



“A Systematic Review On Compliance With Vap Bundle And The Reasons For Non-Compliance With Vap Bundle Among The Staff Nurse’s Working In Icu”

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ABSTRACT: The prevention of ventilator Assisted Pneumonia (VAP), a hospital-acquired infection, among intensive care patients, is a major clinical challenge. It is a condition that is associated with high rates of morbidity, mortality, length of stay, and hospital costs. Nurses’ compliance with the VAP bundle is a major factor that determines the VAP rates. The aim of this paper is to critically review the available literature and identify the compliance of staff nurses working in ICUs with the VAP bundle, and the reasons of their non-compliance with the the VAP bundle. A comprehensive search for primary research articles was conducted using the Medline and PubMed, Eric, Cochrane, and Google scholar databases, using the keywords ‘ventilator-associated pneumonia’, ‘VAP’, ‘ventilator bundle’ and ‘care bundle’, and combining searches using ‘VAP’ with ‘guideline’, ‘implementation’, ‘adherence’, ‘compliance’ ‘Staff Nurses’ ‘reasons for non-compliance were entered into a search engine. A number of highly pertinent papers relevant to the aims of the review were identified, only those papers, which satisfied the inclusion criteria, were selected for inclusion in this review. The findings from this review support that nurses in the 6 studies out of 10 had a compliance rate higher than 50% with the VAP bundle and implementation of several teaching strategies can improve the practices and bring down the VAP rates in ICUs. This study expanded knowledge about important aspects of nursing care; nurses’ compliance with ventilator-associated pneumonia prevention guidelines and the factors that affect their compliance. This knowledge can be used by a health professional to guide the clinical practice and to improve the quality of care. There is convincing evidence to suggest that specific interventions can be employed to improve adherence to the VAP bundle and thereby reduce the VAP rates.

Key Words: VAP, VAP bundle, ICU nurses, Compliance, Non-Adherence.

I INTRODUCTION

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Pneumonia is a common lung infection characterized by a collection of pus and other fluids in the lung air sacs(alveoli). Pneumonia can be caused by many kinds of microorganisms (germs) including bacteria, viruses, fungi or parasites. Ventilator-associated pneumonia (VAP) is an airway Infection that must be developed for more than 48 hrs. After the patient was intubated, it has been reported to occur in 9-27% of all intubated patients. Ventilator-associated pneumonia (VAP) is a significant cause of morbidity and mortality in critically unwell patients.

A prospective observational study, to study the incidence and clinical profile of VAP was carried out over a period of 20 months in the ICU of a tertiary care hospital at New Delhi by Shuvranu Ghosh, Amit Dhamija, Debashish Dhar, Arup Basu, Neeraj Goel. 84 patients of VAP were identified over the study period. The VAP rates were found to be 6.242/ 1000 ventilator days. Mortality in the VAP patients was 61.84%. [European Respiratory Journal 2018]

VAP is preventable, and many practices have been demonstrated to reduce the incidence of VAP and its associated burden of illness. The VAP bundle is a series of evidence-based interventions designed to reduce the prevalence of VAP in mechanically ventilated patients. In 2005, the VAP bundle was part of the initiative, 100,000 lives campaign, launched by the Institute for Health care Improvement (IHI); this initiative aimed to reduce mortality and morbidity in American healthcare (Resar et al.,2005, p.243). The ventilator bundle components are as follow: -

- 1) Elevation of the head of bed to 30-45°
- 2) Daily sedation vacation and daily assessment of readiness to extubate
- 3) Peptic ulcer disease prophylaxis
- 4) Deep vein thrombosis (DVT) prophylaxis
- 5) Suctioning

1.1 Need for study

Babasaheb Deshmukh, Suhas Kadam, Thirumugam M., Rajesh K. (2017) conducted a Clinical study of ventilator-associated pneumonia in tertiary care hospital Kolhapur, Maharashtra, India. Objectives were to determine the Incidence of VAP in ICU, to study the association between causative microorganism and sensitivity, and to study the association between prognosis and incidence of VAP. Setting of the study was the Medical-surgical ICU, D.Y. Patil Medical College and Hospital, Kolhapur Prospective observational study design was adopted. 50 patients subjected to mechanical ventilation for more than 48 hours in a critical Care Facility were selected for the study the study concluded as follows: the incidence of VAP was found to be 78% among ICU patients. The majority (36%) of patients had diabetes mellitus, 30% had hypertension before admission. The microbiological results of Endotracheal Aspirate showed that the majority 36% had pseudomonas, 26% had Acinetobacter, 22% had no growth, 14% staphylococci & 2%

