Surveillance for Ventilator Associated Pneumonia

March, 2023

Objectives

- **At the end of this session, participants will be able to:**
  - Describe key terms and case definitions used in VAP surveillance
  - Complete VAP infection and denominator reporting forms
  - Conduct basic analysis of VAP surveillance data
  - Correctly apply case definition to identify VAP cases

VAP Surveillance – Terms and Case Definition

- **Ventilator**: Any device used to support, assist or control respiration (inclusive of the weaning period) through the application of positive pressure to the airway when delivered via an artificial airway, specifically an oral/nasal endotracheal or tracheostomy tube.

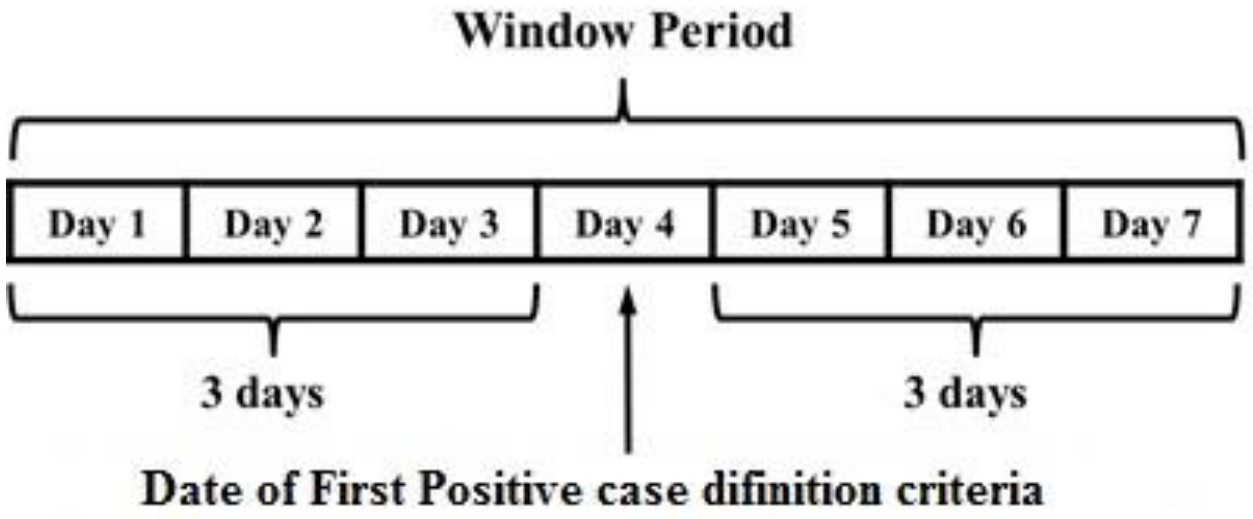
- Note: Ventilation and lung expansion devices that deliver positive pressure to the airway (for example: CPAP, Bipap, bi-level, IPPB and PEEP) via non-invasive means (for example: nasal prongs, nasal mask, full face mask, total mask, etc.) are not considered ventilators unless positive pressure is delivered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

VAP surveillance

- **This surveillance system tracks laboratory confirmed VAP**
  - Must have laboratories that are able to perform Respiratory samples/ blood cultures
  - Hospital microbiology laboratories should be able to identify pathogens to the species level

Key terms – VAP surveillance

- **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 case definition criteria and the 3 calendar days before and the 3 calendar days after.



