ORIGINAL ARTICLE

NURSES' KNOWLEDGE OF EVIDENCE-BASED GUIDELINES FOR PREVENTION OF VENTILATOR-ASSOCIATED PNEUMONIA IN CRITICAL CARE AREAS: A PRE AND POST TEST DESIGN

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Background: Ventilator associated pneumonia (VAP) is a common hospital acquired pneumonia in ventilated patients. VAP is associated with increased morbidity, mortality duration of hospitalization and cost of treatment. Critical care nurses are usually unaware of evidence based preventive guidelines for VAP, resulting in negative impact on all aspects of patient care. This study investigated the impact of a 5-hour teaching module on nurses' knowledge to practice evidence based guidelines for the prevention of VAP. **Methods:** This study was conducted at a private tertiary care teaching hospital in Karachi, Pakistan. Single group pre-test post-test design was used. Forty nurses were included in the study. The knowledge of nurses was assessed before, immediately after and 4 weeks after the intervention. The final sample (n=40) was selected on the basis of the set inclusion criteria. The demographic data sheet was used to collect relevant information about the participants. Knowledge was assessed through a self-developed validated tool, consisting of multiple choice questions. The difference in knowledge was analysed through repeated measures of analysis of variance. The mean scores at 3 time points were compared using the Tukey's multiple comparison procedure. **Results:** Knowledge scores of participants increased significantly after the educational intervention in the first post-test; however, there was a decline in the score in post-test 2. **Conclusion:** The 5-hour teaching module significantly enhanced nurses' knowledge towards evidence based guidelines for the prevention of VAP. Further research is needed to assess the impact of training on nursing practice and to explore factors affecting attitudinal change.

Keywords: Critical care, Pneumonia, Ventilator associated pneumonia, evidence based practice, nurses' knowledge

INTRODUCTION

Ventilator-associated pneumonia (VAP) is the most common nosocomial infection, with the prevalence rates ranging from 10% to 70% in critical care units.[1] It is a sub-type of hospital-acquired pneumonia which occurs in people who are on mechanical ventilation through an endotracheal or tracheotomy tube for at least 48 hours with reported incidence of 6–20 times higher in these patients.[1,2] The VAP basically causes due to aspiration, which is the primary route of transmission of pathogens into the lungs.[1] Factors causing aspiration are oropharyngeal colonization, gastric fluid, and enteral feeding. At times majority of the patients admitted in ICU are already colonized with bacterial infections.[1] In addition cross contamination in ICU is also one of the major causes of VAP in most of the ICU's.[1]

The 2003 guide lines form the centres for disease control and prevention (CDC) reported that 63% of patients admitted to an ICU have oral colonization with a pathogen associated with VAP.[3] As the critically ill patients often have a depressed level of consciousness and an impaired gag reflex, leading to pooling of contaminated secretions in the posterior part of the oropharynx, which increases the risk of VAP in them.[4] The European prevalence of infection in intensive care study concluded that VAP was the most frequent infection acquired in intensive care and account for 45% of all infections in ICUs.[2]

Guidelines to prevent VAP have been published by several expert groups and, when fully implemented, it improved patient outcomes and are showed cost-effective.[3] Despite the rise in evidence-based medicine and the existence of clinical practice guidelines, the use of it in daily nursing practice is still limited.[3]

The occurrence of nosocomial infections leading to VAP is directly related to mal nursing practice, such as improper hand decontamination, oral care, suctioning etc.[3,4] The major reason identified in the literature is that health care professionals lack knowledge of evidence based guidelines to reduce VAP[4,5], and those who are aware rarely compliance the guide lines for the prevention of VAP[6]. In a large, multicentre survey across European ICUs, reported that non-adherence to publish recommendations was about 37%.[5]

Studies indicate that educating health-care workers who care for patients receiving mechanical ventilation can decrease the rate of ventilator-associated pneumonia.[7–10] Babcock and his colleague conducted a multimodal education program to teach nursing and respiratory therapy staffs shows a significant reduction in the incidence of VAP.[7] The study indicated that VAP

rate declined to 57.6% after educational intervention was given.[7]

In addition, by preventing incidence of VAP, it also reduced the estimated patient cost.[9,10] A recent comparative study conducted by using the National Nosocomial Infection Surveillance (NNIS) guidelines revealed that total ICU costs of care between the two patient groups were significant, (p=0.05) and increase in costs due to longer hospital stays.[11,12]

Studies have shown that nurses lack knowledge of evidence based guidelines for the prevention of VAP, a lack of knowledge may be a barrier to adherence.[4,5,9,12–14] Therefore, a study was conducted to identify whether a 5-hour teaching module can have a positive effect on nurses' knowledge to practice evidence based guidelines for the prevention of VAP. The purpose of this study was to identify the critical care nurses knowledge of evidence based guidelines for the prevention of VAP.

