

**IMPLEMENTATION OF ORAL CARE GUIDELINES TO
REDUCE INCIDENCES OF VENTILATOR-ASSOCIATED
PNEUMONIA: A SYSTEMATIC REVIEW OF THE
LITERATURE**

Honors Thesis

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Abstract

BACKGROUND/PURPOSE: Ventilator-Associated Pneumonia (VAP) is a disease process that can arise during the use of mechanical ventilation in the critical care setting. VAP can be prevented if adequate oral care practices are followed. The purpose of this study was to investigate how the implementation of oral care guidelines impact incidence rates of VAP in the Intensive Care Unit (ICU) and to determine specific oral care practices that are useful in the prevention of this disease process.

METHOD: A systematic review of English-language literature was conducted of articles that were published after 2009. The CINAHL Plus Full Text database was used to determine suitable articles based on specific inclusion criteria.

RESULTS: Six articles were found to be relevant and were included in this systematic literature review. This systematic review of the literature investigated specific oral care practices that are recommended to prevent VAP. The American Association of Critical-Care Nurses (AACN) has oral care recommendations in place for nurses to follow however there have yet to be recommendations in place specific to patients undergoing mechanical ventilation. Additionally, this review concluded that facility implementation of oral care guidelines is found to increase nursing adherence to these recommendations.

CONCLUSION: Implementation of oral care guidelines is encouraged to decrease incidences of VAP in the ICU. Interventions included in these protocols provide education and direction to guide nursing care and increase nursing compliance, resulting in decreased VAP incidences in the ICU. Further research is suggested to enhance evidence based nursing practices to determine oral care guidelines that are specific to the prevention of VAP in critical care settings.

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Introduction

In emergency medical situations, it is essential for members of the healthcare team to perform necessary measures in order to ensure optimal patient safety. Mechanical ventilation, interchangeably called intubation, is often performed in critical care settings such as the intensive care unit (ICU) to maintain an airway. In many cases, intubation is performed as a lifesaving procedure to maintain an airway when a patient is hemodynamically unstable and cannot protect the airway on their own, the patient's ventilation efforts are insufficient, or the patient is hypoxic, and all noninvasive methods have been exhausted. In the event that mechanical ventilation is being used in the ICU, it is safe to assume that the overall health status of the patient undergoing mechanical ventilation has been severely compromised making that patient susceptible to many other illnesses. Therefore, it is essential for health care professionals, especially critical care nurses, to understand methods that can be performed to avoid further compromise to critically ill patients.

Ventilator-associated pneumonia (VAP) is a serious, potentially life-threatening complication that can arise from the use of mechanical ventilation. VAP is the second leading hospital acquired infection in the United States impacting intubated patients in the intensive care unit (ICU) and has a mortality rate of approximately 46% (Sedwick, Lance-Smith, Reeder, & Nardi, 2012). Because it is a nosocomial infection, an infection that is acquired within the hospital setting, it is the responsibility of the healthcare team to provide quality care to the patient, ensure their safety, and to understand preventative measures

that can be implemented to avoid acquiring VAP. Patients admitted to the ICU are critically ill and fighting for their lives making it crucial for health care professionals to protect these already susceptible patients from further complications.

Background / Significance

“Ventilator-associated pneumonia is an infection that occurs in patients in the ICU receiving invasive mechanical ventilation and is associated with increased stay in the ICU and in the hospital, increased cost, and may be associated with an increased mortality” (Arroliga et al., 2012, p. 688). This definition manifests the severity of VAP and the potential consequences that can arise making it pertinent for ICU nurses to be made aware of. VAP, being one of the most common hospital acquired infections in critical care areas, must be a concern for nurses caring for intubated patients in order to perform the highest quality care and to increase survival rates for patients in the ICU.

Oral care is an intervention that can be performed by the nursing staff in their patient care routines to decrease VAP incidence rates and therefore should be incorporated into the plan of care for intubated patients (Feider, Mitchell & Bridges, 2010). Although there are other methods involved in VAP prevention, adequate oral hygiene alone is substantial due to the excess salivary retention as a result of impaired swallowing and bacterial growth in intubated patients.

