

**AVANOS** | Review of  
Clinical Data

# ORAL CARE IN MECHANICALLY VENTILATED PATIENTS



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## GUIDELINES

### 1. ORAL CARE FOR PATIENTS AT RISK FOR VENTILATOR ASSOCIATED PNEUMONIA.

*Practice Alert, AACN, 04/2010*

#### **SUMMARY:**

Develop and implement a comprehensive oral hygiene program for patients in critical care and acute care settings who are at high risk for ventilator-associated pneumonia (VAP).

- Brush teeth, gums and tongue at least twice a day using a soft pediatric or adult toothbrush.
- Provide oral moisturizing to oral mucosa and lips every 2 to 4 hours.
- Use an oral chlorhexidine gluconate (0.12%) rinse twice a day during the perioperative period for adult patients who undergo cardiac surgery.
- Routine use of oral chlorhexidine gluconate (0.12%) in other populations is not recommended at this time.

### 2. KOMMISSION FÜR KRANKENHAUSHYGIENE UND INFEKTIONSPRÄVENTION (KRINKO).

*Robert Koch-Institut, November 2013*

#### **SUMMARY:**

The Commission acknowledges mechanical tooth cleaning with antiseptic mouthwash as important measure of basic oral care.

*"The Commission recommends: Regular oral care with antiseptic substances with proven efficacy (Kat IA)."*

### 3. STRATEGIES TO PREVENT VENTILATOR-ASSOCIATED PNEUMONIA IN ACUTE CARE HOSPITALS.

2014 Update. Michael Klompas et al; *Infection Control and Hospital Epidemiology*, Vol. 35, No. 8 (August 2014)

#### SUMMARY:

SHEA (Society for Healthcare Epidemiology of America) updated Practical recommendations to assist acute care hospitals in implementing and prioritizing strategies to prevent ventilator-associated pneumonia (VAP) and other ventilator-associated events (VAEs) and to improve outcomes for mechanically ventilated adults, children, and neonates.

#### BACKGROUND:

VAP & VAE are detrimental to patients and increase costs. Attributable mortality of VAP is estimated to be approximately 10%. Clinical surveys indicate 5%-15% of ventilated patients still develop nosocomial pneumonias.

#### EXCERPT FROM THE GUIDELINES:

SHEA recommends several basic and special practices to improve outcomes based on clinical evidence and expert consensus.

#### BASIC PRACTICES:

- Use noninvasive positive pressure ventilation in selected populations
- Manage patients without sedation whenever possible
- Interrupt sedation daily, assess readiness to extubate daily
- Perform spontaneous breathing trials with sedatives turned off
- Facilitate early mobility
- Utilize endotracheal tubes with subglottic secretion drainage ports for patients expected to require greater than 48 or 72 hours of mechanical ventilation
- Change the ventilator circuit only if visibly soiled or malfunctioning
- Elevate the head of the bed to 30-45 degrees

#### Special approaches

- Selective oral or digestive decontamination
- Regular oral care with chlorhexidine
- Prophylactic probiotics
- Ultrathin polyurethane endotracheal tube cuffs
- Automated control of endotracheal tube cuff pressure
- Saline instillation before tracheal suctioning
- Mechanical tooth brushing

## 4. NHS: NATIONAL HEALTH SERVICE, UK; HIGH IMPACT INTERVENTION CARE BUNDLE TO REDUCE VENTILATION-ASSOCIATION PNEUMONIA.

*National Resource for Infection Control, 2011*

### ELEMENTS OF THE CARE PROCESS:

The 6 actions outlined below are the recommended good practice:

#### 1. Elevation of the head of the bed

The head of the bed is elevated to 30-45° (unless contraindicated).

#### 2. Sedation level assessment

Unless the patient is awake and comfortable, sedation is reduced/held for assessment at least daily (unless contraindicated).

#### 3. Oral hygiene

The mouth is cleaned with chlorhexidine gluconate ( $\geq 1-2\%$  gel or liquid) 6 hourly (as chlorhexidine can be inactivated by toothpaste, a gap of at least 2 hours should be left between its application and tooth brushing).  
Teeth are brushed 12 hourly with standard toothpaste.

#### 4. Subglottic aspiration

A tracheal tube (endotracheal or tracheostomy) which has a subglottic secretion drainage port is used if the patient is expected to be intubated for >72 hrs.  
Secretions are aspirated via the subglottic secretion port 1-2 hourly.

