

Evidence-based strategies to prevent ventilator-associated pneumonia

By Amy Shay, MS, RN, CNS

Defined as pneumonia that develops within 48 of endotracheal intubation, ventilator-associated pneumonia (VAP) is the most common hospital-acquired infection in critical care units. It leads to longer intensive-care stays, increased mechanical ventilation time, greater mortality, and higher costs.

Although VAP incidence in the United States has declined to 0.0 to 4.4 cases per 1,000 patient days, it remains a concern. Prevention strategies focus on three causative mechanisms—bacterial colonization of the respiratory and upper GI tracts, aspiration of contaminated secretions, and contaminated respiratory equipment. Understanding evidence-based strategies can help you reduce your patients' VAP risk.

Recognized evidence-based strategies

Several professional organizations have developed or endorsed evidence-based guidelines for VAP prevention. Here are four of the most commonly recommended strategies.

Use an endotracheal tube with a lumen for continuous suction of subglottic secretions.

Contaminated secretions pool above the endotracheal tube cuff and migrate into the lungs even with a properly inflated cuff. Continuous removal of these secretions by suctioning reduces aspiration risk. Endotracheal tubes with a continuous subglottic suction lumen are linked to reduced VAP rates and decreased

This multifaceted hospital-acquired infection calls for a multidirectional solution.

duration of mechanical ventilation in patients who need more than 48 hours of ventilation.

Keep the head of the bed elevated 30 to 45 degrees.

Unless medically contraindicated, keep the head of the bed elevated for patients with a high aspiration risk, including those who are on mechanical ventilation or have an enteral feeding tube. Supine positioning is linked to higher bacterial counts in aspirated secretions than semirecumbent positioning. Use the bed's angle-indication device to ensure an accurate elevation angle; nurses' estimates of the angle have been shown to be inaccurate.

Commit to an oral care protocol using chlorhexidine.

Within 48 hours of hospitalization, the oral flora of critically ill patients changes to include potential respiratory pathogens rarely found in healthy persons. The endotracheal tube provides a migration route for organisms to travel to the lungs. Oral hygiene protocols with chlorhexidine help combat colonization of the respiratory

tract and reduce dental plaque (which acts as a bacterial reservoir). Although chlorhexidine 0.12% solution is the most commonly used concentration, no firm consensus exists for the most effective concentration. The strongest evidence for chlorhexidine has been reported in the cardiac surgery population, although many hospitals regularly use it for noncardiac surgical patients.

Change the ventilator circuit only when visibly soiled.

Studies evaluating contaminated ventilator circuits show that changing circuits more often doesn't reduce pneumonia incidence. In fact, changing circuits less often may reduce exposure to infectious aerosols. Before patient repositioning, drain the condensation in circuits away from the patient. For details on disinfecting and sterilizing respiratory equipment, visit www.cdc.gov/mmwr/preview/mmwrhtml/rr5303a1.htm.

Other best practices

The practices described below are recommended for VAP by at least one professional organization, although they're not cited as often as the above interventions.

Use NIPPV to avoid intubation or reintubation.

Noninvasive positive pressure ventilation (NIPPV) can be a useful alternative to mechanical ventilation. It has been particularly effective in avoiding the need for intubation in patients who are in the acute phase of chronic ob-

structive pulmonary disease or heart-failure exacerbation. NIPPV also can be used during weaning to shorten duration of intubation (unless contraindicated).

Use effective weaning strategies to reduce mechanical ventilation days.

Because VAP risk rises 1% to 3% every day the patient remains on mechanical ventilation, effective strategies to promote weaning can indirectly lower the risk. Nurse- or therapist-driven weaning protocols that include daily assessment for readiness to wean lead to shorter mechanical ventilation periods.

Additional emerging strategies coordinate sedation cessation with spontaneous breathing trials and include early mobility and delirium assessment to promote freedom from the ventilator. The American Association of Critical-Care Nurses (AACN) introduced the evidence-based ABCDE bundle as an organizational approach to coordinating these complex multidisciplinary weaning efforts. ABCDE stands for **A**wakening and **B**reathing **C**oordination, **D**elirium Monitoring and Management, and **E**arly Mobility.

Avoid nasotracheal intubation.

Nasal obstruction with an endotracheal tube (or feeding tube) can prevent clearing of sinus drainage, leading to hospital-acquired sinusitis and aspiration of contaminated secretions. When possible, avoid nasotracheal intubation.

Potentially effective strategies

Silver-coated endotracheal tubes and kinetic beds aren't recommended by any organization, but some supporting evidence suggests these strategies may be effective.

Nursing practices that help prevent VAP

Several basic nursing practices contribute to successful efforts to prevent ventilator-associated pneumonia (VAP).

Practice proper hand hygiene.

The Association for Professionals in Infection Control and Epidemiology and the Centers for Disease Control and Prevention (CDC) remind practitioners that adhering to hand hygiene protocol is essential to prevent transmission of bacteria when caring for mechanically ventilated patients. CDC recommends wearing gloves when handling respiratory secretions and for contact with objects contaminated by respiratory secretions.

Verify feeding-tube placement and take steps to prevent aspiration.

Routinely verify proper feeding-tube placement. To help prevent aspiration associated with enteral feedings, monitor gastric residual volume and assess for signs and symptoms of gastric overdistention.

Routinely verify endotracheal tube cuff pressure.

Measure endotracheal tube cuff pressure directly; maintain pressure between 20 and 25 cm H₂O. Properly inflated cuff pressure helps prevent microaspiration, VAP, and tracheal injury.

Use silver-coated endotracheal tubes.

Soon after intubation, endotracheal-tube surfaces become coated with a bacterial biofilm. Silver-coated tubes provide antibacterial properties and discourage bacterial adherence, leading to delayed colonization and delayed VAP. Expert opinions on silver-coated endotracheal tubes vary, ranging from "suitable for use" to "additional studies are needed" to "generally not recommended."

Use kinetic beds.

One meta-analysis found that continuous lateral rotation via the kinetic bed led to reduced VAP rates. However, VAP prevention guidelines rarely include this intervention. The kinetic bed remains "generally not recommended" by The Society for Healthcare Epidemiology of America, while the Institute for Clinical Systems Improvement states the bed is "not recommended for routine use." Rationales for not using the bed include lack of positive impact on death rates and ventilation duration; also,

this bed isn't available in some healthcare organizations.

Multifaceted problem, multidirectional solution

VAP is a multifaceted problem that calls for a multidirectional solution. Successful VAP prevention strategies require interdisciplinary cooperation, education, and monitoring of guideline adherence. The complexity of prevention interventions can make protocol compliance challenging; healthcare facilities may want to group small sets of evidence-based interventions together for easier implementation. Bundling interventions has been shown to promote changes in healthcare professionals' practices while providing a useful framework for measuring and reporting compliance. (See *Nursing practices that help prevent VAP*.)

For resources on implementing VAP prevention and ventilator weaning strategies, visit the AACN website (www.aacn.org). ■

Visit www.AmericanNurseToday.com/Archives.aspx for a list of selected references.

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