“Stagnation of saliva promotes proliferation of bacteria. If overgrowth of bacteria occurs in the oral cavity, then an immune response is initiated and the individual becomes infected” (Oshodi & Bench, 2013, p. 751). Essentially, this means that

because of the accumulation of saliva within the oral cavity due to the decreased ability to swallow, bacteria are harbored, and infection is probable. Developing an understanding of the underlying pathophysiology of VAP is important for nurses to become familiar with in order to effectively implement preventative care measures (Oshodi & Bench, 2013).

Methods

A systematic review of literature was conducted using the CINAHL Plus Full Text database for the purpose of narrowing down suitable articles to review for this study. The keywords searched were as follows: *oral care and ventilator-associated pneumonia*. Only full text articles in the English language were used in this research. Only articles published during or after 2009 were included. Other inclusion criteria consisted of at least one author being a nurse in conjunction with having been a peer reviewed research article. Seven articles were assessed for this thesis however six were admissible as they met the exact search criteria and therefore were incorporated in this review.

Results

The review of literature addressed the prevalence of VAP in the ICU, the relationship between enforcing oral care guidelines and the number of VAP occurrences, in addition to distinguishing specific oral hygiene interventions that are associated with the prevention of VAP. The articles reviewed in this study proposed numerous recommendations and interventions that are associated with the reduction of VAP incidences. Although this particular literature review focused solely on the relationship between oral care and VAP, many of the

articles that were reviewed examined a variety of preventative interventions, with each article mentioning the use of oral care practices as one of these interventions. For the purpose of this review of literature, the only approach investigated was oral hygiene practices.

Oral Care Protocol Implementation

Although the intended outcome may be the same, individual nurses have their own ways of providing patient care. The best interest of the patient is always the top priority, however patient care routines may vary depending on the nurse due to different educational and career backgrounds as well as beliefs concerning nursing care. With that in mind, general guidelines describing specific nursing interventions to prevent VAP should be implemented for nurses to refer to when there are certain actions expected of them. Implementing specific oral care guidelines for VAP prevention allows critical care nurses to be made aware of exactly what is expected of them while caring for intubated patients in the ICU. Critical care nurses should always have access to these protocols to refer to when necessary. This leaves minimal room for misunderstanding the expected oral care practices that nurses should be providing to intubated patients.

Along with having specific guidelines in place, nurses must obtain an understanding about the pathophysiology of the disease process to successfully go about decreasing VAP incidences in the critical care setting. *Figure 1* below explains the criteria for diagnosis of ventilator-associated pneumonia (Oshodi & Bench, 2013).

Table 1. Criteria for diagnosis of ventilator-associated pneumonia (VAP)	
Radiology/Signs/Symptoms/Laboratory	
■	The presence of new, persistent or progressive infiltrates on chest radiographs
■	Body temperature > 38°C or < 35.5°C
■	Leucocytosis (>10 X 10 ³ /mm ³) or leucopenia (< 3 X 10 ³ /mm ³)
■	Purulent tracheal aspirate
■	A semi-quantitative culture of tracheal aspirate, positive for pathogenic bacteria, occurring after 48 hours of mechanical ventilation
Adapted from: Centers for Disease Control and Prevention (2013)	

Figure 1: *Criteria for diagnosis of ventilator-associated pneumonia* (Adopted from Oshodi & Bench, Table 1, 2013, p.752)

Critical care nurses should be cognizant of the underlying biological processes of VAP. Understanding the principles of the disease may be associated with an increase in nursing compliance among utilizing preventative methods. If nurses are knowledgeable about the rationales behind nursing care practices, they are more likely to comply with them (Oshodi & Bench, 2013).

One study found that by implementing a comprehensive oral-dental care protocol, incidences of VAP may drastically decrease (Garcia et al., 2009). Adult patients who had been intubated for more than 48 hours were studied at a large teaching hospital in the 10-bed medical intensive care unit (MICU) over a 48-month period. Flow sheets were used to review nursing compliance with the established oral care protocol. The protocol in place consisted of specific interventions for nurses to abide by while caring for intubated patients. These interventions included: daily oral assessment, deep suctioning, tooth brushing and oral cleansing of the lips and tissues. This study revealed a significant decline in ventilator days resulting from increased nursing compliance to the comprehensive oral-dental care protocol. The results showed a VAP rate of 12 per 1000 ventilator days prior to this protocol being put into effect, which decreased to 8 per 1000

ventilator days following the application of the comprehensive oral-dental care protocol (Garcia et al., 2009, p.523). In *Figure 2*, (adapted from Garcia et al., 2009, p.529) the decline of ventilator days in the MICU from the study is presented. This study concluded that adding oral care protocols to VAP prevention guidelines are considerably influential in the reduction of VAP occurrences in the ICU. (Garcia et al., 2009)

