# How to prepare and obtain Surveillance data VAP and CAUTI

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# Definition of Surveillance

Systematic *collection, analysis* and *interpretation* of data on specific events (infections) and disease, followed by *dissemination* of that information in a *timely manner* to those who can improve the outcomes.

# Why HAI surveillance is important ?

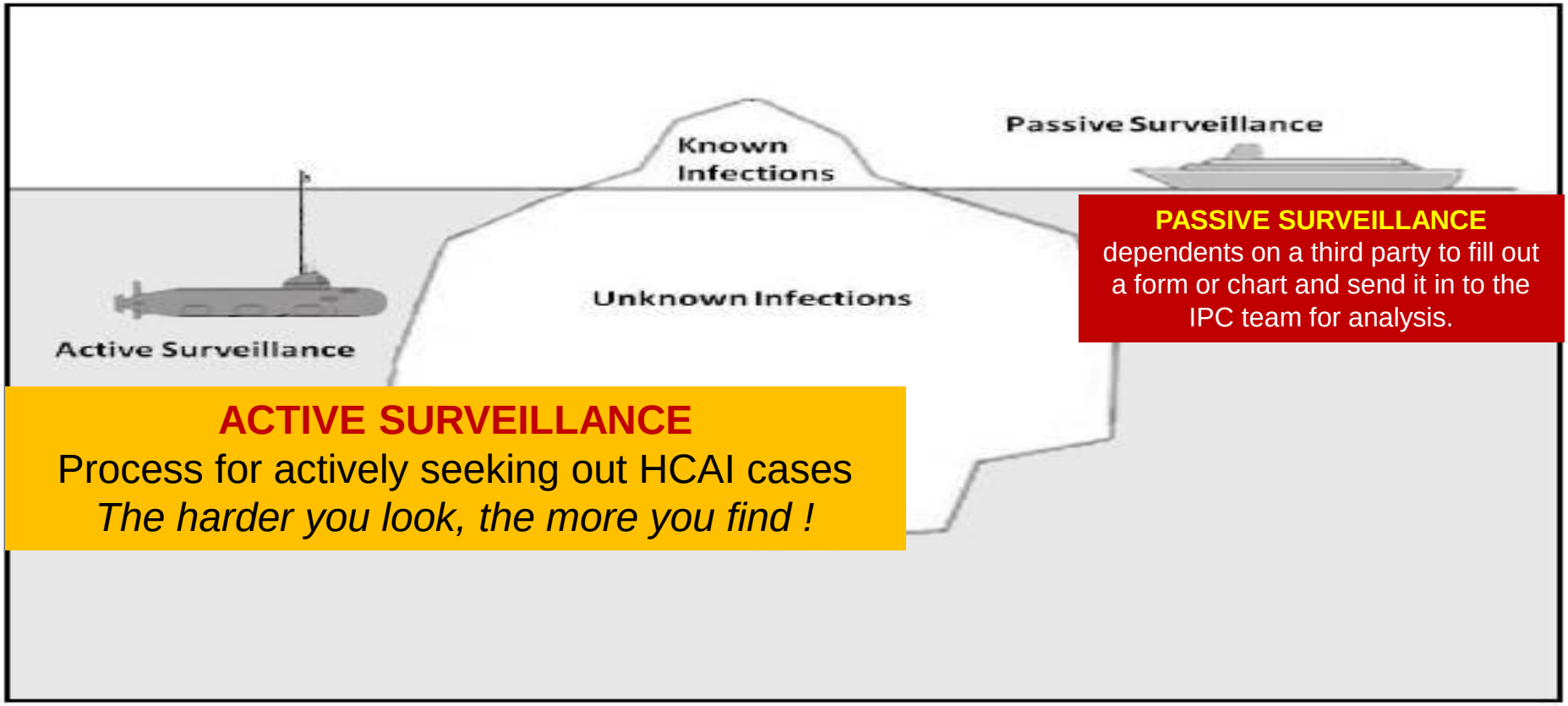
*'If you **cannot measure** it, you **cannot improve** it'*

Lord Kelvin, 1824-1907

The ultimate *aim* of Surveillance is to
*reduce*
*Healthcare-associated* infection rate

Surveillance is
€xpen$ive and time consuming

# ‘Tip of the iceberg’
# Active *vs* passive surveillance




**PASSIVE SURVEILLANCE**
dependents on a third party to fill out a form or chart and send it in to the IPC team for analysis.