#### 5. Tracheal tube cuff pressure

Cuff pressure is measured 4 hourly, maintained between 20-30cm H<sub>2</sub>O (or 2cm H<sub>2</sub>O above peak inspiratory pressure) and recorded on the ICU chart.

#### 6. Stress ulcer prophylaxis

Stress ulcer prophylaxis is prescribed only to high-risk patients according to locally developed guidelines.  
Prophylaxis is reviewed daily.

## LITERATURE REVIEWS

### 5. CAN ROUTINE ORAL CARE WITH ANTISEPTICS PREVENT VENTILATOR-ASSOCIATED PNEUMONIA IN PATIENTS RECEIVING MECHANICAL VENTILATION? AN UPDATE META-ANALYSIS FROM 17 RANDOMIZED CONTROLLED TRIALS.

Li L, Ai Z, Li L, Zheng X, Jie L.

*Int J Clin Exp Med.* 2015 Feb 15;8(2):1645-57. eCollection 2015.

#### BACKGROUND:

Whether oral antiseptics could reduce the risk of ventilator-associated pneumonia (VAP) in patients receiving mechanical ventilation remains controversial. We performed a meta-analysis to assess the effect of oral care with antiseptics on the prevalence of ventilator-associated pneumonia in adult critically ill patients.

#### METHODS:

A comprehensive search of PubMed, Embase and Web of Science were performed to identify relevant studies. Eligible studies were randomized controlled trials of mechanically ventilated adult patients receiving oral care with antiseptics. The quality of included studies was assessed by the Jadad score. Relative risks (RRs), weighted mean differences (WMDs), and 95% confidence intervals (CIs) were calculated and pooled using a fixed-effects model or random-effects model. Heterogeneity among the studies was assessed with I<sup>2</sup> test.

#### RESULTS:

17 studies with a total number of 4249 met the inclusion criteria. Of the 17 studies, 14 assessed the effect of chlorhexidine, and 3 investigated the effect of povidone-iodine. Overall, oral care with antiseptics significantly reduced the prevalence of VAP (RR=0.72, 95% CI: 0.57, 0.92; P=0.008). The use of chlorhexidine was shown to be effective (RR=0.73, 95% CI: 0.57, 0.93; P=0.012), whereas this effect was not observed in povidone-iodine (RR=0.51, 95% CI: 0.09, 2.82; P=0.438). Subgroup analyses showed that oral antiseptics were most marked in cardiac surgery patients (RR=0.54, 95% CI: 0.39, 0.74; P=0.00). Patients with oral antiseptics did not have a reduction in intensive care unit (ICU) mortality (RR=1.11, 95% CI: 0.95, 1.29; P=0.201), length of ICU stay (WMD=-0.10 days, 95% CI: -0.25, 0.05; P=0.188), or duration of mechanical ventilation (WMD=-0.05 days, 95% CI: -0.14, 0.04; P=0.260).

#### CONCLUSION:

Oral care with antiseptics significantly reduced the prevalence of VAP. Chlorhexidine application prevented the occurrence of VAP in mechanically ventilated patients but povidone-iodine did not. Further large-scale, well-designed randomized controlled trials are needed to identify the findings and determine the effect of povidone-iodine application.

PMID: 25932093

## 6. TOOTHBRUSHING MAY REDUCE VENTILATOR-ASSOCIATED PNEUMONIA.

Yusuf H.  
*Evid Based Dent.* 2013 Sep;14(3):89-90.

### DATA SOURCES:

The databases Embase, Medline, CINAHL, the Cochrane Central Register of Controlled Trials, the Cochrane Database of Systematic Reviews, clinical trials.gov and controlled-trials.com were searched. Reference lists of reviewed articles and eligible trials were also searched, and toothpaste and toothbrush manufactures were contacted.

### STUDY SELECTION:

Randomized controlled trials in adults over 18 years receiving mechanical ventilation were included where any kind of oral care involving toothbrushing was compared with any other kind of oral care or control with or without toothbrushing.

### DATA EXTRACTION & SYNTHESIS:

Data were extracted in duplicate and quality assessed using the Cochrane risk of bias tool. The results were combined using a random effects model. The main outcome was VAP.