Proteus mirabilis. ¹

Healthcare-associated infection (HAI) is a major patient safety concern all over the world ². The leading cause of death among (HAI) is ventilator-associated pneumonia (VAP), exceeding deaths due to central line infections, severe sepsis, and respiratory tract infections in non-intubated patients ³. With mortality rates ranging from 15% to 70% depending on the patient population. And approximately 60% of deaths among patients with hospital-acquired pneumonia ⁴. Studies have also shown higher hospital mortality rates of ventilated patients who develop VAP (about 46%) compared to mortality rates of 32% of ventilated patients who do not develop VAP ⁵. VAP is not only associated with high mortality rates but accounts also for increasing the length of stay in ICU by an average of 4 to 9 days ³. Consequently, increasing direct hospitalization costs to up to \$40,000 per patient ⁶. As well as increasing the duration of mechanical ventilation, and making it more difficult to wean the patient from the ventilator ⁷

VAP is preventable. ⁸ Reduction of VAP prevalence implies a significant reduction in treatment costs and impact on mortality in the ICU. ⁹ Prevention of VAP is a team effort, and it is vital to encourage the care team to maintain patient safety. ¹⁰ Many studies have shown that simple and cost-effective measures can significantly reduce the incidence of VAP in developed countries. ¹¹ Nurses make up the vast majority of health care providers. ¹² Based on the abovementioned facts, conducting research on compliance with VAP prevention measures in ICU nurses can be beneficial in identifying shortcomings and resolving them, improving the level of care, and reducing medical and treatment costs. Research studies indicate that, despite the recognition of the need to implement preventive interventions, information about the status of care measures and their implementation in ICUs is not widely available. Therefore, it is unclear which of these interventions is implemented and to what extent. The aim of this study is to review various studies' outcomes on the implementation of VAP preventive measures by nurses in ICUs.

II RESEARCH METHODOLOGY

Research methodology is a science of studying how research is done scientifically. In other words, it is a way to systematically solve the research problem by logically adopting various steps. The methodology helps to understand not only the products of scientific inquiry but the process itself.

2.1 Search Strategy

A comprehensive search for primary research articles was conducted using the Medline and PubMed databases, using the keywords 'ventilator-associated pneumonia', 'VAP', 'ventilator bundle' and 'care bundle', and combining searches using 'VAP' with 'guideline', 'implementation', 'adherence', 'compliance' 'Staff Nurses' 'reasons for non-compliance. The reference lists of retrieved articles were also examined as potential sources. Data were extracted by sample and setting, study design, methodological quality, and reported outcomes. The present study was conducted to assess the compliance with the VAP bundle, among staff nurses working in ICU. Out of 25 articles fulfilling the initial search criteria, 12 articles were chosen for a detailed review of the full text and were included in our review.

2.2 Inclusion Criteria

Primary studies were included if they met the following criteria:

- Research published in the English language between 2010 and 2020;
- Studies that implemented the VAP bundle (including those that used additional elements) in an ICU setting;
- The studies including staff nurse's compliance to VAP bundle
- The studies including reasons for staff nurse's non-compliance to VAP bundle
- Studies in which Clinical outcome measures were reported.

2.3 Exclusion Criteria

- Studies published before 2010
- Studies concentrating on aspects of VAP bundle other than staff nurse's compliance to VAP bundle
- Studies in which clinical outcomes were not measured. For example, studies that examined the effectiveness of an education intervention targeted at health care personnel but did not investigate clinical outcomes associated with VCB use.
- Research conducted in pediatric settings, and other variations of the VCB such as those with less than four of the required elements.

