Surveillance for Healthcare-Associated Infections

June 2021

Objectives

❑ **At the end of these sessions, participants will be able to:**

- Understand the purpose of surveillance for healthcare-associated infections (HAIs)

- Describe key terms and case definitions used in HAI surveillance

- Complete bloodstream infection (BSI) and urinary tract infection (UTI) case report forms and denominator forms

- Conduct basic analysis of HAI surveillance data

- Understand the process for reporting surveillance data to the AIIMS/ICMR network

Agenda

❑ **Introduction to HAI surveillance**
- Roles and responsibilities in HAI surveillance
- Key terms

❑ **BSI surveillance**
- BSI case finding, denominators, and reporting forms
- Analysis of BSI data

❑ **UTI surveillance**
- UTI case finding, denominators, and reporting forms
- Analysis of UTI data

What is surveillance?

Public health surveillance is "the ongoing, systematic collection, analysis, and interpretation of health-related data essential to planning, implementation, and evaluation of public health practice."

http://www.who.int/topics/public_health_surveillance/en/

A "public health model" applied to hospitals

❑ **Perform surveillance to identify HAIs**

❑ **Analyze surveillance data to find potential problems**

❑ **Use epidemiological investigation techniques against epidemic and endemic HAIs**

❑ **Implement interventions to protect those at risk (patients, staff, etc.)**

Dixon R. MMWR 60(04);58-63
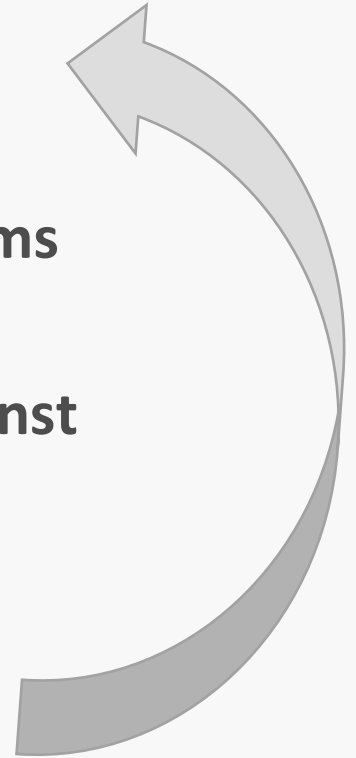
How can HAI surveillance help a National health system?
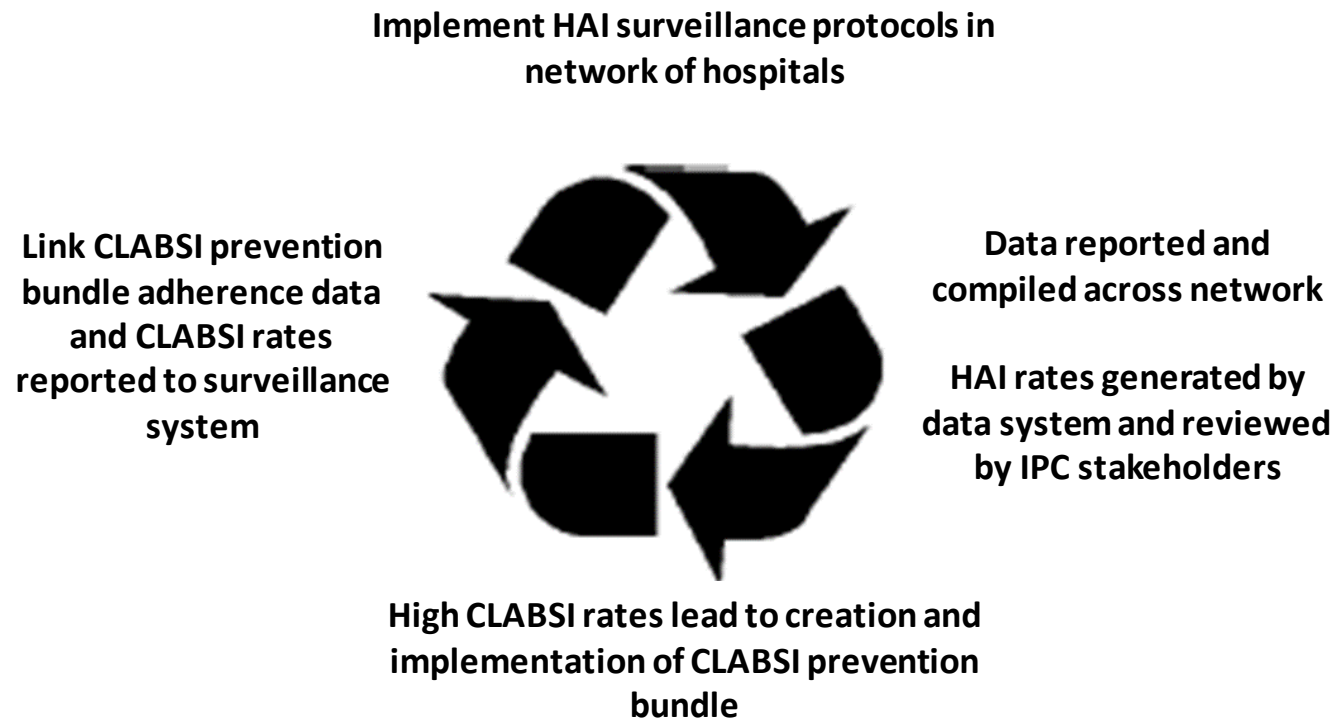
How can HAI surveillance help a health system?