**ACTIVE SURVEILLANCE**
Process for actively seeking out HCAI cases
*The harder you look, the more you find !*

*From: PIDAC Best Practices for Surveillance of Health Care-Associated Infections in Patient and Resident Populations,* June 2011 www.pidac.ca

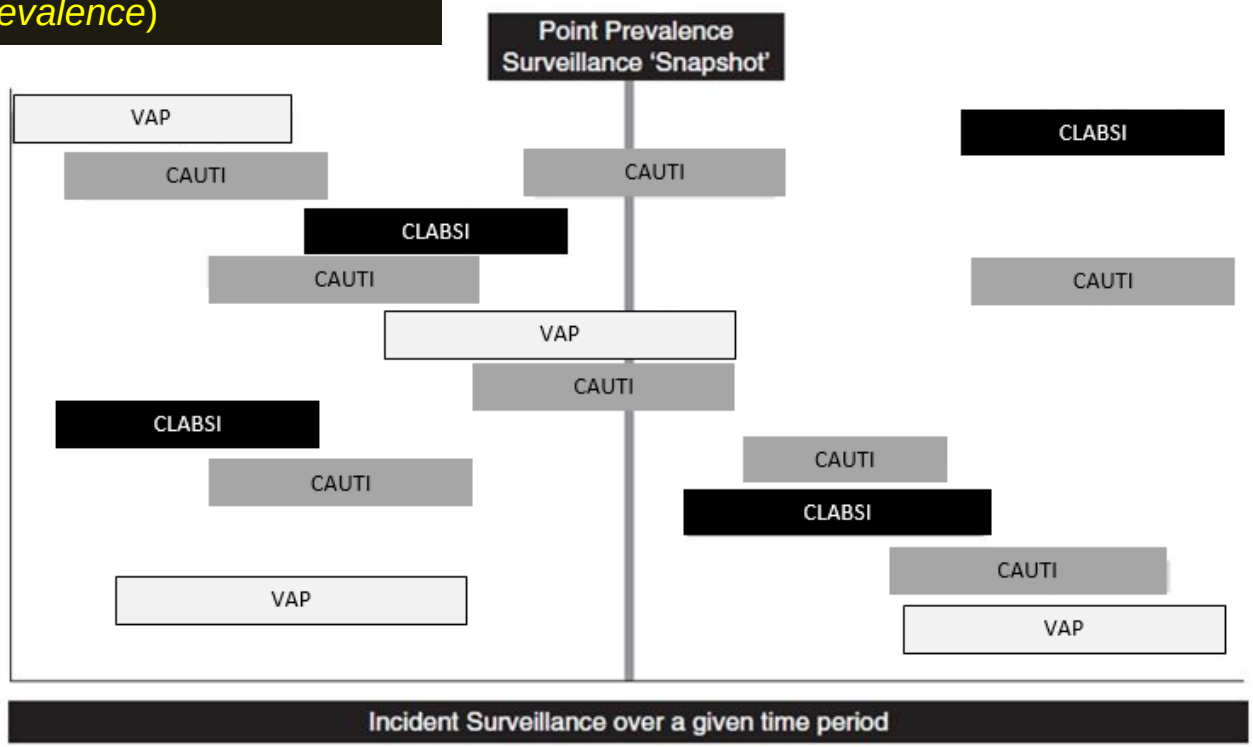
# Types of Surveillance

| Type of Surveillance | Methods | Overall reduction in infection rate |
|---|---|---|
| Total<br>(Not recommended) | **Target whole hospital/ward**<br>Routine collection, tabulation, analysis and dissemination of all information on the occurrence of nosocomial infections in a specified *ward* and/or *hospital.* | **11- 48%** |
| Target-oriented<br>(Recommended) | **Target specific infections, units or groups of patients**<br>Site Directed *e.g.* Blood Stream Infections, Surgical Site Infections<br>Unit Directed *e.g.* adult or neonatal Intensive Care Unit<br>Procedure Directed *e.g.* IV catheter-related infections. | **14 -71%** |

