

A Study to Assess the Compliance on Hand Hygiene during Bundle of Care Interventions among Healthcare Professionals Working in ICU of a Tertiary Care Hospital

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ABSTRACT

Background: Imparting quality healthcare to the critically ill patient is associated with competence, compassion, and excellent care by healthcare professionals. It includes the development and widespread application of evidence-based interventions, following guidelines, and protocol-based care on ventilator-associated bundle approach to ensure the delivery of care to prevent ventilator-associated problems.

Materials and methods: Quantitative evaluative approach, pre-experimental research, one group pre- and post-test design by the convenient method of sampling 70 staff nurses were selected. A self-structured compliance checklist was used to collect the data.

Results: The level of compliance with handwashing revealed that all the samples 70 (100) have complied with the handwashing technique during the clean and sterile procedure on the patient in all three shifts and 30 (42.9%) subjects were very good in following the handwashing in the morning compared to evening and night. With regard to inserting the catheter into the ET tube gently by using an aseptic technique to perform endotracheal suctioning, 28 (40%) samples had carried out in all three shifts respectively and 50 (71.4%) were good in adhering in following all the steps. In relation to cuff pressure monitoring, it was carried out by 63 (90%) of the samples and around 43 (61.4%) subjects were found to be good in all the three shifts, respectively.

Conclusion: Healthcare professionals need to adopt the protocols and policies. Implementation appropriately helps in the prevention of ventilator-associated problems, and quality care will be improved.

Keywords: Care bundle, Critically ill patients, Healthcare professionals, Protocol-based care, Ventilator-associated problems.

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HIGHLIGHTS

Ventilator-associated problems endure being potential complications encountered with intubated patients in intensive care units (ICUs). These problems present critical care nurses with the unique challenge to incorporate bundled practices approach to delivery of quality care. The aim of this study is to assess the nursing professionals on selected compliance with ventilator-associated bundle.

INTRODUCTION

The imperative and precise aspect of ICUs is the utilization of advanced technologies such as invasive monitoring and mechanical support for deteriorating organs and systems, particularly the cardiovascular and respiratory system. Endotracheal intubation and tracheostomy are the most frequently performed procedures in ICUs. The presence of endotracheal tube in the respiratory tract is considered as a foremost risk factor for the development of ventilator-associated problems.¹

The process of creating artificial respiration by means of the endotracheal tube would deprive patient of the likelihood of heat, humidification, and purification of the inhaled air which indeed generates more interventions, contributing to the development of healthcare-associated infections such as ventilator-associated problems such as acute respiratory distress syndrome, oxygen toxicity, ventilator-associated pneumonia (VAP), and respiratory failure. Mechanically ventilated patients are more likely to develop pulmonary infection and pneumonia.² During the stay of the

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patient in ICU, nosocomial infections (NIs) constitute an important worldwide health problem with high morbidity and mortality rates as well as economic consequences.^{3,4}

Moreover, critically ill patients have immunological deficiencies because of their illnesses, making them unable to respond to bacterial invasion of the lungs. According to the Centers for Disease Control and Prevention (CDC, 2020), ventilator-associated problems include pulmonary infections, acute respiratory distress syndrome, VAP, which is the type of pneumonia developing 48 hours post-intubation.⁵

Incidence of VAP ranges from 5 to 67%, with the highest rates seen among immunocompromised, surgical, and elderly patients. It is diagnosed by the presence of a number of indicators including, manifestations of pulmonary infection as, the presence of a disturbance in body temperature $>38^{\circ}\text{C}$ or $<36^{\circ}\text{C}$, leukocytosis and purulent tracheal secretions, new or persistent infiltrates detectable on chest radiographs, and positive deep tracheal aspiration culture. Ventilator-associated problems are the most commonly reported healthcare-acquired infection in CCUs and the rates might count 27% of all infections in CCUs.^{6,7}

In a prospective observational study, total of 105 patients, who were on mechanical ventilation for more than 48 hours were included. A total of 60 patients fulfilled the clinical and microbiological criteria for the diagnosis of VAP. The incidence of VAP in the study was 57.14%, and the incidence density of VAP was 31.7/1000 ventilator days.⁸ Out of the 60 cases, 21 (35%) were categorized under early-onset group and 39 (65%) under the late-onset group. The overall mortality associated with VAP was observed to be 48.33%. It was concluded that the incidence of VAP was 57.14%.⁹ The study showed that the incidence of VAP was directly proportional to the duration of mechanical ventilation. The most common pathogens causing VAP were *Acinetobacter* species and *Pseudomonas aeruginosa* and were associated with a high fatality rate.¹⁰