❑ **Systematic collection of data on HAIs and dissemination to stakeholders allows a health system to**

- Estimate the burden of HAIs
  - Cases
  - Deaths
  - Costs
- Detect outbreaks and emerging diseases
- Evaluate impact of prevention strategies
- Monitor the quality of infection control practices

Allegranzi et al, Lancet. 2011

Surveillance should be a circular process

I. Implementation of surveillance: goals definition, surveillance protocol data collection

2. Feedback and dissemination: data analysis, interpretation, comparisons, discussion

3. Prevention: decisions and corrective actions

4. Evaluation of the impact on nosocomial infections by surveillance (trends) or other studies

The surveillance cycle – an HAI example

Implement HAI surveillance protocols in network of hospitals

Link CLABSI prevention bundle adherence data and CLABSI rates reported to surveillance system

Data reported and compiled across network

HAI rates generated by data system and reviewed by IPC stakeholders

High CLABSI rates lead to creation and implementation of CLABSI prevention bundle

HAI surveillance – a network approach

❑ **Building networks of health facilities that perform surveillance can be powerful**

- Better estimation of HAI burden
- Development of network-level benchmarks to assess performance
- Capacity to evaluate interventions across facilities
- Establishment of a cadre of committed and motivated facilities to act as "change agents"

❑ **There are challenges to establishing and maintaining networks**

- Difficult to ensure constant surveillance practice as networks grow
- Constant need for training and mentorship (staff turnover, etc.)
- Resource limitations

Establishing an HAI surveillance network in India

❑ **Lead hospital identified, with sufficient resources and staffing to coordinate network activities**

❑ **Resource-appropriate protocols developed, with ongoing training and support**

❑ **Diverse group of motivated facilities participating (geographically, public vs. private, specialty vs. community)**

❑ **Baseline level of microbiology capacity**

❑ **System for centralized data entry, analysis, and feedback**

HAI surveillance – ground rules for facilities

❏ **Know the protocol**
  ▪ Case definitions and reporting rules, reporting requirements, etc.

❏ **Consistently apply the case definition criteria**
  ▪ Report events meeting criteria; exclude those that don't
  ▪ Failure to do so will result in poor data quality and decreased usefulness of data

❏ **Don't be afraid to ask questions**

❏ **Discuss concerns about the criteria and protocol with central network team – don't change things on your own**

Surveillance case definitions vs. clinical diagnoses

❑ **Surveillance case definitions may not always align with clinical diagnoses**

   ▪ Surveillance case definitions are used to identify trends in a population

   ▪ Clinical diagnoses are used to identify and treat disease in an individual patient

Consider this scenario:

❑ A patient was admitted to the ICU on 15 June after suffering a stroke. A central line was placed on 17 June. The patient develops a mild fever on 22 June and blood specimens are collected. One of two blood specimens grows *Staphylococcus aureus*. The patient had no evidence of infection at other body sites and is afebrile after 22 June. He was discharged from the ICU on 10 July.

❑ This episode meets the BSI case definition and is classified as a CLABSI. You discuss this case with an infectious disease doctor. The doctor states that the patient did not have a true clinical infection and the BSI should not be reported. Do you agree?

Surveillance case definitions vs. clinical diagnoses

❑ Despite the doctor's comments, the case should be reported since it meets the BSI surveillance case definition

❑ Clinical judgment should not be used to "overrule" the reporting of cases that meet the surveillance case definition

Surveillance case definitions

❑ Balance in creating a surveillance definition – identifying "true" events vs. ensuring that surveillance is not too labor intensive

❑ Need to ensure that all surveillance sites can implement the protocol

❑ No surveillance definition is perfect!
  ▪ Some clinical infections may not be reported based on rules in the case definition
    • Patients unable to vocalize symptoms of UTI
  ▪ Some events that may not be true clinical infections may meet the case definition
    • 1 out of 4 blood culture bottles positive for *S. aureus*

HAI Surveillance – Background and Expectations

Objectives of HAI surveillance

❑ **Determine the burden and outcomes of HAIs using standardized metrics**

❑ **Identify the most frequent pathogens causing HAIs and their antibiotic susceptibility patterns**

❑ **Provide platform for measuring impact of prevention strategies on HAI rates and patient outcomes**

❑ **Identify potential risk factors associated with HAIs to target interventions**

Why standardized surveillance?

❑ **Surveillance protocols describe standard methodology and case definitions to be used across the reporting network**

❑ **Benefits of standard protocols:**
- Can combine data across hospitals to calculate overall HAI rates for the network
- Can compare hospital-specific HAI rates across the reporting network
- Can compare HAI rates within the same hospital across time periods

❑ **Hospital surveillance teams should regularly review and refer to protocols when performing surveillance!**

HAI surveillance - settings

❑ **In order to be successful in performing surveillance, participating hospitals should have:**

- Administrative support for surveillance implementation
- Infection control personnel and other dedicated staff members with sufficient time and resources
- Access to a microbiology laboratory with capacity to perform needed diagnostics
- Data reporting capabilities (e.g., an Internet-connected computer for entering surveillance data)

HAI surveillance - settings

❑ **Surveillance will occur in ICU locations, which may include**
- Adult
- Pediatric
- Neonatal

❑ **Why ICUs?**
- Well-defined patient population at high risk of HAI
- Case finding relatively straightforward
- High levels of device utilization
- Relatively high staffing levels

❑ **Doing standardized surveillance across all units is extremely labor intensive – start small!**

HAI Surveillance – Roles and Responsibilities

Key participants in HAI surveillance networks

❑ Central network surveillance team

❑ Hospital surveillance coordinator

❑ Hospital surveillance team

❑ Hospital microbiology lab

❑ Clinical staff in units performing surveillance

Key participants in HAI surveillance networks

❑ **Central network surveillance team (AIIMS, New Delhi)**

- Primary responsibility for overall implementation of surveillance across all hospitals in the network
- Prepares surveillance protocols, forms, and reporting systems with technical partners
- Identifies participating hospitals and provides training resources
- Assists hospitals as they implement surveillance
- Serves as a central resource for addressing questions and issues
- Receives data from hospitals and maintains data reporting system
- Creates and shares surveillance data feedback reports with participating hospitals
- Participates in activities, including on-site visits, that support standardized surveillance implementation across hospitals

