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A Study to Assess the Knowledge and Compliance of Critical Care Nurses Regarding Ventilator Care Bundle in Prevention of Ventilator Associated Pneumonia

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Abstract: This study aims to assess the knowledge and compliance of staff nurses regarding ventilator care bundle in prevention of ventilator associated Pneumonia. Knowledge of nurses on ventilator care bundle for the prevention of VAP and adherence to them would reduce the risk of occurrence of VAP and decrease morbidity and mortality of mechanically ventilated patients in the ICU. An exploratory survey research design was adopted and a convenient sampling technique was selected for the study. The findings revealed that more than half of the (56.7%) staff nurses had excellent knowledge regarding ventilator care bundle and 43.3% of them had good knowledge regarding ventilator care bundle. It also showed that knowledge and compliance of staff nurses regarding ventilator care bundle were found to have significant association. More the knowledge, better is the compliance, as the p- value is less than 0.05. The study also revealed that area of work and shift were found to have significant association with the compliances of the staff nurses regarding ventilator care bundle.

Key Words: Knowledge, compliance, Critical care nurse, Ventilator care bundle, Ventilator associated pneumonia.

1. INTRODUCTION:

VAP is a problem in intensive care units worldwide and dramatically increases morbidity and mortality rates on mechanically ventilated patients. It is the common infectious complication among patients admitted to intensive care units. The lungs are usually amongst the major organs involved in multiple organ failure and thus the challenge of delivering appropriate ventilation with as little complication as possible is extremely important. To ensure the highest standard of nursing care, nursing practice must be based on a strong body of scientific knowledge. This can be achieved through adherence to the evidence-based guidelines for prevention of VAP, ultimately improving patients' outcomes. Improved outcome will shorten patient's ICU length of stay, hospitalization as well as benefit the patient financially with decreased hospital costs. Hospitals also gain benefits as they are continually faced with the challenge of providing cost effective services to patients and communities.

The four primary recommended practices include: elevating the head of the bed to 30 degrees, sedation vacations, oral care with chlorhexidine (CHG) and subglottic suctioning endotracheal

tubes. The nurses are expected to care for these patients in a setting of intensive care unit. The nurses should have thorough knowledge of the modes of ventilation, assessment and troubleshooting of ventilators and assessment and care of the patients requiring mechanical ventilation.

2. NEED OF THE STUDY

Ventilator associated pneumonia that occurs within 48-72 hours after intubation is usually termed early onset pneumonia; it often results from aspiration, which complicates the intubation process. Ventilator associated pneumonia that occurs after this period is considered late onset pneumonia. Approximately 10-28% of critical care patients develop VAP and is the most common and fatal infection of ICU, In India it affects 9-27 % of intubated patients and doubles the risk of mortality as compared with similar patients without VAP. VAP may account for up to 60% of all Health- care associated infections.

Current best practices for patients at risk of VAP can be established by conducting systematic literature reviews on the ventilator bundle and factors related to VAP and by communicating evidence-based findings through education sessions.

The investigators observed several instances where nurses had less knowledge and compliance regarding ventilator care bundle in prevention of ventilator associated pneumonia. On interaction the nurses showed lack of knowledge about ventilator care bundle and so their participation in care of prevention of ventilator associated pneumonia was found less. Hence, the investigators felt need to assess the knowledge and compliance of critical care nurses regarding ventilator care bundle in prevention of ventilator associated pneumonia.

3. PROBLEM STATEMENT

A study to assess the knowledge and compliance of critical care nurses regarding ventilator care bundle in prevention of ventilator associated pneumonia

4. OBJECTIVES OF THE STUDY

- To assess the knowledge of staff nurses regarding ventilator care bundle.



- To assess the compliance of staff nurses regarding ventilator care bundle.
- To assess the association between the knowledge and the compliance of staff nurses regarding ventilator care bundle.
- To associate the finding with the demographic variables.

