Pneumonia and Ventilator-Associated Pneumonia Prevention
Objectives

• Differentiate long term care and acute care definitions of respiratory infections
• Review the epidemiology and pathogenesis of pneumonia (PNEU) and ventilator-associated pneumonia (VAP), focusing on modifiable risk factors
• Discuss evidence-based prevention practices for PNEU, ventilator associated events (VAE), and VAP
• Describe adherence monitoring of prevention practices
Pneumonia in Long Term Care Facilities (LTC)

• Second most common cause of infection in LTC
• Leading cause of death from infections in LTC
• LTC-acquired pneumonia significantly higher than community-acquired pneumonia in the elderly population
• Elderly LTC residents are predisposed to pneumonia
  • Decreased clearance of bacteria from the airways
  • Altered throat flora
  • Poor functional status
  • Presence of feeding tubes
  • Swallowing difficulties and aspiration
  • Inadequate oral care

SHEA/APIC Guideline: Infection Prevention and Control in the Long-Term Care Facility  https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3375028/#
Pneumonia Prevention in LTC

- Perform hand hygiene after contact with respiratory secretions
- Use gloves for suctioning, and cleaning respiratory equipment
- Elevate the head of the bed 30 to 45 degrees during tube feeding and for at least 1 hour after to decrease aspiration
- Promote pneumococcal vaccine
- Promote annual influenza vaccination
- Promote influenza vaccination of HCP
- Ensure adequate nutrition and hydration
- Provide routine oral care

APIC Infection Preventionist’s to Long Term Care, 2013
https://apic.org/APICStore/Products/Product?id=SLS6008
Preventing Pneumonia in Hospitals

• Educate staff on pneumonia prevention
• Clean respiratory equipment and devices before sterilization or disinfection.
  • Clean shortly after use
  • Ensure appropriate rinsing, drying and packaging
• Use standard precautions – consistently!
  • Hand hygiene before and after patient care
  • Wear gloves when handling respiratory secretions
  • Change gloves and perform hand hygiene between patients and after touching contaminated equipment

CDC/HICPAC Guidelines for Preventing Health-Care Associated Pneumonia, 2003
https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5303a1.htm
Preventing Pneumonia in Hospitals

- Provide pneumococcal vaccination
- Provide annual influenza vaccination
- Prevent aspiration
- Ensure oral care with an antiseptic agent
- Encourage post operative coughing, deep breathing, and early ambulation.

CDC/HICPAC Guidelines for Preventing Health-Care Associated Pneumonia, 2003

https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5303a1.htm
Ventilator-Associated Pneumonia (VAP)

- Up to 50% patients with VAP die
  - Varies with patient population and organism type
  - Highest mortality occurs in patients with severe illness and infection with non-fermentative gram-negative bacilli (e.g., *Acinetobacter* or *Burkholderia* species)
- Increases ICU length of stay >6 days
  - $40,000 estimated cost

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

**Early onset**
- Occurs in first four days of hospitalization
- More likely to be caused by *Moraxella catarrhalis*, *H. influenzae*, or *S. pneumoniae*

**Late onset**
- Occurs five or more days into hospitalization
- Often caused by gram-negative bacilli, or *S. aureus* (including MRSA), yeasts, fungi, *legionellae* and *Pneumocystis carinii*
Pathogenesis of VAP

Results from:

- Aspiration of secretions
- Colonization of aero-digestive tract
- Contaminated respiratory or other medical equipment
VAP Pathogens

- *Staphylococcus aureus* - 24.7%
- *Pseudomonas aeruginosa* - 16.5%
- *Klebsiella pneumoniae/oxy* - 10.2%
- *Enterobacter* spp. - 8.3%
- *Acinetobacter* spp. - 6.1%
- *Escherichia coli* – 5.4%
- *Serratia* spp.- 4.6%
- *Stenotrophomonas maltophilia* – 3.9%

NHSN Antimicrobial Resistance Report: Distribution of all Pathogens Reported by HAI Type, Appendix to Table 4, 2011-2014

Challenges in VAP Prevention

Pre-existing conditions (non-modifiable risk factors):

- Head trauma
- Coma
- Nutritional deficiencies
- Immunocompromised
- Multi organ system failure
- Acidosis
- Co-morbidities
- History of smoking or pulmonary disease
VAP Prevention: Modifiable Risk Factors