### RESULTS:

Six trials involving a total of 1408 patients were included. The risk of bias was high in four trials, low in one and unclear in the other. In four trials, there was a trend toward lower ventilator-associated pneumonia rates (risk ratio, 0.77; 95% confidence interval, 0.50-1.21;  $p = 0.26$ ). The only trial with low risk of bias suggested that toothbrushing significantly reduced ventilator-associated pneumonia (risk ratio, 0.26; 95% confidence interval, 0.10-0.67;  $p = 0.006$ ). Use of chlorhexidine antiseptics seems to attenuate the effect of toothbrushing on ventilator-associated pneumonia ( $p$  for the interaction = 0.02). One trial comparing electric vs. manual toothbrushing showed no difference in ventilator-associated pneumonia rates (risk ratio, 0.96; 95% confidence interval, 0.47-1.96;  $p = 0.91$ ). Toothbrushing did not impact on length of ICU stay, or ICU or hospital mortality.

### CONCLUSION:

In summary, randomized trials to date show that toothbrushing is associated with a trend toward lower rates of VAP in intubated, mechanically ventilated critically ill patients. There is no clear difference between electric and manual toothbrushing. Toothbrushing has no effect on ICU mortality, hospital mortality, or ICU length of stay.

PMID: 24071681



## PROSPECTIVE STUDIES

### 7. COST OF A VENTILATOR-ASSOCIATED PNEUMONIA IN A SHOCK TRAUMA INTENSIVE CARE UNIT.

*Cocanour CS, Ostrosky-Zeichner; Surg Infect (Larchmt). 2005 Spring;6(1):65-72.*

#### BACKGROUND:

Nosocomial pneumonia and especially ventilator-associated pneumonia (VAP) are costly complications for the hospitalized patient. Nosocomial pneumonia has been estimated to cost \$5,000 per episode, but the specific cost for a VAP has not been well estimated. As part of a successful performance improvement program in decreasing VAP from 10 VAPs/100 ICU admissions to 2.5 VAPs/100 ICU admissions, we examined the costs associated with VAP.

#### METHODS:

From January 1, 2002, through September 30, 2003, Shock Trauma Intensive Care Unit patients and charts were reviewed concurrently by an infection control practitioner for development of VAP as defined by National Nosocomial Infection Surveillance (NNIS) guidelines. Costs were obtained from the hospital's cost accounting software Transition Systems version 3.1.01 (TSI). All patients requiring greater than one day of mechanical ventilation were evaluated. Seventy patients with VAP and 70 patients without VAP were matched according to age and Injury Severity Score. Differences were compared using Kruskal-Wallis and two sample T-tests. Significance was considered for  $p < 0.05$ .

#### RESULTS:

The ICU cost difference was significant ( $p < 0.05$ ) between the case-controlled patients with VAP (\$82,195) and those without VAP (\$25,037). There was also a significant increase in ICU length of stay (21.6 versus 6.4 days) and the number of ventilator days (17.7 versus 5.8; both,  $p < 0.05$ ). Mortality was not different in the case-controlled population. A substantial portion of the increased cost of a VAP was from the increase in ICU length of stay (\$1,861/day). Pharmacy, respiratory and "other" also accounted for the increases when cost distribution was analyzed. This translates into a cost avoidance of approximately \$428,685 per 100 admissions to the ICU.

#### CONCLUSIONS:

Ventilator-associated pneumonia not only leads to a significant increase in ventilator days and ICU length of stay, but adds substantially to hospital costs. In our ICU, an episode of VAP costs \$57,000 per occurrence.

PMID: 15865552

## 8. REDUCING VENTILATOR-ASSOCIATED PNEUMONIA THROUGH ADVANCED ORAL-DENTAL CARE: A 48-MONTH STUDY.

Garcia R, Jendresky L, Colbert L, Bailey A, Zaman M, Majumder M.

*Am J Crit Care.* 2009 Nov;18(6):523-32.

### OBJECTIVE:

To determine the effect of implementing a comprehensive oral and dental care system and protocol on the rate of ventilator-associated pneumonia.

