drug 8** S I R N	**Drug 9** S I R N	**Drug 10** S I R N

_____	Organism 2 _____ Specify:	**Drug 1** S I R N	**Drug 2** S I R N	**Drug 3** S I R N	**Drug 4** S I R N	**Drug 5** S I R N
		Drug 6 S I R N	**Drug 7** S I R N	**Drug 8** S I R N	**Drug 9** S I R N	**Drug 10** S I R N
_____	Organism 3 _____ Specify:	**Drug 1** S I R N	**Drug 2** S I R N	**Drug 3** S I R N	**Drug 4** S I R N	**Drug 5** S I R N
		Drug 6 S I R N	**Drug 7** S I R N	**Drug 8** S I R N	**Drug 9** S I R N	**Drug 10** S I R N

Comments

Result Codes

S = Susceptible I = Intermediate R = Resistant NS = Non -susceptible S -DD = Susceptible -dose dependent N = Not tested

[§] GENTHL results: S = Susceptible/Synergistic and R = Resistant/Not Synergistic

[†] Clinical breakpoints have not been set. S/R designations should be based upon epidemiological cutoffs of S = MIC ≤ 2 and R = MIC ≥ 4

AKF	Amikacin-fosfomycin	AMC	Amoxicillin-clavulanate	AMK	Amikacin
AMOX	Amoxicillin	AMP	ampicillin	AMPSUL	ampicillin sulbactam
AMXCLV	amoxicillin clavulanic acid	ANID	anidulafungin	AZA	Aztreonam-avibactam
AZL	Azlocillin	AZM	Azithromycin	AZT	aztreonam
BES	Besifloxacin	BPM	Biapenem	BPR	Ceftobiprole
C/T	Ceftolozane-tazobactam	CASPO	caspofungin	CAT	Cefetamet
CB	Carbenicillin	CDN	Cefditoren	CDR	Cefdinir
CDZ	Cadazolid	CEFAZ	cefazolin	CEFEP	cefepime
CEFOT	cefotaxime	CEFOX	cefoxitin	CEFTAZ	ceftazidime
CEFTRX	ceftriaxone	CEFUR	cefuroxime	CEP	Cephalothin
Cfm	Cefamandole	Cfr	Cefaclor	CHL	Chloramphenicol
CID	Cefonicid	CIN	Cinoxacin	CIPRO	ciprofloxacin
CLA	Clarithromycin	CLIND	clindamycin	CLX	Clinafloxacin
CMZ	Cefmetazole	COL	Colistin	CPA	Ceftaroline-avibactam
CPR	Cefpirome	CPT	Ceftaroline	CPZ	Cefoperazone
CTB	Ceftibuten	CTET	cefotetan	CTZ	Ceftizoxime
CZA	ceftazidime-avibactam	DAL	Dalbavancin	DAPTO	daptomycin
DFX	Delafloxacin	DIC	Dicloxacillin	DORI	doripenem
DOXY	doxycycline	DTM	Dirithromycin	ERTA	ertapenem
ERV	Eravacycline	ERYTH	erythromycin	FARO	Faropenem
FC	Fusidic acid	FDX	Fidaxomicin	FIN	Finafloxacin
FLUCO	fluconazole	FLUCY	flucytosine	FLX	Fleroxacin
FOS	Fosfomycin	FP	Cefprozil	FPZ	Cefepime-tazobactam
GAT	Gatifloxacin	GEM	Gemifloxacin	GENT	gentamicin
GENTHL	gentamicin - high level test	GEP	Gepotidacin	GRN	Garenoxacin

GRX	Grepafloxacin	HAP	Cephapirin	HLS	Streptomycin synergy
ICL	Iclaprim	IMI	imipenem	ITRA	itraconazole
KAN	Kanamycin	LEVO	levofloxacin	LMU	Lefamulin
LND	Levonadifloxacin	LNZ	linezolid	LOM	Lomefloxacin
LOR	Loracarbef	MEC	Mecillinam	MERO	meropenem
METH	methicillin	MEV	Meropenem-vaborabactam	MEZ	Mezlocillin
MICA	micafungin	MINO	minocycline	MOX	Moxalactam
MOXI	moxifloxacin	MTZ	Metronidazole	MUP	Mupirocin
NAF	Nafcillin	NAL	Nalidixic acid	NET	netilmicin
NIT	Nitazoxanide	NITRO	nitrofurantoin	NOR	norfloxacin
OFL	Ofloxacin	OMC	Omadacyline	ORI	Oritavancin
OX	oxacillin	PB	polymyxin B	PEF	Pefloxacin
PEN	Penicillin	PEX	Pexiganan	PIP	piperacillin
PIPTAZ	piperacillin/tazobactam	PLZ	Plazomicin	POD	Cefpodoxime
PRU	Ulifloxacin	QDA	Quinupristin-dalfopristin	RAD	Cephradine
RAM	Ramoplanin	RIF	rifampin	RZM	Razupenem
SEC	Secnidazole	SOL	Solithromycin	SPT	Spectinomycin
SPX	Sparfloxacin	SSS	Sulfonamides	STR	Streptomycin
SULO	Sulopenem	SUR	Surotomycin	TBR	Trospectomycin
TEICO	teicoplanin	TEL	Telithromycin	TETRA	tetracycline
TIC	Ticarcillin	TICLAV	ticarcillin/clavulnate	TIG	Tigecycline
TOBRA	tobramycin	TVA	Trovafloxacin	TZD	Tedizolid
VANC	vancomycin	VORI	voriconazole	ZWK	Nafithromycin
TIN	Tinoxanide	TLV	Telavancin	TMP	Trimethoprim
TMZ	trimethoprim/sulfamethoxazole	TNZ	Tinidazole		

Bloodstream Infection (BSI) – Case Investigation Worksheet and Table

For all positive blood cultures:

1. Record collection date of blood culture:_____/_____/_____ Continue to Question 2.
2. Select type of organism in positive blood culture:
   - □ Recognized Pathogen. If selected, then date of event = collection date of positive culture. Skip to Question 4.
   - □ Common Commensal. If selected, continue to Question 3.
3. For common commensals only,

   3a. Did the common commensal have a matching blood culture collected on the same or consecutive day?
   - □ Yes. If selected, record the result on the case investigation table and continue to Question 3b.
   - □ No. If selected, the case definition is not met. **Do not report this episode** .