Harbarth S *et al. JHI* 2003;54:258-266

# Incidence *vs* Point Prevalence Surveillance

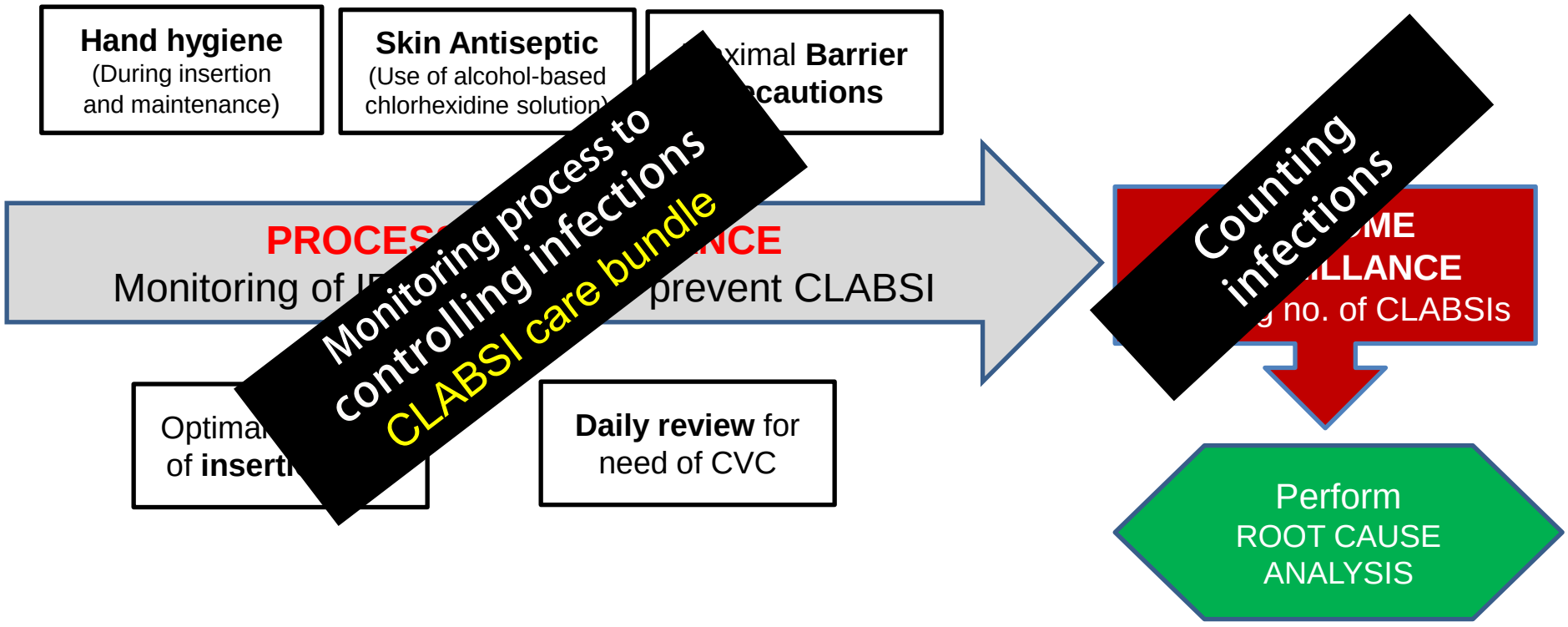
The ***prevalence*** rate is the proportion of patients in the population who have an active infection either during a specified period of time (*period prevalence*) or at a specified point in time (*point prevalence*)




The ***incidence*** rate is the number of new cases that appear in the population at risk over a given time period

# Process *vs* Outcome Surveillance

## Central-Line Associated Blood Stream Infections: [CLABSI]



# Requirement of doing surveillance

- **Definitions**
- **Infection Prevention & Control Team**
- **Admin and Clerical staff**
- **IT Support** (hardware & soft ware)
- **Training of Team doing surveillance**
  - Training of individuals performing surveillance
  - Data validation, input, analysis and dissemination

# Requirement of doing surveillance

- **Dealing with data**
  - Collection, independent validation, analysis and dissemination of that information in a timely manner to relevant individual
- **Support and Agreement**
  - Hospital administrator
  - Clinical Team
  - Involvement of multidisciplinary team e.g. ICU ward round
  - Implementation plan to reduce HAIs

# Definitions

- Definitions are ***complex*** and require ***subjective judgement*** for interpretation
- It is essential that the personnel who are responsible for the collection of data require ***substantive training*** and *practice to develop proficiency* to help reduce subjectivity and help promote consistency
- Need for an ***independent validation***

# Problem with definitions

- There are *no internationally agreed definitions* on outcome surveillance
- Discrepancy between ***'epidemiological' vs 'clinical diagnosis***' of infection
- CDC Ventilator Associated Pneumonia (VAP) rates compared with American College of Chest Physicians rates amongst 2,060 patients ventilated and identified 12 cases of VAP using CDC criteria, whereas ACCP criteria identified 83 cases (**1.2** vs **8.5** cases per 1000 ventilator days respectively).

