Standard Operative Procedures

Surveillance for Ventilator Associated Pneumonia in Intensive Care Units

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

VAP Module

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1 BACKGROUND

Ventilator-associated pneumonia (VAP) has been recognized as one of the most important preventable causes of morbidity and mortality in critically ill patients by the Institute of Healthcare Improvement. The median rate of VAP/1,000 ventilator-days ranges from 2.2 in pediatric ICUs to 14.7 in trauma ICUs. The rates are higher in ICUs of developing countries. VAP has a cumulative incidence of 10 to 25% and accounts for approximately 25% of all ICU infections and 50% of its antibiotic prescription, making it the primary focus for risk-reduction strategies. VAP is also associated with a very high mortality, which is generally highest in the medical ICUs and in those with pneumonia due to multi-drug-resistant (MDR) pathogens.

This makes it important to capture the burden of VAP in Indian ICUs.

2 INTRODUCTION

This SOP describes the methods used to be in conducting VAP surveillance in Adult intensive care units. All hospitals participating in the HAI surveillance network must adhere to the surveillance case definitions and data collection and reporting procedures described here, in order to ensure that data is comparable across sites.

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

3 SURVEILLANCE SETTINGS

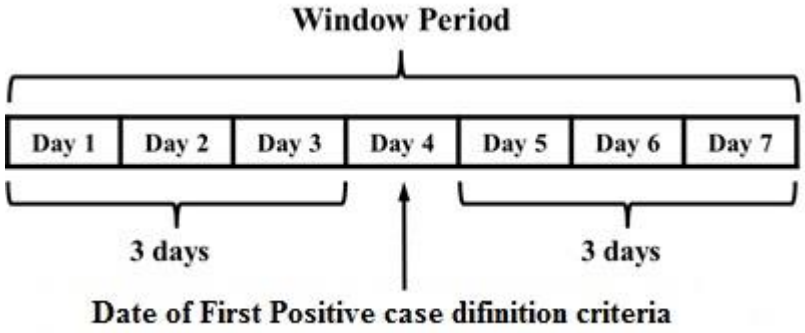
- Surveillance will be undertaken in Adult ICU
- Only Ventilated patients will be included for this surveillance

4 SURVEILLANCE FOR VAP

The surveillance definitions in the modules have been adopted from the CDC's Pediatric definitions for VAP and the definitions being used in some HAI Network sites like AIIMS, New Delhi, PD Hunduja Hospital, Mumbai and Tata Medical Hospital, Kolkata. 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 case definition criteria and the 3 calendar days before and the 3 calendar days after.



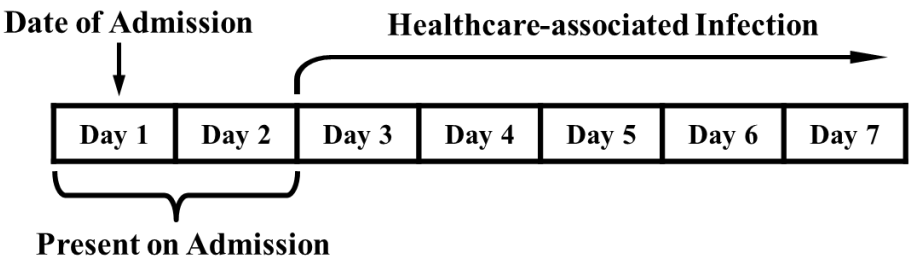
Date of Event: The date when the first criteria used to meet the case definition occurs for the first time within the window period.

Note: If the first element used to meet the case definition is a Microbiology 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.



Physician's diagnosis of pneumonia alone is not an acceptable criterion for POA

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 are considered part of the same infection for surveillance purposes and added to the original event.

Examples of Applying the Event Timeframe for VAP:

- A patient has a new infiltrate on chest X ray on the 3rd st July, with fever and dyspnea that developed on the 1st July. BAL aspirate taken on the 4th July grows *Klebsiella pneumoniae* in counts 10^5/ ml. The patient is treated for VAP by the clinicians. A BAL grows *Acinetobacter baumannii* in significant counts on July 8th. Based on the VAP protocol, this episode is classified as a VAP, with a date of event of 1st July. The Event Timeframe for this episode of VAP runs from July 1-14. No new VAP can be reported for this patient during this time period. The positive BAL culture with *Acinetobacter baumannii* would be considered part of the initial VAP 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 VAP (July 1-14), it should be investigated as a potential new BSI/ VAP and reported as a new event if all criteria are met.