Table No.1 Summary of Studies Reviewed

Studies on staff nurse's compliance with VAP bundle					
Sr.No.	First Author	Research design	Sample	Year of study	Results
1.	Fernandes Savia	Descriptive	150 ICU nurses	2018	46.6% showed adequate compliance to VAP bundle practices ¹³
2.	Sami M. Aloush	A structure observational design	100 ICU nurses	2017	63% showed 'insufficient compliance'. ¹⁴
3.	Alexis Luna	Quantitative Descriptive design	28 ICU nurses	2015	68% of the participants reported compliance ¹⁵
4.	Saiede Masomeh Tabaeian	Descriptive cross-sectional study	120 ICU nurses	2014	56.32% of the criteria for the prevention of VAP in theICU were met ¹⁶
5.	Hadi Hamishehkar	Observational study	143 nurses working in 10 evaluated ICUs	2014	36.5% showed adequate compliance to VAP bundle practices ¹⁷

6.	A. Al-Harthy	Audit	medical files of 88adults ventilated patients	2014	Overall compliance with VAP bundle practices was 87.05% ¹⁸
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7.	Kim-Peng Lim	Retrospective and prospective observational study	28,454 SICU patients were analyzed	2013	Compliance with VAP bundle by nurses was 80.3% ¹⁹
8.	Nahla Shaaban Ali	descriptive exploratory design	45 critical care nurses	2013	Amongst all participants of nurses in medical critical care units, coronary care units and surgical critical care units in the current study; only 50%, 38.4%, 33.3% respectively showed compliance to VAP bundle ²⁰
9.	Dorothy Bird	Retrospective and prospective observational study	Patients admitted to 2 SICUs (12 & 16 bedded respectively) between March 1, 2006 to May 31, 2009	2010	Compliance with the VAP bundle was 91% and 81% by staff in each respective SICU ²¹
10.	Mohannadb Hasan Alhirish	Descriptive design	60 ICU nurses	2010	Overall % of compliance was 77.7% Only 54.2% of them carried out hand rubbing adequately 91.6% of nurses perform sterile ETT suction Oral care for patients using antiseptics solution by 80% Head of bed elevation by 85% ²²

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Table no.2

Studies on reasons for noncompliance on VAP bundle					
Sr.No.	First Author	Research design	Sample	Year of study	Results
1.	Mohammadrez aYeganeh ²³	Cross-sectional study	219 nurses working in 14 intensive care units at 11 Guilan hospitals	2016	Lack of knowledge may be a potential barrier to adherence to evidence-based guidelines for the prevention of VAP
2.	Hadi Hamishehkar	Observational study	143 nurses working in 10 evaluated ICUs	2014	The main reasons for non-adherence was summarized as workload, lack of knowledge and lack of strict monitoring protocols for compliance with VAP bundle.
3.	Ricart, Maite RN ²⁴	Descriptive study.	110 nurses working collectively in 2 ICUs	2013	The most important reasons for non adherence were <ul style="list-style-type: none"> • Unavailability of resources (37.0%), • Patient discomfort (8.2%), • Disagreement with reported trial results (7.8%), • Fear of potential adverse effects (5.8%), and • Costs (3.4%)

4.	Mohannad Hasan Alhirish	Descriptiv edesign	60 ICU nurses	2010	<ul style="list-style-type: none"> • The common barriers that hinder from performing measures to prevent cross contamination was unavailability of the necessary material and workload • Measures to prevent host factors were not foreseen in department protocol. <ul style="list-style-type: none"> • Absence of information about the performance of the VAP prevention procedures,
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III FINDINGS AND INTERPRETATION

3.1 Studies on compliance with VAP bundle

The study on Intensive Care Nurse's Compliance to Ventilator-Associated Pneumonia Prevention Practices conducted by Fernandes Savia, Banerjee Alope and Dasila, Prabha assessed the practices of 150 nurses working in ICU's of multispecialty hospitals using non-probability convenient sampling technique. Data was collected using a structured observational checklist on practices followed by nurses for the prevention of VAP. Most of the nurses complied to hand hygiene practices (7.81+1.600), adhered to the positioning of the patient (0.98+0.728) and did nasogastric feeding practices (0.98+0.728). The nurses lacked compliance to various other aspects of VAP prevention guidelines such as endotracheal suctioning care, oral care, PUD prophylaxis, DVT prophylaxis, sedation vacation and weaning practices. The general overall practice score of nurses regarding VAP prevention was (mean=13.2+8.173) i.e., 46.6% of study participants showed adequate compliance to practices. The study concentrates only on the nurse's compliance with the VAP bundle and we feel that there's a chance of Hawthorne effect as the method of data collection was by observation technique, which can change the actual behavior pattern of staff nurses and thereby affect the study results.

