HRET HIIN PVAP Training #1
February 8, 2019
11:00 a.m. – 11:30 a.m. CT
Welcome and Introductions

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Learning Objectives:

- Review VAC and IVAC key terms and how to meet VAC and IVAC definitions
- Learn PVAP key terms and how to meet PVAP definition
- Describe the VAE surveillance definition algorithm
Why Do I Want To Know About VACs, IVACs, & PVAP?

A retrospective cohort study examining 20,356 episodes of mechanical ventilation (MV)¹

- VAEs
  - 1,141 ventilator-associated conditions (VACs)
  - 431 infection-related VACs (IVACs)
  - 266 possible cases of ventilator-associated pneumonia (PVAP)

- Patients with a VAE have:
  - More days to extubation
  - More days to discharge
  - Higher mortality rate

Connect the Safety Dots

Ventilator Harm

- Immobility
- Atelectasis
- Pulmonary edema (PE)
- Acute respiratory distress syndrome (ARDS)
- Morbidity
- Mortality
- Increased length of stay (LOS)
- Cost
- VAC
- IVAC
- VAP
- Antibiotic resistance
- Clostridium difficile colitis

Mortality

Morbidity

VAP

Increased length of stay (LOS)

Antibiotic resistance

Clostridium difficile colitis

Cost
Why Use the New VAE Surveillance Definitions?

✓ CAPTURES SIMILAR SET OF COMPLICATIONS TO TRADITIONAL VAP

✓ FASTER

✓ MORE OBJECTIVE

✓ SUPERIOR PREDICTOR OF OUTCOMES


National Health Safety Network VAE Definition

Objective

Streamlined

Potentially Automatable

Defines a broad range of conditions and complications occurring in mechanically ventilated patients
Broadening the Surveillance

- The definition of VAE is intentionally broader than traditional VAP surveillance
- Common VACs:
  - ARDS
  - Pulmonary Embolism
  - Thromboembolic disease
  - Sepsis
- Clinical ramifications?
  - Respiratory deterioration in previously stable patients is a risk factor for increased morbidity and mortality
Are VAEs Preventable?

- Many providers feel some of the conditions associated with VAEs are pre-existing.
- Preliminary data from the first year of VAE data collection showed approximately 79 percent of VAEs were in patients who were either on MV for ≥5 days or in the hospital for ≥5 days at the time of VAE onset.\(^6\)
- Time to onset data suggest that the majority of VAEs are likely hospital-associated based on previous criteria.\(^7,8\)

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Possible Complications of Mechanical Ventilation

- VAE
  - Ventilator-associated condition (VAC)
  - Infection-related ventilator-associated condition (IVAC)
- VAP
- Acute Respiratory Distress Syndrome (ARDS)
- Sepsis
- Pulmonary embolism
- Pulmonary edema
- Barotrauma
- And more
What Types of Mechanical Ventilation Are Included?

- All types of mechanical ventilation, except:
  - High-frequency ventilation
  - Extracorporeal membrane oxygenation
  - Lung expansion devices, such as—
    - Intermittent positive pressure breathing
    - Nasal positive end-expiratory pressure (PEEP)
    - Nasal continuous positive airway pressure

- Airway pressure release ventilation (APRV) and related modes are included but only fraction of inspired oxygen (FiO₂) values are used
VAE Definition Algorithm Tiers

Respiratory status component
- Patient on mechanical ventilation > 2 days
- Baseline period of stability or improvement, followed by sustained period of worsening oxygenation
- VAC

Infection / inflammation component
- General evidence of infection/inflammation
- IVAC

Additional evidence
- Positive results of microbiological testing
- Possible or Probable VAP

VAE Definition Algorithm

- Algorithm is **progressive** in terms of criteria to be met
- Each subsequent tier is **not more significant/worse than the one before** – detection of VAC is just as significant as a detection of IVAC or PVAP

- **All events start with VAC**
  - IVAC is not necessarily “worse” than having VAC
  - PVAP is not necessarily “worse” than having IVAC

- The fundamental definition within the algorithm is the **VAC defined on the basis of respiratory deterioration**
  - IVAC - additional evidence that the event may be infectious vs. non-infectious
  - PVAP – additional evidence the infection may be respiratory related
VAC – Definition Criteria

✓ Patient intubated for >2 calendar days (earliest day of event is calendar day 3)

✓ Baseline stability
  ▪ Stable or improving baseline period
  ▪ The 2 calendar days immediately preceding the first day of increased oxygen requirement, defined as an increased daily minimum PEEP or FiO₂

Patient on mechanical ventilation > 2 days

Baseline period of stability or improvement, followed by sustained period of worsening oxygenation

VAC
VAC – Determination

After period of stability or improvement on the ventilator, the patient exhibits at least one of these indicators of worsening oxygenation:

- Daily minimum PEEP values increase $\geq 3$ cm H$_2$O over daily minimum for the preceding 2 calendar days
- Daily minimum FiO$_2$ values increase $\geq 0.20$ over daily minimum for preceding 2 calendar days
- PEEP or FiO$_2$ must be maintained for $\geq 1$ hour (two consecutive hour readings) (see next slide for exceptions to this rule)
VAC – Exceptions to 1-Hour Rule

- If PEEP or FiO\textsubscript{2} values are not recorded hourly, use lowest value.

- If PEEP or FiO\textsubscript{2} values are not stable for at least 1 hour, use the lowest value.
  
  - Patient extubated early in the day.
  
  - Patient admitted late in the day.