   3b. Did the patient have at least one of the following signs or symptoms during the window period?
   - □ Yes. If selected, record the signs/symptoms on the case investigation table and continue to Question 3c.
   - □ No. If selected, the case definition is not met. **Do not report this episode.**

Patients > 12 months	Patients ≤ 12 months
▪ Fever (>38°C) ▪ Hypotension	▪ Fever (>38°C) ▪ Hypotension ▪ Hypothermia (<36°C) ▪ Apnea ▪ Bradycardia

   3c. Determine the date of event (the date the first case definition criteria– blood culture collection or sign/symptom – occurred in the window period). Indicate on case investigation table and continue to Question 4.

4. Are all of the following inclusion criteria true?
   - □ Yes. **This episode should be reported** . Start a BSI case report form for the patient. Continue to Question 5.
   - □ No. Inclusion criteria are not met. **Do not report this episode.**

Inclusion Criteria
• The Date of Event does not occur during the Event Timeframe of a previous primary BSI • The Date of Event occurs >2 days after hospital admission (where Date of Hospital admission=Day1) • The Date of Event occurs >2 days after ICU admission (where Date of ICUadmission=Day 1)

5. Perform follow up activities on all case report forms. Use the case investigation table to organize relevant data.
   - Report information on presence of central line(s) in Section 2 – Invasive Devices
   - Report all matching positive cultures that occur during the Secondary BSI Attribution Period in Section 3– Infections at Other Body Sites
     - Secondary BSI Attribution Period = 14 days before date of event to 7 days after date of event (where date of event = day 1) – section 3
   - Report the first positive blood culture and all positive blood cultures that occur during the EventTimeframe for primary BSIs in Section 5 – Organisms and AntibioticSusceptibility
     - Event Timeframe = 14 days after date of event (where date of event = day 1)
     - For secondary BSIs, no Event Timeframe is created
   - At the end of the patient's hospitalization, specify the patient's outcome in Section 4.
6. Submit the case report form after all information is completed.

BSI Case Investigation Table

Hospital Admission Date:____/____/_____ ICU Admission Date:_____/____/_____

Date	First Positive Culture Record information for first positive blood culture on the line with the X.	Window Period Record matching commensal culture and symptoms.	Date of Event (DOE) Indicate DOE with an X.	Secondary BSI Attribution Period Record positive cultures from other body sites collected during the 14 days before DOE and the 7 days after DOE. DOE = Day 1.	Event Timeframe Record positive cultures from blood cultures collected during the 14 days after the DOE. DOE = Day 1.	Central Line? (Y/N)
	X					

Appendix 4- BSI Case Report Form Instructions

Surveillance unit Number	Add the ICU Code in this row
Case Type	Add whether the case if BSI or UTI
Patient Name	Add the name of the patient. This will remain with the Surveillance unit and will not be seen by the AIIMS team
Medical record Number	Add the Medical record number here. This will remain with the Surveillance unit and will not be seen by the AIIMS team
Hospital Name	
Sex	
Date of Birth	Record the date of the patient birth using this format: DD/MM/YYYY. If DOB is unknown, age in years may be mentioned. DOB is mandatory for neonates.
Birth Weight	Required only for neonates housed in neonatal intensive care unit.
Date of Hospital Admission	Record the date of the hospital admission using this format: DD/MM/YYYY.
Location prior to hospital admission	Check one. Indicate the location the patient was in immediately prior to admission to the hospital.
Date of admission to Surveillance Unit	Record the date as DD/MM/YYYY.
Date of event	Record the date as DD/MM/YYYY. Enter thedate when the first criteria used to meet the case definition occurred. Note: If the first criteria to meet the case definition is a laboratory diagnostic test, the laboratory specimen collection date should be reported as the date of event.
Laboratory Result	Fill out Section 5 on Organism and Antibiotic Susceptibility Testing.
Did the patient have a central line in place at any time on the date of event or day before the date of event?	Check one. If "No," skip to Section 3, Infections at Other Body Sites.
Was the central line in place for >2 calendar days?	Required if central line in place at any time on date of event or day before. Check one. If "No," skip to Section 3, Infections at Other Body Sites. Note: If a central line is removed and reinserted on the same or following day, in the same or different site, it is considered as one continuous central line.
Type(s) of central line(s) in place	Required if patient had central line in place for >2 calendar days. Search the medical record for central lines that were in place for > 2 days and in place at any time on the date of event or the day before the date of event. Check the type(s) of the central lines that apply. If "Other," specify on the line provided. Do not document 'brand names' in 'other'.

Location(s) of central line(s) in place	Required if patient had central line in place for >2 calendar days. Search the medical record for central lines that were in place for > 2 days and in place at any time on the date of event or the day before the date of event. Check the locations(s) of the central lines that apply. If "Other," specify on the line provided.
Was a positive, matching culture obtained from another body site(s) during the Secondary BSI Attribution Period?	Check one. If "Yes," list Specimen Collected, Date of Culture, and Organisms Isolated in the table provided. If "No," skip to Section 4, Outcome.
Specimen Collected, Date of culture, and Organism	Required if there was a positive culture from another body site that matches any of the blood cultures obtained within the secondary BSI Attribution Period. Fill out table for each positive culture obtained from another body site Record the date as DD/MM/YYYY.
Patient Status at end of 14 Days after DOE	Required. Check one. Report the status of the patient at the end of 14 days after the date of event (for primary BSIs, this is the end of the Event Timeframe).
Patient outcome at end of hospitalization	Keep the case report form(s) for a patient on hand and consider them incomplete until the end of the patient's hospital stay. Record the patient's outcome as of the end of their hospital stay by selecting one of the options.
Date of discharge, transfer, or death	Record date as DD/MMM/YYYY. Record the date that the patient was discharged, transferred to a different hospital, or died during the admission when the HAI occurred.
Organism ID and Antibiotic Susceptibility Testing	Record date of specimen collection as DD/MM/YYYY Specify species if known, otherwise report as spp. For pathogens not listed in the case report form, specify in the row for "Other Organisms" and provide antibiotic susceptibility results. Circle the pathogen's susceptibility result using the codes defined on the case report forms. Report every organism isolated from blood cultures collected during the Secondary BSI Attribution Period and Event Timeframe
Comments	Enter any comments, questions, or doubts about this event in the space provided.

