

Ventilator Associated Pneumonia and Hand Hygiene Compliance in Trauma Intensive Care Units

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Abstract

Introduction: Prevention of ventilator associated pneumonia in critically ill patients is very important and one of the most determinants in this way is hand hygiene compliance. Nurses who take care of the patient and staff who are in contact with the patient for any reason should be aware of the importance and methods of ventilator associated pneumonia and have been trained in this field. In this study, we investigated the knowledge of intensive care units staff about prevention methods of ventilator associated pneumonia. We also evaluated the hand hygiene compliance as one of the most important preventive factors.

Materials and Methods: We designed a descriptive study in which, the nursing staff knowledge verified by a reliable and valid questionnaire. We used observational method to check the hand hygiene compliance using a standard checklist prepared by the center for disease control (CDC).

Results: The rate of hand hygiene compliance among the staff was $48.4 \pm 5\%$. Knowledge assessment of nursing staff regarding prevention methods of ventilator associated pneumonia, revealed that their mean acquired score was 6.1 ± 1.67 of 10.

Conclusion: In spite of the training and emphasis placed on hand hygiene in our intensive care units, there is a need for more supervision in this area for more compliance. Nursing staff awareness about prevention methods of ventilator associated pneumonia is not desirable, and we need more training in this field.

Keywords: Intensive Care Unit; Ventilator Associated Pneumonia; Hand Hygiene; Training; Personnel Awareness

Introduction

Critically ill patients may undergo mechanical ventilation as a basic treatment. This process sometimes involve ventilator-associated events (VAE). In order to observe VAE with increased objectivity, measurability, reliability, effectiveness, and comparability, some definitions were presented by the Center for disease control and prevention (CDC) [1,2].

When the patient's respiratory status becomes worse after a two-day period of stability or partial recovery, ventilator-associated conditions (VAC) have occurred; If the VAC is along with the evidence of infection including fever or leukocytosis and prescription of a new antibiotic drug, infection-related ventilator-associated complication (IVAC) have occurred; Ultimately, ventilator-associated pneumonia (VAP) is a type of pneumonia developed in intubated patients, which underwent mechanical ventilation for at least 48 hours, before presentation of pneumonia [1].

The organism which mostly causes VAP is multi-drug resistance (MDR) gram-negative bacilli, gram positives and Candida [3,4].

If these complications occurred during mechanical ventilation, there may be some consequences such as longer ICU stay, increased hospital costs and prolonged mechanical ventilation.

There are some prevention strategies regarding VAP, which is called VAP bundle: the use of noninvasive ventilation if possible, minimal sedation during mechanical ventilation, daily assessment to see if the patients are ready for extubation using spontaneous breath trials without using sedatives, assisting for early mobility, use of endotracheal tubes with subglottic secretions drainage port (EVAC tube) for patients who need mechanical ventilation for more than 48 to 72 hours, 30-45 degrees head of bed elevation, change of ventilator circuit only if there are visible contamination or tubes malfunction, selective oral or digestive tract decontamination using local and oral antibiotics, probiotics prescription, tooth brushing, chlorhexidine mouthwash, special endotracheal tube cuff materials (polyurethane), control of endotracheal tube cuff pressure, and hand hygiene compliance [5].

Nseir, *et al.* revealed that, the continuous control of tracheal cuff pressure prevent against microaspiration and pneumonia [6]. Steven, *et al.* [7] and Doyle, *et al.* [8] presented commercially available endotracheal tubes used for prevention of VAP. Hudson, *et al.* [9], Damas, *et al.* [10], Wang, *et al.* [11], Frost, *et al.* [12], Dezfulian, *et al.* [13], Juneja, *et al.* [14], Masjedi, *et al.* [15] and Williams, *et al.* [16], discussed about the impact of subglottic suctioning on the incidence of ventilator associated pneumonia, and its positive effects.

Accumulation and micro-aspiration of oropharyngeal secretions at the top of the endotracheal tube cuff, in the subglottic region, is known as a key factor in the development of VAP [6]. In order to prevent micro-aspiration, some endotracheal tubes with a special port for drainage of subglottic secretions using medical suctions or a simple syringe, are commercially available, named EVAC Tubes [7,8,15].

Intensive care units staff, have a prominent role in prevention of ventilator associated pneumonia because of their close contact with patients. Yeganeh, *et al.* [17], Al-Sayaghi [18], Safdari, *et al.* [19] and Blot, *et al.* [20] presented some knowledge surveys among intensive care nurses.

In this study, we investigated the knowledge of intensive care units staff about prevention methods of ventilator associated pneumonia. We also evaluate the hand hygiene compliance as one of the most important preventive factors.

Methods

This study was performed in a tertiary referral teaching hospital with six intensive care units, include 54 intensive care beds, designed for trauma patients.

We designed a descriptive study in which, The staff awareness of ventilator-associated pneumonia and its prevention were evaluated based on a questionnaire which previously its validity and reliability, have been proved in our country by Yeganeh, *et al.* [17].

This questionnaire, consists 10 questions about performing nasal intubation compared to oral intubation, standard frequency of ventilator corrugate tubes change, the use of heat moist exchanger (HME) filters as humidifier during mechanical ventilation, standard frequency of HME change, frequency of replace the tubing of the suction system, endotracheal tubes designed for suctioning of subglottic discharge and its effect on ventilator-associated pneumonia, effect of rotating beds on ventilator-associated pneumonia in comparison with standard beds, the effect of patient positioning on risk reduction of ventilator-associated pneumonia and the best mouthwash recommended to reduce the risk of ventilator-associated pneumonia.