Key participants in HAI surveillance networks

❑ **Hospital surveillance coordinator**
- Primary responsibility for implementing surveillance at the hospital
- Ensures that surveillance team is working with key hospital stakeholders to identify HAI events and collect denominator data
- Reviews HAI case report forms and denominator data to ensure accuracy
- Reports data to network on a regular basis
- Disseminates surveillance reports to relevant stakeholders
- Facilitates support visits

❑ **Hospital surveillance team**
- Engages microbiology lab and clinical staff to obtain data on potential HAIs
- Identifies HAIs and completes reporting forms

Key participants in HAI surveillance networks

❑ **Hospital Microbiology lab**
- Provides data to hospital surveillance team on a regular basis
  - Access to logbooks
  - Reports from electronic systems, if available
- Ensures that data being provided to surveillance team is complete
  - All positive blood cultures from ICUs participating in BSI surveillance, for example

❑ **Clinical staff in units performing surveillance**
- Review protocol and be familiar with case definitions
- Should ensure that suspected patients have complete investigations done to confirm that they meet the case definition
  - Patients with symptoms of possible infection who have not had blood cultures drawn, for example
- Assist with collection of denominator data

HAI Surveillance – Key Terms

HAIs under surveillance in this network

❑ **Bloodstream infections (BSI)**

  ▪ Healthcare-associated BSIs will be classified into categories:
    • Central line-associated bloodstream infection (CLABSI)
    • Primary BSI, not central line-associated
    • Secondary BSI

❑ **Urinary tract infections (UTI)**

  ▪ Healthcare-associated UTIs will be classified as either catheter-associated UTI (CAUTI) or non-catheter associated UTI

❑ **Case definitions modified from US CDC NHSN and European CDC HAI-Net**

  ▪ Modifications to address different levels of resources available in low and middle income countries

Identifying potential HAI episodes

❑ **Consider this patient:**

- Admitted to hospital 15 September and sent to the ICU
- Fever 18 September
- Blood cultures collected 19 September, no growth
- Fever 20 September
- Hypotension 21 September
- Fever 24 September
- 2 blood cultures collected 25 September grow *S. epidermidis*
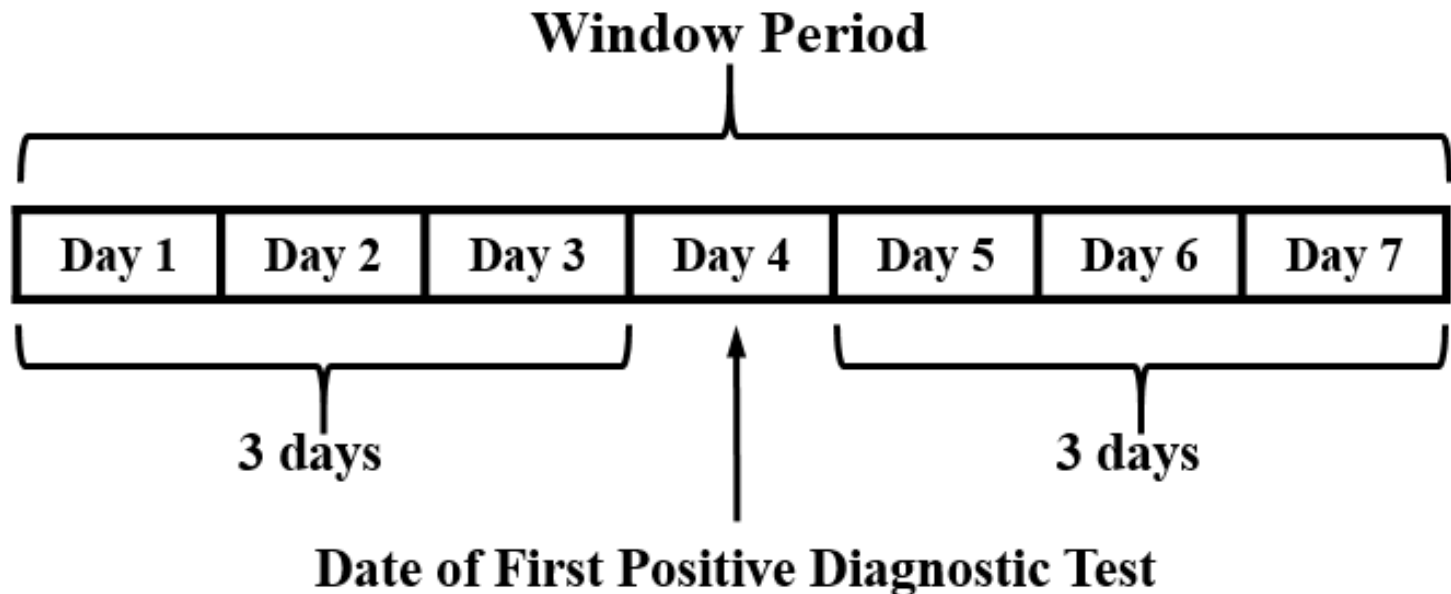- Blood culture collected 30 September grows *Acinetobacter baumanii*

❑ **Many symptoms and cultures – how do we organize them to decide when an infection is present?**