Ventilator-associated problems have been associated with increased morbidity, longer hospital stay, increased healthcare costs, and higher mortality rates, so its prevention would be a major challenge in critical care units.¹¹ Recently, reducing the risk of ventilator-associated problems had been identified as a national patient safety goal. Therefore, evidence-based guidelines were created in 2015, which is finally updated in 2019 by the Institute for Healthcare Improvement (IHI) in an attempt to find a solution to the problems associated with ventilators.¹² These guidelines are called VAP Prevention Bundles and they incorporate a number of evidence-based strategies proved to prevent VAP. However, establishing a bundle in and of itself is not enough to guarantee VAP prevention. The investigator found it necessary to also monitor compliance with this set of practices in order to reach the effectiveness of its use in the ICU.¹³

STATEMENT OF THE PROBLEM

A study to assess the compliance on hand hygiene, endotracheal suctioning, cuff pressure of bundle interventions in VAP prevention among healthcare professionals working in ICU at selected tertiary care hospital.

OBJECTIVES

- To determine the level of compliance of hand hygiene, endotracheal suctioning, and cuff pressure of bundle interventions among healthcare professionals working in the critical care unit.
- To identify the associated factors with selected bundle interventions on VAP among healthcare professionals working in the critical care unit.

MATERIALS AND METHODS

Research Approach and Design

The Quantitative evaluative approach with pre-experimental research with one group pre- and post-test design was adopted in this study.

Population and Sampling

A convenient method of sampling, whereby 70 registered staff nurses working in medical ICU were selected who met the inclusion and exclusion criteria.

Criteria for Sample Selection

Inclusion Criteria

The healthcare professionals:

- Working in a Medical ICU.
- Who have a Degree or Diploma in Nursing.

Exclusion Criteria

The healthcare professionals:

- Having less than 6 months of experience.
- Who were not willing to participate.

Limitations

The study was limited to the following:

- Seventy subjects, which can be included in all the critical care unit staffs.
- Medical ICU, which can be included in Neurology ICU, Cardiothoracic ICU, and Trauma ICU.
- Only the VAP bundle was taken, which would have included CLABSI, CAUTI, and SSI bundles.

ETHICAL CONSIDERATIONS

The proposal was presented to the Institutional Human Ethical Committee (IHEC) and reviewed the proposal on its expedited review meeting. After getting ethical clearance, data collection was done. Informed consent was obtained from all the study participants, and the researcher emphasized that participation in the study is entirely voluntary, the anonymity and the confidentiality of their responses were assured.

DEVELOPMENT OF DATA COLLECTION INSTRUMENT

The tool was prepared by the investigator based on the objectives of the study after the consultation with experts in nursing and medical by doing extensive review of the literature.

RELIABILITY

The reliability of the instrument denotes the consistency of measures obtained of an attribute or concept in clinical practice. Based on the results obtained by the pilot study on all three shifts assessment, intra class correlation coefficient for consistency has been calculated and it was observed 0.85 for handwashing, 0.90 for endotracheal suctioning, and 0.96 for cuff pressure monitoring. This indicates that good consistency exists on the practice of the staff nurses working in the critical care unit.

DATA COLLECTION PROCEDURE

The informed and written consent was obtained from the study participants. The baseline data of demographic and professional variables were collected from the staff nurses. The practice of healthcare professionals regarding certain interventional methods, including VAP bundle, which is existing in the hospital, was assessed by using the observation checklist developed by the investigator. The data were collected in the

morning shift from 6 am to 11 am, in the afternoon 1 pm to 3 pm, and at night 7.30 pm to 10 pm. The data were gathered by the researcher and an experienced respiratory therapist who works round a clock in the ICU. The observation on handwashing, endotracheal tube suctioning, and cuff pressure monitoring was observed on all the three shifts morning, evening, and night, respectively.

PLAN FOR DATA ANALYSIS

- The data were analyzed by using both descriptive statistics—frequency, mean and standard deviation.
- Inferential statistics Generalized Estimating Equation (GEE) was used to assess the effectiveness of the multifaceted bundle interventions on level of compliance among nursing professionals.
- Freidman test was used to associate the significant variation that exists between morning, evening, and night shifts.
- Kruskal–Wallis test was applied to assess the association between knowledge and level of compliance on multifaceted bundle interventions.

FINDINGS AND DISCUSSION

Frequency and Percentage Distribution of Demographic and Professional Variable

The subjects included in this study reveal that the majority of the samples 59 (89.3%) were females, and 54 (77.1%) belonged to senior staff nurse. In total years of professional experience, most of the samples 62 (88.6 %) had been working for more than 5 years.

In total years of experience in the critical care unit, 47 (67.1) samples had experience for less than 3 years, and the majority 46 (65.7%) were allotted with two patients per shift.