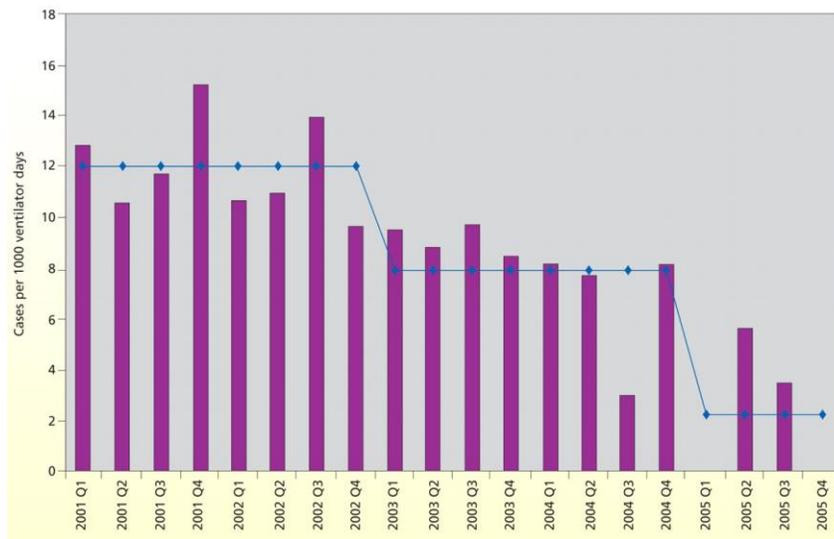


Figure 2: Ventilator-associated pneumonia rates in the MICU by quarter (Q), 2001-2005. (Adopted from Garcia et al., Figure 2, 2009, p.529)

According to a study performed by Kiyoshi-Teo and Blegen (2015), nursing adherence to oral care guidelines is one of the most essential factors of VAP prevention. It is recommended that oral care guidelines be put into effect in hospitals to increase the likelihood of nurses consistently incorporating proper oral care techniques in the care of intubated patients. This study focused on how putting institutional oral hygiene protocols into effect influences the oral care provided by nurses in the ICU. “Nurses may find themselves liable if they do not practice according to institutional standards” (Kiyoshi-Teo & Blegen, 2015, p.

310). The types of guidelines that were in place during this study included order sets, nursing policies and information bulletins. Nursing policies were the most detailed in explaining the expectations on how to properly perform oral hygiene. It was found that with order sets the nurses were more likely to be aware of the guidelines, prioritize and enforce these protocols in the care of their patients (Kiyoshi-Teo & Blegen, 2015).

This study also discovered potential reasons that nurses may be noncompliant to oral care guidelines. Some of these reasons were reported to be: “concern for patients’ discomfort and fear of adverse events, lack of resources, disagreement with the guideline content, and lack of belief in the effectiveness of strategies” (Kiyoshi-Teo & Blegen, 2015, p.310). These reported reasons for noncompliance determine the need for further research and education about suitable oral hygiene practices for the care of mechanically ventilated patients in the ICU.

“Despite strong evidence in the literature on the role of oral care in prevention of VAP, nurses continue to view it as a comfort measure with low priority” (Oshodi & Bench, 2013, p.756). Providing nurses with more reliable sources that demonstrate the effectiveness of oral care practices could alleviate some of the reported reasons for noncompliance and cause oral care to increase in priority. If evidence-based practice is observed more frequently, there could be an increase in nursing adherence to oral care recommendations. The study determined that noncompliance to oral care guidelines is decreased when there are set guidelines in place at hospitals (Kiyoshi-Teo & Blegen, 2015).

Interventions

Oral care interventions that are proven beneficial by evidenced based practice must be understood by the nursing staff in order to increase compliance. When creating a VAP bundle intended to decrease incidences of VAP among ICU patients, one study discovered that application of oral chlorhexidine, an oral antiseptic, had a strong impact on reducing VAP rates whereas the use of oral antibiotics did not have the same effect (Sedwick et al., 2012). This study also found that patients with more dental plaque were at higher risk for developing VAP.