1. Prevent aspiration of secretions
   - Maintain elevation of head of bed (HOB) 30-45 degrees
   - Avoid gastric over-distention
   - Avoid unplanned extubation and re-intubation
   - Use cuffed endotracheal tube with in-line or subglottic suctioning
   - Encourage early mobilization of patients with physical/occupational therapy
VAP Prevention: Modifiable Risk Factors

2. Reduce duration of ventilation
   • Conduct “sedation vacations”
   • Assess readiness to wean from vent daily
   • Conduct spontaneous breathing trials
3. Reduce colonization of airway and digestive tract
   • Use non-invasive ventilation methods when possible (e.g., CPAP, BiPAP)
   • Use oro-tracheal over naso-tracheal intubation
   • Naso-tracheal tube may cause sinusitis, which increases VAP risk
3. Reduce colonization of airway and digestive tract - continued

- Use cuffed Endotracheal Tube (ETT) with inline or subglottic suctioning
  - Minimizes secretions above cuff; prevents contamination of lower airway
- Avoid acid suppressive therapy for patients not at high risk for stress ulcer or stress gastritis
  - Increases colonization of the digestive tract
VAP Prevention: Modifiable Risk Factors -5

3. Reduce colonization of airway and digestive tract - continued

- Perform regular oral care with an antiseptic agent
- Reduce the opportunities to introduce pathogens into the airway
  - Perform good hand hygiene
  - Use gloves for contact with respiratory secretions or contaminated objects; follow with hand hygiene
  - Educate staff to avoid contaminating the ETT from patient’s mouth, HCP hands, introducing pathogens from patient’s other body sites or the environment
VAP Prevention: Modifiable Risk Factors -6

4. Prevent exposure to contaminated equipment
   • Use sterile water to rinse reusable respiratory equipment
   • Remove condensate from ventilatory circuits
   • Change ventilatory circuit only when malfunctioning or visibly soiled
   • Store and disinfect respiratory equipment effectively
Measure Adherence to VAP Prevention Practices

• California HAI public reporting and prevention laws do not require reporting VAP/VAE to CDPH
• Reporting laws do require hospitals to implement VAP prevention guidelines and process measures (HSC 1288.9)
IP Role in Pneumonia Prevention

• Ensure policies reflect current evidence based practices
  • CDC guidelines
• Ensure staff competency upon hire and at least annually
  • New hire orientation
  • Annual skills fair
  • Return demonstration to ensure competency
• Establish an adherence monitoring program for measuring prevention care practices
  • Use tools to measure adherence
• Provide feedback to frontline staff and leaders
  • Present adherence results to each unit
Are Pneumonia Prevention Care Practices Used in YOUR Facility?

- Maintain HOB 30-45 degrees
- Avoid gastric distention
- Encourage early mobilization
- Conduct “sedation vacations”
- Assess readiness to wean
- Use cuffed ETT with inline suctioning
- Avoid acid suppressive therapy if possible
- Perform regular oral care
- Perform hand hygiene
- Prevent exposure to contaminated equipment

You won’t know if you don’t monitor!
## Adherence Monitoring Tool - VAE Prevention

<table>
<thead>
<tr>
<th>Ventilator Pneumonia Prevention Observations</th>
<th>Pt 1</th>
<th>Pt 2</th>
<th>Adherence by Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head of bed 30-45 degrees</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Sedation vacation documented</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Readiness to wean documented</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Oral care with an antiseptic agent is performed regularly (per policy)</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Hand hygiene performed before providing care</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Sterile water used to rinse reusable respiratory equipment</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Condensate in ventilatory circuit is removed</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Ventilatory circuit is changed only when malfunctioning or soiled</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

# Yes _______  # Observed_______  #Yes/#Observed = % Adherence  ____%
Pneumonia Prevention Summary

• Morbid complications of ventilated patients are common but many are preventable

• Focus on prevention care practices
  • Elevate head of the bed
  • Regular oral care with antiseptic
  • Daily sedation interruption and assessment of readiness to extubate

• Regularly monitor adherence of prevention care practices and provide feedback to frontline staff
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


• 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)
References and Resources

  
  [https://www.cambridge.org/core/services/aop-cambridge-core/content/view/96F1AC4F148B6FB8C80F3A7B094CA240/S0195941700031684a.pdf/surveillance_definitions_of_infections_in_longterm_care_facilities_revisiting_the_mcgeer_criteria.pdf](https://www.cambridge.org/core/services/aop-cambridge-core/content/view/96F1AC4F148B6FB8C80F3A7B094CA240/S0195941700031684a.pdf/surveillance_definitions_of_infections_in_longterm_care_facilities_revisiting_the_mcgeer_criteria.pdf)
Questions?

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