

Ventilator-Associated Pneumonia: What can we do to prevent it?

Elevation of the Head of the Bed



Elevation of HOB: Evidence

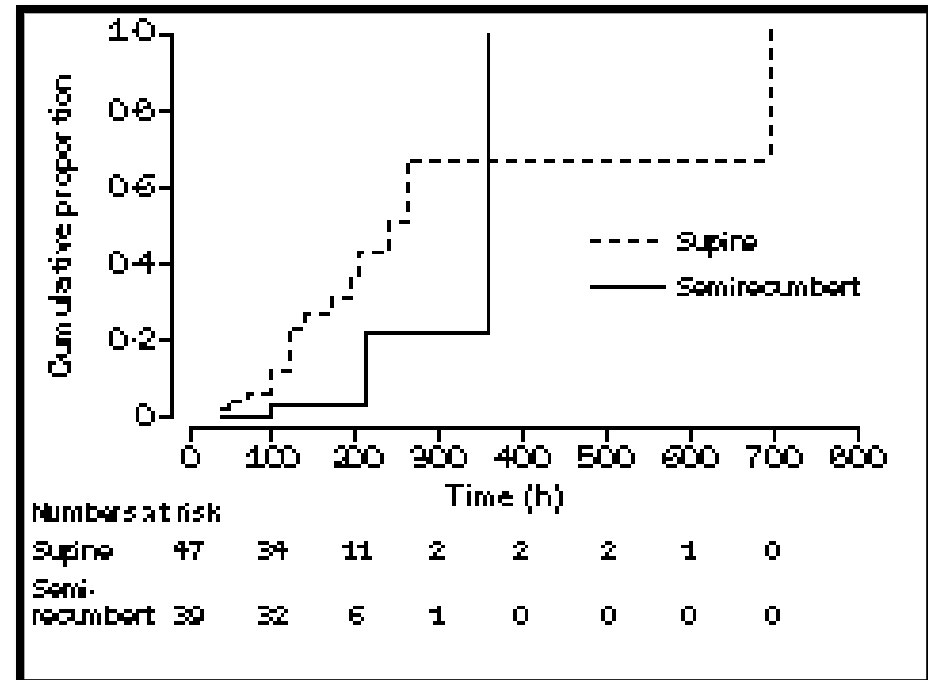
- Semi-recumbent position decreases gastro-esophageal reflux and subsequent aspiration
 - Study with radioactively-labeled gastric contents demonstrated reflux and aspiration reduced when HOB at 45°
 - Various degrees of HOB elevation have not been compared, but some degree of elevation appears warranted
- Prospective cohort study of 277 patients requiring mechanical ventilation
 - Supine head position associated with 3-fold increase in risk of VAP

Torres A, et al. *Ann Intern Med.* 1992;116:540. Kollef M, et al. *JAMA.* 1993;270:1965.



Elevation of HOB: Evidence

- RCT in 2 ICUs
- 3 of 39 (8%) pts in semi-recumbent group (45°) vs. 16/47 (34%) in supine group (0°) developed VAP (p=0.003)
- Study terminated early at interim analysis



Drakulovic M, et al. Lancet. 1999;354:1851.

Elevation of HOB: Recommendation

- **HOB should be elevated $\geq 30^\circ$**
 - Exceptions
 - 15-30° < 1 year of age
 - ECMO
 - Oscillator
 - Premature neonates (<30 wks gestational age) during first month of life
 - Patients for whom attending physician is concerned there is a contraindication (must document reason)
 - Procedures during which elevated HOB is prohibitive



Chlorhexidine Oral Care



CHG Oral Care: Evidence

- Gingival and dental plaque rapidly becomes colonized with bacteria in intubated patients due to poor oral hygiene and lack of mechanical elimination
- Meticulous oral care reduces microbial burden in upper airway
- Safety and feasibility of CHG oral care appear favorable

DeRiso A, et al. *Chest*. 1996;109:1556. Chan E, et al. *BMJ*. 2007;10:1136. Chlebicki M, et al. 2007. 35:595.