Sami M. Aloush, conducted a study on Nurses' implementation of ventilator-associated pneumonia prevention guidelines: an observational study in Jordan. The purpose of this study was to assess nurses' compliance with ventilator-associated pneumonia prevention guidelines and the factors that influence their compliance. One hundred nurses were observed during their care for patients on a mechanical ventilator. The observers documented nurses' implementation of ventilator-associated pneumonia prevention guidelines using a structured observational sheet. Results showed that Compliance of nurses was found to be unsatisfactory. Of the participants, 63% showed 'insufficient compliance'. Nurses working in units with a 1:1 nurse: patient ratio and lower beds' capacity demonstrated higher compliance and their intensive care units had a lower rate of ventilator-associated pneumonia and shorter intensive care unit stay in comparison with their counterparts working with a 1:2 nurse: patient ratio and higher beds' capacity. The non-Participant approach of data collection in this study reduces the biases in findings. As per the study, low nurse-patient ratio and large intensive care unit beds capacity was found to affect nurses' compliance and patients' outcomes. This study expanded knowledge about important aspects of nursing care; nurses' compliance with ventilator-associated pneumonia prevention guidelines and the factors that affect their compliance. This knowledge can be used by a health professional to guide the clinical practice and to improve the quality of care.

Alexis Luna's study on An Exploration of Nurse Adherence to Ventilator-Associated Pneumonia Bundle Interventions developed a 57-item questionnaire to gather data on the degree to which VAP bundle interventions were implemented by the ICU nurses. Self-reported nurse perception of adherence to VAP bundle interventions was considered met for 68% of the sample population. In this study, however, sedation vacations and spontaneous breathing trials were counted as separate interventions because spontaneous breathing trials do not occur if sedation vacations for mechanically ventilated patients are not successful. A sample size of this study is smaller to generalize the findings. As mentioned in the limitations, the questionnaire didn't include how the nurses felt about the quality of bundle care they provide, which would have helped to identify the nurses' negative perception of their abilities that may affect the care provided. Another limitation of this study is relying on the participants' memory for data that can also lead to bias.

Saiede Masomeh Tabaeian, Ahmadreza Yazdannik, Saeed Abbasi conducted a study on compliance with the Standards for Prevention of Ventilator-Associated Pneumonia by Nurses in the Intensive Care Units. 120 nurses in 11 intensive care units of hospitals affiliated to Isfahan University of Medical Sciences, Iran, were assessed for 4 months from July to October 2014. The implementation of all measures for the prevention of VAP was investigated through observation and using a checklist. The mean compliance with the standards for the prevention of VAP in the intensive care unit by the nurses was 56.32%. The findings of the present study showed that the prevalence of use of personal equipment in protecting the airway was 80.3%, oral decontamination of the patient with chlorhexidine in each shift was met in 87.5% of cases, 89.1% compliance with the use of disposable and sterile equipment for mouth and airway suction. The compliance with the criterion of 30–45° elevation of the head of the bed was observed in 96.6% of cases in the present study. The findings of this study indicated that the criterion of the timely evacuation of the water container of the ventilator circuit was applied in 96.6% of cases. The results showed that compliance with the requirements of VAP prevention by nurses in ICUs was relatively acceptable. Nevertheless, in the present study, no intervention was conducted before gathering the information, and the results indicated the common performance of the nurses.

Hadi Hamishehkar et.al. Did an observational study, conducted on 10 Intensive Care Units (ICUs) of four hospitals in three steps. In the first step, VAP care bundle compliance includes head of bed (HOB) elevation, endotracheal cuff pressure (ETCP), mouthwash time, utilizing close suction systems, subglottic secretion drainage, type of suction package, and hand washes

before suctioning was evaluated. In the second and third steps, ICU staff were trained and its effect on VAP care bundle compliance was investigated. Finally, an inquiry from nurses was conducted to evaluate the obtained results. A total of 552 checklists consisting of 294 observations in the pre-education group and 258 observations in the post-education group were filled. Mean VAP care bundle compliance in pre-education and post-education stages was 36.5% and 41.2%, respectively ($P > 0.05$). The study concluded that adherence to the VAP care bundle was inappropriate. Education seems to be ineffective in improving VAP care bundle compliance. Frequent recall of the necessity of the VAP care bundle and the continuous supervision of ICU staff is highly recommended. In this study, adherence to the VAP care bundle was unexpectedly low before and after education steps. The results of this study imply that education is not sufficiently effective in improving VAP prevention bundle compliance among nurses and ICU staff which is contradictory to several other studies that prove that education can improve the VAP prevention practices. This study recommends that the infection control stewardship committee in each hospital take charge of the strict supervision of VAP care bundle compliance.

