VENTILATOR ASSOCIATED PNEUMONIA

Practice Alert Statements:
- All patients receiving mechanical ventilation, as well as those at high risk for aspiration (e.g., decreased level of consciousness; enteral tube in place), should have the head of the bed (HOB) elevated at an angle of 30 to 45° unless medically contraindicated.1-7 (Level VI)
- Use an endotracheal tube (ET) with a dorsal lumen above the endotracheal cuff to allow drainage by continuous suctioning of tracheal secretions that accumulate in the subglottic area.1-2,8-13 (Level VI)
- Do not routinely change, on the basis of duration of use, the patient’s ventilator circuit.1,14-17 (Level VI)

Supporting Evidence:
- Critically ill patients who are intubated for > 24 hours are at 6 to 21 times the risk of developing ventilator-associated pneumonia (VAP)1,2,18-20 and those intubated for < 24 hours are at 3 times the risk of VAP.20 Other risk factors for VAP include decreased level of consciousness, supine positioning with HOB flat, use of H₂ antagonists and antacids, gastric distention, presence of gastric or small intestine tubes, enteral feedings, and a trauma or COPD diagnosis.1,18-22 VAP is reported to occur at rates of 10 to 35 cases / 1000 ventilator days, depending on the clinical situation.1,19
- Morbidity and mortality associated with the development of VAP is high, with mortality rates ranging from 20 to 41%.20,23-25 Development of VAP increases ventilator days, critical care and hospital lengths of stay (LOS) by 4, 4 and 9 days, respectively,18,23,26 and results in > $11,000 additional costs / VAP case.18,25,27
- Micro or macro aspiration of oropharyngeal and/or gastric fluids are presumed to be an essential step in the development of VAP.1,2,12,28 Pulmonary aspiration is increased by supine positioning and pooling of secretions above the ET tube cuff.1,3,19
- Compared to supine positioning, studies have shown that simple positioning with HOB elevation to 30° or higher significantly reduces gastric reflux and VAP.3-7 yet national surveys and reports in the literature describe poor compliance rates with HOB elevation in critical care units.20,29-34
- Studies on the use of special ET tubes which remove secretions pooled above the cuff with continuous suction decrease VAP by 45 to 50 %.8-11
- Studies on the frequency of ventilator circuit changes have found no increase in VAP with prolonged use.14-17
- National regulatory and expert consensus groups include the AACN VAP Practice Alert interventions as critical to decreasing VAP rates.1,2,35-37

AACN Grading Level of Evidence

- Level I. Manufacturers recommendation only.
- Level II. Theory based-no research data to support recommendations; Recommendations from expert consensus group may exist.
- Level III. Laboratory or bench data only-no clinical data to support recommendations
- Level IV. Limited clinical studies to support recommendations.
- Level V. Clinical studies in more that one or two different populations or situations to support recommendations.
- Level VI. Clinical studies in a variety of patient populations and situations to support recommendations.

Actions for Nursing Practice:
- Always keep mechanically ventilated patients HOB elevated to 30° or higher, unless medically contraindicated; use an ET tube with continuous suction above the cuff in patients expected to be intubated > 48 hours; do not routinely change ventilator circuits.
- Assure that your critical care unit has written practice documents such as a policy, procedure or standards of care that includes these practice alerts.38

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- Determine your unit's rate of compliance with the HOB elevation directive and use an ET tube with continuous suction above the cuff (click here for PI audit tool).
- If compliance with HOB elevation is < 90%, develop a plan to improve compliance:
  - Consider forming a multidisciplinary task force (nurses, physicians, respiratory therapists, clinical pharmacists) to address VAP practice changes.
  - Educate staff about the significance of hospital-acquired pneumonias in critically ill patients and how the interventions listed in the Practice Alert can reduce VAP (click for education slide program).
  - Incorporate content into orientation programs, initial and annual competency verifications.
  - Develop a variety of communication strategies to alert and remind staff of the importance of these VAP interventions and to disseminate results of audits.
  - Develop documentation standards for HOB elevation that include a rationale for when HOB elevation is not done.
  - Incorporate HOB elevation to at least 30° in mechanically ventilated patients or patients at high risk for aspiration in any unit standing orders. Also include HOB elevation monitoring in your critical care scorecard/QI plan/PI activities to assure that compliance levels are maintained.

**Expected Outcomes:**
- Decrease in VAP rates for the unit
- Increase in number of patients with HOB elevation to at least 30°
- Cost savings due to decreased rates of VAP and less frequent ventilator circuit changes

**Resources:**
- **Education Materials:**
  - Power Point slide program for VAP education sessions (www.aacn.org)
  - Online continuing education program on prevention strategies for VAP (http://www.nellcor.com/educ/onlineed.aspx)
- **Audit Tools:**
  - Measurement of compliance with HOB elevation in mechanically ventilated patients (www.aacn.org)
- **Others:**
  - Methods for estimating HOB elevation (www.aacn.org)
  - For additional information/assistance, contact a clinical practice specialist with the AACN Practice Resource Network (PRN) via email at practice@aacn.org or via phone at 1-800-394-5995 x217.

**References:**

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42. Fox MY. Toward a zero VAP rate: personal and team approaches in the ICU. *Critical Care Nursing Quarterly.* 2006;29(2):108-14.