Surveillance for Healthcare-Associated Infections (HAI) in Intensive Care Units:

UTI Module

List of Abbreviations

BSI: Bloodstream Infection

CDC: United States Centers for Disease Control and Prevention

CAUTI: Catheter-Associated Urinary Tract Infection

CFU: Colony Forming Unit

DHQP: Division of Healthcare Quality Promotion

DUR: Device Utilization Rate

ECDC: European Centre for Disease Prevention and Control

HAI: Healthcare-Associated Infection

HAI-Net: Healthcare-Associated Infections Surveillance Network

ICU: Intensive Care Unit

NHSN: National Healthcare Safety Network

NICU: Neonatal Intensive Care Unit

PICU: Pediatric Intensive Care Unit

UTI: Urinary Tract Infection

Table of Contents

1 INTRODUCTION

This module describes the methods to conduct surveillance for healthcare-associated urinary tract infections (UTI) in intensive care unit (ICU) settings to ensure standardized application of case definitions, data collection, and reporting procedures. This module should be used in conjunction with the overview protocol *Surveillance for Healthcare -Associated Infections (HAI) in Intensive Care Units* by infection control practitioners and others involved in surveillance of healthcare-associated UTIs. This module may also be used by stakeholders and end users of surveillance data as a way to understand how UTI data are collected and how rates are generated.

2 SURVEILLANCE SETTINGS

Surveillance will occur in ICU locations, which may include adult, pediatric intensive care units (PICU), and neonatal critical/intensive care units (NICU), due to the relative ease of case finding and collection of denominator data, and the high rates ofdevice utilization.

3 DEFINITIONS

The following definitions have been adopted from the European Centre for Disease Prevention and Control s (ECDC) HAI-Net [1] and the United States Centers for Disease Control and Prevention s (CDC) National Healthcare Safety Network (NHSN) [2].The case definitions are for the purpose of surveillance only and are not meant to serve as clinical definitions for use in diagnosis and treatment.

3.1 KEY TERMS

Key terms that apply to this module are included in Section 4.1 (Key Terms) of the *Surveillance for Healthcare -Associated Infections (HAI) in Intensive Care Units* protocol.

3.2 UTI SURVEILLANCE DEFINITIONS

The surveillance case definition includes healthcar e-associated microbiologically confirmed UTIs (e.g., UTIs with positive urine cultures). UTIs that are not cultureconfirmed are not included in this surveillance.

Culture-Confirmed UTI

- A patient with all of the following:
  - a positive urine culture of no more than two species of organisms
  - at least one organism with ≥10^5 colony forming units (CFU)/ml

  AND
- At least one of following with no other recognized cause:
  - fever (>38°C)
  - suprapubic tenderness
  - urgency
  - frequency
  - dysuria

3.3 ADDITIONAL DEFINITIONS

Indwelling Urinary Catheter : a drainage tube that is inserted into the urinary bladder through the urethra, is left in place, and connected to a drainage bag. This is also called a Foley catheter. Condom or straight in-and-out catheters are not included nor are nephrostomy tubes or suprapubic catheters unless a Foley catheter is also present.

Catheter-associated UTI (CAUTI): A patient who meets the UTI case defintion and additionally meets one of the following criteria:

- An indwelling urinary catheter in place for >2 calendar days on the date of event, with day of device placement being Day 1,

  OR
- An indwelling urinary catheter in place for >2 calendar days that had been removed on the date of event or the day before the date of event

Note: If a catheter is removed and reinserted on the same or following day, it is considered as one continuous usage.

4 SURVEILLANCE METHODS

The process of conducting UTI surveillance in this protocol requires active, patient-based, prospective identification of cases and collection of de nominator data by staff trained in HAI surveillance.

4.1 CASE FINDING

Section 5.1 (Case Finding) of the *Surveillance for Healthcare-Associated Infections (HAI) in Intensive Care Units* protocol provides expectations for case finding strategies to be used in UTI surveillance.

Appendix 1 of this UTI module protocol provides a flow chart that summarizes the steps in finding UTI cases.

4.2 CASE REPORTING FOR UTI

Once surveillance staff have evaluated all patients in the ICUs under surveillance and identified cases meeting the UTI case definition, they will complete the UTI case report form (Appendix 2) for each case. The case report form includes basic information about the patient s UTI episode and lists the isolated organism(s) and antimicrobial susceptibility testing results. Instructions for completion of the UTI case report form can be found in Appendix 3.

Additional case reporting rules, including details on interpretation and reporting of laboratory results, are described in Section 5.2 (Case Reporting) in the *Surveillance for Healthcare -Associated Infections (HAI) in Intensive Care Units* protocol.

Additional Reporting Rules Specific to UTI:

- Single urine cultures with > 2 organisms are routinely regarded as contaminated cultures and should not be used for UTI surveillance.

  Example: *Klebsiella pneumoniae* , *E. coli* , and *Citrobacter freundii* are isolated from a urine culture on March 1. This culture should be regarded as contaminated and not used in surveillance.

- If > 2 organisms are isolated over multiple urine cultures, urine cultures may be used to meet the case definition.

  Example: *Klebsiella pneumoniae* and *Citrobacter freundii* are isolated from a urine culture on March 1, and *E. coli* is isolated from a urine culture from the same patient on March 3. All three organisms would be reported on the UTI case report form.

- All organisms that are seen on gram stain or isolated by urine culture should be reported, including organisms such as *Candida* species.

4.3 DENOMINATORS (FOR CALCULATION OF INCIDENCE RATES)

Urinary catheter days and patient days are the denominators used to determine UTIand CAUTI incidence rates. Denominator data should be **collected at the same time every day** for each participating unit or ward under surveillance, including weekends and holidays. The denominator forms for collection of patient days and urinary catheter days can be found as Appendix 2 of the *Surveillance for Healthcare – Associated Infections (HAI) in Intensive Care Units* protocol.

- **Urinary Catheter day :** denominator data is calculated as the number of patients with an indwelling urinary catheter in each unit under surveillance, each day. Surveillance staff should *record the number of patients in the surveillance unit who have an indwelling urinary catheter in place .*

- **Patient day :**denominator data is calculated as the total number of patients per day in the unit under surveillance. Patient days should be collected at the same time as urinary catheter days.

