Pneumonia and Ventilator-Associated Pneumonia Surveillance

Last Updated 2017
Objectives

• Describe surveillance definitions for pneumonia (PNEU), ventilator associated events (VAE), and ventilator associated pneumonia (VAP)
• Demonstrate how to use the NHSN VAE Calculator
• Review importance of feedback of HAI results to staff
Pneumonia (PNEU) Surveillance Definition

- **PNEU** definition used for non-ventilated patients
- Surveillance definition can be met by 3 different criteria using combinations of imaging, signs/symptoms of infection, and laboratory results
  - Clinically defined pneumonia (PNU1)
  - Pneumonia with specific laboratory findings (PNU2)
  - Pneumonia in immuno-compromised patients (PNU3)
- Used frequently for CLABSI surveillance to determine if BSI is primary or secondary to pneumonia
  - Candida and other yeast are not considered causative pathogens of pneumonia
Identifying Ventilator-Associated Events (VAE) and Pneumonia (VAP)

- Follow NHSN surveillance protocols
- Work with ICU and respiratory therapy staff to develop alerting process
- Monitor ventilated patient for
  - Positive cultures
  - Changes in WBC
  - Patient temperature chart/log
  - Pharmacy reports of antimicrobial use
  - Change in respiratory secretions
Defining VAE and VAP

• Pneumonia definition is subjective and complex
• Surveillance definition algorithm detects a broad range of conditions/complications that occur in mechanically ventilated patients
• Ventilator-associated event (VAE) defines
  • Ventilator-associated conditions (VAC)
  • Infection-related ventilator-associated complications (IVAC)
  • Possible ventilator-associated pneumonia (PVAP)
Applying VAE and Pneumonia Surveillance Definitions

- **VAE** definition is used for all ventilated patients in adult locations regardless of age (excludes high frequency ventilated and extracorporeal life support patients)
  - IVAC is an infection-related VAE
  - IVAC/PVAP is pneumonia that occurs in patients intubated and on mechanical ventilation
- **VAP/PNEU** definition is used for pediatric locations
  - Includes pediatric locations (e.g., PICU)
  - Excludes NICU
VAE/VAP Surveillance Definition

• Patient must be ventilated >2 calendar days
• Patient must have ≥3 calendar days of stability or improvement of oxygenation followed by >2 calendar days of worsening oxygenation
• Earliest date of event for VAE is mechanical ventilation day 3 (first day of worsening oxygenation)
• First possible day that VAC criteria can be fulfilled is mechanical ventilation day 4
• For VAE surveillance, PEEP values between 0 - 5 cmH2O will be considered equivalent

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Ventilator Associated Event (VAE)

- Daily minimum PEEP and FiO₂ values are defined as the lowest value set on the ventilator during a calendar day (and maintained for at least 1 hour)
  - If there is no value documented to have been maintained for at least 1 hour, the daily minimum value is the lowest value set on the ventilator during the calendar day
- VAE optional denominator – episodes of mechanical ventilation (EMV)
  - An episode of mechanical ventilation is a period of days during which the patient was mechanically ventilated for some portion of each consecutive day
VAC Criteria

• A baseline period of stability or improvement on the ventilator, defined by ≥2 calendar days of stable or decreasing daily minimum FiO$_2$ or PEEP

• The baseline period is defined as the 2 calendar days immediately preceding the first day of increased daily minimum PEEP or FiO$_2$

AND

• After the period of stability – At least 1 of the following 2 criteria sustained for ≥2 calendar days:
  1. Increase in daily minimum FiO$_2$ of ≥20 points over the daily minimum FiO$_2$ in the baseline period
  2. Increase in daily minimum PEEP of ≥3 cmH$_2$O
IVAC Criteria

- Meets VAE criteria for VAC
  - AND
- On or after calendar day 3 on ventilator and within 2 calendar days before or after onset worsening oxygenation:
- BOTH of the following 2 criteria are met:
  - 1. Temp >38°C or <36°C
    - OR
    - WBC >12,000 cells/mm³ or <4,000 cells/mm³
  - 2. A new antimicrobial agent(s) is started, and is continued for >4 calendar days

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PVAP Criteria

• Meets VAE criteria for IVAC

AND

• On or after calendar day 3 on ventilator and within 2 calendar days before or after onset of worsening oxygenation:

One of the following three criteria is met:

1. Positive culture (see list) without requirement for purulent respiratory secretions*

2. Purulent respiratory secretions plus specified positive respiratory culture*

3. Positive pleural culture, lung histopathology, or diagnostic test for Legionella, or specified virus*

*Consult VAE protocol for organism exclusions

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1. Enter ventilator data, follow instructions

**NHSN VAE Calculator Version 4.0**

<table>
<thead>
<tr>
<th>MV Day</th>
<th>Date</th>
<th>Min. PEEP (cmH2O)</th>
<th>Min. FiO2 (20 - 100)</th>
<th>VAE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9/7/2017</td>
<td>5</td>
<td>80</td>
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<tr>
<td>2</td>
<td>9/8/2017</td>
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<tr>
<td>4</td>
<td>9/10/2017</td>
<td>5</td>
<td>100</td>
<td>† VAC</td>
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<td>5</td>
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<tr>
<td>9</td>
<td>9/15/2017</td>
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</tbody>
</table>

**Legend:** † - VAE Window  ‡ - VAE Date  ¶ - Qualifying Antimicrobial Day (QAD)

**NHSN VAE Calculator Version 4.0**

https://www.cdc.gov/nhsn/vae-calculator/index.html

**Ventilator Associated Condition (VAC), based on FiO2 values occurred on 9/10/2017**

Click on the **Go to IVAC** button to move to the next part of the protocol.

Meets VAC Criteria. “Go to IVAC”
2. Enter temperature, WBC count, antibiotics

3. Click “Calculate IVAC”

An IVAC was found for this patient. Click on the "Go To PVAP" button to go to the next part of the definition or click on the "Explain..." button for an explanation of how this determination was made.

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<tr>
<th>MV Day</th>
<th>Date</th>
<th>Hide PEEP (cmH₂O)</th>
<th>Min. PEEP</th>
<th>Hide Min. FiO₂</th>
<th>Min. FiO₂</th>
<th>VAE</th>
<th>T ≥ 36° or T &gt; 38°</th>
<th>WBC ≤ 4,000 or WBC ≥ 12,000 cells/mm³</th>
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Meets IVAC Criteria. “Go to PVAP”

NHSN VAE Calculator Version 4.0
NHSN PVAP

1. Check off criteria in table, then “Calculate PVAP”

The event on 9/10/2017 conforms to a Possible Ventilator-Associated Pneumonia (PVAP) definition. For a discussion of why, click on the Explain button.

2. Result:
   - After calculating PVAP, a pop up will appear verifying the type of event.
   - Select Explain for information on the criteria used.
• Enter monthly denominator data for each patient location
  – Patient days
  – Ventilator line days
Enter VAE Event

- Add VAE Events as they occur
- Collect criteria meeting definition to enter into NHSN
- NHSN has a worksheet available for data collection
- Use VAE Calculator
• Generate data set prior to creating a report
• Choose report according to need
  • SIR report- Your incidence compared to expected incidence
  • SUR report- Your ventilator usage compared to expected
Feedback VAE Results

• Share VAE SIR and SUR progress results with
  • ICU staff
  • ICU Committee
  • Infection Control Committee
  • Leadership

• Analysis of your data helps identify areas for further education and prevention activities
Pneumonia Surveillance Summary

• Surveillance for pneumonia and VAP challenging

• VAE definitions reduce variability
  • Used only in adult locations

• Consistent use of standard surveillance methods and PNEU/VAE/VAP definitions are essential for accurate case finding

• Analysis and feedback of VAE/VAP data is necessary to review progress in VAE/VAP reduction
References for VAP Prevention and Bundles

• Institute for Healthcare Improvement (IHI)
  http://www.ihi.org/resources/Pages/Tools/HowtoGuidePreventVAP.aspx

• SHEA Compendium: Strategies to Prevent Ventilator-Associated Pneumonia in Acute Care Hospitals: 2014 Update
References and Resources


• NHSN Patient Safety Module: Chapter 6 (PNEU/VAP) [http://www.cdc.gov/nhsn/PDFs/pscManual/6pscVAPcurrent.pdf](http://www.cdc.gov/nhsn/PDFs/pscManual/6pscVAPcurrent.pdf)

• Chapter 10(VAE) [http://www.cdc.gov/nhsn/PDFs/pscManual/10-VAE_FINAL.pdf](http://www.cdc.gov/nhsn/PDFs/pscManual/10-VAE_FINAL.pdf)
Questions?

For more information, please contact any HAI Liaison IP Team member

Or email HAIProgram@cdph.ca.gov