5. CONCEPTUAL FRAMEWORK

The **Health belief model** has been applied to a broad range of health behaviors and subject populations. The health belief model includes the following components:

1. Individual Perception
2. Modifying Factors
3. Likelihood Of action

Individual Perception: In this study, individual perception includes perceived susceptibility and perceived seriousness of VAP related to inadequate knowledge and compliance of critical care nurses regarding ventilator care bundle in prevention of ventilator associated Pneumonia.

Modifying Factors: Modifying Factors is the second component of this model, which consists of demographic variables, perceived threat of disease and cues to action.

Demographic Variables: It consists of staff related: Age, Gender, Education Status, Total years of Experience, Total years of ICU experience, Area of work, shift.

Patient related: Ventilation days, sign and symptoms seen in patients for VAP.

Cues to Action: It consists of Health education, mass media campaign, advice from others, workshops, journals, magazine articles related to knowledge and compliance nurses regarding ventilator care bundle in prevention of ventilator associated Pneumonia.

Likelihood of actions: The third component of this model is likelihood of action. The likelihood of a person's taking recommended preventive health action depends on the perceived benefits of the action minus the perceived barrier to the action.

In this study, the perceived benefits of action may be prevention of VAP.

The perceived barriers to the action are: Nurses lack knowledge and compliance regarding ventilator care bundle in prevention of ventilator associated pneumonia.

Recommendation of action consists of the actions taken by the investigator to create knowledge among nurses regarding ventilator care bundle in

prevention of VAP & practicing ventilator care bundle for prevention of ventilator associated pneumonia.

6. REVIEW OF LITERATURE:

I. Literature related to incidence of ventilator associate pneumonia

Dr Mohan et al, (2013) conducted a study on clinical profile and outcome in patients with ventilator associated pneumonia in ICU at a tertiary care hospital in Karnataka. Patients who were on mechanical ventilation for more than 48 hours were monitored at frequent intervals for development of VAP using clinical and microbiological criteria until discharge or death. A total of 230 patients were on ventilator in ICU. Among them 48 developed VAP with the incidence of 20.8%. Undifferentiated fever was the commonest diagnosis followed by dengue and malaria. Chronic respiratory failure, supine head position are the risk factors associated with VAP.

II. Literature related to Causes of ventilator associate pneumonia (VAP)

Ranjit S, Bhattarai B (2011) conducted a study on incidence and risk factors for ventilator associated pneumonia in Kathmandu university Hospital stated that VAP is a major cause of morbidity in the intensive care unit. 69 patients who were mechanically ventilated for more than 48 hours were evaluated. The result revealed that 22 out of 69 patients (31.88%) developed VAP, majority of the between 4 days to 14 days. Reintubation, invasive lines, H2 blockers and low Pao2/Fio2 were identified as major risk factors in our study. The patients with ventilator associated pneumonia had significantly longer duration of mechanical ventilation.

III. Literature Related to knowledge and compliance of staff nurses regarding ventilator care bundle in prevention of VAP

Khaled M. Al-Sayaghi (2014) conducted a study on assess the knowledge among intensive care nurses in Yemen regarding the prevention of VAP. 387questionnaires were collected response Rate 75.4%. (The nurses were most frequently correct) < 60% (regarding oral care, semi recumbent position, preventing unplanned extubating, emptying of condensate from ventilator tubing, daily sedation interruption and assessment of readiness for weaning and endotracheal tubes with extra lumen for subglottic secretions drainage. Nurses had the least knowledge (>24%) regarding frequency of humidifier and suction system changes, use of kinetic beds, and oral route for tracheal intubation.





The nurse’s knowledge mean total score was (47.3%) 7.1 on 15 items (holding a bachelor degree in nursing and acquisition of a short course in respiratory therapy were shown to be associated

with better knowledge scores. Hence it was concluded that knowledge of evidenced based strategies for preventing VAP is low among nurses working in Yemen ICU s.

6.1 MATERIAL AND METHODS:

6.1.2 Research Approach:

In this study a descriptive approach was considered appropriate.