### METHODS<sup>†</sup>:

Patients more than 18 years old receiving mechanical ventilation for more than 48 hours in a medical intensive care unit at a university-affiliated medical center were studied in 2 consecutive 24-month periods. Patients in the group studied before the intervention (n = 779) had no oral assessments, no suctioning of the subglottic space, no tooth brushing, and suctioning of secretions in the oral cavity as needed. The group studied during the intervention (n = 759) included patients treated under a protocol whereby the oral cavity was assessed, deep suctioning was done every 6 hours, oral tissue cleansing was done every 4 hours or as needed, and tooth brushing was done twice daily.

### RESULTS:

Compliance with protocol components exceeded 80%. The groups did not differ significantly in age, sex, or severity of illness. The rate of ventilator-associated pneumonia was 12.0 per 1000 ventilator days before the intervention and decreased to 8.0 per 1000 ventilator days during the intervention (P = .06). Duration of mechanical ventilation and length of stay in the intensive care unit differed significantly between groups, as did mortality.

### CONCLUSION:

Our findings suggest that use of advanced tools, a comprehensive oral care protocol, and staff compliance with the protocol can significantly reduce rates of ventilator-associated pneumonia and associated costs.

PMID: 19635805

<sup>†</sup>In this study SAGE oral care kits were used.

## 9. THE IMPACT OF IMPLEMENTING MULTIFACETED INTERVENTIONS ON THE PREVENTION OF VENTILATOR-ASSOCIATED PNEUMONIA.

*Khan R, Al-Dorzi HM, Al-Attas K, Ahmed FW, Marini AM, Mundekadan S, Balkhy HH, Tannous J, Almesnad A, Mannion D, Tamim HM, Arabi YM.*

*Am J Infect Control. 2016 Mar 1;44(3):320-6.*

### OBJECTIVE:

This before and after study aimed at evaluating the effectiveness of implementing a VAP prevention bundle by a multidisciplinary team between years 2008 and 2013.

### MATERIALS & METHODS<sup>‡</sup>:

From 2008 to 2011, control phase of the study, hospital had implemented VAP control bundle. The VAP incidence was still high during this phase. An experimental phase from January 2011 to December 2013 was designed with evidence based revised VAP care bundle (7- element care: **Nursing care:** head-of-bed elevation 30°-45°, oral care with chlorhexidine (using AVANOS<sup>†</sup> Q4 Oral care kit), **Physician care:** daily sedation vacation and assessment for extubation, peptic ulcer disease prophylaxis, deep vein thrombosis prophylaxis, **Respiratory Therapist Care:** endotracheal intubation with in-line suction and subglottic suctioning (Closed suction with AVANOS<sup>†</sup> turbo cleaning system and ET tube Taperguard ), and maintenance of endotracheal tube cuff pressure at 20-30 mmHg) in order to bring down the VAP rates and increase the compliance to VAP bundle approach. During both the phases, all mechanically ventilated patients admitted to the intensive care unit between 2008 and 2013 were prospectively followed for VAP development according to the National Healthcare Safety Network criteria. Additionally the compliance rates were compared between two phases.

### RESULTS:

A total of 3665 patients received mechanical ventilation, and there were 9445 monitored observations for bundle compliance. The patients in the experimental group (2011-2013) were sicker with higher APACHE III scores and more comorbidities. Total bundle compliance was 90.7% before initiation of the VAP team and 94.2% after (P < .0001). Bundle compliance remained above 90% after introduction of the VAP prevention team in 2011, and reached 97% in 2013. The number of patients observed for bundle compliance were almost double in experimental phase making it more robust. The number of VAP episodes decreased from 144 during 2008-2010 to only 14 during 2011-2013 (P < .0001). The rate of VAP decreased from 8.6 per 1000 ventilator-days to 2.0 per 1000 ventilator-days (P < .0001) after implementation of the care bundle. The ICU mortality in the experimental phase was also less. However the decrease in ICU length of stay and duration of mechanical ventilation could not be demonstrated in experimental phase, possibly due to out of "VAP bundle" factors and the sample population in experimental group was more critical.

### CONCLUSION:

This project demonstrates that a systematic implementation of a multidisciplinary team approach with high compliance to evidence based best practices adhered to as a bundle, can reduce the incidence of VAP.

**PMID: 26940595**

<sup>†</sup>In this study AVANOS<sup>†</sup> (formerly Kimberly Clark Health Care) oral care kits and Closed suction systems were used.