Setting the window period

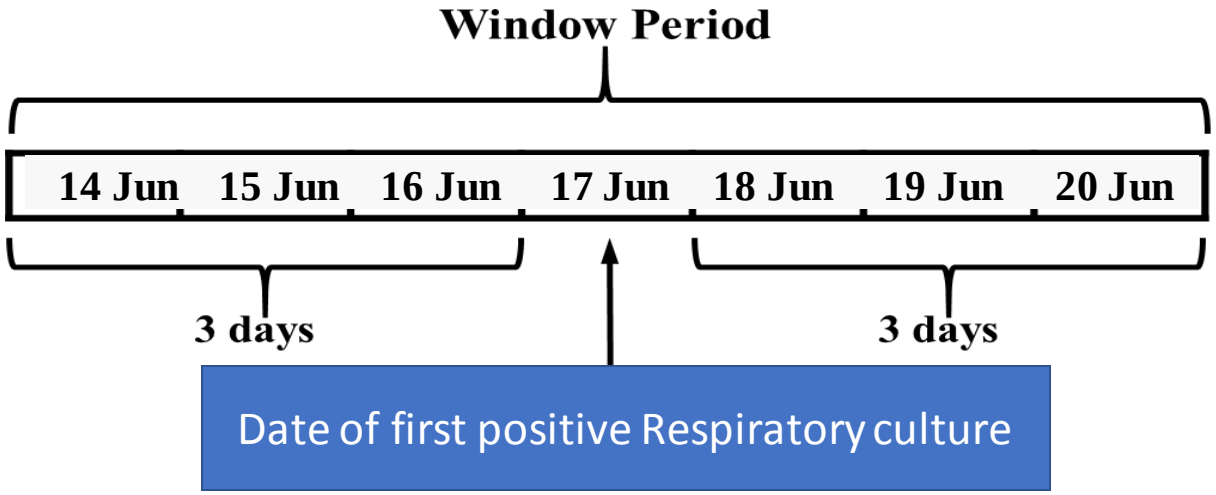
- **The Microbiology lab calls you on 19 June to report that a BAL culture collected from a patient in the ICU on 17 June is growing *Klebsiella pneumoniae*.**

- **What is the window period for this potential VAP?**

Setting the window period

- The microbiology lab calls you on 19 June to report that a BAL culture collected from a patient in the ICU on 17 June is growing *Klebsiella pneumoniae*

- What is the window period for this potential VAP?

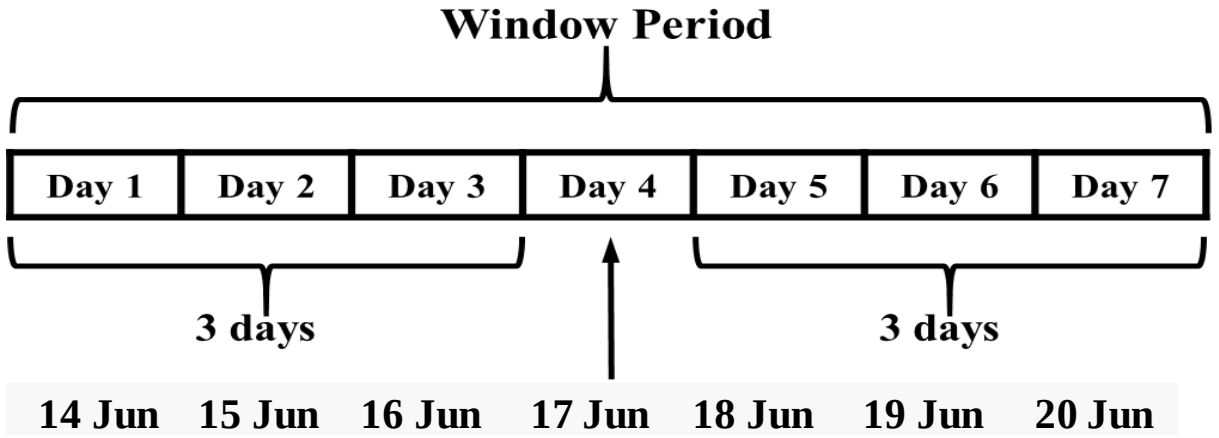


Key terms – VAP surveillance

- **Date of event**
  - The date when the first element used to meet the VAP case definition occurs for the first time within the window period