- HAI surveillance protocols provide rules and processes for finding infections

Key terms

❑ Window period

- ▪ All case definition must be met within a 7 day time frame known as the "window period"
- ▪ Includes the date the first positive diagnostic test is <u>collected</u>, the three calendar days before, and the three calendar days after
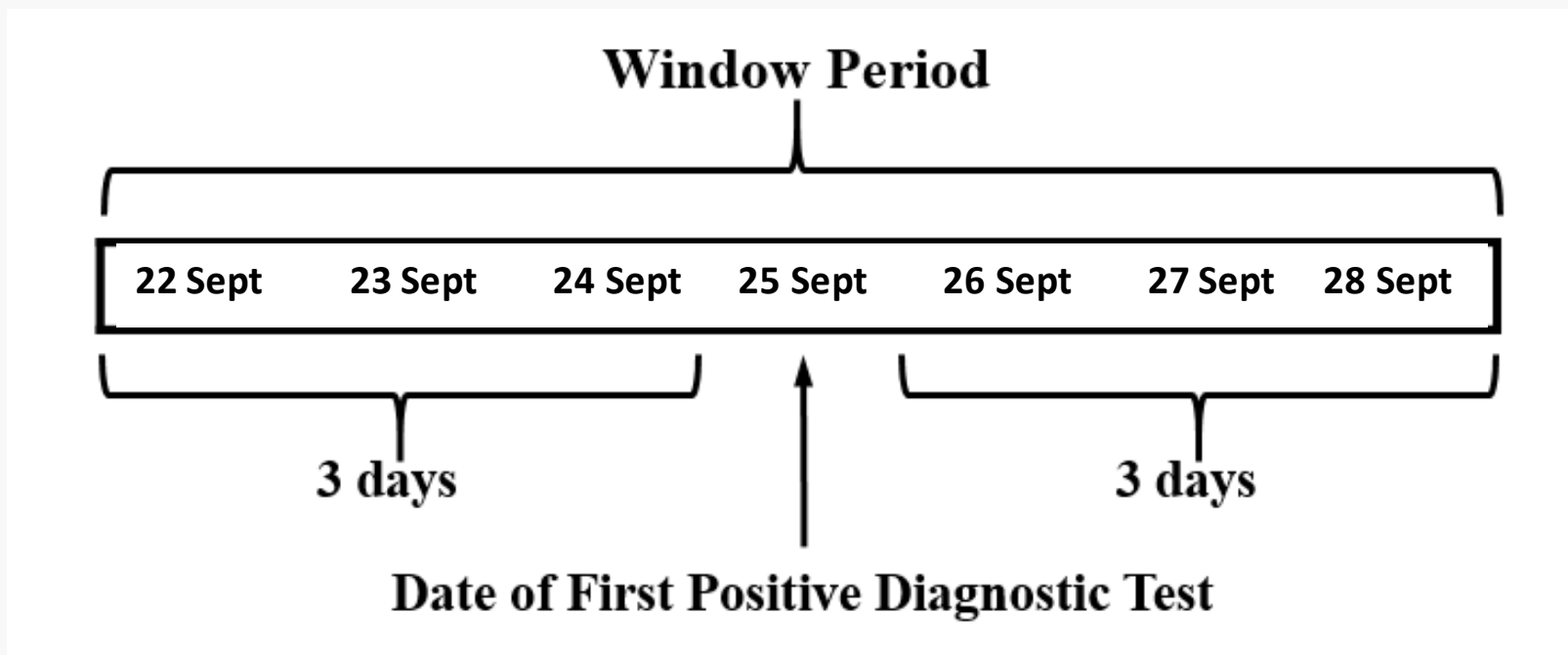
Key terms – Window Period

❑ **Our patient from the previous example:**

- First positive blood culture collected 25 September
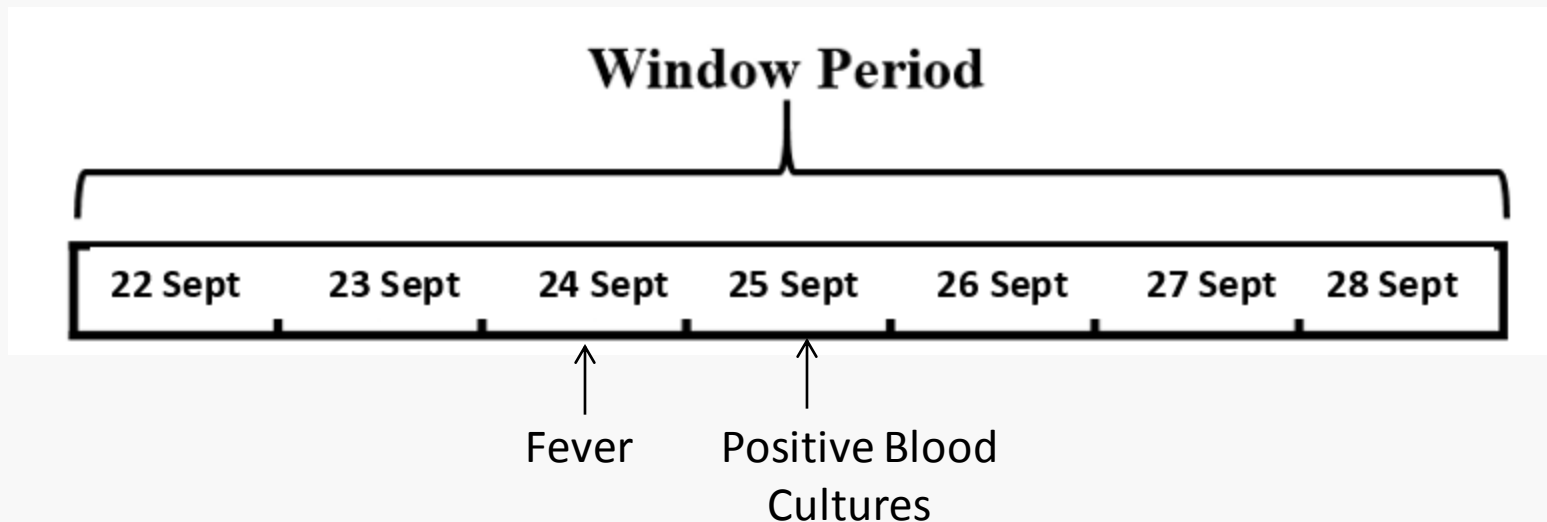- Window period starts on 22 September and ends on 28 September