Level of Compliance on Handwashing among Healthcare Professionals Working in the Critical Care Unit

The level of compliance on handwashing revealed that all the samples 70 (100) complied with the handwashing technique during the clean and sterile procedure on the patient in all three shifts. Only 25 (35.7%) had washed their hands after contact with a source of an arterial line, catheters, or wound care during the morning shift. Use of alcohol rub before, during, and after the procedure by samples was 47 (67.1%), respectively, in all the shifts. Washing hands after contact with inanimate objects in the immediate vicinity of a patient (i.e., ventilator, bed rail) were 15 (24.3%) carried out by the samples during all the shifts, respectively. Only 17 (24.3%) washed their hands after removing the gloves during the morning shift, and 16 (27.1%) were done during evening and night shifts.

Level of Compliance on Suctioning from the Endotracheal Tube among Healthcare Professionals Working in Critical Care Unit

It revealed that handwashing and wearing gloves before suctioning were carried out by 35 (50%) samples, and preparing the sterile equipment required during suctioning was carried out by 30 (42.9%) samples during all three shifts, respectively. In maintaining adequate pressure in endotracheal tube cuff, 30 (42.9%) samples were followed in all three shifts. Inserting the catheter into the ET tube gently by using an aseptic technique and then endotracheal suctioning, 28 (40%) samples had carried out in all three shifts.

Table 1: Mean and standard deviation of handwashing, endotracheal suctioning, checking cuff pressure among healthcare professionals working in critical care unit ($N = 70$)

Activities	Shift	Mean	Standard deviation	Friedman test value	p-value
Handwashing	Morning	0.32	0.19	1.45	0.48 (NS)
	Evening	0.31	0.12		
	Night	0.31	0.15		
Endotracheal suctioning	Morning	0.36	0.12	11.2	0.004 (S)
	Evening	0.36	0.10		
	Night	0.33	0.09		
Monitoring cuff pressure	Morning	0.45	0.14	5.3	0.072 (NS)
	Evening	0.46	0.15		
	Night	0.46	0.15		

In using separate suction catheters for oral suctioning, 26 (37%) samples had carried out in all three shifts. All the samples 70 (100) had done documentation and washed their hands after suctioning.

Level of Compliance on Monitoring Cuff Pressure among Healthcare Professionals Working in Critical Care Unit

It represents that monitoring the cuff pressure before suctioning was carried out by the 4 (5.7%) subjects only in evening and night shifts, and cuff pressure monitoring at 20 cm H₂O to 30 cm H₂O was carried out by 63 (90%) of samples, in all the three shifts, respectively. Checking the cuff pressure after suctioning, 6 (8.6%) samples were done during the morning shift, and 7 (10%) were carried out during evening and night shifts, respectively. In monitoring the cuff pressure six hourly once, 18 (25.7%) samples were carried out during evening and night shifts. All the samples 70 (100%) had documented the procedure and washed their hands after suctioning. The study supported that the capillary pressure in the tracheal mucosa is 20 cm of H₂O. Thus, a cuff pressure higher than this value can bring about ischemic changes in the tracheal mucosa leading to ulceration, necrosis, and fistula formation.^{14,15}

Table 1 explicits the mean and standard deviation of handwashing in all the three shifts. The mean and standard deviation in handwashing during morning shift was 0.32 and 0.19, in the evening shift was 0.31 and 0.12, and during the night was 0.31 and 0.15, respectively. Friedman's test value shows 1.45, and the *p*-value was 0.48, which was not significant.

In endotracheal suctioning, the mean and standard deviation during morning was 0.36 and 0.12, during evening it was 0.36 and 0.10, and at night it was 0.33 and 0.09, respectively. Friedman's test value shows 11.2, and the *p*-value was <0.004, which shows significance.

In monitoring the cuff pressure, the mean and standard deviation during morning was 0.45 and 0.14, during evening it was 0.46 and 0.15, and at night it was 0.46 and 0.15, respectively. Friedman's test value shows 5.3, and the *p*-value was 0.072, which was not significant.

Table 2 explores that 30 (42.9%) subjects were very good in following the handwashing in the morning compared to evening and night, moreover, 44 (62.9%) subjects were found good in following handwashing in the afternoon and average in all the three shifts. Hand hygiene is an effective way of removing transient bacteria from the hands; however, nurses' compliance with hand hygiene in the current study has been average.

There are several reasons which may explain this phenomenon; may be due to the frequency of patient care contact, heavy workload, and understaffing. All these reasons may adversely affect hand hygiene compliance. This finding is consistent with Augustyn who mentioned that failure to wash hands and change gloves between patients has been associated with an increased incidence of VAP.

In endotracheal suctioning, it was found that almost 50 (71.4%) were good in adhering in following all the steps and 15 (21.4%) subjects were very good and average in following the steps in endotracheal suctioning in all the three shifts, respectively. It was supported by Guterres da Silva who conducted a study on bundle to prevent VAP in an ICU, when considering each work shift, the practice obtained expected quality during morning and afternoon shifts, reaching compliance of 92% and 85.5%, respectively. However, compliance with this practice during the night shift was only 68.7%.

