

Ventilator-Associated Pneumonia Prevention

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Abstract

Ventilator-Associated Pneumonia is a common form of hospital acquired pneumonia associated with mechanically ventilated patients. Evidence-based research revealed that some interventions performed by the health care team decrease the occurrence of Ventilator-Associated Pneumonia. Many hospitals have taken the initiative to incorporate universal interventions, but new evidence suggests there are more effective ways to implement traditional interventions to improve patient outcomes. Concepts that will be discussed are: a bundle checklist, identifying at-risk patients, head of bed elevation, oral care, and proper suctioning. Researchers found modifications to traditional interventions to improve patient outcomes.

Keywords: Ventilator Associated Pneumonia, Ventilator Acquired Pneumonia, Prevention, Intervention, Education

Ventilator-Associated Pneumonia (VAP) is defined as the development of pneumonia 48 hours after endotracheal intubation (Villar, Pannuti, Nery, Morillo, Carmona, & Romito, 2016). It is caused by the naturally occurring bacteria in the patient's mouth that travels to the lungs and causes inflammation and fluid accumulation.

Many hospital protocols are implemented with the purpose of diminishing the occurrence of hospital-acquired infections (HAI). A protocol is a grouping of interventions established by a hospital to treat a specific ailment. The interventions in a protocol differ between hospitals because a universal protocol has not been established for VAP by the medical community. In the Intensive Care Unit (ICU), patients are particularly at risk for HAI related to the severity of comorbidities as well as to the trauma that the patient has experienced prior to admission. Ventilated patients are at specific risk related to VAP, which can be fatal.

There are many existing interventions with evidence to support their effectiveness. However, there is new research suggesting tailored interventions to improve patient outcomes. The focus of this paper will be: proper utilization of VAP bundles, at risk patient profiling, proper head of bed elevation monitoring, concentration and frequency of chlorohexidine in oral care, and reinforcement of proper suction technique. The purpose of this article is to promote prevention interventions to decrease VAP.

All articles utilized were from the Cumulative Index to Nursing and Allied Health database. All articles were published within the last five years and are peer reviewed. A 2015 datasheet from the CDC was also utilized for the purpose of this paper.

Statistics

VAP is the second most common HAI and the most common infection in ventilated patients (Villar et al., 2016). As a result of VAP, length of stay in the ICU extends by 5 to 7 days and hospital stay extends another 2 to 3 days (Gianakis, McNett, Belle, Moran, & Grimm, 2015). The cost of treatment ranges from nine thousand to forty thousand dollars per patient per stay (Gianakis et al., 2015). It has been proposed by government officials that VAP be considered for non-reimbursement for Medicare and Medicaid, meaning that the hospitals would pay for treatment (Mietto, Pincioli, Patel, & Berra, 2013). While this presents incentives to hospitals to improve and implement current VAP protocols, it may affect the ability of hospitals to make improvements related to loss of finances. Of the patients that contract VAP, the mortality rate is reported to be

33% to 50% (Villar et al., 2016). With this high mortality rate, the best treatment for positive patient outcomes is prevention.

Background

Bundle Checklist

Checklists are a helpful way to effectively and efficiently complete tasks. A study was conducted on the implementation of a checklist to determine if it assisted the healthcare team in completion of all VAP interventions (Reper, Dicker, Damas, Huyghens, & Haeiterman, 2017). The clinical care educator discussed VAP bundle compliance and checklists with intensive care nurses. The checklist included head of bed elevation, oral care, daily sedation vacation, readiness to wean assessment, and endotracheal cuff pressure measurement. Nurses were required to complete the checklist in the morning, afternoon, and evening. The adherence to the VAP bundle increased from 61% to 74% because of the education intervention (Reper et al., 2017). This exemplifies the impact continued nursing education can have on increasing adherence to an already established protocol.

At Risk Patients Profiling

A risk profile for patients on ventilators to assist with monitoring for VAP is necessary in the ICU. Risk factors for VAP have been identified as age, number of ventilator days, and traumatic brain injuries. For every decrease of ten years of age, the chances of VAP double. For every five additional days on the ventilator, chances of VAP increased by one and a half times (Grinakis et al., 2015). Though not as significant, it was noted that ventilated patients with traumatic brain injuries are at a slightly higher risk compared to patients without head injuries. Systematically identifying at-risk patients could help the health care team recognize the importance of VAP interventions more for that specific patient, making them more conscientious about performing their duties.

Head of Bed Elevation

The head of the bed elevation for all ventilated patients should be at a 30 degree angle to prevent VAP. It is important to keep the bed at precisely 30 degrees because previous research demonstrated that lower head of bed elevation caused higher rates of VAP and higher head of bed elevation puts the patient at risk for unintentional inhalation of oral fluids into the lungs (Wolken, Woodruff, Smith, Albert, Douglas, 2012). A study revealed that bed angle monitoring devices increase adherence to proper head of bed elevation. The researchers developed an electronic monitoring system with visual displays of the actual head of bed elevation angle and coinciding audio alarms, which lead to an increase in adherence from 61% to 76% in adherence to head of bed angle (Wolken et al., 2012).