Key terms – Window Period

❑ **Our patient from the previous example:**

▪ Symptoms used to meet HAI case definition must fall in window period

- Fever on 18 and 20 September; hypotension on 21 September – all before start of window period, cannot be used

- Fever on 24 September can be used since it falls in window period

Window Period

| 22 Sept | 23 Sept | 24 Sept | 25 Sept | 26 Sept | 27 Sept | 28 Sept |

Fever   Positive Blood Cultures
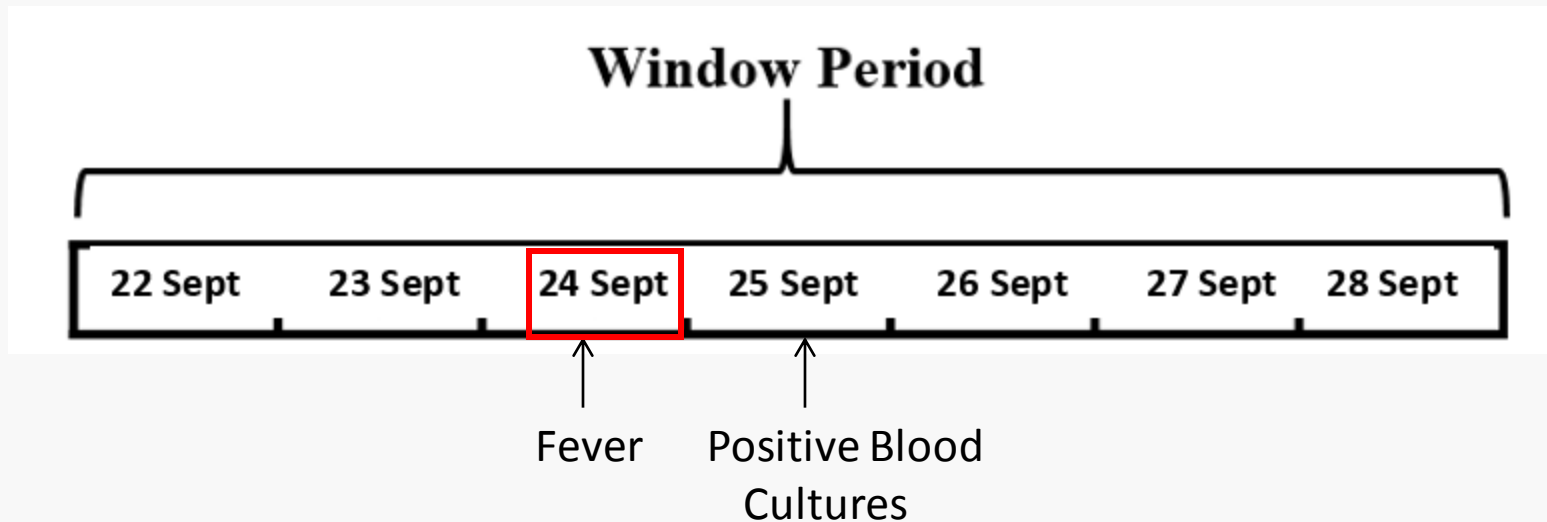
Key terms

❑ **Date of event**

- The date when the <u>first element used to meet the HAI case definition occurs for the first time</u> within the window period
  - This may be a positive diagnostic test or a clinical sign/symptom

- If the first element used to meet the HAI case definition is a laboratory diagnostic test, then the <u>date of specimen collection</u> should be reported as the date of event
  - Do not report date that lab test was performed or date that results of the lab test were confirmed

- If the first element used to meet the HAI case definition is a clinical symptom, then the <u>first date the symptom appeared in the window period</u> should be reported as the date of event

Key terms – date of event

Admitted to hospital 15 September and sent to the ICU
Fever 18 September
Blood cultures (19 September): no growth
Fever 20 September
Hypotension 21 September
Fever 24 September
2 blood cultures collected 25 September: *S. epidermidis*
Blood culture collected 30 September grows *A baumanii*

❑ **Our patient from the previous example:**

- This patient meets the BSI case definition
- The first element used to meet the case definition is a fever that occurred on 24 September
- Date of event = 24 September

Key terms
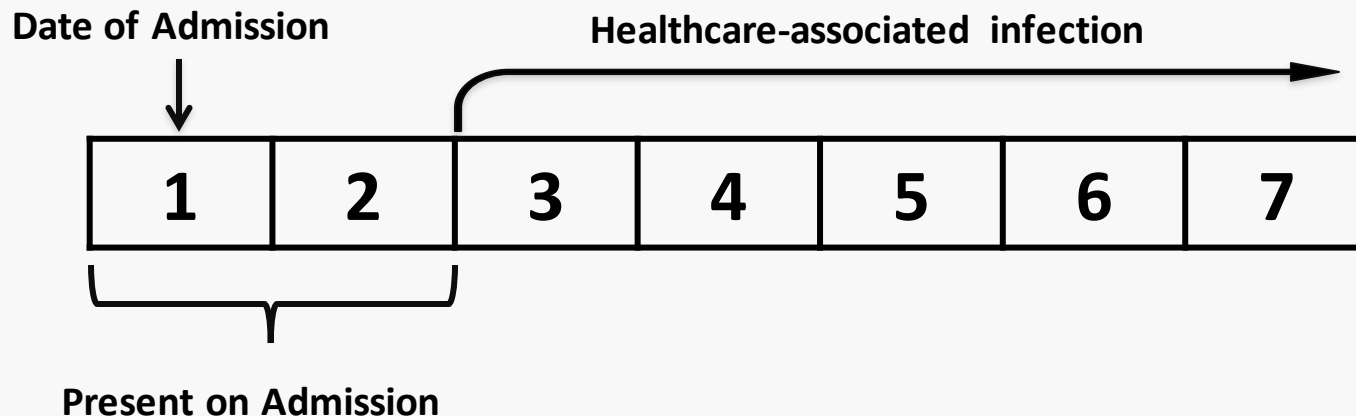
❑ **Healthcare-associated infection (HAI)**
- Date of event >2 calendar days after date of hospital admission
- Date of hospital admission = Day 1