    - **NICU patient days:** If feasible, participating hospitals conducting surveillance in NICUs may choose to collect the denominator data stratified by birth weight categories using the NICU denominator data collection form, or they may choose to use the regular/non-stratified denominator data collection form. NICUs collecting the denominator data by birth weight category will be able to stratify HAI rates by five birth weight categories.

4.4 ANALYSIS PLAN

Data will be analyzed for all UTIs combined and stratified by device associati on (e.g., CAUTI vs. non-CAUTI). Incidence rates will be calculated for both total UTI and CAUTI, as described below.

Calculation of Incidence

- **UTI-incidence rate:** UTI per 1000 patient days. Divide the number of reported UTI by the number of patient days and then multiply by 1000.

- **CAUTI rate:** CAUTI per 1000 urinary catheter-days. Divide the number of reported CAUTI by the number of urinary catheter days and then multiply by 1000.

Device Utilization Ratio (DUR)

The device utilization ratio (DUR) is used during reporting to contextualize the UTI incidence. This is important because facilities that have high rates of indwelling urinary catheter usage will likely have

higher UTI and CAUTI rates. The DUR can be calculated by dividing the number of urinary catheter days by the number of patient days as shown in the formula below.

$$DUR = \frac{\text{\# of indwelling urinary catheter days}}{\text{\# of patient days for the days where urinary catheter days are also collected}}$$

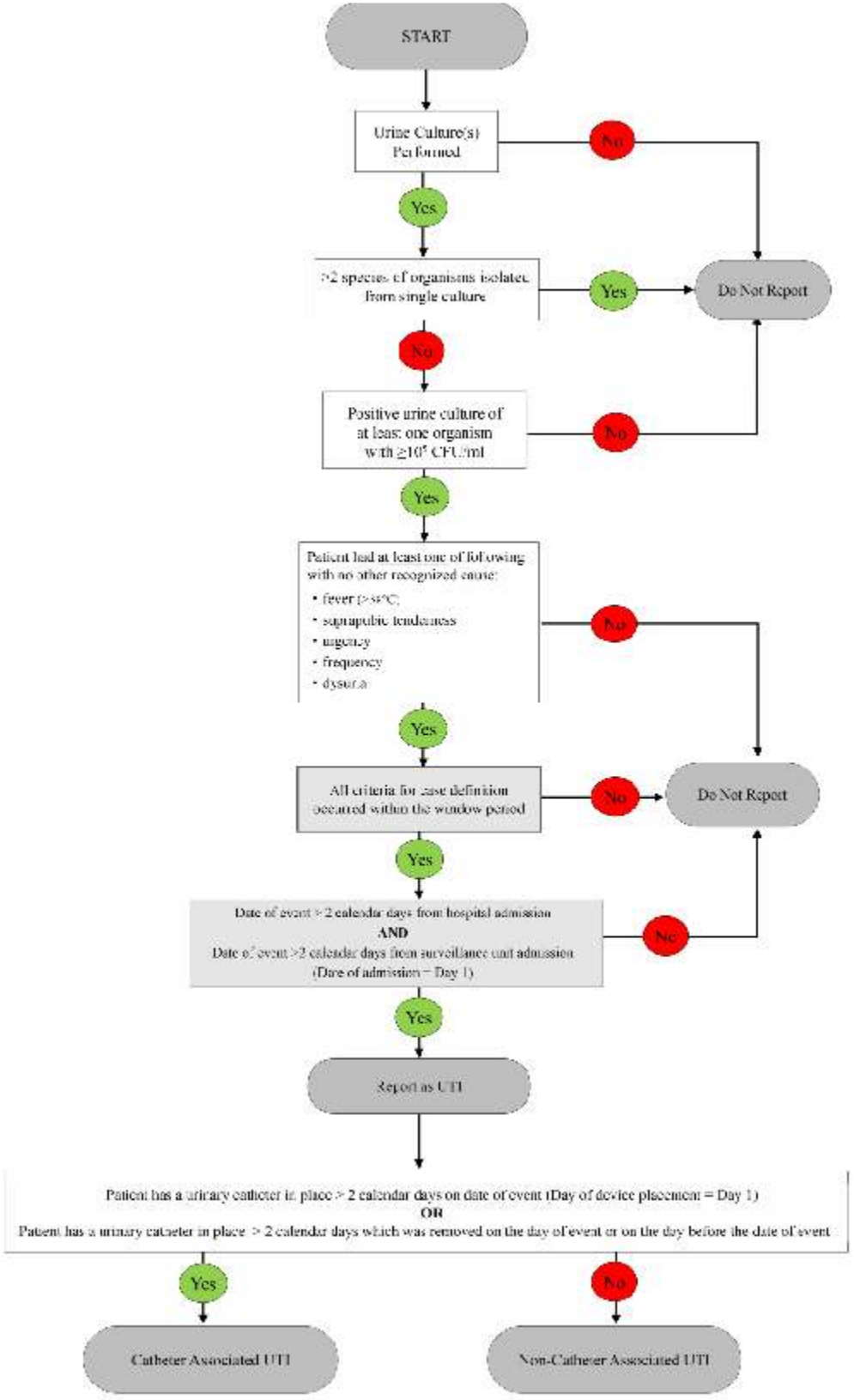
5 REFERENCES

1. European Centre for Disease Prevention and Control. Healthcare-associated Infections Surveillance Network (HAI-Net): European surveillance of healthcare associated infections in intensive care units; Available from: http://ecdc.europa.eu/en/publications/Publications/healthcare-associated-infections-HAI-ICU-protocol.pdf.

2. Centers for Disease Control and Prevention. National Healthcare Safety Network: Acute Care Hospital Surveillance for Urinary Tract Infections; Available from: http://www.cdc.gov/nhsn/acute-care-hospital/cauti/index.html.

6 APPENDICES

Appendix 1 – UTI Case Finding Flowchart



Note: If a urinary catheter is removed and reinserted on the same or following day, it is considered as one continuous usage.