Example of Window period, date of event and event timeframe for VAP

Surveillance Unit Day	Clinical / Laboratory Criteria	Window Period	Event Timeframe
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13		Fever, Dyspnea,	**Date of Event**
14			
15	(+) BAL culture *K. pneumoniae*	Chest X Ray: New Infiltrates	
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			

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).

Ventilator-associated pneumonia (VAP): A pneumonia where the patient is on mechanical ventilation for >2 calendar days on the date of event, with day of ventilator placement being Day 1

AND

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

(If the patients came with a ventilator to your hospital setting, the ventilator day count begins with the admission date to the first inpatient location)

For reporting Multiple episodes of VAP, the Repeat Infection Timeframe (RIT) guidance from BSI/UTI Module needs to be followed

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 VAP surveillance protocol. The module includes case definitions and additional event-specific methods for case reporting and data analysis.

4.2 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, X-rays, laboratory records, and patient charts, including history and physical exam notes, nurses/physicians notes, temperature charts, Microbiology culture reports 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., BAL/ ETA cultures). For each positive culture, staff will collect additional clinical data to determine if the case definitions are met.

ICU clinical staff should be familiar with the case definitions, 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.

X-Rays: Interpretation of X-ray findings for VAP surveillance will be confirmed by the Clinicians/ Radiologists, as per the protocol of each participating ICU.

4.3 CASE REPORTING

Once surveillance staff have evaluated all patients in the ICUs under surveillance and identified cases meeting the VAP case definition, a standardized case report form will be used to collect all required data. The VAP module includes 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 VAP

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

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, ventilator days (a count of the total number of patients per day that had ventilator). Denominator data should be collected at the same time, every day for each participating unit under surveillance.

Surveillance on Multiple HAI Modules

If surveillance is being conducted on VAP, BSI and UTI, and all HAI event case definitions are met, the corresponding forms should be completed.

Since VAP surveillance is being conducted on a pilot basis, the definitions for BSI surveillance (especially secondary BSIs) will continue to be the same for all the units under HAI surveillance network.

4.4 Data Management and Analysis

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 Case report and denominator 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 ICMR, 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.

4.5 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 Ventilator-days to ensure accurate denominator collection and avoid internal errors (for example, the number of ventilator-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.

4.6 Data Usage and Ownership

Data generated as part of this surveillance is intended for internal use of the hospital 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.

5 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.

Patient name/ registration number will not be shared with JPNATC, AIIMS

6 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

C. Lab findings

At least *one* of the following:
- Organism identified from blood/ or pleural fluid
- Positive quantitative/ semi-quantitative culture from BAL/endotracheal aspirate
- ≥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 **(Appendix 4 defines immunocompromised patients)**

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

7 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)

7.1 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 central line-days.

7.2 ANALYSIS PLAN

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 • Rales or bronchial breath sounds • Worsening gas exchange (for example: O2 desaturations [for example: PaO2/FiO2≤240], increased oxygen requirements, or increased ventilator demand)	□ Yes (if yes) Date _____ □ No □ Yes (if yes) Date _____ □ No □ Yes (if yes) Date _____ □ No
C. Lab Findings • Organism identified from blood/ or pleural fluid • Positive quantitative/ semi-quantitative culture from BAL/endotracheal aspirate • ≥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 testing methods • Patient is immunocompromised and a matching *Candida spp* from blood and sputum/ endotracheal aspirate/ BAL is obtained	□ Yes (if yes) Date _____ □ No □ Yes (if yes) Date _____ □ No □ Yes (if yes) Date _____ □ No □ Yes (if yes) Date _____ □ No □ 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**

