AACN Practice Alert

Prevention of Ventilator-Associated Pneumonia in Adults

Scope and Impact of the Problem

Critically ill patients who are intubated are at risk for development of ventilator-associated pneumonia (VAP). The National Healthcare Safety Network reported that the incidence of VAP for various types of hospital units is from 0.0 to 4.4 per 1000 ventilator days.[1] Although reported incidence rates have been steadily declining, it remains unclear whether this decrease is related to prevention efforts, reporting definitions, or a combination of the two.

The mortality associated with VAP is significant. Published mortality rates are from 0% to 70%, depending on the population studied, clinical condition, and timing of VAP identification and antibiotic administration. More recent meta-analyses report VAP-attributable mortality rates between 4.4% and 13%.[2-6]

AACN Levels of Evidence

Level A Meta-analysis of quantitative studies or metasynthesis of qualitative studies with results that consistently support a specific action, intervention, or treatment (including systematic review of randomized controlled trials)

Level B Well-designed, controlled studies with results that consistently support a specific action, intervention, or treatment

Level C Qualitative studies, descriptive or correlational studies, integrative reviews, systematic reviews, or randomized controlled trials with inconsistent results

Level D Peer-reviewed professional and organizational standards with the support of clinical study recommendations

Level E Multiple case reports, theory-based evidence from expert opinions, or peer-reviewed professional organizational standards without clinical studies to support recommendations

Level M Manufacturer's recommendations only

Expected Nursing Practice

1. Collaborate to identify patients where implementation of noninvasive positive pressure ventilation (NIPPV) may be appropriate to prevent the need for intubation.[7-9] [level C]
2. Assess readiness to extubate daily through combined spontaneous awakening trials (SATs: sedation interruption/minimization) and spontaneous breathing trials (SBTs), unless clinically contraindicated.[10-20] [level C]
3. Maintain and improve physical conditioning through early exercise and mobility.[21-28] [level C]
4. Elevate the head of bed (HOB) to 30° to 45° unless clinically contraindicated in patients receiving mechanical ventilation, as well as patients at high risk for aspiration.[29-32] [level C]
5. Minimize pooling of secretions above the endotracheal tube cuff by using an endotracheal tube with subglottic suction capability in patients with anticipated intubation greater than 48 to 72 hours.[33-39] [level C]
6. Change ventilator circuits only if visibly soiled; do not change ventilator circuits routinely.[40-43] [level C]

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©2017 American Association of Critical-Care Nurses doi:https://doi.org/10.4037/ccn2017460

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7. Perform oral care using chlorhexidine.[44-56] [level C]
8. Use ventilator bundles to reduce ventilator-associated events (VAEs) and VAP. [level C]

Supporting Evidence

Avoiding Intubation

NIPPV is associated with lower pneumonia rates than is invasive mechanical ventilation.[7-9]

Assessing for Early Weaning and Mobility

Implementation of paired SATs and SBTs may reduce duration of mechanical ventilation/intubation, thereby reducing the risk of VAEs/VAP. Further, early exercise and mobilization reduce time to extubation, decrease length of stay, and support the return to independent function.[10,17-19,57,58]

Reducing Risk of Aspiration

Microaspiration and macroaspiration of oral and gastric secretions are suspected as key factors in the development of VAP. Aspiration may be increased by supine positioning and by collection of secretions above the endotracheal cuff. HOB elevation to greater than 30° to 45° may reduce aspiration of oral and gastric secretions associated with the supine position.[31,59,60]

Use of endotracheal tubes capable of continuous aspiration of subglottic secretions may reduce the incidence of VAP. Technologic advances in the design of endotracheal tube cuffs such as use of polyurethane and innovations in cuff shape may further reduce aspiration. Maintenance of optimal cuff pressures has also been recommended.[33,35-39,61-64]

Oral Care

Application of chlorhexidine during routine oral care reduces the incidence of VAP. Although this benefit may extend to all patients at risk for VAP, most evidence supports use of chlorhexidine primarily in cardiac surgery patients.[44-56]

Use of Ventilator Bundle

Use of evidence-based bundled practices may reduce VAP when the practices are consistently applied. These practices have been described as "ventilator bundles" and are integrated into other recommendations such as the ABCDEF bundles.[27,28,57,65-70]

The Centers for Disease Control and Prevention (CDC) issued an updated framework in 2013 to classify VAP within a more complex framework of VAEs.[71] The purpose of the CDC framework was to create more precise surveillance definitions to overcome the limitation of traditional VAP surveillance definitions and to expand the framework to broader events and complications associated with mechanical ventilation. *It is important to note that this framework was designed to guide surveillance only.* It was not designed as a clinical framework to guide prevention and management of VAEs, including VAP. Within these guidelines, VAP is further defined as either "possible VAP" or "probable VAP." Probable VAP is the definition within the CDC framework that is closest to the traditional definitions of VAP. The best available literature to guide improved outcomes in patients receiving mechanical ventilation continues to be publications aimed at the prevention of VAP and subsequently VAEs.

Implementation/Organizational Support for Practice

Ensure that the unit has written practice documents such as policies and procedures or practice guidelines regarding VAP prevention.

Determine your unit's compliance rate with ventilator bundle interventions (eg, HOB elevation directive, use of subglottic suctioning, and performance of SAT/SBTs)

Develop an interprofessional task force to address practice changes related to preventing VAP/VAE.

Educate staff about the significance of hospital-acquired infections in the critically ill patients and how the interventions in the AACN's VAP practice alert can reduce VAP/VAEs.

Incorporate educational content into orientation programs and monitor competency.

Incorporate interventions from this VAP practice alert in the unit's standing orders and admission order sets.

Develop documentation standards as well as integration of interventions from this VAP practice alert into clinical documentation (electronic health records).

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Need More Information or Help?

1. Go to www.aacn.org, click Clinical Resources, and scroll down to select AACN Practice Resource Network.
2. Vollman K, Sole ML. Endotracheal tube and oral care. In: Wiegand D, ed. *AACN Procedure Manual for Critical Care.* 6th ed. St Louis, MO: Elsevier (Saunders); 2011.
3. Speck K, Rawat N, Weiner NC, Tujuba HG, Farley D, Berenholtz S. A systematic approach for developing a ventilator-associated pneumonia prevention bundle. *Am J Infect Control.* 2016; 44(6):652-656.
4. For more information on the ABCDEF bundle, access www.iculiberation.org.
5. CDC's information on VAE and VAP: www.cdc.gov.
6. AACN Practice Alert: Oral Care for Acutely and Critically Ill Patients. *Crit Care Nurse.* 2017; 37(3):e19-e21.

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Approved by the Clinical Resources Task Force, December 2016.

Financial Disclosures
None reported.

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