CHG Oral Care: Evidence

- Oral decontamination for prevention of VAP in mechanically ventilated patients: meta-analysis
 - 7 RCTs with 2144 patients found that oral antiseptics significantly reduced incidence of VAP by 44% (RR 0.56, 0.39-0.81)
- Topical CHG for prevention of VAP: meta-analysis
 - 7 RCTs with 1650 patients found a trend towards decreased VAP with use of oral CHG care (RR 0.70; 0.47-1.04)



CHG Oral Care: Recommendations

- **Chorhexidine 0.12% oral solution (15 ml bid until 24 hours after extubation) for all intubated patients**
 - Exceptions
 - Hypersensitivity to component of solution
 - <18 years of age
- **Brush patients' teeth bid with soft toothbrush to remove dental plaque prior to using CHG**
- **Continue routine q4-6 hr routine oral care: cleaning and moistening mouth using oral swabs or sterile water and gauze**





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Subglottic Suctioning



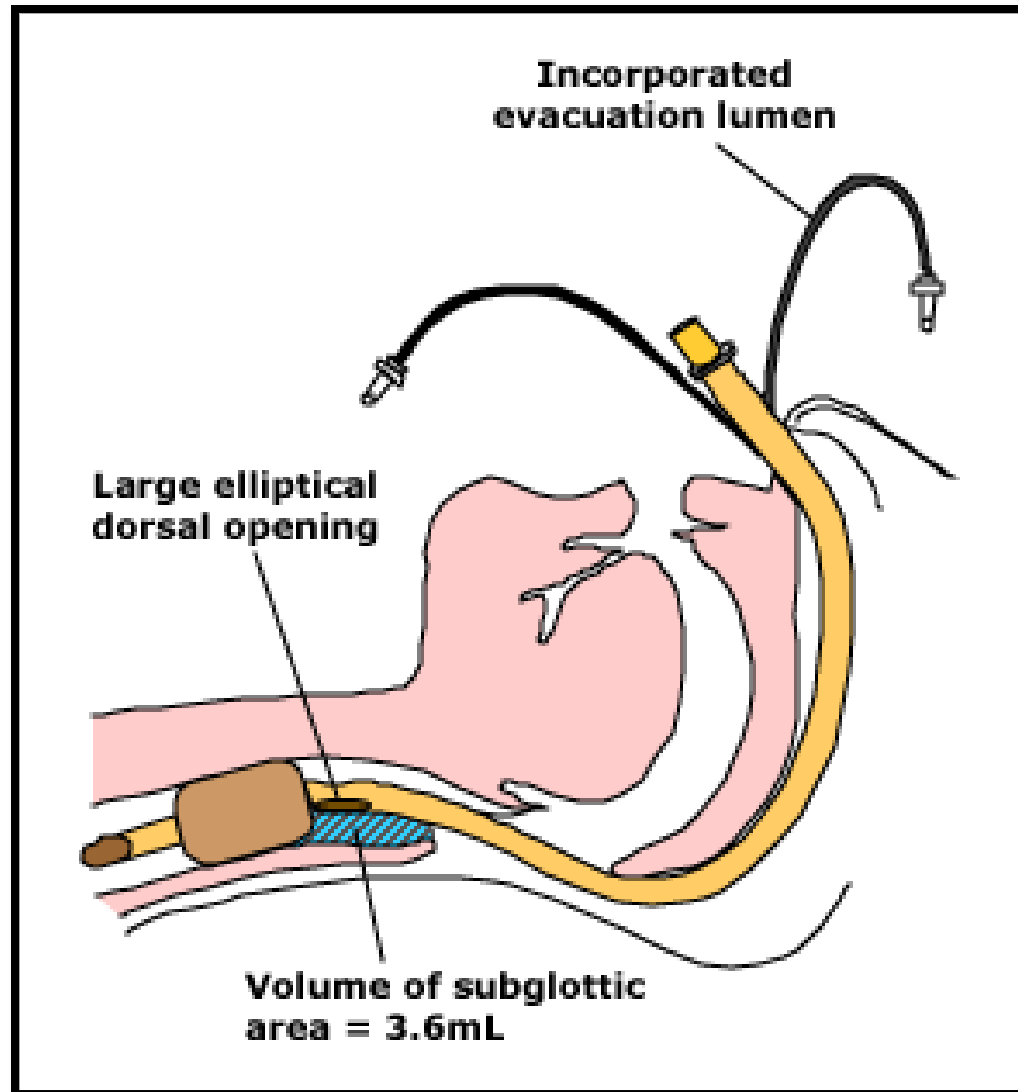
Subglottic Suctioning: Evidence

- Drainage of subglottic secretions lessens the risk of aspiration
- Specially designed endotracheal tubes have been developed to provide continuous or intermittent subglottic secretion removal

Kollef M, et al. Chest. 1999;116:1339. Smulders K, et al. Chest 2002;121:858.