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IVAC – Criterion 1

✓ Patient meets criteria for VAC (VAC must be determined before IVAC can be considered)

✓ The patient must meet BOTH of the following criteria on or after calendar day 3 of mechanical ventilation AND within 2 calendar days before or after the onset of worsening oxygenation:

  ▪ **Criterion 1**
    - Temp > 38°C (100.4°F) or < 36°C (96.8°F), OR
    - White blood cell count ≥ 12,000 cells/cubic millimeter (mm³), OR
    - White blood cell count ≤ 4,000 cells/cubic millimeter (mm³)

  ▪ **Criterion 2**
    - A new antimicrobial agent(s) is started and continued for ≥ 4 calendar days

General evidence of infection/inflammation
IVAC – Criterion 2

✓ Patient meets criteria for VAC (VAC must be determined before IVAC can be considered)

✓ The patient must meet **BOTH** of the following criteria on or after calendar day 3 of mechanical ventilation **AND** within 2 calendar days before or after the onset of worsening oxygenation:
  - **Criterion 1**
    - Temp > 38°C (100.4°F) or < 36°C (96.8°F), OR
    - White blood cell count ≥ 12,000 cells/cubic millimeter (mm$^3$), OR
    - White blood cell count ≤ 4,000 cells/cubic millimeter (mm$^3$)
  - **Criterion 2**
    - A new antimicrobial agent(s) is started and continued for ≥ 4 calendar days
IVAC Antimicrobial Criteria

Standardizes assessment method of antimicrobial therapy without the need for specific information, such as—

✓ Drug dosing
✓ Renal function
✓ Indication for therapy
Definition – New Antimicrobial Agent

Any agent listed on the next slide that is initiated in the VAE window period—

- Was not given on either of the 2 days preceding the current start date
- Must be continued for ≥ 4 consecutive days
- Does not need to be the same antimicrobial agent for the 4 days
- Can be considered continuous if a single day is skipped between two doses of the same agent
- Must be administered intravenously, intramuscularly, via digestive tract, or via respiratory tract
IVAC – Antimicrobials Included

Current
- Antibacterials
- Antifungals, limited antivirals

Former
- Broad range of agents for healthcare-associated infections, not just respiratory infections

Listed in the CDC’s VAE Manual
http://www.cdc.gov/nhsn/PDFs/pscManual/10-VAE_FINAL.pdf
IVAC – Antimicrobials NOT Included

- Anti-HIV agents
- Anti-tuberculosis agents
- Agents used to treat viral hepatitis
- Agents used to treat herpes virus infection
- Anti-parasitics
PVAP- Possible Ventilator Associated Pneumonia

- Meet all criteria for VAC & IVAC

AND

- Positive results of new microbiological testing

IVAC

Positive results of microbiological testing

Possible or Probable VAP
PVAP - Criteria

On or after calendar day 3 of mechanical ventilation and within 2 calendar days before or after onset of worsening oxygenation, **ONE** of the following criteria is met (taking into account organism exclusions specified in their protocol):

- Criterion 1
- Criterion 2
- Criterion 3

**Possible or Probable VAP**
PVAP - Criterion 1

1) Criterion 1: Positive culture of one of the following specimens, meeting quantitative or semi-quantitative thresholds as outlined in protocol, without requirement for purulent respiratory secretions:
   • Endotracheal aspirate, $\geq 10^5$ CFU/ml or corresponding semi-quantitative result
   • Bronchoalveolar lavage, $\geq 10^4$ CFU/ml or corresponding semi-quantitative result
   • Lung tissue, $\geq 10^4$ CFU/g or corresponding semi-quantitative result
   • Protected specimen brush, $\geq 10^3$ CFU/ml or corresponding semi-quantitative result
PVAP- Criterion 2

2) Criterion 2: Purulent respiratory secretions (defined as secretions from the lungs, bronchi, or trachea that contain \(>25\) neutrophils and \(<10\) squamous epithelial cells per low power field ([lpf, x100])\(^*\) \textbf{PLUS} organism identified from one of the following specimens (to include qualitative culture, or quantitative/semi-quantitative culture without sufficient growth to meet criterion #1):

- Sputum
- Endotracheal aspirate
- Bronchoalveolar lavage
- Lung tissue
- Protected specimen brush

\(^*\) If the laboratory reports semi-quantitative results, those results must correspond to the above quantitative thresholds. See additional instructions for using the purulent respiratory secretions criterion in the VAE Protocol.
Criterion 3: One of the following positive tests:

- Organism identified from pleural fluid (where specimen was obtained during thoracentesis or initial placement of chest tube and NOT from an indwelling chest tube)
- Lung histopathology, defined as: 1) abscess formation or foci of consolidation with intense neutrophil accumulation in bronchioles and alveoli; 2) evidence of lung parenchyma invasion by fungi (hyphae, pseudohyphae or yeast forms); 3) evidence of infection with the viral pathogens listed below based on results of immunohistochemical assays, cytology, or microscopy performed on lung tissue
- Diagnostic test for *Legionella* species
- Diagnostic test on respiratory secretions for influenza virus, respiratory syncytial virus, adenovirus, parainfluenza virus, rhinovirus, human metapneumovirus, coronavirus
Questions?
PVAP Training #2

Friday, February 15, 2019 (11:00 a.m. – 11:30 a.m. CT)
Register here.

- Explain Secondary BSI Assignment and VAE Surveillance
- Understand how to correctly enter PVAP into NHSN
- Learn how to use the VAE calculator for PVAP
HRET Resources

2018 VAE Change Package

2018 VAE Checklist
thank you!