Pneumonia and Ventilator-Associated Pneumonia Surveillance
Objectives

- Discuss McGeer’s respiratory infection criteria for LTC
- 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
Clinical vs Surveillance Definitions

Clinical criteria used by physicians for patient care and management may differ from surveillance criteria

• Clinical
  • Patient centered
  • Used for therapeutic decisions

• Surveillance
  • Population based
  • Applied exactly the same way each time
  • Physician diagnosis of infection is acceptable for some infections
Long Term Care Facilities (LTC)- Definitions

McGeer Criteria

- Four categories of respiratory infections with varying criteria:
  1. Common cold symptoms/pharyngitis
  2. Influenza-like illness
  3. Pneumonia
  4. Lower respiratory tract (bronchitis or tracheobronchitis)

- Categories are used for LTCF surveillance definitions


https://www.cambridge.org/core/services/aop-cambridge-core/content
LTC: Constitutional Criteria Definitions

- Standardized terminology in McGeer Criteria – Table 2
  - Fever
  - Leukocytosis
  - Acute change in mental status from baseline
  - Acute functional decline

Refer to Table 2 in the McGeer Criteria for more detailed definitions of these constitutional criteria

https://www.cambridge.org/core/services/aop-cambridge-core/content
LTC: Common Cold Syndrome or Pharyngitis

- At least 2 criteria must be
  1. Runny nose or sneezing
  2. Stuffy nose
  3. Sore throat, hoarseness, or difficulty swallowing
  4. Dry cough
  5. Swollen or tender glands in the neck

https://www.cambridge.org/core/services/aop-cambridge-core/content
LTC: Influenza-like Illness

• Both Criteria 1 and 2 must be present

1. Fever

2. At least 3 of the following influenza-like illness sub-criteria
   a. Chills
   b. New headache or eye pain
   c. Myalgias or body aches
   d. Malaise or loss of appetite
   e. Sore throat
   f. New or increased dry cough

https://www.cambridge.org/core/services/aop-cambridge-core/content
LTC: Pneumonia

• All 3 criteria must be present
  1. Interpretation of a chest radiograph as demonstrating pneumonia or the presence of a new infiltrate
  2. At least 1 of the following respiratory sub-criteria
     a. New or increased cough
     b. New or increased sputum production
     c. 02 saturation <94% on room air or a reduction in 02 saturation of >3% from baseline
     d. New or changed lung examination abnormalities
     e. Pleuritic chest pain
     f. Respiratory rate of >25 breaths/min
  3. At least 1 of the constitutional criteria (see Table 2)

https://www.cambridge.org/core/services/aop-cambridge-core/content
LTC: Lower Respiratory Tract

Bronchitis or tracheobronchitis

• All 3 criteria must be present

  1. Chest radiograph not performed or negative results for pneumonia or new infiltrate

  2. At least 2 of the respiratory sub-criteria (a-f) listed in previous slide

  3. At least 1 of the constitutional criteria (see Table 2)

https://www.cambridge.org/core/services/aop-cambridge-core/content
Identifying VAE and 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 Ventilator-Associated Events Including Pneumonia

- 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)

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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
• **PNEU** definition is used for non-ventilated patients
  - Also, to determine if BSI is primary or secondary to pneumonia
Pneumonia Surveillance Definition

Use for determining secondary BSI infections or Pediatric VAP

Surveillance definition can be met by 3 different criteria:

- Clinically defined pneumonia (PNU1)
- Pneumonia with specific laboratory findings (PNU2)
- Pneumonia in immuno-compromised patients (PNU3)
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

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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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NHSN VAE Calculator Version 4.0

1. Enter ventilator data, follow instructions

https://www.cdc.gov/nhsn/vae-calculator/index.html
NHSN VAE Calculator Version 4.0, cont’d

2. Enter temperature, WBC count, antibiotics

3. Click “Calculate IVAC”

NHSN VAE Calculator Version 4.0
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.
Add Monthly VAE Summary Data

- Enter monthly denominator data for each patient location
  - Patient days
  - Ventilator line days
Add 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
NHSN VAE Analysis

- 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

• Diagnosis of VAP is 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?

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