Device for Continuous Aspiration of Subglottic Secretions



Subglottic Suctioning: Evidence

- Subglottic secretion drainage for the prevention of VAP: meta-analysis
 - 13 RCTs with 2442 patients
 - 12/13 studies reported reduction in VAP rates in subglottic secretion arm
 - Overall reduction in VAP rates was 45%
 - Subglottic secretion drainage also associated with reduced duration of mechanical ventilation and ICU LOS

Muscedere J, et al. Crit Care Med. 2011;39:1985.



Subglottic Suctioning: Recommendations

- **Continuous subglottic suctioning system recommended for patients expected to be mechanically ventilated for >72 hours**
 - Exceptions
 - Units that do not use cuffed ETTs: continue routine q1-2 hr and prn suctioning



Sedation Vacation



Sedation Vacation: Definition

- Daily scheduled interruptions of sedation based on criteria
 - If candidate for sedation interruption, sedation decreased or turned off to determine if extubation criteria met
 - If extubation criteria met, patient is extubated



Sedation Vacation: Evidence

- Weaning patients from ventilator easier when patients able to assist with extubation by coughing and controlling secretions
- Lightening sedation decreases amount of time patients remain mechanically ventilated
 - RCT of 128 mechanically ventilated pts: >2 day reduction in duration of mechanical ventilation in arm with scheduled interruption of sedation (~7 to 5 days, $p < 0.01$)

Schewickert W, et al. Crit Care Med. 2004;32;1272.



Sedation Vacation: Recommendations

- **Lighten or discontinue sedation at least once daily until patient is awake, can follow commands, or until he/she becomes uncomfortable or agitated**
 - Use validated sedation scale (i.e., RASS)
 - Usually performed by nursing and RT, but will leave to discretion of individual units
 - Caution: Patients not sedated as deeply have potential for self-extubation and associated risks
 - Exception
 - Patients for whom attending physician is concerned there is a contraindication (must document reason)



Richmond Agitation Sedation Scale (RASS)

Target RASS	RASS Description
+ 4	Combative, violent, danger to staff
+ 3	Pulls or removes tube(s) or catheters; aggressive
+ 2	Frequent nonpurposeful movement, fights ventilator
+ 1	Anxious, apprehensive , but not aggressive
0	Alert and calm
- 1	awakens to voice (eye opening/contact) >10 sec
- 2	light sedation, briefly awakens to voice (eye opening/contact) <10 sec
- 3	moderate sedation, movement or eye opening. No eye contact
- 4	deep sedation, no response to voice, but movement or eye opening to physical stimulation
- 5	Unarousable, no response to voice or physical stimulation

Assessment of Readiness to Extubate



Assessment of Readiness to Extubate: Evidence

- Decreased time on ventilator = decreased risk of VAP
- Before-and-after study of standardized nurse and RT-driven ventilator weaning protocol
 - Reduced VAP rates by 10%

Dries D, et al. J Trauma. 2004;56:943.



Assessment of Readiness to Extubate: Recommendation

- **Daily spontaneous awakening and breathing trials when sedation is weaned**
 - Assess adequate hemodynamic and respiratory status as well as ability to manage secretions
 - Usually performed by nursing and RT, but will leave to discretion of individual units
 - Patients deemed candidates for extubation should be discussed with ICU physicians
 - Exception
 - Patients for whom attending physician is concerned there is a contraindication (must document reason)



Summary

- 1- HOB $\geq 30^\circ$
- 2- Chlorhexidine oral care
- 3- Subglottic suctioning
- 4- Sedation vacation
- 5- Assessment of Readiness to extubate

