



## Critical Care Provider's Practices for Prevention of Ventilator Associated Pneumonia

### KEYWORDS

Ventilator Associated Pneumonia, preventive practices, Critical care providers, Intensive Care Unit

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**ABSTRACT** Ventilator-associated pneumonia (VAP) is the common nosocomial infection in critically ill patients. Practice of certain interventions can reduce the risk of development of VAP in mechanically ventilated patients. The aim of the study was to assess the practices of critical care providers, to prevent VAP in mechanically ventilated patients of Intensive Care Units (ICU's). The study adopted event sampling, involved 100 observations of 10 preventive practices of VAP. Data were collected from five ICU's of the tertiary care hospital. VAP Preventive Practices were been observed using an observational checklist. The result showed that most of the VAP prevention practices were been followed by the critical care providers such as elevation of head end of bed, changing ventilator circuits for every patients and use of new suction tube for each suctioning and following asepsis during the procedure. The preventive practice of VAP was favorable. The study concluded that there is a need of evidence based practice protocol for prevention of VAP in the ICU's.

### Introduction

Ventilator associated pneumonia (VAP) is a type of pneumonia occurring in a mechanically ventilated patient after 48 hours of intubation. It is one of the leading cause of death among hospital associated infections (Kalanuria, Zai, & Mirsk, 2014). As critically ill patients need longer stay in ICU, mechanical ventilation for longer duration of time, increased use of antibiotics and increasing cost of health care, strategies for prevention of VAP should be given a high priority. Intubation and mechanical ventilation allows direct entry of bacteria into the lower respiratory tract, which increases the risk of pulmonary infection. Bacterial colonization in the respiratory tract is further facilitated by the absence of the cough reflex and excessive mucus secretion in the mechanically ventilated patients. Infections are also easily transmitted by healthcare personnel due to poor hand hygiene (Alp & Voss, 2006) ( Craven & Hjalmarson, 2010).

Routine critical care nursing interventions have been shown to reduce the incidence of VAP ( Ricart, Lorente, Diaz, Kollef, & Rello, 2003). Prevention of VAP focuses on decreasing the risk of aspiration, preventing the entry and colonization of pathogens in the respiratory tract, meticulous hand hygiene and infection control. (Alp & Voss, 2006 ) Best practice and preventive measures are important aspects of intensive care for patients who receive mechanical ventilation. Gaps exist between what is expected of healthcare workers to be practiced and what actual care patients receive.

### Materials and methods:

A cross sectional study was conducted in five Intensive Care Units of Kasturba Hospital, Manipal. The observation checklist consisted ten items on preventive practices of VAP such as head end elevation, hand hygiene, oral care frequency and chlorhexidine use, endotracheal suctioning frequency and asepsis, change of suction catheters

and ventilator circuits, and patient positioning. Inter-rater reliability was used to establish the reliability of practice checklist( $r = 0.79$ ). Study adopted event sampling technique, where 100 observations of ten preventive practices were been observed among the critical care providers, in one month duration. Critical care providers included were; nurses, respiratory therapists and physiotherapists providing care in medical and surgical intensive care units. Events based on the checklist were selected, a single event at a time was observed with concealed observation. If one followed the preventive practices scored one and zero if not followed. The findings from the observations are described in frequency and percentage of practices. Ethical clearance was obtained from the institutional ethical committee and hospital infection control committee.

### Results

The demographic characteristics showed that 71% of the critical care providers were females and 29% were male, Majority (81%) of them were nurses, and also few of them were physiotherapist(8%) and respiratory Therapists(11%) . The educational qualification of them was Diploma (51%) as well as graduates (49%) in the respective profession. Majority (62%) of them had less than two years of work experience in the intensive care units and few of them (38%) had worked more than 2 years.

The description of the preventive practices of VAP is given in table 1.

### Discussion:

Healthcare-associated infections (HAIs) are related with 5% to 35% of mortality rates and hence are a major threat to patient safety. HAI's are commonly caused by invasive medical devices and poor staff adherence to infection prevention practices. VAP is one of the most common infections occurring in patients receiving mechanical ventilation for a prolonged period, typically 48 to 72 hours after en-

otracheal intubation (Augustyn , 2007). Early-onset VAP occurs 48 to 96 hours after intubation and late-onset is commonly seen 96 hours after intubation (Pieracci & Barie , 2007). VAP is attributable to 20% to 50% of deaths in patients on mechanical ventilation; the mortality rate can be up to 70% in patients with multi-resistant infections (Rea-Neto , Youssef , Tuche , Brunkhorst , Ranieri, & Reinhart , 2008).