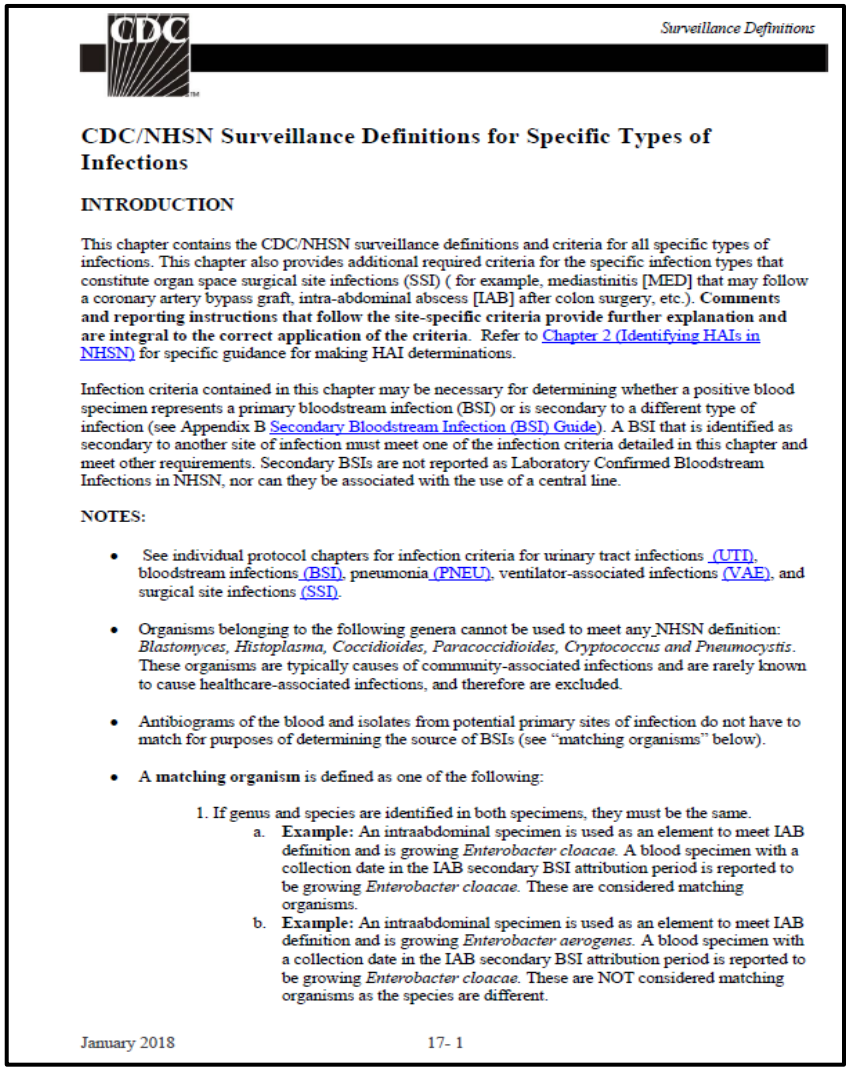
Skrupky LP et al.*Crit Care Med* 2012; 40:281 -284

# ECDC and CDC definitions

## Jan 2017


https://ecdc.europa.eu/sites/portal/files/documents/HAI-Net-ICU-protocol-v2.2_0.pdf

## Jan 2018



CDC

*Surveillance Definitions*

**CDC/NHSN Surveillance Definitions for Specific Types of Infections**

**INTRODUCTION**

This chapter contains the CDC/NHSN surveillance definitions and criteria for all specific types of infections. This chapter also provides additional required criteria for the specific infection types that constitute organ space surgical site infections (SSI) ( for example, mediastinitis [MED] that may follow a coronary artery bypass graft, intra-abdominal abscess [IAB] after colon surgery, etc.). **Comments and reporting instructions that follow the site-specific criteria provide further explanation and are integral to the correct application of the criteria**. Refer to Chapter 2 (Identifying HAIs in NHSN) for specific guidance for making HAI determinations.