Determining the date of event

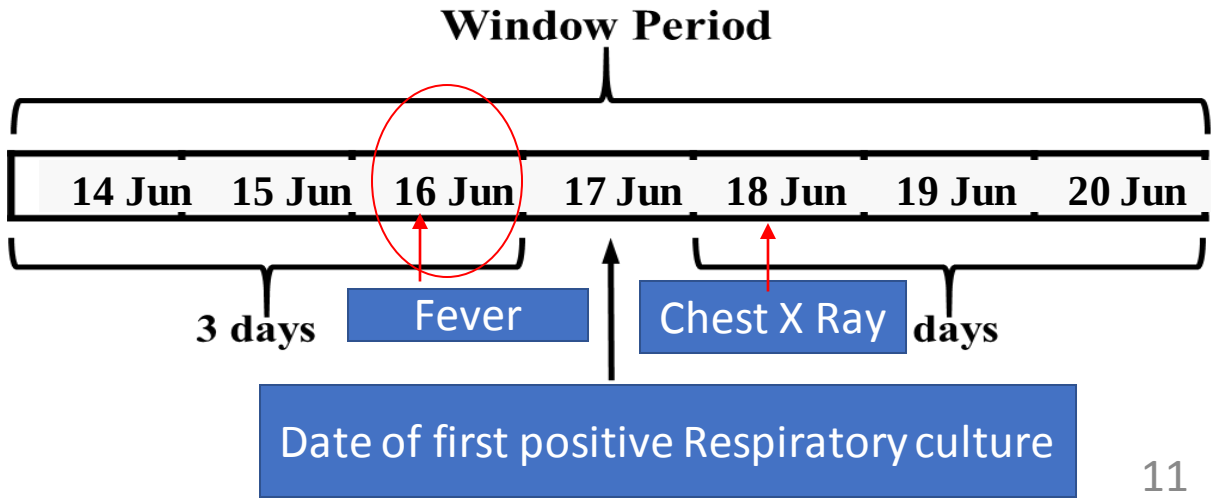
- You review the chart of the patient with *K. pneumoniae* from the previous example and find that the patient had a chest X ray with progressive infiltrates on 18 June. The patient developed a fever on 16 June. The patient meets the VAP case definition. What is the date of event for this VAP?



Date of first positive Respiratory culture

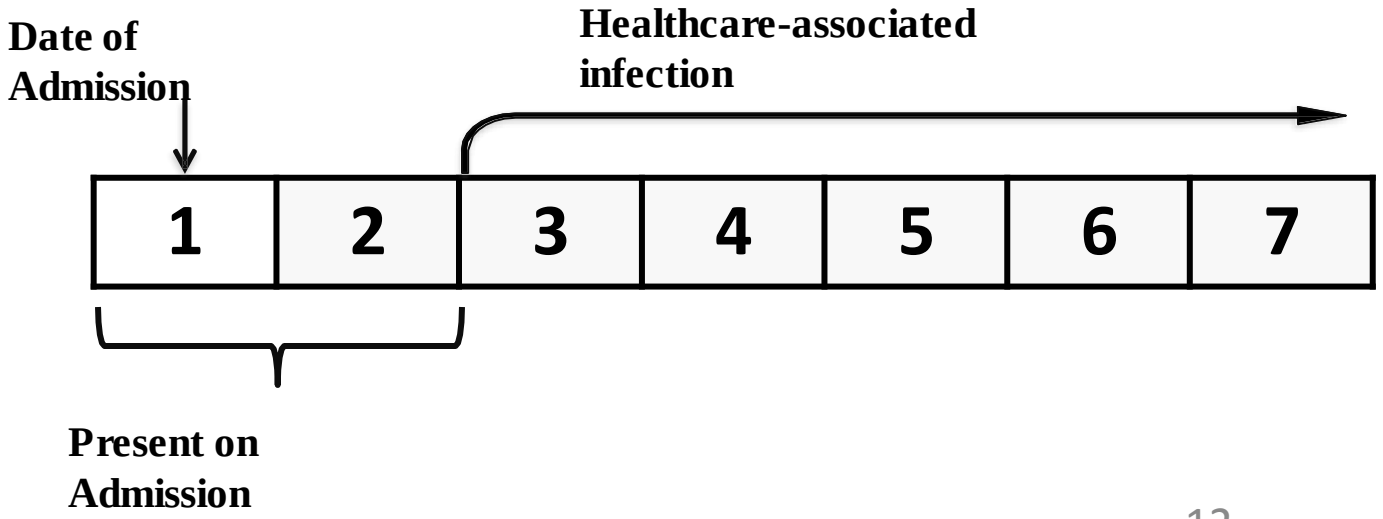
Determining the date of event

- You review the chart of the patient with *K. pneumoniae* from the previous example and find that the patient had a chest X ray with progressive infiltrates on 18 June. The patient developed a fever on 16 June. The patient meets the VAP case definition. What is the date of event for this VAP?