During examination of institutional guideline influences on oral hygiene, it was found that oral swabbing is the most common oral care practice used by critical care nurses (Kiyoshi-Teo & Blegen, 2015). Although oral swabbing is the most common practice used, tooth brushing has been found to be most effective but is performed less often. This study investigated nursing compliance in practices that adhere to the recommendations of the American Association of Critical-Care Nurses (AACN) regarding proper oral care practices, which are as follows: “(1) brush teeth, gums and tongue at least twice a day using a soft pediatric or adult toothbrush; (2) provide oral moisture to oral mucosa and lips every 2 to 4 hours; and (3) use an oral chlorhexidine gluconate (0.12%) rinse twice a day during the perioperative period for adult patients who undergo cardiac surgery” (Kiyoshi-Teo & Blegen, 2015, p.310). Taking the AACN’s recommendations under consideration, the authors created a model of interventions that should be followed for patients undergoing mechanical

ventilation in order to prevent VAP. These recommendations include an oral cavity assessment, use of an oral swab to swab the oral cavity, tooth brushing, suctioning, oral rinsing and providing moisture to the oral mucosa (Kiyoshi-Teo & Blegen, 2015). Nurses should accommodate their direct patient care routines to comply with these recommendations to decrease VAP incidence rates in the critical care setting.

Another research study investigated in this review sought to determine the best oral care practices to protect intubated patients from acquiring VAP. The researchers in this study took the AACN's recommendations into account and used them as a model to compare to the oral hygiene interventions that are being used in practice for intubated patients in the ICU (Feider, Mitchell & Bridges, 2010). The study concluded that the most common policies for patients receiving mechanical ventilation advise the following interventions: using a toothbrush every 12 hours with toothpaste, swabbing the oral cavity with a foam swab every 2 to 4 hours, using toothpaste with a swab every 4 to 12 hours, suctioning the oral cavity every 2 hours, and assessment of the oral cavity every 4 hours (Feider, Mitchell & Bridges, 2010, p. 179). While the AACN has provided recommendations for oral care, these recommendations are not specifically for intubated patients therefore further interventions should be researched to increase the effectiveness of VAP prevention.

Discussion

This systematic review of literature evaluated six articles that researched the correlation between implementation of oral care guidelines and reduction of

VAP rates in the ICU. The review of literature also investigated recommended interventions that are used in critical care settings to prevent VAP. Among the most common interventions were the use of oral chlorhexidine, use of foam swabs to swab the oral cavity, tooth brushing with toothpaste, oral suctioning, providing moisture to the oral mucosa, oral rinsing and oral cavity assessments (Kiyoshi-Teo & Blegen, 2015). While these interventions are significant and directly related to reducing incidences of VAP, it is essential that nurses comply with hospital protocols for VAP rates to decrease.

The review of literature identified that a substantial factor related to oral care and VAP prevention is nursing compliance to oral care guidelines. It was found that nursing compliance rates increase in the ICU when there is an oral care protocol in place at the facility (Kiyoshi-Teo & Blegen, 2015). Nursing protocols can be implemented in the form of order sets, informational bulletins and nursing policies. Nursing compliance rates can decline due to a variety of factors including knowledge deficits related to VAP, lack of resources, disagreement with the recommendations in place, concern for patients and disbelief of the effectiveness of the practices (Kiyoshi-Teo & Blegen, 2015). If further research is done and nurses are provided with evidence-based resources about the impact of oral care on VAP prevention to reflect on, then nursing compliance rates with oral care would likely increase and VAP incidences would decrease.

Nursing Implications

Critical care nurses play an important role in decreasing VAP incidences because nurses are the ones providing direct care to intubated patients in the ICU.

Nurses are the health care professionals who must enforce VAP prevention protocols by integrating recommended practices into patient care. “Oral hygiene is a nursing intervention that may decrease VAP incidence rates” (Feider, Mitchell & Bridges, 2010, p.179). It is essential to have oral care guidelines in place for nurses in efforts to reduce VAP rates altogether.

Limitations

It is important to note that this systematic review of literature investigated only oral care practices as a preventative measure of VAP and did not look at other preventative methods for this disease process. Some of the studies that were analyzed for this systematic review of literature researched the use of multiple VAP prevention techniques, not solely oral care practices. The outcomes may have been different in some of the reviewed research articles if each intervention was investigated individually, rather than examining protocols and their interventions altogether.

