Proactively Preventing Ventilator-associated Events (VAE)

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Webinar Goals
Implement evidence-based VAE prevention strategies right away.

Topics
- History of CDC’s ventilator-associated pneumonia (VAP) surveillance definitions and rationale for change
- Four new CDC 2013 VAE categories
- Evidence-based VAE preventive strategies
- Barriers and solutions to implementation
VAP Impact on Patient Outcomes
Increased morbidity, mortality, hospital LOS

National Healthcare Safety Network (NHSN)* reported for 2013:
- >3,525 VAPs
- Hospital units:
  0.0-5.8 per 1,000 ventilator days

*Replaced National Nosocomial Infection Surveillance System (NNIS)
History of VAP

- 1970: CDC’s NNIS starts surveillance for nosocomial pneumonia
- 1980: New surveillance criteria implemented
- 1990: VAP defined as “PNEU” event within 48 hours of mechanical ventilation
- 2002: Diagnosing VAP Using 2002 Criteria

Diagnosing VAP Using 2002 Criteria

- Determined by:
  - Subjective clinical signs/symptoms
  - Radiographic evidence
  - Laboratory data

- Not sensitive or specific compared with histopathological “gold standard”
Consequences of Vague VAP Criteria

Hospitals and even their own units:

- Employed divergent and noncomparable approaches to VAP surveillance and reporting
  - Included some “gaming”

Repercussions for...

- Clinicians and Researchers
  - Hard to identify effective strategies to prevent/treat VAP

- Public health
  - Healthcare-associated infections at heart of healthcare policy and prevention initiatives

- Hospitals
  - Reimbursement programs linked to outcomes (Medicare/Medicaid)

Conclusion: Need for accurate, reliable outcome measurement!
National Quality Forum (NQF)

- **Role**: To set standards for healthcare
- **Focus**: Improve healthcare quality
- Asked CDC to reconsider VAP criteria
**CDC Responds**

Convenes leaders from **Critical Care Societies Collaborative** (AACN, ACCP, ATS, SCCM) and others from key organizations.

**Purpose:** Identify objective approach to surveillance/reporting in mechanically ventilated patients

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**CDC Workgroup**

- Develops surveillance definition algorithm
  - Identifies broader range of VAEs

- Finds most VAEs due to
  - Pneumonia
  - ARDS
  - Atelectasis
  - Pulmonary edema

  **All potentially preventable by nurses!**

Within 2 days before or after onset of worsening oxygenation, patient meets BOTH:
- Temperature >38°C or <36°C
- WBC (≥12 or ≤4)
- New antimicrobials started and continued for ≥4 days

IVAC algorithm:
- Purulent secretions OR Positive culture
- Either: Purulent secretions AND positive culture
- OR: Specific diagnostic findings (purulent secretions not necessary): histopathology, pleural fluid cultures, etc.
Challenges Related to Changing VAP Criteria

Unknowns

- How historical rates based on old definition compare with “possible” and “probable” VAP
- Accuracy of previously reported hospital rates comparing pre- and post outcomes of interventions

Makes identifying preventive strategies difficult

Looking at the Science

What is the relationship of VACs to IVAC, Possible and Probable VAP?
Study 1: Developing Evidence-based Guidelines for VAP Prevention

- **Method**: Systematic review of science related to prevention of VAP
- **Sample**: All randomized controlled trials (RCTs) and systematic reviews on VAP prevention in adults, published from 1980 to October 2006

Results: Evidence-based Guidelines for Prevention

**Recommended**
- Intubate orally
- Change ventilator circuit only if soiled
- Change airway humidifiers every 5-7 days as indicated
- Use closed suctioning system
- Change suctioning systems only as needed
- Use subglottic secretion drainage for expected ventilation >72 hrs

**Consider**
- Set HOB at 45° when possible
- Use oral antiseptic (chlorhexidine)
Study 2: Implementing VAP Prevention Guidelines: Correlation with Guideline Adherence and VAP Rates

- **Design:** Prospective study: 2007-2009
- **Sample:** 11 community and academic medical center ICUs; 30 adults/site (330 total) for each of 4 time periods; Total=1,320 patients
- **Method:** Implementation of 14 VAP evidence-based diagnostic, treatment and prevention guidelines