❑ **Present on admission (POA)**
- Date of event occurs ≤ 2 calendar days after hospital admission

Date of Admission

Healthcare-associated infection

1	2	3	4	5	6	7

Present on Admission

Key terms – HAI vs. POA

❑ **Our patient from the previous example:**

- ▪ The patient was admitted to the hospital on 15 September
- ▪ The date of event for the BSI is 24 September
- ▪ This BSI is classified as a healthcare-associated infection

Date of Admission

Healthcare-associated infection

15 Sep	16 Sep	17 Sep	18 Sep	19 Sep	20 Sep	21 Sep	22 Sep	23 Sep	24 Sep	25 Sep

Present on Admission (Day 1 and 2)

Date of Event
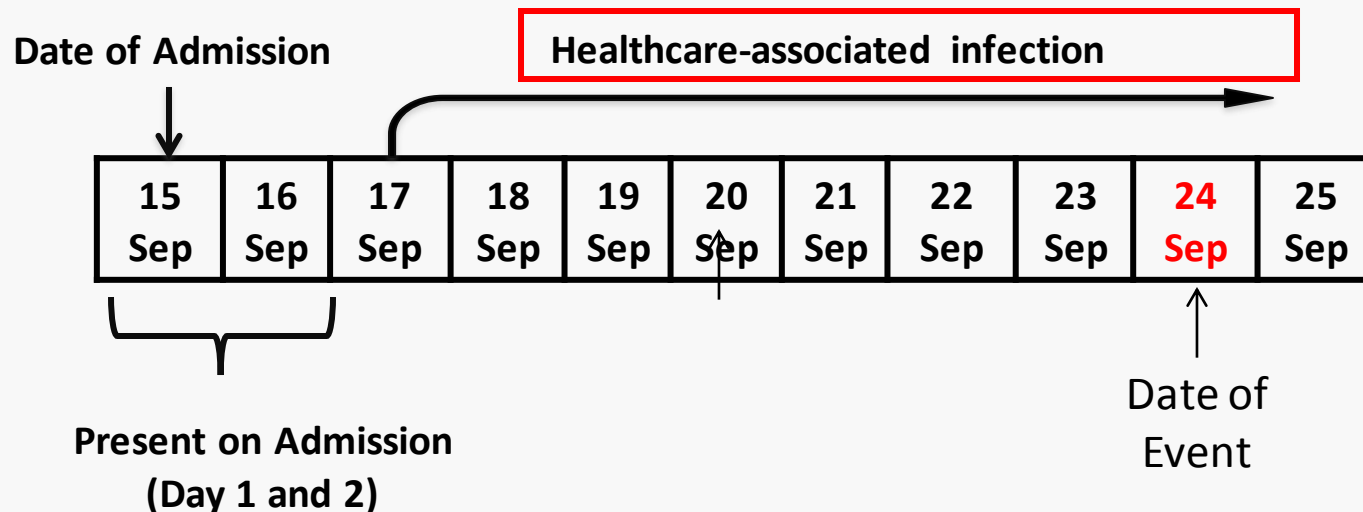
Key terms

❑ **Surveillance protocol includes a rule to separate HAI events for the same patient**

❑ **Event Timeframe**

- 14-day timeframe during which a primary HAI event is considered to be ongoing and no new HAIs <u>of the same type</u> can be reported for the patient

- Date of event = day 1 of the Event Timeframe

- Pathogens identified during the Event Timeframe are added to the case report form of the initial HAI
  - Pathogens from blood cultures collected during a BSI's Event Timeframe
  - Pathogens from urine cultures collected during a UTI's Event Timeframe

Admitted to hospital 15 September and sent to the ICU
Fever 18 September
Blood cultures (19 September): no growth
Fever 20 September
Hypotension 21 September
Fever 24 September
2 blood cultures collected 25 September: *S. epidermidis*
Blood culture collected 30 September grows *A baumanii*

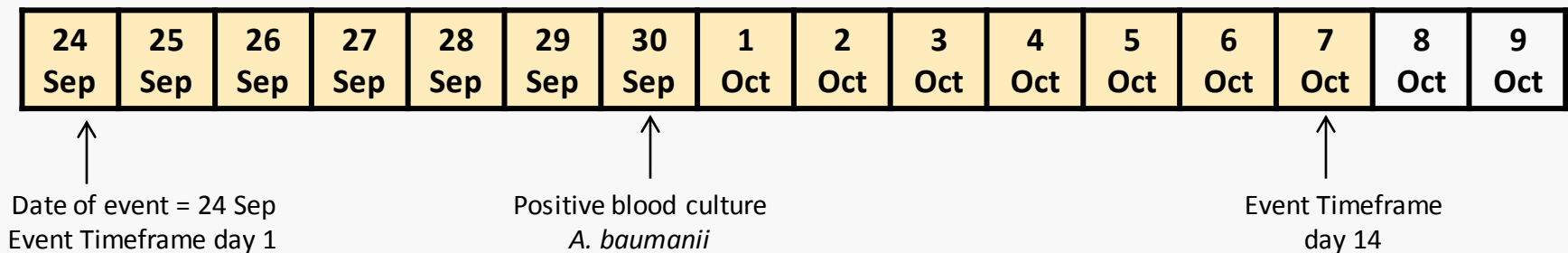❏ **Our patient from the previous example:**