Infection criteria contained in this chapter may be necessary for determining whether a positive blood specimen represents a primary bloodstream infection (BSI) or is secondary to a different type of infection (see Appendix B Secondary Bloodstream Infection (BSI) Guide). A BSI that is identified as secondary to another site of infection must meet one of the infection criteria detailed in this chapter and meet other requirements. Secondary BSIs are not reported as Laboratory Confirmed Bloodstream Infections in NHSN, nor can they be associated with the use of a central line.

**NOTES:**

- See individual protocol chapters for infection criteria for urinary tract infections (UTI), bloodstream infections (BSI), pneumonia (PNEU), ventilator-associated infections (VAE), and surgical site infections (SSI).
- Organisms belonging to the following genera cannot be used to meet any NHSN definition: *Blastomyces, Histoplasma, Coccidioides, Paracoccidioides, Cryptococcus and Pneumocystis*. These organisms are typically causes of community-associated infections and are rarely known to cause healthcare-associated infections, and therefore are excluded.
- Antibiograms of the blood and isolates from potential primary sites of infection do not have to match for purposes of determining the source of BSIs (see "matching organisms" below).
- **A matching organism** is defined as one of the following:

  1. If genus and species are identified in both specimens, they must be the same.
     a. **Example:** An intraabdominal specimen is used as an element to meet IAB definition and is growing *Enterobacter cloacae*. A blood specimen with a collection date in the IAB secondary BSI attribution period is reported to be growing *Enterobacter cloacae*. These are considered matching organisms.
     b. **Example:** An intraabdominal specimen is used as an element to meet IAB definition and is growing *Enterobacter aerogenes*. A blood specimen with a collection date in the IAB secondary BSI attribution period is reported to be growing *Enterobacter cloacae*. These are NOT considered matching organisms as the species are different.

January 2018 17- 1

https://www.cdc.gov/nhsn/pdfs/pscmanual/17pscnosinfdef_current.pdf

# Definition

Respiratory tract infections

# **CDC**: Ventilator-associated pneumonia

- A pneumonia where the patient is on mechanical ventilation for **>2 calendar days** on the date of event, with day of ventilator placement being Day 1

  AND

- The ventilator was in place on the date of event or the day before.

- (If the ventilator was in place prior to inpatient admission, the ventilator day count begins with the admission date to the first inpatient location).

# **CDC**: Ventilator-associated pneumonia

- *Ventilation and lung expansion devices* that deliver positive pressure to the airway (for example: CPAP, Bipap, bi-level, IPPB and PEEP) via *non-invasive* means (for example: nasal prongs, nasal mask, full face mask, total mask, etc.) are **not considered ventilators** unless positive pressure is delivered via an artificial airway (oral/nasal endotracheal or tracheostomy tube)

# Diagnosis of pneumonias

## Imaging Test Evidence (Chest *x*-ray)

- **Two or more** serial **chest imaging** test results with **at least one** of the following
  - New and persistent or progressive and persistent
    - Infiltrate
    - Consolidation
    - Cavitation

- **Note:** In patients without underlying pulmonary or cardiac disease (for example: respiratory distress syndrome, bronchopulmonary dysplasia, pulmonary oedema, or chronic obstructive pulmonary disease), one definitive imaging test result is acceptable

# Diagnosis of pneumonias

## Signs/Symptoms/Laboratory

- For any patient, at ***least one*** of the following:
  - ***Fever*** (>38.0°C or >100.4°F)
  - ***Leukopenia*** (≤ 4000 WBC/$mm^3$ ) or ***leucocytosis*** (>12000 WBC/$mm^3$ )
  - **For adults** >70 years old, altered mental status with no other recognized cause

  **AND**
  - at ***least two*** of the following:
    - **New onset of purulent sputum** or change in character of sputum, or increased respiratory secretions, or increased suctioning requirements
    - **New onset or worsening cough**, or dyspnoea, or tachypnoea
    - Rales or bronchial breath sounds
    - **Worsening gas exchange** (for example: $O_2$ desaturations (for example: Pa $O_2$ /Fi $O_2$

# Laboratory / Microbiology

- At ***least one*** of the following:
  - Organism identified **from blood**
  - Organism identified **from pleural fluid**
  - Positive quantitative culture or corresponding semi-quantitative culture result from minimally-contaminated LRT specimen (specifically, **BAL, protected specimen brushing or endotracheal aspirate**)
  - ≥5% BAL-obtained cells contain intracellular bacteria on **direct microscopic exam** (for example: Gram's stain)
  - Positive quantitative culture or corresponding semi-quantitative culture **result of lung tissue**