We used observational method to check the hand hygiene compliance using a standard checklist from the center for disease control (CDC) available online on its web site. This observation done by an expert nurse in a subtle way using a printed check list.

Data were analyzed using IBM SPSS software 23; Q-square and Mann-Whitney U test was used to compare variables between the two groups.

Results

In assessing the knowledge of caregivers regarding prevention methods of ventilator associated pneumonia, their mean acquired score was 6.1 ± 1.67 of 10.

We asked them about the preference of orotracheal than nasotracheal intubation, 51.76% of staff opinion was correct. We asked them about the frequency of replacement of corrugated tubes connected to ventilator; 56.47% of answers was correct. We asked them about the best humidifier of respiratory gases and its frequency of replacement, 70.59% and 40% of staff opinion was correct, respectively. We asked them about the comparison of open and close suctioning, 44.71% of answers was correct. We asked them about the frequency of suction tubes replacement, 52.94% of answers was correct. We asked them about the impact of EVAC tubes on ventilator associated pneumonia, 67.06% of staff opinion was correct. The correct opinions are 57.65%, 82.35% and 84.71% about the effect of rotating intensive care unit beds, best patient position and recommended mouth wash, respectively.

Doctors, nurses, nurse assistances, radiology technicians, physiotherapists and service personnel gained a mean score of 7.5 ± 2.12 , 6.32 ± 1.57 , 5.37 ± 1.85 , 6.5 ± 2.12 , 6.5 ± 2.12 and 4.9 ± 2.28 of 10, respectively.

The analysis of hand hygiene surveillance revealed that, among 178 person enrolled in our study (all care givers), the overall hand hygiene compliance among intensive caregivers was 48.3%. Adequate technique done by 47.2% of them. Hand hygiene compliance by nurses, doctors, nurse assistances and patient relatives, was 47%, 21.43%, 41% and 77.27%, respectively.

Hand hygiene was done using water and soap in 30.23% of cases and alcohol base hand rubs in 69.77% of cases. Both method used by 1.25% of them (hand washing then alcohol rubbing). 76.92% of caregivers used towel after hand washing with water and soap.

Hand hygiene compliance during morning, evening and night shifts, was 37.92%, 38.46% and 40%, respectively.

Discussion

According to the results of this study, the knowledge of the personnel was moderate about ventilator associated pneumonia and its prophylactic issues. Doctors had highest, and service personnel had lower information. Two separate studies in 2014, conducted by Al-Sayaghi, *et al.* [18] and Safdari, *et al.* [19], concluded that intensive care nurses' information about prevention of VAP is low, but this study revealed that, the average of our personnel information was acceptable (> 60%). Blot, *et al.* reported that, only 70 percent of nurses in intensive care units are familiar with the suction of the subglottic secretions in order to prevent VAP [20], this result is near to our results (67.06%). Some centers, train the nurses about use of EVAC tubes for subglottic suctioning by conducting research projects in intensive care units [23].

Despite of clinical evidences about the usefulness of hand hygiene compliance for prevention of nosocomial infections, the compliance are low to intermediate in our settings; on the other hand, intensive care givers have a predominant role in prevention of these infections, specially ventilator associated pneumonia; So, the necessity of designing such studies was obvious.

Although hand hygiene compliance prevents nosocomial infections based on clinical evidence, there is a low compliance in order to use this method in the required settings. The role of intensive caregivers in preventing the infections like ventilator-associated pneumonia is very influential.

Training the nurses is in adhere to the highly effective preventive principles as mentioned in Tolentino-de los Reyes., *et al.* study [21], therefore the need to continuing education in this field will be fully felt. Nurses working in intensive care units, receive a lot of training during the Academic training period, as well as receive continuing education courses during their work period. Our study showed, despite the acceptable awareness of personnel, hand hygiene compliance is less than expected; so, seems these educations must be combined with frequent reminders and ongoing surveillance. Hamishehkar., *et al.* reported that the educational programs is essential but it cannot eliminate the need for warnings and surveillances about VAP prevention [22], so reminders and continued surveillances must be added to the education for better results.

The causes of non-compliance in the field of infection control are: inadequate training, lack of essential supplies for controlling the infection (Face mask, gowns, caps, latex sterile gloves) due to financial deficiencies, personal characteristics of personnel, presence of skin allergy in contact with detergent and alcoholic solutions.

Non-nursing personnel, especially nurse assistants and service workers, are very important in this regard; they often do not follow infection control tips in contact with patients due to unawareness, high workload and lack of adequate time to do tasks. In addition to the transmission of infection among patients in the ICU, this issue is leads to some risks, including microbial colonization. It is necessary to train them, providing the infection control related materials and equipment and supervising them during their work [22].

Despite academic training and higher knowledge in the field of infection control, doctors were not regardful in this way. The nurse who is responsible for the intensive care unit, should be able to refrain from physicians contact with the patient, if they don't follow the infection control rules and also should be able to stop the procedures, if sterile field breakdown happened during procedures.

The observation of hand hygiene compliance for infection control, in the morning, afternoon and night working shifts showed that there was no difference in this regard, and these results clearly show that, if everyone bound up himself to infection control rules, this task will be performed in any work shifts.

Our hospitals do not have acceptable rates for the occurrence of nosocomial infection, and the statistics in this area are limited to positive microbial cultures reports, which in most cases do not represent infectious disease, but may be due to microbial colonization. So, some comprehensive studies to determine the true incidence of these infections in intensive care units are underway.

Conclusion

According to the results of our study, despite acceptable awareness of the personnel, hand hygiene compliance is less than expected; so these educations must be combined with frequent reminders and ongoing surveillance.

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Conflict of Interest

The authors report no conflict of interests. The authors alone are responsible for the content and writing of this article.

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