		SIRN	SIRN	SIRN	SIRN	SIRN
		PIPTAZ SIRN	**TETRA** SIRN	**DOXY** SIRN	**MINO** SIRN	**TMZ** SIRN
		TOBRA SIRN	**OTHER DRUG 1** SIRN	**OTHER DRUG** SIRN	**OTHER DRUG 3** SIRN	**OTHER DI** SIRN
		OTHER DRUG 5 SIRN				
_____	*Acinetobacter baumannii complex*	**AMK** SIRN	**AMPSUL** SIRN	**CEFTAZ** SIRN	**CEFOT** SIRN	**CIPRO** SIRN
		LEVO SIRN	**COL** SIRN	**PB** SIRN	**GENT** SIRN	**IMI** SIRN
		TICLAV SIRN	**MERO** SIRN	**DORI** SIRN	**NET** SIRN	**PIP** SIRN
		PIPTAZ SIRN	**TETRA** SIRN	**DOXY** SIRN	**MINO** SIRN	**TMZ** SIRN
		TOBRA SIRN	**OTHER DRUG 1** SIRN	**OTHER DRUG** SIRN	**OTHER DRUG 3** SIRN	**OTHER DI** SIRN
		OTHER DRUG 5 SIRN				
_____	*Acinetobacter lwoffii*	**AMK** SIRN	**AMPSUL** SIRN	**CEFTAZ** SIRN	**CEFOT** SIRN	**CIPRO** SIRN
		LEVO SIRN	**COL** SIRN	**PB** SIRN	**GENT** SIRN	**IMI** SIRN
		TICLAV SIRN	**MERO** SIRN	**DORI** SIRN	**NET** SIRN	**PIP** SIRN
		PIPTAZ SIRN	**TETRA** SIRN	**DOXY** SIRN	**MINO** SIRN	**TMZ** SIRN
		TOBRA SIRN	**OTHER DRUG 1** SIRN	**OTHER DRUG** SIRN	**OTHER DRUG 3** SIRN	**OTHER DI** SIRN
		OTHER DRUG 5 SIRN				
_____	*Acinetobacter sp.* Please Specify Species: ____	**AMK** SIRN	**AMPSUL** SIRN	**CEFTAZ** SIRN	**CEFOT** SIRN	**CIPRO** SIRN
		LEVO SIRN	**COL** SIRN	**PB** SIRN	**GENT** SIRN	**IMI** SIRN
		TICLAV SIRN	**MERO** SIRN	**DORI** SIRN	**NET** SIRN	**PIP** SIRN
		PIPTAZ SIRN	**TETRA** SIRN	**DOXY** SIRN	**MINO** SIRN	**TMZ** SIRN
		TOBRA SIRN	**OTHER DRUG 1** SIRN	**OTHER DRUG** SIRN	**OTHER DRUG 3** SIRN	**OTHER DI** SIRN
		OTHER DRUG 5 SIRN				
_____	*Escherichia coli*	**AMK** SIRN	**CEFAZ** SIRN	**CEFEP** SIRN	**CEFOT** SIRN	**CEFTRX** SIRN
		CEFTAZ SIRN	**CEFUR** SIRN	**CEFOX** SIRN	**CTET** SIRN	**CIPRO** SIRN

		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 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	
_____	*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 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	
_____	*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 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	
_____	*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 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	
		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

_____	*Klebsiella pneumoniae*					
		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 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	
_____	*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 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	
_____	*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** S I R N	**OTHER DRUG 4** S I R N	**OTHER DI** 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** S I R N	**OTHER DRUG 4** S I R N	**OTHER DI** 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** S I R N	**OTHER DRUG 4** S I R N	**OTHER DI** S I R N

		MICA S I R N	**VORI** S I R N	**OTHER DRUG** S I R N	**OTHER DRUG 2** S I R N	**OTHER DI** S I R N
		OTHER DRUG 4 S I R N	**OTHER DRUG 5** S I R N			
_____	*Candida spp*. Please Specify Species: ____ **(Only for ICP)**	**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** S I R N	**OTHER DRUG 2** S I R N	**OTHER DI** 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		