# ECDC: Pneumonia

**RADIOLOGY**

Chest X-rays or CT scans – suggestive pneumonia

**No Radiology = No Pneumonia**

+

**SIGNS & SYMPTOMS**

- Fever >38°C with no other cause
- Leukopaenia (<4000 WBC/mm$^3$) or leucocytosis (≥12 000 WBC/mm$^3$)
- **and** at least ONE of the following:

(or at least TWO if clinical pneumonia only = PN4 and PN5)

- New onset purulent sputum (or change in sputum)
- Cough or dyspnoea or tachypnoea.
- Suggestive auscultation (rales or bronchial breath sounds, wheeze)
- Worsening gas exchange(e.g., O2 desaturation or increased oxygen requirements or increased ventilation demand)

±

**MICROBIOLOGY**

| PN1 | PN2 | PN3 | PN4 | PN5 |
|---|---|---|---|---|
| Quantitative culture from LRT (BAL, PB, DPA) | Quantitative culture from possibly *contaminated* LRT (ETA) | Alternative microbiology (other related sites, histopathology, PCR, other) | Sputum culture/non-quantitative Lower respiratory tract specimen | No positive microbiology |

# Definition

Urinary Tract Infection

# Key principles of CAUTI recognition

- Diagnosis of CAUTI is challenging because **bacteriuria** is often present and **not a reliable indicator alone for infection** (i.e. does not differentiate between colonisation and infection)

- Thus, need bacteriuria **and clinical signs or symptoms**

- Patients with long term catheters will often have high concentrations of bacteria in the urine without having infection - *asymptomatic bacteriuria*

- **Standardised definitions important to determine true infection burden (refer to surveillance modules for additional information)**
  - Centers for Disease Control and Prevention (CDC)
  - European Centre for Diseases Prevention and Control (ECDC)

# **CDC** definition of CAUTI

Patient must meet 1, 2, and 3 below:

1. Patient had an indwelling urinary catheter in place for **> 2 days**
2. Patient has **≥1** of the following signs or symptoms:
   - Fever (>38.0°C)
   - Suprapubic tenderness (no other recognized cause)
   - Costovertebral angle pain/tenderness (no other recognized cause)
   - *Urinary urgency (cannot be used when catheter is in place)*
   - *Urinary frequency (cannot be used when catheter is in place)*
   - *Dysuria (cannot be used when catheter is in place)*
3. Patient has a **urine culture** with no more than two species of organisms identified, at least one of which is a **bacterium of ≥$10^5$** CFU/ml


- CDC National Healthcare Safety Network (NHSN) Patient Safety Component Manual UTI 2017. At: https://www.cdc.gov/nhsn/pdfs/pscmanual/7psccauticurrent.pdf

# Urinary Tract Infection

| **UTI-A**<br>Microbiologically **confirmed**<br>**Symptomatic UTI** | **UTI-B**<br>Microbiologically **unconfirmed**<br>**Symptomatic UTI** | **UTI-C**<br>**Asymptomatic bacteriuria** |
|---|---|---|
| **≥1** of following (no other cause):<br>•Fever (>38$^{o}$C)<br>•Urgency<br>•Frequency<br>•Suprapubic tenderness<br><br>AND<br><br>**Positive urine culture**<br><br>(**≥10$^{5}$ microorgs**(≤2 species)/ml) | **≥2** of following (no other cause):<br>•Fever (>38$^{o}$C)<br>•Urgency<br>•Frequency<br>•Suprapubic tenderness<br>AND<br>≥ 1 of following<br>•Positive dipstick urine<br>•Pyuria (≥10WBC/ml)<br>•Organisms gram of unspun urine<br>•≥ 2 urine cultures same uropathogen **≥10$^{2}$organisms/ml**<br>•*Physician diagnosis of UTI* | DO NOT REPORT FOR PPS<br>No symptoms<br><br>**Note:**<br>**BSI secondary to UTI or asymptomatic bacteriuria are reported BSI and S-UTI rather than UTI code** |

# ECDC definition of UTI-A and CAUTI

- CAUTI
  - If a **urinary catheter** was present (even intermittently) in the **7 days** preceding the onset of infection.