A. Al-Harthy, A. F. Mady, H. Al-Hanafy, W. Al-Etreby, M. Asim Rana conducted a clinical audit to assess the VAP bundle compliance in ICU. Concurrent snapshot review of the medical files of 88 adults ventilated patients took place, during April 2014, for evidence of compliance with components of the VAP bundle, namely: Hand hygiene, mouth wash, the elevation of the head of the bed (HOB), sedation vacation, non-routine changing of the ventilator tubing, and the use of Endotracheal tube (ETT) with subglottic suction port. Results showed compliance with mouth wash and non-routine tubing change was 100%, while compliance with hand hygiene was 87.5%, compliance with the elevation of HOB was 95.2%, compliance with sedation vacation was 65.5%, no patients were intubated with ETT with subglottic suction port, so the compliance was 0%. The study concluded that Compliance with the nursing elements of the VAP bundle (mouth wash, hand hygiene, and non-routine changing of the ventilator tubing) is up to standards, while the inconsistencies were observed from the physician's side. Data was collected using the snapshot method which may limit the minute details that can be collected while using the observation technique.

Kim-Peng Lim et.al conducted a study to assess the Efficacy of ventilator-associated pneumonia care bundle for the prevention of ventilator-associated pneumonia in the surgical intensive care units of a medical center. This study analyses the SICU utilization, ventilator utilization, and VAP incidence between January 2006 and March 2013 to assess the impact of VAP bundle in a clinical setting. The overall compliance rates of the post-VAP bundle phase of doctors,

nurses, and respiratory therapists were 97.9%, 80.3%, and 73.7%, respectively. The study concluded that implementation of VAP bundle care decreases the incidence of VAP at SICU. Multidisciplinary teamwork, education, and a comprehensive checklist to improve healthcare workers' compliance are the keys to success. This study had certain limitations. First, although the VAP bundle was performed prospectively at all ICUs, the researcher focused on retrospective chart reviews of SICU patients. The complexity of variable patients' characteristics, surgery types, different disease severity scoring systems at each SICU might all render the comparison to be difficult. Second, this study's results were limited to the SICUs of a single center. So, generalization of findings is not possible. The researcher believes that their modified VAP bundle care described in the study is an effective measure for lowering the VAP incidence at SICU.

Nahla Shaaban Ali conducted a study on Critical Care Nurses' Knowledge and Compliance with Ventilator-Associated Pneumonia Bundle at Cairo University Hospitals. A descriptive exploratory design was utilized in the current study. The study was conducted at three critical care units (medical, coronary, and surgical critical care units) in Cairo. The results showed that the majority of the studied sample (90%) had unsatisfactory knowledge, while approximately 10% from the internship category got satisfactory levels. The study also revealed that all nurses at different work areas (Medical ICU, coronary ICU, surgical ICU) didn't comply with VAP bundle elements. Out of 29 items, their means were as follows; 9.40 + 8.10, 9.72 + 9.2 & 5.99 + 7.13 respectively. In addition, it shows that there is no significant statistical difference between the means of three work areas regarding compliance with elements of ventilator bundle practice ($f= 0.82$; $p= 0.44$). university Hospitals in Egypt. Finally, the study finding revealed that more than three fourth of nurses had low knowledge regarding predisposing, risk factors, signs and symptoms, diagnosis, treatment, and components of ventilator bundle practices in ventilator-associated pneumonia. The study failed to find out if there is any association between DVT prophylaxis and decreasing rates of ventilator-associated pneumonia.

Dorothy Bird et.al. Conducted a study on Adherence to Ventilator-Associated Pneumonia Bundle and Incidence of Ventilator-Associated Pneumonia in the Surgical Intensive Care Unit. Prospectively collected data were retrospectively examined from our Infection Control Committee surveillance database of SICU patients over a 38-month period. Patients admitted to two SICUs at a tertiary care academic level I trauma center were study samples. Prior to initiation of the bundle, VAP was seen at a rate of 10.2 cases/1000 ventilator days. Compliance with the VAP bundle by the staff nurses increased over the study period from 53% and 63% to 91% and 81% in each respective SICU. The rate of VAP decreased to 3.4 cases/1000 ventilator days.