Key terms – VAP surveillance

- **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



Key terms – VAP surveillance

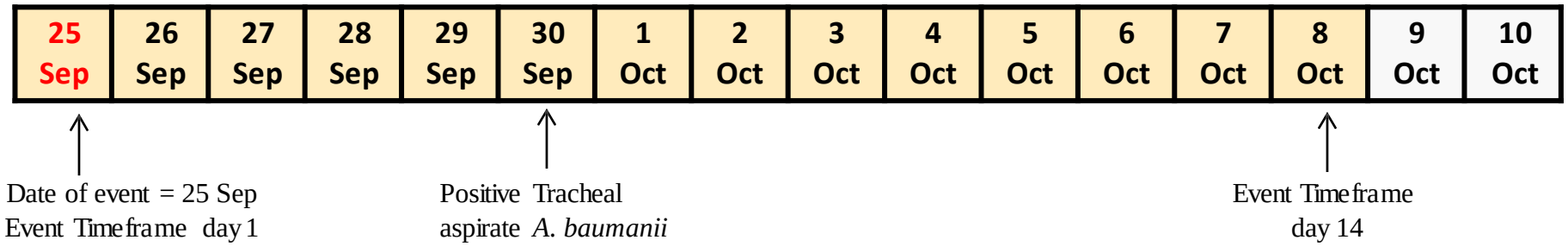
- **Surveillance protocol includes a rule to separate primary HAI events for the same patient**

- **Event Timeframe**

  - 14-day timeframe during which a primary VAP is considered to be ongoing and no new VAPs can be reported for the patient
  - Date of event = day 1 of the Event Timeframe
  - Organisms identified from culture samples taken during the Event Timeframe are added to the case report form of the initial VAP

Key terms – BSI surveillance

- **Example – VAP with date of event of 25 September:**
  - Date of event is Day 1 of Event Timeframe
  - Event Timeframe = 25 Sept to 8 Oct (14 days)



- No new VAPs for this patient can be reported between 25 Sept and 8 Oct
- *A. baumannii* from Tracheal aspirate collected on 30 Sept is not a new VAP per surveillance rules
  - Organism/susceptibility data for *A. baumannii* is added to the 25 Sept VAP case report form

VAP Surveillance – Inclusion Criteria

- **Recall that inclusion criteria have been developed to confirm that a VAP is healthcare associated and attributable to an ICU participating in surveillance**

- **VAPs meeting ALL of the following must be reported:**
  - Date of event does not occur within the Event Timeframe of a previously identified VAP
  - (Date of event >2 calendar days from hospital/ICU admission, with date of hospital /ICU admission as Day 1 – implied by ICU inclusion criteria)

- **If the VAP does not meet ALL of the above, it is not reported**

VAP surveillance – additional definitions

- **A case report form is completed for all VAPs that meet the inclusion criteria**

- **<u>Ventilator-associated pneumonia (VAP)</u>**: 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.
- For reporting Multiple episodes of VAP, the Repeat Infection Timeframe (RIT/ Event time frame) guidance from BSI/UTI Module needs to be followed

VAP Surveillance Definitions

Diagnostic algorithm for VAP

A. One or more serial chest imaging test results with at least *one* of the following

New and persistent **or** Progressive and persistent

- Infiltrate
- Consolidation
- Cavitation

B. Signs and Symptoms

B.1 At least *one* of the following:

- Fever (>38.0° C or >100.4° F)
- Leukopenia (≤4000 WBC/mm3) or leukocytosis (≥12,000 WBC/mm3)
- For adults ≥70 years old, altered mental status with no other recognized cause

And

B.2 At least *one* of the following:

- New onset of purulent sputum
- change in character of sputum
- Increased respiratory secretions
- Increased suctioning requirements
- New onset or worsening cough
- Dyspnea
- Tachypnea
- Rales or bronchial breath sounds
- Worsening gas exchange (for example: O2 desaturations [for example: PaO2/FiO2 ≤240], increased oxygen requirements, or increased ventilator demand)

C. Lab Findings

At least *one* of the following:

- Positive quantitative/ semi-quantitative culture from BAL/endotracheal aspirate/ sputum
- Organism identified from pleural fluid
- ≥5% BAL-obtained cells contain intracellular bacteria on direct microscopic Gram's stain
- Definitive diagnosis of fungal infection through histopathology/ cultures; definitive diagnosis of Bordetella/ Legionella/ Mycoplasma/ Chlamydia/ Viral pneumonia through Molecular/ serological tests
- For Immunocompromised patients, isolation of a matching *Candida* spp from blood and sputum/ endotracheal aspirate/ BAL will also be taken as positive laboratory confirmation.