# What information do we need for surveillance ?

- Infection Window Period (IWP)
- Date of Event ( DOT)
- Present On Admission ( POA)
- Healthcere associated infections (HCAI)
- Repeat Infection Timeframe (RIT)

**Infection Window Period:**

The Infection Window Period (IWP) is defined as the 7-days during which all site-specific infection criteria must be met. It includes the collection date of the first positive **diagnostic test that is used as an element to meet the site-specific infection criterion, the 3 calendar days before and the 3 calendar days after**

**For purposes of defining the Infection Window Period the following examples are considered diagnostic tests:**

laboratory specimen collection
imaging test
procedure or exam

**Infection Window Period**

**3 days before**

**Date of first positive diagnostic test that is used as an element of the site-specific criterion**

**OR**

**In the absence of a diagnostic test, use the date of the first documented localized sign or symptom that is used as an element of the site-specific criterion**

**3 days after**

*Option 1:*

**Correct diagnostic test selection**

| **Hospital Day** | **Infection Window Period** |
|---|---|
| -2 | |
| -1 | |
| 1 | |
| **2 POA** | New onset cough |
| 3 | **Imaging test: Infiltrate** |
| 4 | Fever > 38.0 C |
| 5 | Fever > 38.0 C |
| 6 | Blood culture: *A. baumannii* |
| 7 | Rales, Fever > 38.0 C |
| 8 | Cough, Rales |

*Option 2:* **Incorrect diagnostic test selection**

| **Hospital Day** | **Infection Window Period** |
|---|---|
| -2 | |
| -1 | |
| 1 | |
| 2 | New onset cough |
| **3 HAI** | Imaging test: Infiltrate |
| 4 | Fever > 38.0 C |
| 5 | Fever > 38.0 C |
| 6 | **Blood culture: *A.baumannii*** |
| 7 | Rales, Fever > 38.0 C |
| 8 | Cough, Rales |
| 9 | |

## Date of Event (Event Date):

**The Date of Event (DOE)** is the date the **first element** used to meet an NHSN site-specific infection criterion occurs for the **first time** within the 7-days infection window period

Accurate **determination of DOE** is critical because DOE is used to determine:

- if an event is **HCAI** or **POA**
- location of attribution
- device association
- **day 1** of the Repeat Infection Timeframe

## **Date of Event** and Classification Determination

| **Hospital Day** | **Date of Event Assignment for RIT** | **Classification** |
|---|---|---|
| 2 days before admit | Hospital Day 1 | **POA** |
| 1 day before admit | Hospital Day 1 | |
| 1 | Hospital Day 1 | |
| 2 | Hospital Day 2 | |
| 3 | Hospital Day 3 | **HAI** |
| 4 | Hospital Day 4 | |
| 5 | Hospital Day 5 | |

An infection is considered **Present on Admission (POA)** **if the date of event of the NHSN site-specific infection criterion occurs during the POA time period, which is defined as the day of admission to an inpatient location (calendar day 1), the 2 days before admission, and the calendar day after admission.**

**For purposes of NHSN surveillance and determination of the Repeat Infection Timeframe if the date of event is determined to be either of the two days prior to inpatient admission, then the date of event will be hospital day 1.**

An infection is considered a **Healthcare-associated Infection (HCAI)** if the date of event of the NHSN **site-specific infection criterion occurs on or after the 3rd calendar day of admission** to an inpatient location where day of admission is calendar day 1.

Note the date of event is the date the **first element used to meet the site-specific infection criterion occurs for the first time in the infection window period.**

*Example 1*

| HOSPITAL DAY | INFECTION WINDOW PERIOD |
|---|---|
| 1 | |
| **2 Date of Event** | Fever > 38.0 C |
| 3 | Fever > 38.0 C |
| 4 | **Urine culture: >100,000 CFU/ ml *E. coli*** |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| 11 | |
| 12 | |
| 13 | |
| 14 | |
| 15 | |
| 16 | |
| 17 | |
| 18 | |

**SUTI- POA**

**Date of Event = 2**

**Pathogen = *E. Coli***

*Example 2*

| HOSPITAL DAY | INFECTION WINDOW PERIOD |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| **4 Date of Event** | **Urine culture: >100,000 CFU/ml *E. coli*** |
| 5 | Fever > 38.0 C |
| 6 | Fever > 38.0 C |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| 11 | |
| 12 | |
| 13 | |
| 14 | |
| 15 | |
| 16 | |
| 17 | |
| 18 | |

**SUTI- HCAI**

**Date of Event = 4**

**Pathogen = *E. coli***

**Notes:**

Acceptable documentation includes patient-reported signs or symptoms documented in the medical record by a healthcare professional.
Information **communicated verbally** from facility to facility, or information found in another facility's medical record **cannot be used** unless also documented in the current facility's medical record (with the exception of post –discharge SSI surveillance.)