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Strengths of this study include the large number of patients (approximately 4000) treated in the SICUs setting over 21/2 years. Another important strength is the measurement of the primary outcome (VAP incidence) by an experienced, unchanging infection control team as per the researchers. Among the weaknesses of this study, the researchers did not compare the SICU populations between units or years. This study did not account for contraindications to VAP bundle items when scoring compliance. This may have led to an underestimation of actual guideline compliance.

Mohannad Hasan Alhirish et.al. Conducted a study on Nurses' compliance of evidence-based guidelines for preventing VAP in CCUs. The aim of this study was to assess nurses' compliance of evidence-based guidelines for preventing VAP in CCUs. Two tools were used for data collection VAP Preventive interventions Observation Checklist (VAPPIOC) and VAP knowledge questionnaire (VAPKQ) Results: Nurses had different levels of adherence for many nonpharmacologic strategies. All nurses' responses to the questionnaire, rates, and reasons for non-adherence were addressed. The most important barriers to adherence were the unavailability of resources. The findings suggest the need for the development of guidelines to reduce variability and the need to include the nursing point of view in these guidelines. The strength of the study is it highlights the nurses' practice regarding the implementation of evidence-based guidelines for preventing VAP, barriers that hinder application and nurses' knowledge about these strategies.

3.2 Studies on reasons for non-compliance with VAP bundle

Mohammadreza Yeganeh et.al. Conducted a study on Knowledge of evidence-based guidelines in ventilator-associated pneumonia prevention. The purpose of this study was to assess the intensive care unit nurses' knowledge of evidence-based guidelines for ventilator-associated pneumonia (VAP) prevention at Guilan University of Medical Sciences (GUMS) hospitals, Guilan Province, northern Iran. This cross-sectional study included 219 nurses working in 14 intensive care units at 11 Guilan hospitals. The questionnaire consisted of three parts of demographic information, nurses' knowledge of evidence-based guidelines for the prevention of VAP, and the barrier for the implementation of these guidelines. Of the 219 nurses, 171 (response rate 78.1%) participated in this study, and their mean knowledge score was 4.6. There was no significant relationship between nurses' knowledge score and their work experience ($P = 0.327$), education degree ($P = 0.189$), and their position ($P = 0.168$). The level of knowledge regarding VAP prevention seems inadequate in this study. Although having knowledge about the principles of evidence-based care cannot guarantee the implementation of these principles,

a lack of knowledge may be a potential barrier to adherence to evidence-based guidelines for the prevention of VAP.

Hadi Hamishehkar et.al. Did an observational study, conducted on 10 Intensive Care Units (ICUs) of four hospitals in three steps? From 143 nurses who requested to explain the reasons of low adherence for HOB elevation, hand washing and ETCP, 121 ones state their opinions. Some of them wrote more than one reason. 205 explanations were categorized and summarized in three items as below by the researcher: I am very busy so I focus on the main parts of my work, like writing reports and administration of medicines (n = 78), I do not think maintaining ETCP within the range of 20-30 cm of water and elevating HOB to within the range of 30-45° and hand washing is critical, so I am not strict in adherence to them (n = 17), The system is not restricting about observing VAP bundle, so I am not strict in adherence to the rules (n = 110). To conclude the main reasons for non-adherence were summarized as workload, lack of knowledge, and lack of strict monitoring protocols for compliance with the VAP bundle.

Ricart, Maite RNet.al. Conducted a study on nursing adherence with evidence-based guidelines for preventing ventilator-associated pneumonia, to review barriers to nursing adherence to non-pharmacologic evidence-based guidelines for preventing ventilator-associated pneumonia. Subjects were 110 nurses approached at two critical care nursing meetings. A questionnaire was administered to nurses to assess their adherence to 19 non pharmacologic prevention strategies and to identify barriers to adherence to evidence-based guidelines. Fifty-one nurses responded, and overall, non-adherence was 22.3%. The most important reasons for non-adherence were unavailability of resources (37.0%), patient discomfort (8.2%), disagreement with reported trial results (7.8%), fear of potential adverse effects (5.8%), and costs (3.4%). The most important barriers to implementation were environment-related. The study findings suggest the need for development of multinational guidelines to reduce variability and the need to include the nursing point of view in these guidelines.