Conclusion

Ventilator-associated pneumonia is a serious condition that can be severely detrimental to a patient’s health status if acquired, but it is also preventable. Critical care nurses are the direct caregivers for patients in the ICU and it is important for nurses to be made aware of the benefits of complying with adequate oral care practices to decrease incidences of VAP.

The systematic review of literature investigated the relevance of implementing oral care guidelines into nursing practice as well as specific interventions recommended for VAP prevention. Institutional oral care protocols

were found to increase nursing compliance in providing adequate oral care to intubated patients in critical care areas and are believed to decrease the incidences of VAP in the ICU.

Although research in VAP prevention is expanding and there are some general protocols in place, further examination is recommended because concrete oral care guidelines specifically for intubated patients have yet to be developed. Additional research is also needed to increase nursing compliance with oral care recommendations for intubated patients. Further research can positively impact nursing compliance by providing reliable information for critical care nurses to examine as well as demonstrating valuable evidence that displays the effectiveness of such practices. ICU nurses may become more inclined to implement proper oral hygiene for mechanically ventilated patients if further research suggesting its effectiveness is investigated.

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Appendix

Citation Author(s)/ Year	Design	Theoretical Foundations	Target Population, Sample Size, Location	Type Intervention	Outcomes/ Aims	Results	Limitations	Nursing Implications/Gaps
Arroliga, A. C., Pollard, C. L., Wilde, C. D., Pellizzari, S. J., Chebbo, A., Song, J., et al. (2012). Reduction in the incidence of ventilator-associated pneumonia: A multidisciplinary approach. <i>Respiratory Care, 57</i> (5), 688-696	quantitative	This research consists of a cohort study following implementation of a VAP bundle protocol.	636-bed teaching hospital in central Texas. All patients who were mechanically ventilated from 1/1/2008 and 12/31/2009 in any of the adult ICUs at this hospital were studied. There are 55 adult ICU beds total.	This cohort study looked at all patients that were mechanically ventilated in any of this hospital's adult ICUs from 1/1/2008 to 12/31/2009 after implementing the new VAP bundle. The incidences of VAP were reported before and after implementation of the bundle.	With the implemented VAP bundle the incidences of VAP decreased.	-In 2008 (before implementing the bundle) the incidences of VAP were 4.31/1,000 ventilator days -In 2009 (after implementing the bundle) the incidences of VAP decreased to 1.2/1,000 ventilator days	-Study was done only at one hospital -The process was changed during the study, the respiratory therapists became responsible for oral care rather than the nurses.	-This study is significant to show that VAP prevention measures should be taken and are effective.
Feider, L. L., Mitchell, P., & Bridges, E. (2010). Oral care practices for orally intubated critically ill adults. <i>American Journal of Critical Care, 19</i> (2), 175-183.	quantitative	This study was done to compare oral care practices commonly used by nurses and the recommendations provided by the American Association of Critical Care Nurses (AACN)	347 randomly chosen critical care nurses who are also members of the AACN.	Cross sectional study and a web survey were used for critical care nurses to identify and describe oral care practices.	The study found that oral care policies are in place but not well adhered to.	-50% of nurses performed oral care every 2 hours -42% of nurses did oral care q4 hours -47% thought oral care was a high priority -Nurses with bachelor degrees did oral care more than other nurses -90% used foam swabs -72% used tooth brushes -84% suctioned during oral care -49% used oral chlorhexidine	-the survey response rate was low at 17%, compared to other surveys conducted within AACN members -Responding nurses may have had more interest in oral care than those who did not respond	Understanding nursing adherence rates to policies are important to recognize in order to encourage participation in the best possible way.
Garcia, R., Jendresky, L., Colbert, L., Bailey, A., Zaman, M., & Majumder, M. (2009). Reducing ventilator-associated pneumonia through advanced oral-dental care: A 48-month study. <i>American Journal of Critical Care, 18</i> (6), 523-532.	quantitative	This study was conducted to determine how using a comprehensive oral care guideline impacts the incidences of VAP	Adult patients receiving mechanical ventilation for over 48 hours in the 10-bed medical ICU at Brookdale University Hospital and	-Flow sheets were used to determine the compliance of the nurses on following the implemented oral care guidelines. -statistical analysis to measure the effectiveness of the protocol	The study found that using advanced oral care tools, adequate staff compliance and a comprehensive oral care protocol	-Staff compliance was >80% -The VAP rate was 12.0/1,000 ventilator days before intervention and decreased to 8.0/1,000 ventilator days post intervention	-The study was limited to one hospital – Brookdale University Hospital and Medical Center -The study was limited to a 10 – bed medical ICU which excludes other critical care specialties -Flowsheets could have not been accurate	Nurses should be able to look at this study as an evidenced based practice tool and adapt their care practices accordingly. This study shows that following a comprehensive oral care guideline does in fact decrease VAP