For example, the following would be eligible for use if documented in the current facilities medical record:
- patients states measured fever > 38.0° C
- nursing home documents fever prior to arrival to the hospital and in the POA timeframe patient complains of dysuria

Physician diagnosis **can be accepted as evidence of an infection only when physician diagnosis is an element of the specific infection definition**.

For example, physician diagnosis is not an element of any UTI criteria; therefore, **physician diagnosis of a UTI may not be used to satisfy POA status of a UTI**.

# Repeat Infection Timeframe:

The Repeat Infection Timeframe (RIT) is a 14-days timeframe during which **no new infections of the same type** are reported.

**The RIT applies to both POA and HAI determinations.**

The date of event is Day 1 of the 14-day RIT.

If criteria for the same type of infection are met and the date of event is within the 14-day RIT, another new event is not identified for purposes of tracking or reporting, however, additional pathogens recovered during the RIT from the same type of infection **are added** to the event.

Note the original date of event is maintained as is the original 14-day RIT. Additionally, device association determination location of attribution are not to be amended.

Major Type Examples:

Patients will have no more than one BSI reported in a BSI RIT (LCBI 1, LCBI 2, MBI-LCBI 1,MBI-LCBI 2, MBI-LCBI 3)

Patients will have no more than one PNEU reported in a PNEU RIT (PNU1, PNU2, and PNU3).

Patients will have no more than one UTI reported in a UTI RIT (SUTI, ABUTI, USI)

**Infection Window Period**
(first positive diagnostic test, 3 days before and 3 days after)

**Repeat Infection Timeframe (RIT)**
(date of event = day 1)

**Date of Event**
(date the first element occurs for the first time within the infection window period)

| HOSPITAL DAY | RIT | INFECTION WINDOW PERIOD |
|---|---|---|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | 1 | **Urine culture:** >100,000 cfu/ml<br>*E. coli* |
| 5 | 2 | Fever > 38.0 C |
| 6 | 3 | Fever > 38.0 C |
| 7 | 4 | |
| 8 | 5 | |
| 9 | 6 | Urine culture: No growth |
| 10 | 7 | |
| 11 | 8 | |
| 12 | 9 | Urine culture: > 100,000 cfu/ml<br>*S. aureus* |
| 13 | 10 | |
| 14 | 11 | |
| 15 | 12 | |
| 16 | 13 | |
| 17 | 14 | |
| 18 | | |
| 19 | | |
| | | **SUTI-HAI**<br>**Date of Event = 4**<br>**Pathogens = *E. coli*, *S. aureus*** |

| HOSPITAL DAY | RIT | INFECTION WINDOW PERIOD |
|---|---|---|
| 1 | | No Foley catheter |
| 2 | | No Foley catheter |
| 3 | | No Foley catheter |
| 4 | 1 | **Urine culture:** >100,000 CFU /ml *S. aureus;* dysuria |
| 5 | 2 | Foley catheter inserted |
| 6 | 3 | Foley catheter |
| 7 | 4 | Foley catheter |
| 8 | 5 | Foley catheter<br>**Urine culture**: >100,000 CFU/ml *E. coli;* Fever 39.0°C |
| 9 | 6 | |
| 10 | 7 | |
| 11 | 8 | |
| 12 | 9 | |
| 13 | 10 | |
| 14 | 11 | |
| 15 | 12 | |
| 16 | 13 | |
| 17 | 14 | |
| 18 | | |
| 19 | | |

**Non-catheter associated SUTI**
**Date of Event = Day 4**
**UTI RIT = Day 4 - 17**
**Pathogens: *S.aureus, E.coli***
**(Note: Meeting an event within the RIT does not alter the original determination. Date of Event, device association or RIT does NOT change)**

**Notes:**

- A patient **may have negative cultures** during the RIT without impact on the RIT.

- Do not change the **device-association** determination during the RIT.

- Do not change **location of attribution** determination during the RIT.