Appendix 2- UTI Case Report Form

Surveillance unit Number _____ Case Type_____ Patient Name _____ Medical record Number: _____		Case ID: _____
Hospital Name:		
Sex: ☐ Male ☐ Female	Date of Birth (DD/MM/YYYY):___/__/__ Age(Years): _____ ☐Age/DOB (Unknown)	Birth weight:_____grams (NICU only)
Date of hospital admission:_____/_____/_____	Date of admission to surveillance unit:_____/_____/_____	
Location prior to hospital admission: ☐Home / Community ☐ Another hospital ☐ Unknown		
Linked Case ID **(autogenerated)** do not fill on Hard copy. **Only to be filled on software**		
1. UTI Details		
Date of event *(dd/mm/yyyy)*:	____/_____/_____	
Type of UTI	☐Culture Confirmed UTI	
Fill out culture results in Section 4, Organisms and Antibiotic Susceptibility		
2. Invasive Devices: Urinary Catheters		
Did the patient have a Foley catheter in place at any time on: • The date of event **or** • The day before the date of event?	☐ Yes ☐ No *(skip to 3, Outcome)*	
If **YES,** was the Foley catheter in place for >2 calendar days?	☐ Yes ☐ No	Date of catheter insertion (dd/mm/yyyy): _____/_____/_____
3. Outcome		
Patient status at end of Event Timeframe (14 days after DOE, where DOE = day 1) Date Of Discharge From ICU (dd/mm/yyyy): _____/_____/_____	☐ Still in surveillance unit ☐ Transferred to other hospital ☐ Transferred to other ward/unit within the hospital ☐ Discharged ☐ LAMA ☐ Died ☐ Unknown	Date of discharge, transfer, or death ____/_____/_____
Patient outcome at end of hospitalization	☐ Discharged ☐ Transferred to other hospital ☐ LAMA ☐ Died ☐ Unknown	Date of discharge, transfer, or death: ____/_____/_____

4. Organisms and Antibiotic Susceptibility						
Date of sample collection	**Organism**	**Drugs**				
_____	*Staphylococcus epidermidis*	OX S I R N	CEFOX S I R N	METH S I R N	CLIND S I R N	DAPTO S I R N
		VANC S I R N	OTHER DRUG 1 S I R N	OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N	OTHER DRUG 4 S I R N
		OTHER DRUG 5 S I R N				
_____	*Staphylococcus haemolyticus*	OX S I R N	CEFOX S I R N	METH S I R N	CLIND S I R N	DAPTO S I R N
		VANC S I R N	OTHER DRUG 1 S I R N	OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N	OTHER DRUG 4 S I R N
		OTHER DRUG 5 S I R N				
_____	*Staphylococcus hominis*	OX S I R N	CEFOX S I R N	METH S I R N	CLIND S I R N	DAPTO S I R N
		VANC S I R N	OTHER DRUG 1 S I R N	OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N	OTHER DRUG 4 S I R N
		OTHER DRUG 5 S I R N				
_____	*Staphylococcus, other* coagulase -negative	OX S I R N	CEFOX S I R N	METH S I R N	CLIND S I R N	DAPTO S I R N
		VANC S I R N	OTHER DRUG 1 S I R N	OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N	OTHER DRUG 4 S I R N
		OTHER DRUG 5 S I R N				
_____	*Enterococcus Faecium*	AMP S I R N	DAPTO S I R N	GENTHL§ S I R N	CIPRO S I R N	LNZ S I R N
		TEICO S I R N	VANC S I R N	OTHER DRUG 1 S I R N	OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N
		OTHER DRUG 4 S I R N	OTHER DRUG 5 S I R N			
_____	*Enterococcus faecalis*	AMP S I R N	DAPTO S I R N	GENTHL§ S I R N	CIPRO S I R N	LNZ S I R N
		TEICO S I R N	VANC S I R N	OTHER DRUG 1 S I R N	OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N
		OTHER DRUG 4 S I R N	OTHER DRUG 5 S I R N			
_____	*Enterococcus Sp.* Please Specify Species: ____	AMP S I R N	DAPTO S I R N	GENTHL§ S I R N	CIPRO S I R N	LNZ S I R N
		TEICO S I R N	VANC S I R N	OTHER DRUG 1 S I R N	OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N

		OTHER DRUG 4 S I R N	OTHER DRUG 5 S I R N			
_____	*Staphylococcus aureus*	LEVO S I R N	MOXI S I R N	CLIND S I R N	DAPTO S I R N	DOXY S I R N
		MINO S I R N	ERYTH S I R N	GENT S I R N	LNZ S I R N	OTHER DRUG 1 S I R N
		OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N	OTHER DRUG 4 S I R N	OTHER DRUG 5 S I R N	
_____	*Acinetobacter baumannii*	AMK S I R N	AMPSUL S I R N	CEFTAZ S I R N	CEFOT S I R N	CIPRO S I R N
		LEVO S I R N	COL S I R N	PB S I R N	GENT S I R N	IMI S I R N
		TICLAV S I R N	MERO S I R N	DORI S I R N	NET S I R N	PIP S I R N
		PIPTAZ S I R N	TETRA S I R N	DOXY S I R N	MINO S I R N	TMZ S I R N
		TOBRA S I R N	OTHER DRUG 1 S I R N	OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N	OTHER DRUG 4 S I R N
		OTHER DRUG 5 S I R N				
_____	*Acinetobacter baumannii complex*	AMK S I R N	AMPSUL S I R N	CEFTAZ S I R N	CEFOT S I R N	CIPRO S I R N
		LEVO S I R N	COL S I R N	PB S I R N	GENT S I R N	IMI S I R N
		TICLAV S I R N	MERO S I R N	DORI S I R N	NET S I R N	PIP S I R N
		PIPTAZ S I R N	TETRA S I R N	DOXY S I R N	MINO S I R N	TMZ S I R N
		TOBRA S I R N	OTHER DRUG 1 S I R N	OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N	OTHER DRUG 4 S I R N
		OTHER DRUG 5 S I R N				
_____	*Acinetobacter lwoffii*	AMK S I R N	AMPSUL S I R N	CEFTAZ S I R N	CEFOT S I R N	CIPRO S I R N
		LEVO S I R N	COL S I R N	PB S I R N	GENT S I R N	IMI S I R N
		TICLAV S I R N	MERO S I R N	DORI S I R N	NET S I R N	PIP S I R N
		PIPTAZ S I R N	TETRA S I R N	DOXY S I R N	MINO S I R N	TMZ S I R N
		TOBRA S I R N	OTHER DRUG 1 S I R N	OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N	OTHER DRUG 4 S I R N