METHODS

This study was conducted by using a single group pre-test-post-test design at a tertiary care teaching hospital. Eleven bedded mixed medical-surgical intensive care unit (ICU), which also includes 3 beds for Paediatric Intensive care unit and 9-bedded Cardiac intensive care unit (CCU) at Karachi Pakistan was selected.

Sample size was calculated for repeated measures design. One group of participants was to be assessed at 3 time points. In order to detect standardised difference of 0.75 in the mean score, with 90% power and 5% significance level, assuming the correlation of 0.5, a sample size of 30 participants was required. The sample size was further inflated by 30% up to 40 participants to account for non-responders. Hence, the final sample (n=40) was selected to achieve the study objectives.

Forty nurses were included in the study. The inclusion criteria was being registered nurses (including bedside nurses, head nurses, case managers and clinical nurse instructors), caring for adult patients in critical care areas for at least one year. Those who didn't give their consent for participation were excluded from the study.

A simple and concise demographic data sheet was used to collect primary relevant information about the participants which included gender, intensive care experience, and whether nurses hold a special degree in emergency and intensive care.

To test the dependent variable of knowledge, a self-developed tool, consisting of multiple choice questions, based on Centres for Disease Control and Prevention (CDC) guide lines was adopted.[15] Some of the questions were adopted from a reliable questionnaire developed by Blot, Labeau, Vandijick, Claes, and Van Aken[13], later the tool face and content was validated by experts. The field testing of the tool was conducted among a similar population as the study participants. The questionnaire consisting of 10 questions, was given to 10 participants, all have completed and returned the questionnaire. The difficulty index and discrimination index were calculated**.** Reliability analysis, to calculate Cronbach's alpha coefficient, was also carried out using SPSS-16.0, which was calculated to be 0.77.

To identify the existing level of knowledge of nurses caring for adult patients in critical care areas regarding evidence based guidelines for the prevention of VAP, a pre-test was conducted. Post-test 1 conducted immediately after the teaching module, whereas Post-test 2 was conducted four weeks after the intervention to assess if there was a positive effect on the nurses' knowledge for evidence based practice guidelines for the prevention of VAP. All the 40 participants attempted post-test 1 and 2, which was conducted immediately after the teaching module was delivered.

The teaching module was a 5-hour module conducted as a workshop, focusing on assessment and nursing management based on CDC evidence based guidelines for the prevention of VAP. The final content of the teaching was shared with other content experts for secondary and independent review, and feedback was integrated. Since the teaching module was delivered on the format of a workshop, various teaching learning strategies were employed to assure maximum group participation.

To estimate descriptive statistics the means with standard deviation calculated and for categorical variables the proportions were calculated. The difference between pre-and post-test 1 and post-test 2 was analysed through repeated measures ANOVA, Pre-test, post-test 1 (conducted immediately after the teaching) and post-test 2 (conducted after 4 weeks of the teaching) were considered as test scores at 3 points in time. The mean scores at 3 time points were compared using the Tukey's multiple comparison procedure.[16]

RESULTS

Majority of study subjects were female (80%, 32/40), and having diplomas in nursing (Table-1). Majority of the participants completed their diploma recently. Another significant feature of the study group is that 24 nurses did not have any experience of caring for critically ill patients. Since majority of the nurses are only diploma holders, they are not prepared to deliver specialty care, but they are expected to provide specialty care.

Table-2 shows that there was a difference in mean and standard deviation from baseline (7.8±2.9) to post-test 1 (10.8±2.0) and finally in post-test 2 (9.8±2.1) (F=16.647, p=0.001). As compared to post-test 1, the scores in post-test 2 were still overall better than the scores of the pre-test. In addition there is a slight drop in post-test 2 conducted at an interval of 4 weeks. Though there was a drop in the mean score of post-test 2 as

compared to post-test 1; mean post-test 2 score was significantly higher than the mean score of pre-test.

Table-1: Demographic variables of the participants (n=40)

Variables	Frequency (n)	(%)
Sex		
Male	8	20
Female	32	80
Highest level of academic qualification		
Matriculation (10th grade)	2	5
Intermediate (12th grade)	23	57.5
Bachelors	10	25
Missing	5	12.5
Highest level of professional qualification		
Diploma	34	85
BScN	6	15
Years of experience as a nurse		
<2 years	21	52.5
2–5 years	14	35
5–10 years	5	12.5
Years of experience in critical care areas		
<2 years	21	52.5
2–5 years	17	42.5
5–10 years	2	5
Any workshop attended related to critical care nursing		
None	33	82.5
Attended	7	17.5
Year when course/session attended		
2 years back	2	5
6 months–2 years back	5	12.5
Not applicable	33	82.5

Table-2: Descriptive statistics scores for knowledge of evidence based practice for the prevention of VAP among critical care nurses (n=40)