In monitoring the cuff pressure, around 43 (61.4%) subjects were found to be good in all the three shifts, respectively. It was supported by Guterres da Silva et al., who conducted a study regarding cuff pressure, no shift obtained a safe compliance rate (>80%), being that the lowest rate was observed in the afternoon shift, 41.8%. The morning and night shifts presented 74% and 67.8%, respectively. Moreover, the study finding was supported by a study done by Alhirish, half of nurses were unconvinced of maintenance and control of endotracheal cuff pressure once every 4 hours (Tables 3A and B).

In association with demographic and professional variables, it was found that there was no significant association with handwashing, endotracheal suctioning, and monitoring cuff pressure, respectively. It has been postulated that years of experience are directly proportional to the level of education, that is, the higher the level of education, the more the years of experience, which contribute to reduce the VAP.

Table 2: Classification of healthcare professionals based on the performance of three activities in all three shifts (N = 70)

Variables	Key	Morning		Evening		Night	
		No.	%	No.	%	No.	%
Handwashing	Very good	30	42.9	18	25.7	23	32.9
	Good	24	34.3	44	62.9	35	50.0
	Average	16	22.9	8	11.4	12	17.1
Endotracheal suctioning	Very good	9	12.9	9	12.9	12	17.1
	Good	49	70.0	46	65.7	50	71.4
	Average	11	15.7	15	21.4	9	12.8
Monitoring cuff pressure	Very good	7	10.0	7	10.0	6	8.6
	Good	43	61.4	40	57.1	41	58.6
	Average	16	22.9	17	24.3	18	25.7
	Poor	4	5.7	6	8.6	5	7.1

DISCUSSION

The researcher examined the performance of the staff nurses in association with their practice on hand hygiene, endotracheal suctioning, and maintaining cuff pressure. Monitoring of all these three compliance, directly by the observer can make people more conscious, hence it can be altered in their existing practice. To avoid this, permission was obtained from the authority to check the surveillance camera for monitoring the nursing professionals. There was a significant difference found in endotracheal suctioning among intensive care nurses. It was found that adherence to the practice was higher in the morning shift than in the evening and night shift, it was postulated that training programs and continuous supervision to assure compliance with hand hygiene rules, maintenance of adequate cuff pressure, and prompt endotracheal suctioning can prevent VAP.

Table 3A: Mean and standard deviation of handwashing, endotracheal suctioning, and cuff pressure based on the professional variables and level of significance by using Kruskal–Wallis test (N = 70)

Professional variables	N	Handwashing		Endotracheal suctioning		Cuff pressure	
		Mean	SD	Mean	SD	Mean	SD
Gender							
Male	11	0.38	0.21	0.36	0.11	0.47	0.21
Female	59	0.31	0.18	0.36	0.12	0.44	0.13
Positional status							
Junior SN	8	0.28	0.24	0.30	0.12	0.43	0.07
Staff nurse	8	0.38	0.18	0.48	0.18	0.40	0.19
Senior SN	54	0.32	0.18	0.35	0.10	0.46	0.14
Total years of professional experience							
<3 years	62	0.31	0.19	0.35	0.13	0.45	0.15
>3 years	8	0.38	0.14	0.38	0.09	0.45	0.09
Years of experience in CCU							
0–3 years	47	0.32	0.20	0.35	0.13	0.43	0.14
<3 years	19	0.31	0.17	0.37	0.11	0.50	0.15
Number of patients allotted in each shift							
1	47	0.32	0.17	0.37	0.13	0.46	0.15
2	19	0.34	0.23	0.33	0.11	0.43	0.12
3	4	0.20	0.12	0.28	0.05	0.40	0.16

Table 3B: Determining the level of significance by using Kruskal–Wallis test

Professional variables	Handwashing		Endotracheal suctioning		Monitoring cuff pressure	
	Kruskal–Wallis test	p-value	Kruskal–Wallis test	p-value	Kruskal–Wallis test	p-value
Gender	1.82	0.18	0.03	0.86	0.09	0.76
Positional status	2.89	0.24	5.59	0.06	2.19	0.33
Total years of professional experience	2.24	0.13	0.41	0.52	0.02	0.88
Years of experience in CCU	0.13	0.71	0.34	0.56	2.81	0.09
Number of patients allotted in each shift	1.56	0.46	4.55	0.10	0.64	0.73

CONCLUSION

The present study denotes that the staff nurses play a key role in following ventilator bundle care among mechanical patients. It was identified that interventions by the nurses to prevent VAP were insufficient and that the nurses lacked the necessary training on the issue. It was suggested that nurses should receive on-the-job training to learn more about protection from hospital infections and VAP, and hospitals should establish protocols to prevent VAP.

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