

Apr 16th, 11:00 AM - 2:00 PM

Oral Care Interventions to Prevent Ventilator-Associated Pneumonia in Mechanically-Ventilated Adults

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Mervine, Katrina D.; McColloch, Sarah L.; and Ruby, Kelsey L., "Oral Care Interventions to Prevent Ventilator-Associated Pneumonia in Mechanically-Ventilated Adults" (2014). *The Research and Scholarship Symposium*. 43.
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Oral Care and Ventilator-Associated Pneumonia

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PATIENT CARE ISSUE

- VAP is one of the most common complications seen in the ICU in US hospitals. (Coffin)
- Health consequences for the affected patient:
 - longer hospital stays
 - increased morbidity and mortality
 - associated mortality rate as high as 10% (Coffin)
- Each case costs the hospital an estimated \$50,000-\$57,000 (Restrepo)

EVIDENCE-BASED PRACTICE QUESTION

Question: Is chlorhexidine the best method of oral care to prevent ventilator-associated pneumonia in mechanically-ventilated patients?

P - mechanically ventilated adults in an acute care setting

I - use of chlorhexidine to prevent ventilator-associated pneumonia (VAP)

C - use of chlorhexidine versus the use of hydrogen peroxide to prevent VAP, which was compared to tooth-brushing versus non-toothbrushing

O - chlorhexidine is a better alternative than hydrogen peroxide to prevent VAP

TRAUMA RN INTERVIEW

- Setting: Magnet-designated hospital
- No official policy was found on oral care for ventilated patients
- Expected oral care for mechanically-ventilated patients
 - Respiratory therapy do subglottic suctioning at 0400/1200/2000
 - RNs do toothbrushing at 0800/1600/2400
 - Mouth swabs are offered every 2 hours by PCT or RN
- This hospital uses suction toothbrushes with a hydrogen peroxide-based gel to provide standard oral care
- Peridix, a chlorhexidine-based oral rinse, is only used if ordered by a physician

METHODS

Literature published between 2008 and 2013 was reviewed using PUBMED, MEDLINE, CINAHL, Cochrane, and Up To Date using the key words “oral care,” “ventilator-associated pneumonia,” “toothbrushing,” “VAP,” “oral hygiene,” “hydrogen peroxide,” and “pneumonia.”

SYNTHESIS OF EVIDENCE

Database Searched	Date of Search	Search Strategy	Number of Articles	% of Articles Relevant
PubMed	9/27/13 9/28/13	Ventilator associated pneumonia oral care	62	7%
		VAP oral care	31	3%
		Hydrogen peroxide and ventilator-associated pneumonia	1	100%
CINAHL	9/27/13	Oral care and ventilator associated pneumonia	41	5%
		Hydrogen peroxide and ventilator-associated pneumonia	3	33%
		VAP oral care	15	7%
AHRQ/NGC	9/27/13	Ventilator associated pneumonia oral care	16	13%
Proquest	9/27/13	Ventilator associated pneumonia oral care	102	2%
Cochrane	9/27/13	Oral care VAP	5	40%
Medline	9/27/13 9/29/13	Toothbrushing and ventilator-associated pneumonia	10	20%
		Oral care and ventilator associated pneumonia	59	2%

EVIDENCE-BASED PRACTICE RECOMMENDATIONS

We recommend the use of chlorhexidine as a standard in oral care to decrease VAP rates and overall hospital costs. Chlorhexidine as a standard part of the current oral care regimen will have beneficial results to the patient and the hospital. Despite strong evidence of the improved oral care to prevent VAP, hospital protocol continues to overlook the value of chlorhexidine in preventing VAP.

LIMITATIONS

- Including studies with small sample sizes
- Differing study designs
- Differing definitions of VAP
- Differing oral care protocols
- Differing methods of data collection