		OTHER DRUG 5 S I R N				
_____	*Acinetobacter sp.* Please Specify Species: ____	AMK S I R N	AMPSUL S I R N	CEFTAZ S I R N	CEFOT S I R N	CIPRO S I R N
		LEVO S I R N	COL S I R N	PB S I R N	GENT S I R N	IMI S I R N
		TICLAV S I R N	MERO S I R N	DORI S I R N	NET S I R N	PIP S I R N
		PIPTAZ S I R N	TETRA S I R N	DOXY S I R N	MINO S I R N	TMZ S I R N
		TOBRA S I R N	OTHER DRUG 1 S I R N	OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N	OTHER DRUG 4 S I R N
		OTHER DRUG 5 S I R N				
_____	*Escherichia coli*	AMK S I R N	CEFAZ S I R N	CEFEP S I R N	CEFOT S I R N	CEFTRX S I R N
		CEFTAZ S I R N	CEFUR S I R N	CEFOX S I R N	CTET S I R N	CIPRO S I R N
		EVO S I R N	MOXI S I R N	COL S I R N	PB S I R N	ERTA S I R N
		GENT S I R N	IMI S I R N	MERO S I R N	DORI S I R N	PIPTAZ S I R N
		TETRA S I R N	DOXY S I R N	MINO S I R N	TIG S I R N	OTHER DRUG 1 S I R N
		OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N	OTHER DRUG 4 S I R N	OTHER DRUG 5 S I R N	
_____	*Klebsiella oxytoca*	AMK S I R N	CEFAZ S I R N	CEFEP S I R N	CEFOT S I R N	CEFTRX S I R N
		CEFTAZ S I R N	CEFUR S I R N	CEFOX S I R N	CTET S I R N	CIPRO S I R N
		LEVO S I R N	MOXI S I R N	COL S I R N	PB S I R N	ERTA S I R N
		GENT S I R N	IMI S I R N	MERO S I R N	DORI S I R N	PIPTAZ S I R N
		TETRA S I R N	DOXY S I R N	MINO S I R N	TIG S I R N	OTHER DRUG 1 S I R N
		OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N	OTHER DRUG 4 S I R N	OTHER DRUG 5 S I R N	
_____	*Klebsiella pneumoniae*	AMK S I R N	CEFAZ S I R N	CEFEP S I R N	CEFOT S I R N	CEFTRX S I R N
		CEFTAZ S I R N	CEFUR S I R N	CEFOX S I R N	CTET S I R N	CIPRO S I R N

		LEVO S I R N	MOXI S I R N	COL S I R N	PB S I R N	ERTA S I R N
		GENT S I R N	IMI S I R N	MERO S I R N	DORI S I R N	PIPTAZ S I R N
		TETRA S I R N	DOXY S I R N	MINO S I R N	TIG S I R N	OTHER DRUG 1 S I R N
		OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N	OTHER DRUG 4 S I R N	OTHER DRUG 5 S I R N	
_____	*Klebsiella spp.* Please Specify Species: ____	AMK S I R N	CEFAZ S I R N	CEFEP S I R N	CEFOT S I R N	CEFTRX S I R N
		CEFTAZ S I R N	CEFUR S I R N	CEFOX S I R N	CTET S I R N	CIPRO S I R N
		LEVO S I R N	MOXI S I R N	COL S I R N	PB S I R N	ERTA S I R N
		GENT S I R N	IMI S I R N	MERO S I R N	DORI S I R N	PIPTAZ S I R N
		TETRA S I R N	DOXY S I R N	MINO S I R N	TIG S I R N	OTHER DRUG 1 S I R N
		OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N	OTHER DRUG 4 S I R N	OTHER DRUG 5 S I R N	
_____	*Pseudomonas aeruginosa*	AMK S I R N	AZT S I R N	CEFEP S I R N	CEFTAZ S I R N	CIPRO S I R N
		LEVO S I R N	COL S I R N	PB S I R N	GENT S I R N	IMI S I R N
		MERO S I R N	DORI S I R N	NET S I R N	PIPTAZ S I R N	TOBRA S I R N
		OTHER DRUG 1 S I R N	OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N	OTHER DRUG 4 S I R N	OTHER DRUG 5 S I R N
_____	*Pseudomonas putida*	AMK S I R N	AZT S I R N	CEFEP S I R N	CEFTAZ S I R N	CIPRO S I R N
		LEVO S I R N	COL S I R N	PB S I R N	GENT S I R N	IMI S I R N
		MERO S I R N	DORI S I R N	NET S I R N	PIPTAZ S I R N	TOBRA S I R N
		OTHER DRUG 1 S I R N	OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N	OTHER DRUG 4 S I R N	OTHER DRUG 5 S I R N
_____	*Pseudomonas sp.* Please Specify Species: ____	AMK S I R N	AZT S I R N	CEFEP S I R N	CEFTAZ S I R N	CIPRO S I R N
		LEVO S I R N	COL S I R N	PB S I R N	GENT S I R N	IMI S I R N
		MERO S I R N	DORI S I R N	NET S I R N	PIPTAZ S I R N	TOBRA S I R N