If aseptic techniques are not followed during endotracheal suctioning it may lead to VAP. Suctioning can be performed with an open or with a closed system. Results from 16 clinical trials showed that suctioning with either closed or open tracheal suction systems did not have an effect on the risk of VAP or mortality. ( Subirana, Sola, & Benito, 2007)

In the present study we found that practice of using chlorhexidine for oral care was 91%. Systematic review published by Cochrane library on effect of oral hygiene care on preventing VAP in mechanically ventilated patient's found that chlorhexidine mouthwash or gel is associated with a 40% reduction in the odds of developing VAP in critically ill adults. The review included thirty five randomized controlled trials with different interventions like mouth rinse, swab, toothbrush or combination for oral care. (Shi, et al., 2013).

A study conducted to describe the impact of a VAP prevention protocol on VAP in intensive care units showed that the percentage of mechanically ventilated ICU patients who developed VAP decreased 68% during the study period. Implementation of protocol was done by using a module to educate staff on ventilator care, aspiration prevention measures, and specific oral care interventions . Results suggested there is a significant relationship between head of bed elevation and VAP rate ( $p = 0.0001$ ). The combined interventions of head of bed elevation, toothbrushing, subglottic suctioning and checking the ETT cuff pressures was nearly significant ( $p = 0.07$ ) explaining 46.28% of the variance in VAP rates for the study period ( Shay & O'Malley, 2006)

In order to reduce or eliminate VAP, the Centers for Disease Control and Prevention and national guideline clearinghouse have designed VAP bundles and guidelines. Adherence to these bundles and guidelines will help in reducing the rate of VAP in mechanically ventilated patients. Some of the interventions include meticulous hand hygiene, head end elevation to 30 – 45 degrees, oral care with 2% Chlorhexidine, endotracheal tube cuff pressure maintained at m 20-25 cm H<sub>2</sub>O, new ventilator circuits and filters for every patient. (CDC, 2006) (NGC, 2011)

In a survey study conducted among Twelve hundred nurses, Most (82%) reported compliance with hand-washing guidelines, 75% reported wearing gloves, 50% reported elevating the head of the bed, 25% reported performing subglottic suctioning, and 50% reported having an oral care protocol in their hospital .It was found that guidelines for the prevention VAP from the Centers for Disease Control and Prevention are not consistently or uniformly implemented. (Cason, Tyner, Saunders, & Broome, 2007)

In this study, majority (100%) practiced the head end elevation and 91% were using chlorhexidine solution for oral care and 83% were practicing proper hand washing before doing any procedure. A survey study was conducted in Indian subcontinent to assess the implementation of

selected VAP prevention strategies , which revealed that majority (96.8%) reported using VAP bundles with a high proportion including head elevation (98.4%), chlorhexidine mouth care 83.3%), and hand washing (97.6%) as part of their VAP bundle. (Juneja, Singh, Javeri, Arora, Dang, & Kaushal, 2011)

The present study found that oral care was given every 24 hourly but according to CDC guidelines (2006), the minimum frequency of oral care on ventilated patient is 12 hours. A study investigated the current nursing practice for prevention of VAP in ICUs. A total of 30% participants reported carrying out oral suctioning every 8 to 12 hours, With regard to endotracheal tube and suctioning, most participants (98.0%, 81.3%, and 98.7% respectively) reported using oral intubation route, daily changing of suction system, and using open suction system. A total of 62.0% reported changing the ventilator circuits every new patient 26% change it only when clinically indicated. Maintains head of bed elevated at 30 - 45 degree – 59% (Kandeel & Tantawy, 2012)

It is found that the evidence-based practice education intervention decreased VAP rates by 62.5%. Significant reductions in VAP rates may be achieved through improved education and implementation of oral care protocols. (Zurmehly , 2013) . Hence preventive practices of VAP should be rigorously followed by the critical care providers in order to have better patient outcome.

**Table 1: Preventive practice of VAP**

Preventive Practices of VAP	Practiced		Not practiced	
	Frequency	%	Frequency	%
Head end of the bed elevated (30 – 45 degree).	100	100	-	-
Hand wash before every procedure.	83	83	17	17
Oral care given every 12 hours	0	0	100	100
Chlorhexidine solution used for oral care.	91	91	9	9
Endotracheal suctioning done 4 hourly	67	67	33	33
Used new suction catheter for each suctioning	100	100	0	0
Used sterile techniques during endotracheal suctioning	83	83	17	17
Changed the patient position every 2 – 4 hours	80	80	20	20
Aspirated nasogastric content before each feed for residual volume	80	80	20	20
Used new ventilator circuit for each patient	100	100	-	-

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