Characteristics	Mean±SD	Median	Mode	Range
Pre-test	7.8±2.9	7.0	5.0	7.0
Post Test 1	10.8±2.0	10.9	11.0	9.0
Post Test 2	9.8±2.1	10.0	9.0	6.0

DISCUSSION

The educational intervention significantly improved the knowledge level of the participants regarding evidence based guidelines for VAP prevention. However, they also highlighted the fact that few participants scored lower in post-test 2, as compared to post-test 1, the scores in post-test 2 were still overall better than the scores of the pre-test. The results of the pre-test highlighted that majority of the nurses had a significantly low level of knowledge regarding evidence based guidelines for the prevention of VAP. Nurses scored quite low in some very important areas, like risk factors associated with the development of Ventilator Associated Pneumonia, patient positioning, lack of knowledge regarding CDC recommendation for all ventilated patients for the prevention of VAP.

The available study reports of researches conducted in this area consistently express that nurses generally lack evidence based practice due to either lack of knowledge or due to ignorance. There are no previous studies available within the Pakistani context with which the knowledge level of the nurses of the study group can be compared. It has been suggested by a study that nurses usually lack knowledge of the research and evidence for the prevention of VAP.[14] Majority of the nurses in this part of the world acquire their knowledge of taking care of critically ill patients from their basic educational programs, or from hospital policies and procedures. The demographic profiles of the participants also mentioned that majority of the nurses in the study group were diploma holders, and had less than 2 years of nursing experience. According to the PNC curriculum outline of the Diploma programme, on the whole students are given 230 hours of teaching (theory and clinical) in critical care areas.[17] Though, the students are given exposure to critical care nursing, but they are not prepared or knowledgeable enough to provide evidence based care. The reason of low level of nurses' knowledge could be the lack of integration of learned concepts in the clinical setting. This problem of theory practice gap or lack of clinical integration is not a new problem nor does it only exist in this part of the world.[18] It can, thus, be inferred that clinical teaching with effective mentoring is crucial besides class room teaching. It is also imperative that new nurses be provided supervision and role models within the clinical settings to help them integrate the learned concepts into real patients' care. They also need to be prepared specifically according to the type of patients they will be required to care for.

According to a study the knowledge among intensive care nurses is higher in those having higher experience and holding a special degree in intensive care for the prevention of VAP.[7] However, due to high turnover of nurses and unavailability of formal specialised training on critical care nursing, Pakistan is left with inexperienced and general trained nurses. Furthermore, lack of knowledge of evidence based practice guidelines is a possible barrier for non-adherence to evidence based guide lines for the prevention of VAP.[10] There is a lack of opportunities for higher education in nursing in Pakistan, as the concepts of BScN, and MScN is unfamiliar to most of the people in Pakistan. Since majority of the nurses are only diploma holders, they are not prepared to deliver specialty care, but are expected to provide specialty care.

The analysis revealed a significant difference in the nurses' knowledge before and after the teaching. The overall positive change in the nurses' knowledge after the teaching module reflects that education can bring about change in knowledge level. The effectiveness of teaching or training in increasing knowledge of health care professionals is also supported by other studies.[7,10,14] Hence, the findings of this current study are consistent with theses other studies. A study by Babcock *et al* demonstrated that an educational initiative directed at ICU nurses was associated with decrease in the incidence of VAP.[7] The results also suggested that training for

nursing staff is important for reducing VAP rates using education based intervention. Several other studies also demonstrated that with the implementation of educational initiatives, results in cost savings and reduction in the rate of VAP.[7,10]

Various authors and experts have described certain principles of knowledge retention. A principle being identified that knowledge retention generally falls to 75–89% of its original level after a relatively short 2–3 weeks time.[19] In this study, the knowledge interval was 4 weeks, as the 2nd post-test was conducted 4 weeks after the 1st post-test. Sisson *et al*[20] tested 33 medical students for retention and recall of clinical information 3 months after taking an examination on the same subject. They found that the students' mean score declined 10 percentile points from the original examination. This complements the findings of our study in which the participants were not able to retain the learned knowledge. Overall, the findings of this study complement the findings of other previous studies conducted in similar domains. We also found that the knowledge level of nurses can be increased by providing them training; however, continuing education needs to be provided for better retention of knowledge.

LIMITATIONS

This study was conducted over a short time span, the outcome of VAP after the educational intervention was not evaluated. We conducted 4 sessions with varying class sizes. Thus, there could be variation in the teaching/ learning style or delivery of the module.

CONCLUSION & RECOMMENDATIONS

Nurse working at critical unit are having knowledge gap to be able to prevent incidence of VAP among ventilated patients. The training sessions improved the knowledge of nurses. Retention of knowledge is still an issue and needs further investigation if there is a change in nurses' practice and decrease in the incidence of VAP. It would be worthy to explore the factors affecting retention of knowledge. Studies focusing on attitudinal change seem to be an important area of research. Moreover, nurses own motivation towards availing opportunities for learning, through attending continuing education sessions needs to be explored.

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