		OTHER DRUG 1 S I R N	OTHER DRUG 2 S I R N	OTHER DRUG 3 S I R N	OTHER DRUG 4 S I R N	OTHER DRUG 5 S I R N
_____	*Candida albicans*	ANID S I R N MICA S I R N OTHER DRUG 4 S I R N	CASPO S I R N VORI S I R N OTHER DRUG 5 S I R N	FLUCO S I R N OTHER DRUG 1 S I R N	FLUCY S I R N OTHER DRUG 2 S I R N	ITRA S I R N OTHER DRUG 3 S I R N
_____	*Candida glabrate*	ANID S I R N MICA S I R N OTHER DRUG 4 S I R N	CASPO S I R N VORI S I R N OTHER DRUG 5 S I R N	FLUCO S I R N OTHER DRUG 1 S I R N	FLUCY S I R N OTHER DRUG 2 S I R N	ITRA S I R N OTHER DRUG 3 S I R N
_____	*Candida tropicalis*	ANID S I R N MICA S I R N OTHER DRUG 4 S I R N	CASPO S I R N VORI S I R N OTHER DRUG 5 S I R N	FLUCO S I R N OTHER DRUG 1 S I R N	FLUCY S I R N OTHER DRUG 2 S I R N	ITRA S I R N OTHER DRUG 3 S I R N
_____	*Candida spp .* Please Specify Species: ____	ANID S I R N MICA S I R N OTHER DRUG 4 S I R N	CASPO S I R N VORI S I R N OTHER DRUG 5 S I R N	FLUCO S I R N OTHER DRUG 1 S I R N	FLUCY S I R N OTHER DRUG 2 S I R N	ITRA S I R N OTHER DRUG 3 S I R N
Date of sample collection	**Other Organisms**	**Drugs**				
_____	Organism 1 _____ Specify:	**Drug 1** S I R N **Drug 6** S I R N	**Drug 2** S I R N **Drug 7** S I R N	**Drug 3** S I R N **Drug 8** S I R N	**Drug 4** S I R N **Drug 9** S I R N	**Drug 5** S I R N **Drug 10** S I R N
_____	Organism 2 _____ Specify:	**Drug 1** S I R N **Drug 6** S I R N	**Drug 2** S I R N **Drug 7** S I R N	**Drug 3** S I R N **Drug 8** S I R N	**Drug 4** S I R N **Drug 9** S I R N	**Drug 5** S I R N **Drug 10** S I R N
_____	Organism 3 _____ Specify:	**Drug 1** S I R N **Drug 6** S I R N	**Drug 2** S I R N **Drug 7** S I R N	**Drug 3** S I R N **Drug 8** S I R N	**Drug 4** S I R N **Drug 9** S I R N	**Drug 5** S I R N **Drug 10** S I R N

Comments

Result Codes

S = Susceptible I = Intermediate R = Resistant NS = Non -susceptible S -DD = Susceptible -dose dependent N = Not tested

§ GENTHL results: S = Susceptible/Synergistic and R = Resistant/Not Synergistic

† Clinical breakpoints have not been set. S/R designations should be based upon epidemiological cutoffs of S = MIC ≤ 2 and R = MIC ≥ 4

AKF	Amikacin-fosfomycin	AMC	Amoxicillin-clavulanate	AMK	Amikacin
AMOX	Amoxicillin	AMP	ampicillin	AMPSUL	ampicillin sulbactam
AMXCLV	amoxicillin clavulanic acid	ANID	anidulafungin	AZA	Aztreonam-avibactam
AZL	Azlocillin	AZM	Azithromycin	AZT	aztreonam
BES	Besifloxacin	BPM	Biapenem	BPR	Ceftobiprole
C/T	Ceftolozane-tazobactam	CASPO	caspofungin	CAT	Cefetamet
CB	Carbenicillin	CDN	Cefditoren	CDR	Cefdinir
CDZ	Cadazolid	CEFAZ	cefazolin	CEFEP	cefepime
CEFOT	cefotaxime	CEFOX	cefoxitin	CEFTAZ	ceftazidime
CEFTRX	ceftriaxone	CEFUR	cefuroxime	CEP	Cephalothin
Cfm	Cefamandole	Cfr	Cefaclor	CHL	Chloramphenicol
CID	Cefonicid	CIN	Cinoxacin	CIPRO	ciprofloxacin
CLA	Clarithromycin	CLIND	clindamycin	CLX	Clinafloxacin
CMZ	Cefmetazole	COL	Colistin	CPA	Ceftaroline-avibactam
CPR	Cefpirome	CPT	Ceftaroline	CPZ	Cefoperazone
CTB	Ceftibuten	CTET	cefotetan	CTZ	Ceftizoxime
CZA	ceftazidime-avibactam	DAL	Dalbavancin	DAPTO	daptomycin
DFX	Delafloxacin	DIC	Dicloxacillin	DORI	doripenem
DOXY	doxycycline	DTM	Dirithromycin	ERTA	ertapenem
ERV	Eravacycline	ERYTH	erythromycin	FARO	Faropenem
FC	Fusidic acid	FDX	Fidaxomicin	FIN	Finafloxacin
FLUCO	fluconazole	FLUCY	flucytosine	FLX	Fleroxacin
FOS	Fosfomycin	FP	Cefprozil	FPZ	Cefepime-tazobactam
GAT	Gatifloxacin	GEM	Gemifloxacin	GENT	gentamicin
GENTHL	gentamicin - high level test	GEP	Gepotidacin	GRN	Garenoxacin
GRX	Grepafloxacin	HAP	Cephapirin	HLS	Streptomycin synergy
ICL	Iclaprim	IMI	imipenem	ITRA	itraconazole
KAN	Kanamycin	LEVO	levofloxacin	LMU	Lefamulin
LND	Levonadifloxacin	LNZ	linezolid	LOM	Lomefloxacin
LOR	Loracarbef	MEC	Mecillinam	MERO	meropenem
METH	methicillin	MEV	Meropenem-vaborabactam	MEZ	Mezlocillin
MICA	micafungin	MINO	minocycline	MOX	Moxalactam
MOXI	moxifloxacin	MTZ	Metronidazole	MUP	Mupirocin
NAF	Nafcillin	NAL	Nalidixic acid	NET	netilmicin
NIT	Nitazoxanide	NITRO	nitrofurantoin	NOR	norfloxacin
OFL	Ofloxacin	OMC	Omadacyline	ORI	Oritavancin

OX	oxacillin	PB	polymyxin B	PEF	Pefloxacin
PEN	Penicillin	PEX	Pexiganan	PIP	piperacillin
PIPTAZ	piperacillin/tazobactam	PLZ	Plazomicin	POD	Cefpodoxime
PRU	Ulifloxacin	QDA	Quinupristin-dalfopristin	RAD	Cephradine
RAM	Ramoplanin	RIF	rifampin	RZM	Razupenem
SEC	Secnidazole	SOL	Solithromycin	SPT	Spectinomycin
SPX	Sparfloxacin	SSS	Sulfonamides	STR	Streptomycin
SULO	Sulopenem	SUR	Surotomycin	TBR	Trospectomycin
TEICO	teicoplanin	TEL	Telithromycin	TETRA	tetracycline
TIC	Ticarcillin	TICLAV	ticarcillin/clavulnate	TIG	Tigecycline
TOBRA	tobramycin	TVA	Trovafloxacin	TZD	Tedizolid
VANC	vancomycin	VORI	voriconazole	ZWK	Nafithromycin
TIN	Tinoxanide	TLV	Telavancin	TMP	Trimethoprim
TMZ	trimethoprim/sulfamethoxazole	TNZ	Tinidazole		