- This patient meets the BSI case definition

- The first element used to meet the case definition is a fever that occurred on 24 September

- Date of event = 24 September

Window Period

| 22 Sept | 23 Sept | 24 Sept | 25 Sept | 26 Sept | 27 Sept | 28 Sept |

Fever   Positive Blood Cultures
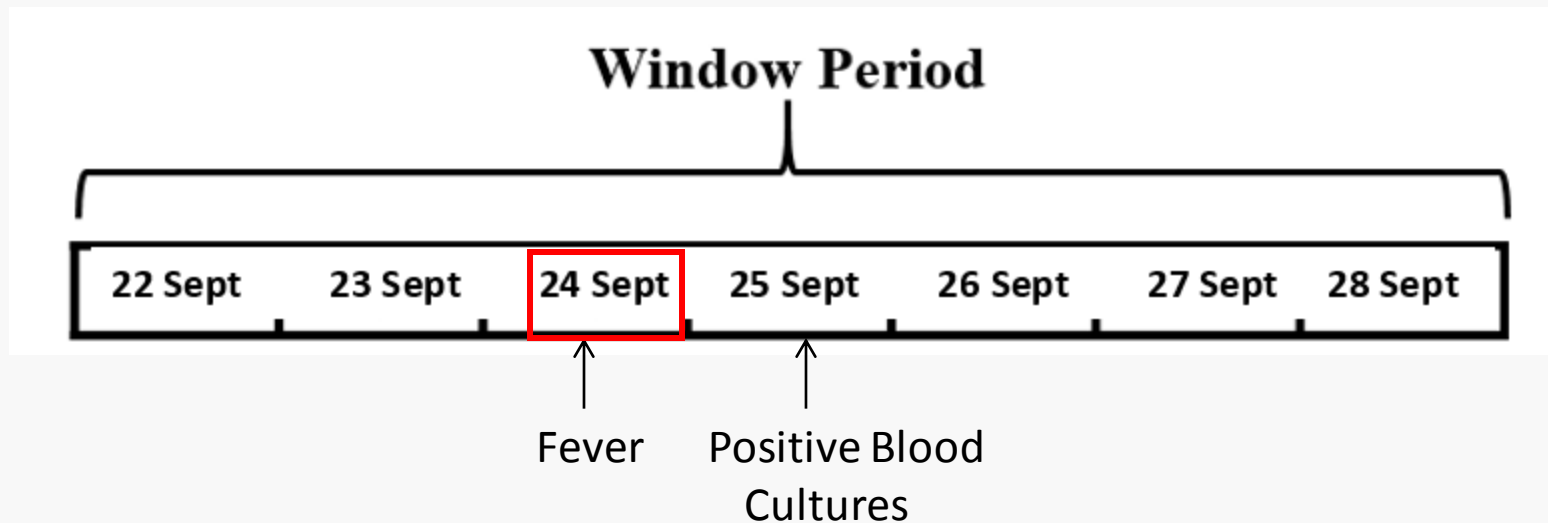
Key terms – Event Timeframe

❑ **Our patient from the previous example:**

- BSI date of event was 24 September, which is Day 1 of Event Timeframe
- Event Timeframe = 24 September to 7 October

24 Sep	25 Sep	26 Sep	27 Sep	28 Sep	29 Sep	30 Sep	1 Oct	2 Oct	3 Oct	4 Oct	5 Oct	6 Oct	7 Oct	8 Oct	9 Oct

Date of event = 24 Sep
Event Timeframe day 1

Positive blood culture
A. baumanii

Event Timeframe
day 14

- No new BSIs for this patient can be reported between 24 Sep and 7 Oct
- Organisms from any positive blood cultures during Event Timeframe are added to the ongoing event's case report form
  - *A. baumanii* from blood collected 30 Sep would not be a new BSI, but is added to the patient's BSI case report form

Key terms - summary

❑ **All key terms will be reviewed again in BSI and UTI training modules**

❑ **Review the generic "Surveillance for HAI in Intensive Care Units" module protocol and become familiar with key terms:**
  - Window period
  - Date of event
  - Healthcare-associated infection
  - Present on admission
  - Event Timeframe

HAI Surveillance – Inclusion Criteria

Inclusion Criteria

❑ **Inclusion criteria have been developed to make sure that only HAIs that can reasonably be attributed to the ICUs participating in surveillance are reported**

❑ **Cases meeting ALL of the following must be reported:**
- Date of event >2 calendar days from hospital admission, with date of hospital admission as Day 1
- Date of event >2 calendar days from surveillance unit admission, with date of surveillance unit admission as Day 1
- Date of event does not occur within the Event Timeframe of a previously identified HAI

❑ **If the case does not meet ALL of the above, it is not reported**

Inclusion Criteria

❑ A patient is admitted to the medical ward of your facility on 6 October. She is transferred to your ICU on 10 October. On 11 October, a blood culture is collected that grows *Acinetobacter baumanii*. The patient has a central line.

❑ Should this episode be reported as a bloodstream infection?