- Isolation of any coagulase-negative *Staphylococcus* species, any *Enterococcus* species and any *Candida* species as well as a report of "yeast" that is not otherwise specified will not be considered a pathogen from the cultures obtained from above samples. The only exception is *Candida* spp. isolated in immunocompromised patients

- **For Diagnosis of VAP, the following algorithm will be used: At least one of each of the following components: A+B1+ B2+C= VAP**

VAP Surveillance – Case Finding

Implementing VAP surveillance: case finding

- **Work with microbiology lab to get regular positive culture data**
  - Check Respiratory/ blood culture log book each day
  - Receive daily report of all positive respiratory/ blood cultures from ICUs

- **Work with ICU clinical staff to evaluate all patients for potential VAP**

- **Query a variety of data sources**
  - Medical records
  - Laboratory records
  - Conversations with clinical staff

DATA ENTRY

- A Case report form will be filled for each case of VAP
- Ventilator and patient days are used for denominators (as for BSI/ UTI Module)

Denominators (For calculation of incidence rates)

- Ventilator days and patient days are the denominators used to calculate VAP incidence rates.
- Denominator data should be **collected at the same time every day** for each participating ICUs under surveillance, including weekends and holidays.
- The denominator forms for collection of patient days and ventilator days are enclosed.

- **Ventilator day** denominator data is calculated as the number of patients on ventilator in each ICU under surveillance, each day. Surveillance staff should *record the number of patients in the surveillance unit who have/ are* on ventilator.

- **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 VDs.

Data Analyses

- VAP Rate The VAP rate per 1000 ventilator days is calculated by dividing the number of VAPs by the number of ventilator days and multiplying the result by 1000 (ventilator days).
  - VAP Rate per 1000 ventilator days = $No.\ of\ VAPs / No.of\ Ventilator\ Days$ X 1000
  - Device Utilization Ratio
- The Ventilator Utilization Ratio is calculated by dividing the number of ventilator days by the number of patient days.
  - DUR = $No.\ of\ Ventilator\ Days / No.\ of\ Patient\ Days$

VAP 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)
Date of hospital admission: ____ /_____ /_____	Date of admission to surveillance unit: ____ /_____ /_____
Location prior to hospital admission:	□ Home / Community □ Another hospital □ Unknown

1. VAP Details	
Date of event *(dd/mm/yyyy)*:	____ /_____ /_____
Fill out culture results in Section 5, Organisms and Antibiotic Susceptibility	
2. Invasive Devices: Ventilator	
Did the patient have a Mechanical ventilator in place at any time on • The date of event **or** • The day before the date of event?	☐ Yes ☐ No
If **YES,** was the ventilator in place for >2 calendar days?	☐ Yes ☐ No
3. Please tick the following	
A. Did the patient have New and persistent **or** Progressive and persistent	
• Infiltrate	☐ Yes (if yes) Date _____ ☐ No
• Consolidation	☐ Yes (if yes) Date _____ ☐ No
• Cavitation	☐ Yes (if yes) Date _____ ☐ No
B. Signs and symptoms B.1	
• Fever (>38.0ºC or >100.4ºF)	☐ Yes (if yes) Date _____ ☐ No
• Leukopenia (≤4000 WBC/mm3) or leukocytosis (≥12,000 WBC/mm3)	☐ Yes (if yes) Date _____ ☐ No
• For adults ≥70 years old, altered mental status with no other recognized cause	☐ Yes (if yes) Date _____ ☐ No
B.2	
• New onset of purulent sputum	☐ Yes (if yes) Date _____ ☐ No
• Change in character of sputum	☐ Yes (if yes) Date _____ ☐ No
• Increased respiratory secretions	☐ Yes (if yes) Date _____ ☐ No
• Increased suctioning requirements	☐ Yes (if yes) Date _____ ☐ No
• New onset or worsening cough	☐ Yes (if yes) Date _____ ☐ No
• Dyspnea	☐ Yes (if yes) Date _____ ☐ No
• Tachypnea	☐ Yes (if yes) Date _____ ☐ No
• Rales or bronchial breath sounds	☐ Yes (if yes) Date _____ ☐ No
• Worsening gas exchange (for example: O2 desaturations [for example: PaO2/FiO2≤240], increased oxygen requirements, or increased ventilator demand)	☐ Yes (if yes) Date _____ ☐ No
C. Lab Findings	
• Organism identified from blood/ or pleural fluid	☐ Yes (if yes) Date _____ ☐ No
• Positive quantitative/ semi-quantitative culture from BAL/endotracheal aspirate	☐ Yes (if yes) Date _____ ☐ No
• ≥5% BAL-obtained cells contain intracellular bacteria on direct microscopic Gram's stain	☐ Yes (if yes) Date _____ ☐ No
• Definitive diagnosis of fungal infection through histopathology/ cultures; definitive diagnosis of Bordetella/ Legionella/ Mycoplasma/ Chlamydia/ Viral pneumonia through Molecular/ serological testing methods	☐ Yes (if yes) Date _____ ☐ No
• Patient is immunocompromised and a matching *Candida spp* from blood and sputum/ endotracheal aspirate/ BAL is obtained	☐ Yes (if yes) Date _____ ☐ No