Urinary Tract Infection (UTI) – Case Investigation Worksheet and Table

For all positive urine cultures:

1. Record collection date of urine culture:_____/____/_____ Continue to Question 2.

2. Does the urine culture have at least one organism with ≥10^5 CFU/mL?
   - ☐ Yes. If selected, continue to Question 3.
   - ☐ No. If selected, the case definition is not met. **Do not report this episode.**

3. Does the urine culture have more than 2 species isolated from it?
   - ☐ Yes. If selected, the case definition is not met. **Do not report this episode.**
   - ☐ No. If selected, continue to Question 4.

4. Did the patient have at least one of the following signs or symptoms during the window period?
   - ☐ Yes. If selected, record the signs/symptoms on the case investigation table and continue to Question 5.
   - ☐ No. If selected, the case definition is not met. **Do not report this episode.**

UTI Signs & Symptoms
• Fever (>38°C) • Suprapubic tenderness • Urinary urgency • Urinary frequency • Dysuria

5. Determine the date of event (the date the first case definition criteria– urine culture collection or sign/symptom – occurred in the window period). Indicate on case investigation table and continue to Question 6.

6. Are ALL of the following inclusion criteria are true?
   - ☐ Yes. **This episode should be reported**. Start a UTI case report form for the patient. Continue to Question 7.
   - ☐ No. Inclusion criteria are not met. **Do not report this episode.**

Inclusion Criteria
▪ The Date of Event does not occur during the Event Timeline of a previous UTI ▪ The Date of Event occurs >2 days after hospital admission (where Date of Hospital admission=Day 1) ▪ The Date of Event occurs >2 days after ICU admission (where Date of ICU admission=Day 1)

7. Perform follow up activities on all case report forms. Use the case investigation table to organize relevant data.
   - Report information on presence of urinary catheter in Section 2 – Invasive Devices
   - Report the first positive urine culture and all positive urine cultures that occur during the Event Timeframe in Section 4 – Organisms and Antibiotic Susceptibility
     - Event Timeframe = 14 days after date of event (where date of event = day 1)
   - At the end of the patient's hospitalization, specify the patient's outcome in Section 3.

8. Submit the case report form after all information is completed.

UTI Case Investigation Table

Hospital Admission Date:____/____/_____ ICU Admission Date:_____/____/_____

Date	**First Positive Culture** Record information for first positive urine culture on the line with the X.	**Window Period** Record additional cultures and symptoms.	**Date of Event (DOE)** Indicate DOE with an X.	**Event Timeframe** Record positive cultures from urine cultures collected during the 14 days after the DOE. DOE = Day 1.	**Urinary Catheter?** (Y/N)
	X				

Appendix 3- UTI Case Report Form Instructions

Data Field	Instructions for Data Collection
Surveillance unit Number	Add the ICU Code in this row
Case Type	Add whether the case if BSI or UTI
Patient Name	Add the name of the patient. This will remain with the Surveillance unit and will not be seen by the AIIMS team
Medical record Number	Add the Medical record number here. This will remain with the Surveillance unit and will not be seen by the AIIMS team
Hospital Name	
Sex	
Date of Birth	Record the date of the patient birth using this format: DD/MM/YYYY. If DOB is unknown, age in years may be mentioned. DOB is mandatory for neonates
Birth Weight	Required only for neonates housed in neonatal intensive care unit.
Date of Hospital Admission	Record the date of the hospital admission using this format: DD/MM/YYYY.
Location prior to hospital admission	Check one. Indicate the location the patient was in immediately prior to admission to the hospital.
Date of admission to Surveillance Unit	Record the date as DD/MM/YYYY.
Date of event	Record the date as DD/MM/YYYY. Enter thedate when the first criteria used to meet the case definition occurred. Note: If the first criteria to meet the case definition is a laboratory diagnostic test, the laboratory specimen collection date should be reported as the date of event.
Laboratory Result	If the patient has a culture with organism identified that is used to meet the UTI case definition then fill out Section 4 on Organism and Antibiotic Susceptibility Testing. Instructions below.
Did the patient have a Foley catheter in place at any time on the date of event or day before the date of event?	Check one. If "No," skip to Section 3, Outcome. Note: A Foley catheter is an indwelling urinary catheter inserted into the urinary bladder through the urethra. Condom, nephrostomy, and suprapubic catheters are not included unless a Foley catheter is also present.
Was the urinary catheter in place for >2 calendar days?	Required if urinary catheter in place at any time on date of event or day before. Check one. If "No" skip to Section 3, Outcome. Note: If a Foley catheter is removed and reinserted on the same or following day, it is considered as one continuous usage.
Patient Status at end of Event Timeframe	Required. Check one. Report the status of the patient at the end of the Event Timeframe.

Patient outcome at end of hospitalization	Keep the case report form(s) for a patient on hand and consider them incomplete until the end of the patient's hospital stay. Record thepatient's outcome as of the end of their hospital stay by selecting one of the options.
Date of discharge, transfer, or death	Record date as DD/MMM/YYYY. Record the date that the patient was discharged, transferred to a different hospital, or died during the admission when the HAI occurred.
Organism ID and Antibiotic Susceptibility Testing	Record date of specimen collection as DD/MM/YYYY Specify species if known, otherwise report as spp. For organsims not listed in the case report form, specify in the row for "Other Organisms" and provide antibiotic susceptibility results. Circle the organsims's susceptibility result using the codes defined on the case report forms. Report every organism isolated from urine cultures collected during the Event Timeframe (14 calendar days, date of event = Day 1)
Comments	Enter any comments, questions, or doubts about this event in the space provided.

शरीरमाद्यं खलु धर्मसाधनम्