6.1.3 Research Design

The research design adopted for this study was an exploratory Survey Research Design.

GROUP	ASSESSMENT
Staff nurses one group pretest only	Knowledge and Compliance test K C

6.1.4 Variables

Independent variable (I.V.)

Independent variable is Ventilator Care Bundle

Dependent variable (I.V.)

In this study, the dependent variable is Knowledge and Compliance

6.1.5 Setting of the Study

The study was conducted in the selected hospital of Pune city which is multispecialty hospital with sophisticated diagnostic and treatment modalities.

Target population: In this study, the target population was the critical care unit nurses of selected hospital.

Sample: Sample for the study comprised of nurses working in selected critical care unit hospital of Pune city.

Sampling Technique: A convenient sampling technique was used for selecting 60 critical care unit nurses of selected hospital.

Sample Size: the sample size selected for this study was 60 who fulfilled the sampling criteria and who expressed willingness to participate in the study were selected.

Inclusion Criteria: Staff nurses providing care to patients on mechanical ventilator

Staff nurses whom are willing to participate.

Exclusion Criteria: Nurses on leave during data collection

Tool Preparation: The present study aimed at assessing knowledge and compliance of critical care nurses regarding ventilator care bundle in prevention of VAP. Thus a self-structured questionnaire and an observational check list was prepared and used for the data collection.

7. DESCRIPTION OF DATA COLLECTION TOOLS:

Section I: Demographic data: It consists of demographic profile of the staff nurses such as age, gender, educational status, Total years of Experience, Total years of ICU experience , Area of work , shift. Patient related: Ventilation days, sign and symptoms seen in patients for VAP .

Section II: It includes 15 questions regarding ventilator care bundle in prevention of VAP.

Section III: Observation checklist to assess the compliances of ventilator care bundle for the prevention of VAP.





Validating the Tool: To validate the instrument, the tool was sent to the experts in medical surgical nursing specialties to get their expert suggestion. The changes had been incorporated as per the expert's suggestion.

Reliability of the Tool: The reliability of the tool was calculating to be 0.9538 for knowledge aspects and 0.8072 for practice aspects. Split half method inter rater method was used to find out the reliability for knowledge and compliance aspects which was analyzed using Karl Pearson co-efficient correlation. Thus, the tool was found reliable.

8. PILOT STUDY

A Pilot study is a small-scale version or trial run of the major study. Its function is to obtain information for improving the project or assessing the feasibility.

The pilot study was conducted on 10 critical care nurses to assess feasibility of the study and to decide the plan for data analysis. The investigator approached the subjects, informed them regarding the objectives of the study and obtained the consent after assuring the subjects about the confidentiality of the data. The same subjects were not included in the final study.

9. Method of Data Collection

- **Permission from the authorities of the selected hospital:** Prior to data collection, permission was obtained from authorities of the selected hospital.
- **Written permission from the critical care nurses:** Informed consent was taken from the critical care nurses prior to the data collection.
- **Data collection from the critical care nurses:** The data collection was done from the period of 22nd July to 24th July 2015. During the study the investigator collected the data.
- **Data collection** was done by using knowledge-based questionnaire on ventilator care bundle. The investigator distributed the questionnaire to the critical care nurses and gave time to fill the questionnaire, approximately 15-20 min. Then the filled questionnaire was collected back by the investigator.
- **Data analysis and interpretation:** The investigator planned to analyze the data in the following manner. Demographic data would be analyzed in terms of frequency and percentage. Fisher- exact test was used to determine the association of knowledge score and compliance score with selected demographic variable.

Data Analysis & Results

The collected data has been organized, tabulated and analyzed by using SPSS (Statistical Package for Social Science) version 10).

The data was presented in the following sections:

Section 1: Distribution of subject based on the personal characteristics in relation to demographic data

Section 2: Analysis of the data related to assessment of the knowledge of staff nurses regarding ventilator care bundle.

Section 3: Analysis of the data related to the assessment of the compliance of staff nurses regarding ventilator care bundle.