Oral Care

Oral care is a hygienic practice in VAP prevention that consists of teeth brushing and the use of chlorohexidine to rinse the mouth. It prevents the bad bacteria in the mouth from colonizing and removes accumulated secretions in the mouth, decreasing the risk of colonization of harmful bacteria in the lungs. A systemic review was conducted to analyze the research available about the effectiveness of the concentration and frequency of chlorohexidine use in oral care (Villar et al., 2016). The study found that a 2% concentration of chlorohexidine implemented four times daily was most effective in the prevention of VAP. However, the results are somewhat controversial as it is unclear whether a concentration of chlorohexidine this potent could cause damage to the mucosa of the teeth and gums over a long period of time (Villar et al., 2016).

Suctioning

Intermittent suctioning is important for ventilated patients because the amount of sedation the patients are given to stay comfortable makes it difficult for the patient to clear their own secretions. This can cause a potential for pneumonia if secretions seep into the lungs. A study was

conducted to determine the adherence to the suctioning protocol before and after health care team education was provided for suctioning (Seema, Pity, & Kiran, 2017). The study revealed a significant difference in performance in many of the steps of the suctioning protocol from pre- to post-education intervention. Steps within the protocol that improved post-education intervention were: need to suction, procedure explanation to patient, hand washing, baseline vital check, pre-oxygenation to 100%, sterile assembly of suction equipment, catheter withdrawn in spiral motion, one minute between suction, sterile technique, documentation, and placement of an extra sterile catheter within reach (Seema et al., 2017). The implementation of additional training and education lead to improved quality of the suction protocol. In addition, there was a positive increase in patient outcomes and a decrease in VAP occurrence (Seema et al., 2017).

Discussion

Given all of the information from the studies concerning different approaches to improve traditional interventions, recommendations will be provided to improve patient outcomes. Many recommendations will require creation and implementation of new tools, education, and further research.

Creation and implementation of a screening identification tool can indicate who is at a low, moderate, or high risk for the development of VAP. Further research is recommended to determine if it is appropriate to implement more aggressive interventions for patients that are at a greater level of risk and less aggressive interventions for patients at a lower level of risk. This could potentially conserve hospital materials and allow nurses to be more time-efficient with care. The level of risk would also influence care by emphasizing the importance of implementation of VAP prevention interventions.

Implementation of a head of bed elevation monitoring system with alarms or a system adjacent to the mentioned system's capabilities is recommended on all VAP patient beds to increase adherence to proper elevation. Although this is intended for VAP patients in the ICU, there are several floors that would also benefit from this monitoring system, representing a valuable asset to all specialties. The use of these monitoring devices should also be included in protocol for ventilated patients to provide consistency of care to patients.

The oral chlorhexidine regimen of using 2% chlorhexidine four times a day, however effective, raises concerns about mucosal breakdown. More studies need to be conducted to determine if a safer concentration or frequency parameter is possible while maintaining effectiveness. Chlorohexidine is only commercially available in certain concentrations. However, if the healthcare team were to convene with pharmaceutical companies to produce multiple chlorohexidine concentrations in increments of .02% from 1% to 2%, this would allow the healthcare team to conduct a study in which the concentrations and frequency could be analyzed in terms of effectiveness and safety in long-term use.

Suction education for the health care team can improve VAP prevention outcomes. The author would like to note that when education was provided to the health care team about any type of intervention, it improved the performance and adherence to that intervention, thereby positively influencing patient outcomes. Not all educational interventions that were reviewed by the author were provided in this paper because of redundancy.

The use of checklists can increase consistent adherence to implementation of VAP interventions. The Institute of Healthcare Improvement devised a VAP bundle consisting of head of bed elevation, oral care with chlorhexidine, stress ulcer prophylaxis, deep venous thrombosis prophylaxis, sedation vacation, and breathing trials (Mietto et al., 2013). When compared to the checklist provided by Reper et al., obvious variations exist (2017). This demonstrates that though a "universal" bundle provided by the Institute of Healthcare Improvement has been established,

deviations still exist. It is recommended that hospitals review their bundle policies and collaborate across the medical community to create a universal standard for VAP prevention. Every couple of years, new research should be taken into consideration and the universal bundle should reflect best practice.

The CDC compiled data for HAI in acute care facilities in the 2015 National CDC Report. Of all hospital reported events, ventilator-associated events were reported by the fewest number of hospitals (“Acute Care Hospitals- 2015 HAI Data Report National Factsheet,” 2017). Therefore, data may be inaccurate due to under-reporting, meaning there is a potentially higher occurrence than has been reported to the CDC. A barrier to under-reporting might be the lower compensation to agencies for higher HAI occurrences. It is recommended that incentive programs are implemented to encourage accurate reporting of ventilator-associated events.

Other interventions were researched for the purpose of this paper. Ulcer prophylaxis and DVT prophylaxis, important as they are to patient outcomes, were not included in this paper because these interventions are universal to bed-ridden patients and are not VAP prevention specific. Topics such as open vs. closed suction systems, sedation vacation, and endotracheal tube type were found, but research was limited or did not demonstrate significant differences in patient outcomes. Because of this limit to some of the research concerning VAP prevention interventions, a gap in knowledge exists. Further research is needed close this knowledge gap.

Conclusion

Care in the ICU evolves, creating the necessity to analyze new research. Recommendations for the continual progression of enhancing and improving VAP prevention interventions are as follows: collaborating across the medical field to enhance the universal VAP bundle, creating a VAP at risk screening tool based on risk factors, implementing a HOBE monitoring system, performing more research about chlorhexidine use in oral care, providing a staff education intervention to review suctioning protocols, creating incentivized programs for VAP reporting, and conducting more research on interventions used for VAP. Implementing any of these suggestions can decrease the incidence of VAP, saving more lives.

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