## 10. EFFECTS OF THREE APPROACHES TO STANDARDIZED ORAL HYGIENE TO REDUCE BACTERIAL COLONIZATION AND VENTILATOR-ASSOCIATED PNEUMONIA IN MECHANICALLY VENTILATED PATIENTS: A RANDOMIZED CONTROL TRIAL.

Berry AM, Davidson PM, Masters J, Rolls K, Ollerton R.

*Int J Nurs Stud.* 2011 Jun;48(6):681-8.

### AIM:

This feasibility study aimed at testing two oral hygiene protocols to assess the effects of microbial colonization of dental plaque with respiratory pathogens (primary outcome) and incidence of ventilator associated pneumonia (secondary outcome). The intent was to assess the best oral hygiene strategy in ICU setting

### MATERIALS & METHODS:

A single blind randomised comparative study conducted in a 20-bed adult intensive care unit in a university hospital. Patients were enrolled over a 15 month period. Patients with an expected duration of mechanical ventilation more than 48 h were eligible. Patients were randomised to one of three study regimens (Group A control, second hourly oral rinse with sterile water, Group B sodium bicarbonate mouth wash second hourly, and Group C twice daily irrigations with chlorhexidine 0.2% aqueous oral rinse and second hourly irrigations with sterile water). All study options included cleaning with a toothbrush and non-foaming toothpaste. Cuff pressure was monitored prior to oral care and subglottic secretion were suctioned after each procedure. At admission no significant differences were found between groups for all clinical data and patients in all groups had similar mix of length of stay.

### RESULTS:

Data from a total of 109 patients were analyzed (out of 225 enrollments, excluded because of death or extubation) Group A 43, Group B 33 and Group C 33 (mean age:  $58 \pm 17$  years, simplified acute physiology score II:  $44 \pm 14$  points). Group B had a greater trend to reduction in bacterial colonization no significant differences could be demonstrated at day 4 of admission ( $p=0.302$ ). Group A was the second best at reduction of dental plaque and group C with chlorhexidine was the one with least reduction. The incidence of ventilator associated pneumonia was evenly spread between Groups B and C (5%) while Group A was only 1%.

### CONCLUSION:

Mechanical cleaning with the help of toothbrush remains to be the most important factor in oral hygiene. The kind of mouth rinsing agent used is not as crucial as mechanical cleaning with toothbrush and a standardized oral care protocol to have effect on reduction in colonization of dental plaque in this study. Similar studies (Garcia et al, 2009, Mori et al, 2006) seem to reiterate this finding. Although this study was limited by sample size, it provides sound basis to power a larger randomized study towards evaluating oral hygiene strategy in ventilated patients.

PMID: 21185559

<sup>†</sup>In this study Individual products were used from undisclosed providers.

## 11. VENTILATOR-ASSOCIATED PNEUMONIA AND ORAL CARE: A SUCCESSFUL QUALITY IMPROVEMENT PROJECT.

Hutchins K, Karras G, Erwin J, Sullivan KL.

*Am J Infect Control.* 2009 Sep;37(7):590-7.

### BACKGROUND:

Ventilator-associated pneumonia (VAP) is a nosocomial pneumonia that develops in patients on mechanical ventilation for  $\geq 48$  hours. VAP develops at an estimated rate of 1% to 3% per day of mechanical ventilation.

### METHODS<sup>‡</sup>:

Quality improvement project. Mechanically ventilated patients received the following oral care every 4 hours: the teeth were brushed with cetylpyridinium chloride (changed to 0.12% chlorhexidine gluconate in 2007) using a suction toothbrush, the oral cavity was cleansed with suction swabs treated with hydrogen peroxide, a mouth moisturizer was applied, deep oropharyngeal suctioning was performed, and suction catheters were used to control secretions. The primary efficacy variable was a diagnosis of VAP in patients mechanically ventilated for  $\geq 48$  hours.

### RESULTS:

The historical average rate of VAP in 2004 was 12.6 cases/1000 ventilator days. After the inception of the quality improvement project, VAP rates decreased to 4.12 (VAP cases/days of ventilation  $\times$  1000) for May to December 2005, to 3.57 for 2006, and to 1.3 for 2007.

### CONCLUSION:

The use of an oral care protocol intervention and ventilator bundle led to an 89.7% reduction in the VAP rate in mechanically ventilated patients from 2004 to 2007.