Inclusion Criteria

❑ **A patient is admitted to the medical ward of your facility on 6 October. She is transferred to your ICU on 10 October. On 11 October, a blood culture is collected that grows *Acinetobacter baumanii*. The patient has a central line.**

❑ **Should this episode be reported as a bloodstream infection?**
- NO. The patient was not in the ICU for more than 2 calendar days before the positive culture was collected.
- This rule prevents ICUs from reporting HAIs that may have been acquired in other units within the hospital, or in other hospitals

HAI Surveillance – Case Finding

Surveillance methodology

❑ **HAI surveillance requires active, patient-based, prospective identification of cases**

- **Active** – surveillance team goes to laboratory and ICUs to review laboratory logs and medical charts
- **Patient-based** – surveillance is done at patient level; patients are followed over time to find clinical signs/symptoms and positive lab tests
- **Prospective** – surveillance is done in "real time" while patients are hospitalized (to the degree possible) and is not solely based on retrospective review of laboratory and medical records

❑ **Case finding methodology is included as Appendix 1 of the generic "Surveillance for HAIs in ICUs" module protocol**

- To be discussed in more detail during BSI/UTI training modules

Case Finding – Flowcharts

Appendix 1 – UTI Case Finding Flowchart
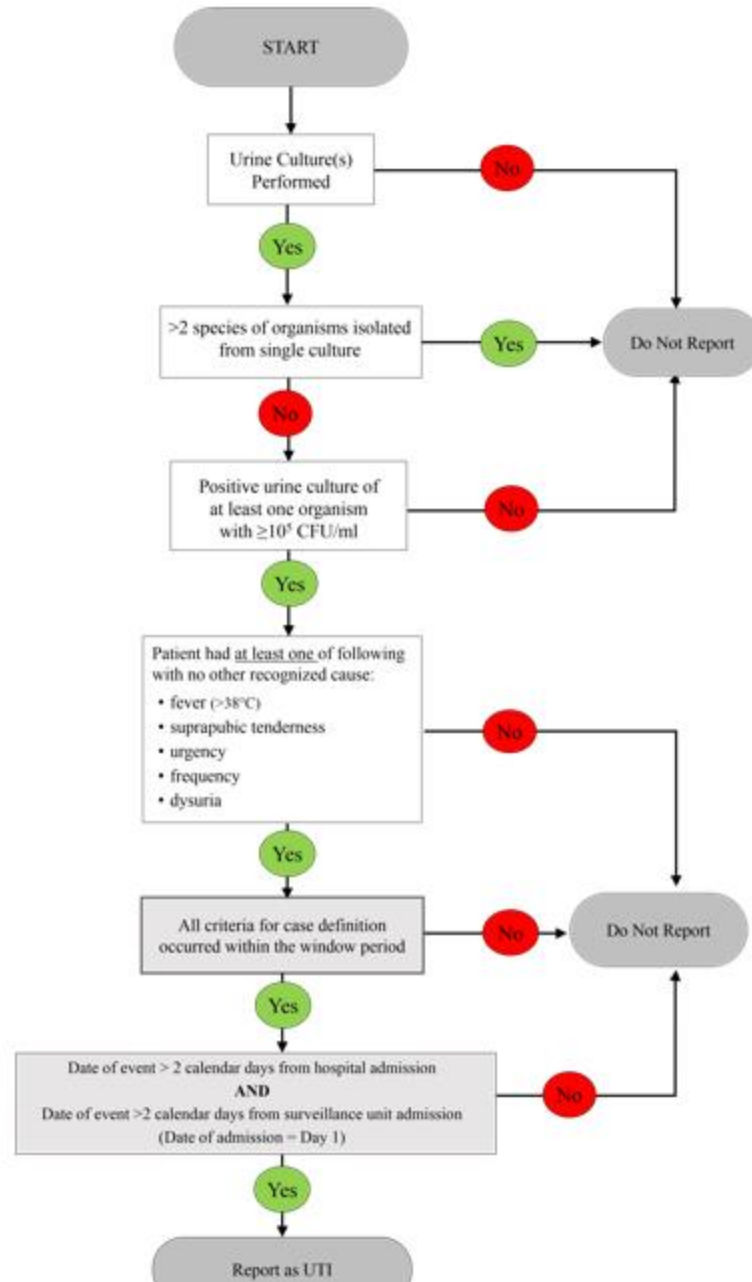
Case Finding – Worksheets

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 $\geq 10^5$ 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.

Case Finding – Investigation Tables

	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				

Case Reporting

❑ **Once an HAI is identified, a standard case report form (CRF) is completed and submitted to the central network team**

- Separate CRFs created for BSI and UTI; included in protocols along with tables of instructions
- CRFs will remain "open" for some time:
    - Collection of additional culture information during Event Timeframe and Secondary BSI Attribution Period
    - Collection of hospitalization outcome

❑ **A web-based platform has been developed for local data entry and analysis; additional training will be provided**

Case Reporting – Multiple HAI types

❑ The same patient may develop a BSI and a UTI during their ICU stay

❑ If a patient meets both the BSI and UTI case definitions, then both the BSI and UTI case report form should be completed

❑ Both the BSI and UTI should be reported, regardless of whether or not the urine and blood isolates match

HAI Surveillance – Review

HAI Surveillance – Review

❑ **Key terms:**

- Window period – date of first positive diagnostic test+/- 3 calendar days
  - All elements of HAI case definition must be met during the window period

- Date of event - date that the first element used to meet the HAI case definition appears for the first time
  - This could be the date of collection for first positive diagnostic test or the date of first clinical sign/symptom

HAI Surveillance – Review

❑ **Key terms:**

- Healthcare-associated infection – date of event >2 calendar days after date of hospital admission (where date of admission = day 1)

- Present on admission - date of event occurs ≤ 2 calendar days after hospital admission

- Event timeframe – 14 day period (date of event = day 1) when an HAI is considered to be ongoing
  - No new HAIs of the same type can be reported for the patient during these 14 days

HAI Surveillance – Review

❑ **Infections meeting ALL of the following inclusion criteria must be reported as part of this surveillance:**

- Date of event >2 calendar days from hospital admission, with date of hospital admission as Day 1

- Date of event >2 calendar days from surveillance unit admission, with date of surveillance unit as Day 1

- Date of event does not occur within the Event Timeframe of a previously identified HAI