Section 4: Analysis of the data related to association between the knowledge and compliance of staff nurses regarding ventilator care bundle.

Section 5: Analysis of the data related to association of knowledge and compliance with demographic variables. (Age, gender, Education, Total years of experience, Total Years of experience, Total Years of ICU experience, Area of work, and shift)

**Section 1:** Distribution of subject based on their personal characteristics in relation to demographic data**Table 1: Distribution of staff Nurses in relation to demographic variables.**

n=60

Demographic Variable	Frequency	%
Age		
21-25years	43	71.7 %
26-30 years	15	25.0%
Above 35 years	2	3.3%
Gender		
Female	45	75.0 %
Male	15	25.0%
Education		
B.Sc	57	95.0 %
GNM	1	1.7%
Post B.Sc	2	3.3 %
Total years of Experience		
1-3 years	49	81.7%
>3 years	11	18.3%
Total years of ICU Experience		
Less than 1 year	35	58.3 %
1-3 years	20	33.3 %
>3 years	5	8.3%
Area of Work		
CCU	20	33.3%
ICU	20	33.3%
NTU	20	33.3%
Shift		
Evening	31	51.7%
Morning	14	23.3 %
Night	15	25.0%

- The above table shows that majority of 71.7% of the staff nurses had age 21-25 years, 25% of them had age 26-30 years, and remaining 3.3% of them had age above 35 years.
- The table also shows that majority of them, 75% were females and 25% of them were males and also 95 % of them had B.Sc. Nursing, 1.7% of them had GNM and 3.3 % of them had Post B.Sc.
- The table shows 81.7% of them had 1-3 years of total experience and 18.3% of them had more than 3 years of experience and also 58.3% of them had less than one year of ICU experience, 33.3% of them had 1-3 years of experience and 8.3% of them had more than 3 years of experience.
- The table also shows that the working area of staff nurses which is 33.3% equally in ICU, CCU and NTU. It also shows that majority 51.7% were in the evening shift followed by 25% in night and 23.3% in morning.

Table 2: Distribution of patient related variables

Patient related variable	Frequency	%
Ventilation days		
1 st	8	13.3%
2 nd	14	23.3%
3 rd	5	8.3%
4 th	5	8.3%
5 th	10	16.7%
7 th	4	6.7%
8 th	3	5%



Patient related variable	Frequency	%
11 th	2	3.3%
12 th	2	3.3%
13 th	2	3.3%
14 th	3	5%
15 th	1	1.7%
20 th	1	1.7%
S/S for VAP		
Purulent sputum	14	23.3%
Purulent sputum, Fever > 38.5 C	4	6.7%
Purulent sputum, Fever > 38.5 C, Leukocytosis	2	3.3%
Purulent sputum, Fever > 38.5 C, +ve sputum & blood culture	1	1.7%
Purulent sputum, Leukocytosis, +ve sputum & blood culture	1	1.7%
Fever > 38.5 C	5	8.3%
Fever > 38.5 C, Leukocytosis	3	5%
Fever > 38.5 C, +ve sputum & blood culture	2	3.3%
+ve sputum & blood culture	6	10%
None	22	36.7%

Section II

ANALYSIS OF THE DATA RELATED TO THE ASSESSMENT OF THE KNOWLEDGE OF STAFF NURSES REGARDING VENTILATOR CARE BUNDLE

Table 3: Knowledge of staff nurses regarding ventilator care bundle

Knowledge	Frequency	%
Good	26	43.3%
Excellent	34	56.7%

The above table shows that more than half (56.7%) of the staff nurses had excellent knowledge regarding ventilator care bundle and 43.3% of them had good knowledge regarding ventilator care bundle.

Section III

ANALYSIS OF THE DATA RELATED TO THE ASSESSMENT OF THE COMPLIANCE OF STAFF NURSES REGARDING VENTILATOR CARE BUNDLE

Table 4: Compliance of staff nurses regarding ventilator care bundle

Compliance	Frequency	%
Satisfactory	11	18.3%
Good	43	71.7%
Excellent	6	10%

The above table shows that majority (71.7%) of the staff nurses had good compliance regarding ventilator care bundle, 18.3% of them had satisfactory compliance regarding ventilator care bundle and 10% of them had excellent compliance regarding ventilator care bundle.