			Medical Center.	over the length of the study period which was from 1/1/2003 to 12/31/2004 and then the confirmatory period which was from 1/1/2005 to 12/31/2005.	significantly decreases incidences of VAP.			rates for mechanically ventilated patients.
Kiyoshi-Teo, & Blegen, M. (2015). Influence of institutional guidelines on oral hygiene practices in intensive care units. <i>American Journal of Critical Care</i> , 24(4), 309-317.	qualitative	The purpose of the study was to see how institutional guidelines on oral hygiene influence nursing compliance and practice and how these practices relate to VAP prevention.	576 critical care nurses from 8 different hospitals in northern California were studied. These nurses represented 1 academic, 3 public and 4 private nonprofit hospitals as well as 18 ICUs altogether.	A 21-question survey exploring oral hygiene practices used as well as nursing perceptions on the given practices was given between June 2010 and April 2011.	The study found that institutional implemented guidelines related to oral hygiene practices do impact the oral hygiene practices provided by nurses.	-Nursing awareness, priority level and adherence were found to be higher when specific order sets were present -Nurses provided oral care and oral assessments more often when institutional guidelines were in place.	-The location was localized to northern California -Only 8 hospitals in close proximity to each other were studied	Understanding that specific nursing care practices may increase with implementation of institutional guidelines is important for hospitals to be aware of. The quality of nursing care could potentially increase in certain areas if those areas are recognized with institutional protocols.
Oshodi, T. O., & Bench, S. (2013). Ventilator-associated pneumonia, liver disease and oral chlorhexidine. <i>British Journal of Nursing</i> , 22(13), 751-758.	qualitative	The purpose of this was to determine if the use of oral chlorhexidine solution is helpful to use for intubated patients who also have been diagnosed with liver dysfunction.	The target population is patients in the intensive care unit undergoing mechanical ventilation who also suffer from liver dysfunction.	A systematic review of the literature was done to evaluate the effectiveness of oral chlorhexidine in the target population.	The review of literature found that further research is needed because they did not find any research studies that evaluated intubated patients who specifically had liver dysfunction.	The review of literature did not find any information regarding oral chlorhexidine use in intubated patients who also suffered from liver dysfunction. They found that oral care is beneficial to reduce incidences of VAP in intubated patients altogether.	There were no studies found that evaluated the effectiveness of oral chlorhexidine in intubated patients with liver dysfunction.	Further research is needed to determine if this practice is beneficial for the patient population with liver dysfunction. Understanding this might affect nursing oral care interventions with these types of patients.

<p>Sedwick, M. B., Lance-Smith, M., Reeder, S. J., & Nardi, J. (2012). Using evidence-based practice to prevent ventilator-associated pneumonia. <i>Critical Care Nurse</i>, 32(4), 41-51.</p>	<p>quantitative</p>	<p>This study was focused on developing strategies to reduce the rate of ventilator-associated pneumonia (VAP) in intensive care units (ICU).</p>	<p>The target population is mechanically ventilated patients and ICU nurses.</p>	<p>Compliance audits were used to assess if the Institute of Healthcare Improvement's ventilator bundle protocol was effective.</p>	<p>Strictly following VAP prevention guidelines will drastically improve patient outcomes.</p>	<p>The results were directly related to compliance in preventative areas. For example, the oral care protocol never reached full compliance. Rates of VAP decreased from 9.47 to 1.9 cases per 1000 ventilator days in this study due to adhering to VAP prevention practices.</p>	<p>The compliance audits done in this study were only performed at one hospital, Lankenau Hospital, in Pennsylvania.</p>	<p>The use of evidence based practices is important for nurses to know and adhere to when preventing VAP, as well as with many other diseases. If nurses are unaware of current and up to date practices, the nursing field cannot evolve and patients wouldn't be getting quality and safe care. Developing strategies to reduce VAP is significant in ICUs everywhere.</p>
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