Appendix 1 – VAP Case Report Form Instructions

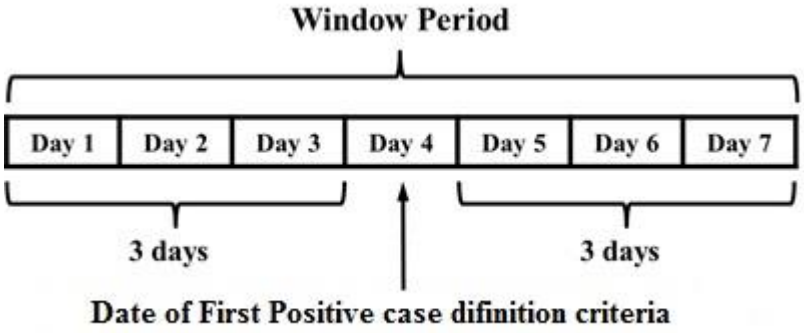
Data Field	Instructions for Data Collection
Case ID	Add patient to patient register and use information to assign a new Case ID ending in "BSI." Write the Case ID in the space provided. There should be one Case ID per event.
Hospital Name	
Sex	
Date of Birth	Record the date of the patient birth using this format: DD/MM/YYYY.
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.
Laboratory Result	Fill out Section 5 on Organism and Antibiotic Susceptibility Testing.
Locations where patient was housed on the date of event	In the provided, list all the locations in the hospital where the patient was housed on the date of event in chronological order. If unknown, write "Unknown"
Locations where patient was housed on the day before the date of event	In the provided, list all the locations in the hospital where the patient was housed on the day before the date of event in chronological order. If unknown, write "Unknown"
Did the patient have a ventilator 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
Was the ventilator in place for >2 calendar days?	Required if ventilator was in place at any time on date of event or day before. Check one. If "No," skip to Section 3 Note: If ventilator is removed and reinserted on the same or following day, it is considered as one continuous ventilator.
Patient Outcome	Required. Check one. 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	Required if outcome is not unknown. 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 Event Timeframe (14 calendar days, date of event = Day 1)

Appendix 2 – 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 VAP 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, X-ray 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 criteria is identified, create the window period (3 calendar days before and the 3 calendar days after the first criteria).



5. Once the window period has been created, use the patient's X-ray, 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 (X-ray finding).
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 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 VAP event for which the case definition was met is considered to be occurring and no new infections of that same type can be reported.
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 during the Event Timeframe for VAP 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.

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

Appendix 4
Definition of Immunosuppressed patients

● All patients currently being treated for malignant disease with immunosuppressive chemotherapy or radiotherapy, and for at least six months after terminating such treatment
● All patients who have received a solid organ transplant and are currently on immunosuppressive treatment
● Patients who have received a bone marrow transplant until at least 12 months after finishing all immunosuppressive treatment, or longer where the patient has developed graft-versus-host disease. The decision to vaccinate should depend upon the type of transplant and immune status of the patient. Further advice can be found in current guidance produced by the European Group for Blood and Marrow Transplantation (www.ebmt.org) and the Royal College of Paediatrics and Child Health (www.rcpch.ac.uk)
● All patients receiving systemic high-dose steroids until at least three months after treatment has stopped. This would include children who receive prednisolone, orally or rectally, at a daily dose (or its equivalent) of 2mg/kg/day for at least one week, or 1mg/kg/day for one month. For adults, an equivalent dose is harder to define but immunosuppression should be considered in those who receive 40mg of prednisolone per day for more than one week. Occasionally, there may be individuals on lower doses of steroids who may be immunosuppressed, and are at increased risk from infections. Therefore, live vaccines should be considered with caution in discussion with a relevant specialist physician
● Patients receiving other types of immunosuppressive drugs (e.g. azathioprine, ciclosporin, methotrexate, cyclophosphamide, leflunomide and the newer cytokine inhibitors) alone or in combination with lower doses of steroids. The advice of the physician or immunologist in charge should be sought for at least six months after treatment
Patients with evidence of severe primary immunodeficiency, for example, severe combined immunodeficiency (SCID), Wiskott-Aldrich syndrome and other combined immunodeficiency syndromes

● Patients with immunosuppression due to HIV infection (see section below).

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/456562/Green_Book_Chapter_34_v3_0.pdf

https://www.gov.uk/government/publications/varicella-the-green-book-chapter-34

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