Results: Increased Adherence to VAP Guidelines Correlates With Decreased Incidence of VAP

<table>
<thead>
<tr>
<th>Change from baseline</th>
<th>Adherence to VAP Guidelines (P=0.007)</th>
<th>VAP Rates (P=0.003)</th>
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<tr>
<td></td>
<td>15.8%</td>
<td>38.3%</td>
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Study 3: Determining the Relationship Between VACs, IVACs and VAP—and Clinical Impact

Methods:
- Retrospectively applied VAC and IVAC definitions to data from Study 2
- 1,320 patients (previously described)

Results: VAP, VAC and IVAC Criteria Identify Somewhat Different Patients

- VAC intentionally broad: captures some pneumonia and pulmonary edema, ARDS, atelectasis
- IVAC (subset of VAC): plus suggestive of infection. Not all are VAP
- Not all VAP patients meet VAC criteria
Conclusions

- Poor agreement between VAC, IVAC and VAP
- Patients with a VAC or IVAC:
  - Significantly more
    - Ventilator days
    - Hospital days
    - Antibiotic days
  - Higher hospital mortality than those with neither condition
- Higher adoption of VAP preventative measures → lower VAP and VAC rates

Preventing VAEs
How VACs Occur
Particularly IVAC and Possible/Probable VAP

Sterile lower respiratory tract breeched from:
- Aspiration of secretions
- Colonization of aerodigestive tract
- Contaminated equipment or medications

Associated Risk Factors

- Prolonged intubation
- Enteral feeding
- Witnessed aspiration
- Paralytic agents/sedation
- Underlying illness (immune-suppressed)
- Extremes of age

Evidence-based approach is needed:
Target key risk factors for lung contamination
Recommendations: Levels of Evidence

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<thead>
<tr>
<th>Levels</th>
<th>Implementation</th>
<th>Supported by</th>
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<tbody>
<tr>
<td>STRONG S</td>
<td>Strongly recommended</td>
<td>Well-designed experimental, clinical, or epidemiologic studies</td>
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<tr>
<td>MODERATE M</td>
<td></td>
<td>Some experimental, clinical, or epidemiologic studies and strong theoretical rationale</td>
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Recommendations: General Interventions

1. Educate clinicians about their role in prevention
2. Emphasize hand hygiene and surveillance
3. Prevent complications of immobility (VTE, UTI, PU)
   - Use nursing interventions and prophylaxis
Barriers

- Inconsistent
  - Hand hygiene (better when observed)
  - Knowledge of VAP prevention

- Insufficient attention to “interventional hygiene” (targeting mobility, VAP, BSI, UTI, PU)

McGuckin, et al, nurses fail to:
- Adequately understand value of interventional hygiene
- Take ownership

Solutions

- Reinforce education regularly
- Provide tools, resources, processes to facilitate interventional hygiene
- Develop a culture of accountability
  - Example: “Intentional Rounds”
Intentional Rounds Promote Culture Change

Don’t tell me—show me at the bedside!
- APN selects patient(s)
- APN discusses all aspects of care
  - Focus: Prevention and key nurse sensitive metrics
  - Very popular and well attended!

Recommendation 2: Prevent Aspiration

- Use cuffed tube and continuous aspiration of subglottic secretions (CASS)
- Maintain cuff pressures ~20 cm H₂O
- Maintain HOB (or backrest elevation) at 30-45°
- Prevent gastric overdistension
Barriers

- CASS tubes considered too expensive; not always available (recommended if >72 hours of ventilation)
- HOB elevation rarely maintained
- Cuff pressures vary with changes in position

Solutions

- Compare costs related to CASS tubes with VAP-related costs
- Audit and provide education frequently on:
  - Use of bed-level indicators and appropriate backrest elevation
- Monitor and maintain cuff pressures (evaluate in different positions)
Recommendation 3: Reduce Gastric Colonization

**S**
- Perform regular oral care
  *(timing/type unresolved)*

**M**
- Orotracheal vs nasal intubation
  *(risk of sinusitis)*

Barriers

- Oral care takes time
- Other aspects of care considered more important
- Protocol for intubations may not stress use of oral route.
  - Other units (ED, etc.) may not know about preference for oral route
**Solutions**