PMID: 19716460

<sup>‡</sup>In this study SAGE oral care kits were used.

## 12. THE EFFECTIVENESS OF AN ORAL HEALTH CARE PROGRAM FOR PREVENTING VENTILATOR-ASSOCIATED PNEUMONIA.

Liao YM, Tsai JR, Chou FH.

*Nurs Crit Care.* 2015 Mar;20(2):89-97.

### AIMS & OBJECTIVE:

The Intent of this study was to demonstrate the importance of nursing care and non-pharmacological approaches in the reduction of VAP infection rate. The study aimed at determining the effectiveness of an oral health care program with respect to reducing VAP by comparing the VAP incidence and oral assessment scores between control and experimental group patients.

### MATERIALS & METHODS:

The study was conducted between March 2007 and March 2008 in recruiting patients who required artificial airways with ventilator at Medical and Surgical ICU center I South Taiwan (control group (n=100) and experimental group (n=99). The two groups were highly homogenous in composition.

An evidence based oral health care program was used in the experimental group and the control group was cared using standard nursing care practices in hospital. In the control group following regimen was followed: (1) Airway management by checking the endotracheal tube cuff pressure and keeping its pressure around 20-24mmHg by nursing staff every day. (2) Mouth care was performed using a sponge and tap water by the nursing staff with their own personal experience. The routine care did not include oral assessment and semi-recumbent positions for patients (in general, the positions of the HOB were kept smaller than 15° for these patients.). In the experimental group the regimen differed to as follows: (1) Airway management by checking endotracheal tube cuff pressure and keeping cuff pressure on 20-24mmHg by nursing staff every 8 h, using Barnason's oral assessment, oral care with mouthrinse and soft toothbrush performed atleast 5 min, HOB elevation 30° Both the groups received the assigned treatment for four consecutive days.

### RESULTS:

There were noticeable differences between the two groups. The experimental group had VAP incidence of only 4% compared to control group which was at 18% (p=0.004), a 4.5 fold decrease of VAP incidence in experimental group. The bacterial count in sputum was also considerably less in experimental group (9%) compared to control group (20%), p=0.043. The oral assessment guide (OAG) mean score (9.16 ± 2.07) of the experimental group was lower (P<0.05) from that of the control group (10.07 ± 1.79). Further to this finding, the OAG scores had a significant drop in experimental group and significant hike in control group (P<0.01) for the third post-test data when there was no significant difference for the pre-test or the first and second post-test data between groups, indicating that an increased duration of intervention resulted in significant decreases in the OAG scores in the experimental group compared with the control group. Also the experimental group was found to have only gram positive bacteria and control group had gram negative bacteria in addition.

### CONCLUSION:

The study proved that VAP incidence can be significantly reduced using VAP bundle with evidence based standardized and regular oral care in the center.

PMID: 25532600

<sup>†</sup>The study did not use specific oral care kits; minimum 5 min. of tooth brushing (soft children's toothbrush) with chlorhexidine 0.2%, performed as per oral assessment score (8,4 or 2 hourly).

# 13. REDUCING VENTILATOR-ASSOCIATED PNEUMONIA IN ADULT PATIENTS THROUGH HIGH STANDARDS OF ORAL CARE: A HISTORICAL CONTROL STUDY.

Cutler LR, Sluman P.

*Intensive Crit Care Nurs.* 2014 Apr;30(2):61-8.

## OBJECTIVE:

The before and after study aimed at evaluating impact of revised oral hygiene care on VAP incidence and costs in ICU. Also the study looks at baseline VAP rates, compliance with Oral care before and after.

## MATERIALS & METHODS:

A before and after study, matching the clinical audit cycle for practical purposes of evaluation and implementing change, was executed between July 2009 and December 2011 in a 22 bed ICU in Northern England. A total of 1087 patients, mechanically ventilated for at least 48 hours in a general adult critical care unit, were counted as sample size. The incidence of VAP in observation phase of the study with 528 patients before a practice change, involving assessing compliance with existing care bundle was compared to the incidence in 559 patients after a practice change. The patient was counted to have developed VAP if he/she was started on antibiotics for new pneumonia during 48 hours in ICU. The revised regime during practice change phase constituted: minimum 8 hrly oral care, twice daily mechanical tooth brushing with toothpaste, oropharyngeal suctioning, four time use of chlorhexidine gel 1%, and thrice daily recording of ET cuff pressures. Before the change patients were provided oral care with chlorhexidine gluconate 0.02% without standardized frequency and standardized tooth brushing. The costs of revised oral hygiene protocol and incremental costs of VAP (only antibiotics) were calculated.