4. Outcome

Patient status at end of 14 days after DOE (Where DOE = Day 1)	□ Still in surveillance unit □ Transferred to other hospital □ Transferred to other ward/unit within the hospital □ Discharged □ LAMA Date of discharge, transfer, or death: □ Died ____/_____/_____ □ Unknown
Patient outcome at end of hospitalization	□ Discharged Date of discharge, transfer, or death: □ Transferred to other hospital □ LAMA □ Died ____/_____/_____ □ Unknown

5. Organisms and Antibiotic Susceptibility

Date of sample collection	Organism	Drugs				
_____	*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 DI** S I R N
		OTHER DRUG 2 S I R N	**OTHER DRUG 3** S I R N	**OTHER DRUG** 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	**MERO**	**DORI**	**NET**	**PIP**

		MICA SIRN	**VORI** SIRN	**OTHER DRUG** SIRN	**OTHER DRUG 2** SIRN	**OTHER DI** SIRN
		OTHER DRUG 4 SIRN	**OTHER DRUG 5** SIRN			
_____	*Candida spp.* Please Specify Species: ____ **(Only for ICP)**	**ANID** SIRN	**CASPO** SIRN	**FLUCO** SIRN	**FLUCY** SIRN	**ITRA** SIRN
		MICA SIRN	**VORI** SIRN	**OTHER DRUG** SIRN	**OTHER DRUG 2** SIRN	**OTHER DI** SIRN
		OTHER DRUG 4 SIRN	**OTHER DRUG 5** SIRN			
Date of sample collection	**Other Organisms**	**Drugs**				
_____	Organism 1 _____ Specify:	**Drug 1** SIRN	**Drug 2** SIRN	**Drug 3** SIRN	**Drug 4** SIRN	**Drug 5** SIRN
		Drug 6 SIRN	**Drug 7** SIRN	**Drug 8** SIRN	**Drug 9** SIRN	**Drug 10** SIRN
_____	Organism 2 _____ Specify:	**Drug 1** SIRN	**Drug 2** SIRN	**Drug 3** SIRN	**Drug 4** SIRN	**Drug 5** SIRN
		Drug 6 SIRN	**Drug 7** SIRN	**Drug 8** SIRN	**Drug 9** SIRN	**Drug 10** SIRN
_____	Organism 3 _____ Specify:	**Drug 1** SIRN	**Drug 2** SIRN	**Drug 3** SIRN	**Drug 4** SIRN	**Drug 5** SIRN
						Drug

Appendix 3 - 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	Number of patients with ventilator
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
31				
Totals				
	Patient-days:	Central-line days:	Urinary Catheter days:	Ventilator days

Collecting denominator data

- **Denominator data should be collected at the same time every day**
  - Even on weekends or holidays
  - Denominators should only reflect the patients present in the surveillance unit at the time of collection
  - Data collection can be done by surveillance staff or clinical staff working in the surveillance unit
- **Each surveillance location should have its own denominator data collection form**
  - Denominator counts are recorded on the form for each day
  - Daily counts are added up at the end of each month and the form is given to the hospital surveillance team
  - A new denominator data collection form is started in each surveillance unit on the first day of each month