RESULTS

Author (Year)	Level of Evidence	Purpose	Sample	Treatment	Results	Findings
Arroliga, et al. (2012)	Level IV	To evaluate the effectiveness of an interdisciplinary task force to implement the use of a ventilator-care bundle to reduce VAP rates.	2,782 cases (2,587 pts)	2007: hydrogen peroxide solution q4h with oral swabs and a toothbrush. Oral care by RNs. 2008: hydrogen peroxide solution e4h with oral swabs and a toothbrush. Oral care by RTs and RNs. 2009: chlorhexidine solution for oral care q12h by RTs.	75% rate of reduction in VAP cases after oral care was performed by RTs and use of chlorhexidine over hydrogen peroxide.	There was a significant decrease in VAP rates following implementation of chlorhexidine as part of the ventilator care bundle.
Dahiya (2012)	Level II	To test if chlorhexidine was more effective than hydrogen peroxide in decreasing risk of VAP	70 pts	Control group: oral care with hydrogen peroxide bid. Experimental group: oral care with chlorhexidine bid.	Chlorhexidine solution was significantly more effective in reducing bacterial colonization than hydrogen peroxide.	Chlorhexidine should be used over hydrogen peroxide to reduce risk of VAP.
Garcia, et al. (2009)	Level III	To evaluate how VAP rate is affected by a comprehensive oral care protocol.	1538 pts	Control group: “standard” oral care, oral suctioning, and glycerin swabs. Experimental group: Oropharyngeal suctioning q6h, oral cleansing q4h, tooth brushing bid.	Control group: VAP 12.0 per 1000 ventilator days. Experimental groups: VAP 8.0 per 1000 ventilator days.	VAP rates were significantly reduced through comprehensive oral care and compliance to a structured facility protocol.
Gu, et al. (2012)	Level I	To assess the effect of toothbrushing on VAP through systematic review of RCTs.	4 RCTs; 828 pts	Control groups: no toothbrushing. Intervention groups: toothbrushing.	Toothbrushing was not found to significantly decrease incidence of VAP.	VAP rates are not significantly reduced by toothbrushing.
Lorente, et al. (2012)	Level II	To compare incidence of VAP in patients receiving oral care with and without toothbrushing.	436 pts	Control group: Gauze with 20mL of 0.12% chlorhexidine digluconate was used to cleanse mouth q8h. Experimental group: manual toothbrushing for 90 seconds.	There was no statistically significant difference in incidence of VAP between brushing or not brushing.	Adding manual toothbrushing to chlorhexidine oral care does not prevent VAP.
Munro, et al. (2009)	Level II	To evaluate the effectiveness of toothbrushing, the use of chlorhexidine, and the use of both concurrently to prevent VAP.	249 pts	Control group: usual care. T ₁ : 0.12% chlorhexidine oral swab bid. T ₂ : toothbrushing q3d. T ₃ : toothbrushing q3d and chlorhexidine swabs bid.	Toothbrushing was ineffective at reducing VAP. Chlorhexidine alone was more effective in preventing VAP than toothbrushing and chlorhexidine swabbing combined.	Chlorhexidine swabs are most effective at preventing VAP. Toothbrushing alone and toothbrushing with chlorhexidine did not significantly decrease VAP risk.
Oshodi & Bench (2013)	Level I	To review several RCTs to determine the best method of oral hygiene to prevent VAP.	7 RCTs; 1,727 pts	Control groups: placebo gel or “usual care”. Intervention groups: 0.12% (3), 0.2% (1) or 2% (2) concentrations of chlorhexidine.	Chlorhexidine is useful in preventing VAP. Toothbrushing may not be effective at preventing VAP	The authors recommend using a chlorhexidine-based gel to reduce VAP risk.
Roberts & Moule (2011)	Level I	To review literature that studies the effectiveness of using chlorhexidine and toothbrushing in reducing VAP rates.	4 RCTs; ≥ 1,107 pts	All studies included the use of chlorhexidine. The control groups used standard oral care procedures, including bicarbonate isotonic solution mouth rinse (1), suctioning (4), and moisturizing gel (2).	Chlorhexidine was found to reduce the incidence of VAP. One study found that tooth brushing did not decrease the chance of contracting VAP.	While chlorhexidine has proven to be effective in preventing VAP, more research is needed before a recommendation is made.
Shi, et al. (2013)	Level I	To review RCTs to assess the relationship of oral hygiene to VAP.	35 RCTs (5374 pts)	Various oral care practices, including toothbrushing, chlorhexidine, and standard oral care.	17 RCTs conclude chlorhexidine is associated with decreased VAP risk. 4 trials found no difference between toothbrushing and not toothbrushing	Chlorhexidine is found to decrease VAP risk.
Zhang, et al. (2013)	Level I	To evaluate how chlorhexidine can prevent VAP and determine which concentration is most beneficial.	18 RCTs of 572 ICU pts aged 15 or older.	Control group: standard oral care. Experimental group: Oral care using different chlorhexidine concentrations of 0.12% and 2% chlorhexidine.	All studies showed chlorhexidine could significantly prevent and reduce VAP, with the majority in favor of 0.12% chlorhexidine.	0.12% chlorhexidine solution is most effective in preventing VAP.

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