## RESULTS:

The compliance to VAP care bundle practices of oral care, humidification, endotracheal suction, head of bed elevation were already high in before practice change phase and there were no significant differences between compliance rates during the full project duration (around 90% throughout with little month on month variation). In the control phase, out of the 528 patients mechanically ventilated for at least 48 hours before the change, 47 developed VAP (mean incidence of VAP was 8.9%, 95% CI 0.07-0.12). The mean VAP per 1000 ventilator days was 13.6 (95% CI 13.1-14.0). Following the change in practice, in the experimental phase, 24 of 559 patients developed VAP ( new mean incidence of VAP 4.1%, 95% CI 0.03-0.06). The mean VAP per 1000 ventilator days was 6.9 (95% CI 6.5-7.1). The calculated relative risk reduction due to the practice change was 0.53 ( $p < 0.01$ ). There was a 50% reduction in spend on antibiotics because of reduced VAP during the experimental phase. The additional cost savings due to reduced length of stay and associated critical vcare costs have not been calculated in this study.

## CONCLUSION:

A revised VAP prevention bundle with key focus on oral care with standardized practices (twice daily mechanical tooth brushing with tooth paste, our times per day use of chlorhexidine 1% gel) resulted in a significant reduction in VAP and the costs of treating VAP.

PMID: 24314858

## 14. ORAL CARE IN VENTILATED PATIENTS – CAN WE IMPROVE IT?

Pivkina et al, Abstract # 0070; European Society of Intensive Care Medicine 2014

### INTRODUCTION:

Oral hygiene significantly decreases the risk of ventilator-associated pneumonia (VAP). Yet, ICU nurses frequently perceive oral care as a challenging task. Special devices for oral care may facilitate the procedure.

### AIM:

To compare the efficacy and usability of oral care methods in ventilated patients.

### METHODS:

This is an open, controlled randomized study (period jan 2013-feb 2014) in which patients were designated to receive either (1) traditional oral care with use of swabs, dressing forceps, metal tray and suction catheter or (2) special oral care with a kit including Yankauer, suction toothbrushes, suction and applicator swabs, containers for antiseptic solution (0.02% aqueous chlorohexidene solution). Usability of the methods was evaluated by means of a questionnaire filled out by nurses after each oral care intervention. Questionnaires reflected oral care method convenience, simplicity and efficacy, risk of oral mucosa trauma and procedure time. The 5-grade scale ranging from 1 (very bad) to 5 (very good) was used. VAP rate, onset time, use of antibiotics for VAP, length of ventilation and ICU stay was monitored in both patient groups.

### RESULTS:

40 patients were enrolled in the study, 19 received traditional and 21 specialized oral care. The incidence of new VAP cases decreased in the main group from 68.4% +/- 10.6% ( $p < 0.05$ ), days of VAP/100 days tracheal intubation - from 52.4/100 to 18.4/100 ( $p < 0.05$ ), pneumonia developed later (8.7 vs 4.8 days,  $p > 0.05$ ) was registered. 18 ICU nurses took part in the usability study and processed 152 questionnaires. Results of the evaluation are in the table.

### Evaluation of oral treatment methods (questionnaire data)

Indicator, %	TRADITIONAL METHOD					SPECIALIZED KITS				
	5	4	3	2	1	5	4	3	2	1
Convenience	-	-	100.0	-	-	78.9	21.1	-	-	-
Ease of use	-	-	89.5	10.5	-	88.2	9.2	2.6	-	-
Effectiveness	-	19.7	80.3	-	-	81.6	14.5	3.9	-	-
Risk of mucosal trauma	-	19.8	10.5	69.7	-	78.9	17.1	4.0	-	-

### CONCLUSION:

The use of special oral care seems to reduce VAP rate and as such also antibiotic consumption. The overall usability of the kit was perceived very valuable.

#### References:

Fourrier et al, Effect of gingival and dental plaque atiseptic decontamination on nosocomial infections cquired in the intensive care unit: a double bind placebo controlled multicenter study. Crit Care Med;33;1728-1735









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