**Section IV****ANALYSIS OF THE DATA RELATED TO THE ASSOCIATION BETWEEN THE KNOWLEDGE AND COMPLIANCE OF STAFF NURSES REGARDING VENTILATOR CARE BUNDLE****Table 5: Fisher's exact test for association between the knowledge and compliance of staff nurses regarding ventilator care bundle**

Knowledge	Compliance			p-value
	Satisfactory	Good	Excellent	
Good	9	25	0	0.003
Excellent	2	18	6	

As the p-value is less than 0.05 the null hypothesis is rejected. Knowledge and Compliance of staff nurses regarding ventilator care bundle were found to have significant association. More the knowledge better is the compliance.

Section V**ANALYSIS OF DATA RELATED TO THE ASSOCIATION OF KNOWLEDGE AND COMPLIANCE WITH DEMOGRAPHIC VARIABLES****Table 6: Fisher's exact test for association between knowledge regarding ventilator care bundle and selected demographic variables of staff nurses.**

Demographic Variable		Knowledge		p-value
		Good	Excellent	
Age	21-25years	20	23	0.773
	26-30 years	5	10	
	Above 35 years	1	1	
Gender	Female	22	23	0.114
	Male	4	11	
Education	B.Sc	24	33	0.184
	GNM	0	1	
	Post B.Sc	2	0	
Total years of Experience	1-3 years	22	27	0.433
	> 3 years	4	7	
Total years of ICU Experience	Less than 1 year	18	17	0.343
	1-3 years	6	14	
	>3 years	2	3	
Area of Work	CCU	8	12	0.847
	ICU	10	10	
	NTU	8	12	
Shift	Evening	8	23	0.000
	Morning	13	1	
	Night	5	10	

As the p-value corresponding to shift was small, the null hypothesis is rejected. Shift was found to have significant association with the knowledge of staff nurses regarding ventilator care bundle.

**Table 7: Fisher’s exact test for association between compliance regarding ventilator care bundle and selected demographic variables of staff nurses.**

Demographic Variable		Compliance			p-value
		Satisfactory	Good	Excellent	
Age	21-25years	10	28	5	0.572
	26-30 years	1	13	1	
	Above 35 years	0	2	0	
Gender	Female	9	30	6	0.315
	Male	2	13	0	
Education	B.Sc	11	41	5	0.446
	GNM	0	1	0	
	Post B.Sc	0	1	1	
Total years of Experience	1-3 years	10	33	6	0.351
	> 3 years	1	10	0	
Total years of ICU Experience	Less than 1 year	8	22	5	0.147
	1-3 years	2	18	0	
	>3 years	1	3	1	
Area of Work	CCU	4	13	3	0.027
	ICU	7	12	1	
	NTU	0	18	2	
Shift	Evening	5	25	1	0.001
	Morning	0	9	5	
	Night	6	9	0	

As the p-values corresponding to area of work and shift was small, the null hypothesis is rejected. Area of work and shift were found to have significant association with the compliances of the staff nurses regarding ventilator care

- Few problems faced for data collection were busy staff schedule, shift changes, difficulty in getting the same staff and routine offs.

10. Limitations of the study

The study should have been delimited to,

- Time constraint was a major problem faced for the study.
- There was difficulty in getting permission from administrative heads of the selected hospitals.
- Study cannot be generalized due to small number of subjects.
- Nonprobability purposive sampling was used for the study due to time constraint.

CONCLUSION:

The findings of the study show that there is a highly significant association between knowledge and compliance scores of the group. There is significant association of knowledge score with shift and compliance scores with area of work and shift as ‘p’value <0.001.

This study could help in increasing the knowledge and compliance of staff nurses regarding ventilator care bundle in prevention of VAP.

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