**Oral Care**
- Educate staff on importance of oral care
- Determine consistent approach including time/type (unresolved evidence for frequency)
- Make it easy to accomplish and provide reminders
- Identify champions
- Take ownership of oral care

**Orotracheal vs nasal intubations**
- Educate staff to request oral intubation
- Collaborative with other units (ED, anesthesia, etc.) to assure oral intubations
Recommendation 4: Reduce Risk of Contamination of Respiratory Equipment

- Wash hands
- Change tubing and equipment only when visibly soiled
- Use sterile water when rinsing reusable respiratory equipment
- Properly store and disinfect

Barriers and Solutions

**Barrier**
- Lack of policies governing care and cleaning of equipment

**Solution**
- Collaborate with Respiratory Care to ensure recommendations are implemented and monitored
Recommendation 5: Prevent Complications of Mechanical Ventilation

- Consider noninvasive ventilation (easy access/protocols to promote use)
- Prevent unplanned extubations and reintubations
- Minimize sedation; discontinue early
- Perform daily “Wake Up and Breathe Trials”
  - Use protocols for sedation withdrawal and spontaneous breathing trials (SBTs)*

Barriers
Non-invasive ventilation and unplanned extubation

- Noninvasive ventilation is:
  - Often considered too late
  - Hard to apply effectively in emergencies
- Rates of unplanned extubations/reintubations often unknown
  - Result: lack of prevention strategies to reduce rates
- Misconception that physical restraints may prevent unplanned extubation
Solutions
Noninvasive ventilation and unplanned extubation

- Noninvasive ventilation: develop protocols for indications and uses; educate staff
- Instead of physical restraints (which do not prevent unplanned extubation):
  - Use pharmacologic agents sparingly
  - Assess for delirium
  - Do not delay SBTs if indicated

Barriers
Limiting sedation

Misperceptions:
- Patients prefer to be sedated
- Sedation promotes patient comfort
- It’s better if patients don’t remember being ventilated
- Withdrawing sedation causes psychological stress
- Sedation best via infusion to deliver steady state of the drug
**Solutions**

Limiting sedation

- Educate staff about use of sedation, misconceptions, and potential complications, eg:
  - Prolonged ventilation
  - Adverse clinical outcomes (delirium, cognitive dysfunction etc.)
- Treat pain first
  - Start sedation only if clearly indicated (eg, anxiety, paralytic use).

**Barriers and Solutions**

“Wake Up and Breathe Trials”

**Barriers**

- Time consuming
- Difficult to ensure they are performed

**Solution**

- Nurses, therapists and physicians must consider optimal timing of trials for all involved
Summary

- New CDC VAE algorithm designed to make surveillance of VAEs (including VAP) more accurate.
  - Accuracy of definitions will help establish validity of preventive strategies

- Strategies associated with lower rates of VAP and VAC include:
  - Preventing aspiration
  - Reducing gastric colonization
  - Reducing risk of contamination of respiratory equipment
  - Weaning off ventilator ASAP
Prevention of VAEs is possible and nurses can make a difference! Our patients’ lives depend on it!

As Yoda said....

"Do or not do. There is no try!"

AACN Implementation Tools and Resources

Designed to help you apply these practices in your environment

- Tools and Tactics: Blue Print for Reducing VAEs
- A Gap Analysis for Reducing VAEs
- AACN Practice Alerts™:
  - Oral Care for Patients at Risk for VAP
  - Prevention of Aspiration
  - Audit of HOB Elevation in Intubated Patients
  - Assessing Pain in the Critically Ill Adult
- SAS and RASS Sedation Assessment Tools
- BPS and CPOT Pain Assessment Scales
- Nurse-driven Pain and Sedation Protocol
- Wake Up and Breathe Protocol
- Early Progressive Mobility Protocol

Find these tools on the VAE webinar information page at [www.aacn.org](http://www.aacn.org).
Prevent Ventilator Associated Events Now—Improve Patient Outcomes

1. Download the **Implementation Tools**. Find them on the VAE webinar information page at www.aacn.org.

2. **Discuss** the tools and recommended practices with your colleagues.

3. **Implement practices** that are suitable for your unit.

4. Join the **Webinar Series Learn Network** online discussion forum to continue the conversation.