Mohannad Hasan Alhirish et.al. Conducted a study on Nurses' compliance of evidence-based guidelines for preventing VAP in CCUs. According to this study finding the most common barriers that hinder nurses to perform measures to prevent cross-contamination was the unavailability of the necessary material and workload. Concerning nursing measures to prevent host factors, Nurses reported that these measures were not foreseen in department protocol. One limitation of this study is the subjects reported no information about the performance of the procedures related to VAP prevention.

3.3 Appraisal of Studies

3.3.1 Study design

Out of the 14 studies included in this review 6 are descriptive, 4 are observational, one cross-sectional study and one is an audit report. All these studies addressed the rate of compliance of staff nurses working in ICUs in the results. 4 studies explained the reasons for staff nurses' nonadherence to the VAP bundle.

3.3.2 Sample

Altman et al. (2001) suggest that careful descriptions of study participants, setting, sample selection, and size should be reported. The authors state that descriptions of study participants' characteristics and setting in which they were studied are necessary so that readers can assess the generalizability of the results of the study. The authors also explain that the description of sample selection and size helps the readers to detect internal validity associated with ascertaining statistically significant and clinically important differences of a given size if such differences exist. Investigators for all the 12 studies reported participants, setting, and sample size in their studies.

3.3.3 Data collection

Relevant data for the selected studies were collected from different databases like PubMed, Google Scholar, ERIC database library, Cochrane database.

3.4 Results

There is a wide variability of data reported in the 12 selected studies. 6 studies out of 10 showed that more than 50% of nurses showed compliance with the VAP bundle and the main reasons for non-adherence are lack of knowledge, lack of supplies, lack of proper institutional protocols and workload.

IV DISCUSSION

All of the 12 studies that were reviewed are limited by their research designs in that they did not have control groups. However, it is argued that this would be unethical because the VAP bundle is known to improve outcomes. In addition, the studies employed various methods to collect data, of which several were subject to potential collector bias. If no specific control is

imposed on data collection and recording, the possibility for incomplete data or inaccurate data is increased. Another limiting factor, in terms of the research design, was that the studies were unblinded. Although it is conceded that it would be very difficult to blind the VAP bundle intervention, this can mean that people who are aware that they are part of an audited study alter their recording of events and their practices in such a way that it does not reflect their usual practice. This is specially the case with observational designs and can impact on the 'true' nature of results. The findings from this review support that nurses in the 6 studies out of 10 had a compliance rate higher than 50% with VAP bundle and implementation of several teaching strategies can improve the practices and bring down the VAP rates in ICUs.

In this study, we found that despite mixed findings in previous reviews, they are reasonably effective tools for changing provider behavior and quality of care, if designed correctly (Hysong, 2009). Improving compliance with the VAP bundle has been shown to improve VAP outcomes. Forexample, Cocanour et al. (2006) demonstrated that daily audit of compliance with a modified VCB and weekly feedback reporting of results was associated with a statistically significant decrease in VAP rates.

V CONCLUSION

Nurses' compliance with ventilator associated pneumonia prevention guidelines was found to be inadequate in 4 out of 10 studies reviewed. The findings from this review support that nurses in the 6 studies out of 10 had a compliance rate higher than 50% with the VAP bundle. Improper work environment and lack of knowledge were found to affect nurses' compliance and patients' outcomes. This study expanded knowledge about important aspects of nursing care; nurses' compliance with ventilator-associated pneumonia prevention guidelines and the factors that affect their compliance. This knowledge can be used by health professionals to guide clinical practice and to improve the quality of care. There is convincing evidence to suggest that specific interventions can be employed to improve the adherence to VAP bundle and thereby reducing the VAP rates.

VI RECOMMENDATIONS

- Education, awareness, and enlightening are a must for the successful implementation of any advocated intervention or practice. Awareness campaigns on the VAP bundle are required to educate nurses about its importance.
- Decreasing the load of work on the nurses is recommended, so that the best care can be

provided.

- Administration of the ICU will be addressed to provide proper protocols to follow with respect to VAP bundle practices.

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