THE IMPACT OF IN-SERVICE EDUCATION ON ICU NURSES’ KNOWLEDGE AND COMPLIANCE WITH PRACTICES FOR PREVENTING VENTILATOR-ASSOCIATED PNEUMONIA

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Ennies Musvosvi
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ABSTRACT

THE IMPACT OF IN-SERVICE EDUCATION ON ICU NURSES’ KNOWLEDGE AND COMPLIANCE WITH PRACTICES FOR PREVENTING VENTILATOR-ASSOCIATED PNEUMONIA

by

Ennies Musvosvi

Master of Science in Nursing

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Ventilator-Associated Pneumonia (VAP) is the leading cause of hospital-acquired infections in the Intensive Care Unit (ICU). A diagnosis of VAP automatically translates to increased morbidity and mortality rates, length of stay, and treatment costs. Although VAP prevention requires a multi-disciplinary approach, ICU nurses play a pivotal role in the prevention of VAP. The purpose of this study was to evaluate the impact of in-service education on ICU nurses’ knowledge and compliance with practices for preventing VAP. A quasi-experimental nonequivalent groups design was selected to examine nurses’ knowledge and compliance with ventilator bundle elements before and after in-service education. One sample nonparametric testing was used to analyze pretest and posttest scores. Twenty-five nurses from the interventional group scored 100% on the
pretest (no room for improvement), resulting in a statistically significant score increase ($p=.009$). However, nurses who had room for improvement, had a mean score increase of 1.33 ($P<.0.0=0.0156$. The overall compliance with ventilator bundle elements had a mean increase of 4.3% among the intervention group. Results of this study showed evidence to support the claim that an educational in-service is effective in improving knowledge and compliance with elements of the ventilator bundle.
CHAPTER I

INTRODUCTION

Ventilator-associated pneumonia (VAP) is a complex problem among patients in the Intensive Care Units (ICU). The ICU nurses’ role is integral to the prevention and treatment of hospital acquired infections especially in the mechanically ventilated patient. In some cases however, poor patient outcomes are due to either a lack of knowledge in managing disease processes or failure to translate knowledge into practice. Although there is a lot of current literature on Ventilator Associated Pneumonia (VAP) and measures to prevent it, little is reported regarding ICU nurses’ knowledge of VAP and translation of this knowledge into practice. The purpose of this study is to examine nurses’ knowledge of ventilator-associated pneumonia (VAP), and the impact of an educational in-service on knowledge and nursing practice to prevent VAP.

VAP is the leading cause of hospital-acquired infections in the ICUs (Sedwick, Lance-Smith, Reeder, & Nardi, 2012). However, even with much attention on preventative measures in the last decade, the prevalence of VAP remains as high as 23% in mechanically ventilated patients (Dellit, Owens, & McGowens, Jr; 2007, Davis, 2006). Augustyn (2007) noted that an ICU patient’s length of stay is increased by 5-7 days once they are diagnosed with VAP. This increased length of stay automatically translates to an increase in hospital costs. In the United States, a diagnosis of VAP often increases the cost of treatment by an average of $20,000 (Restrepo, Anzueto, Arroliga, & Afessa, 2010) to $40,000 in a

Given the above statistics, it would be safe to conclude that the high incidence, costs of treatment and the high mortality rates associated with VAP are suggestive of either a gap in knowledge of VAP or a failure to translate that knowledge into practice by those caring for this patient population. Healthcare delivery has shifted toward evidence-based practice in recent years and the goal of evidence-based practice is to improve and provide high quality health care, resulting in positive patient outcomes (Tolentino-DelosReyes, Ruppert, & Shaio, 2007). It is therefore a matter of paramount importance that nurses stay current with evidence-based practice in order to change behavior.

Numerous studies exist regarding evidence-based measures for preventing VAP, however, only a few studies have been performed in recent years to assess the impact of an educational in service on knowledge and its impact on practice in preventing VAP (Tolentino-DelosReyes et al., 2007; Welch & Austin, 2008). Although there is currently no literature to show a definitive correlation between the use of ventilator bundles and a decrease in VAP rates, there is strong evidence to suggest a positive association between the two (Lawrence & Fulbrook, 2011). There also remains a deficiency in literature regarding nurses’ knowledge of VAP and its preventive measures.

Given the deficiency in current literature regarding direct studies to examine ICU nurses’ knowledge of VAP, this study will provide an opportunity to examine a group of ICU nurses’ knowledge before and after an educational in-service on VAP. The
study will also assess the impact of that educational intervention on nursing practice in preventing VAP.

Relevance and Importance to Nursing

Examining nursing knowledge is a significant way to assess the delivery of quality care and success in practice. The importance of delivering evidence-based care to prevent VAP by the ICU nurse cannot be underestimated. Education can play a significant role in adhering to evidence based practices. This study’s main purpose is to examine ICU nurses’ knowledge of VAP and the impact of an educational in-service on nursing practice when caring for a mechanically ventilated patient.

Aim

The purpose of an improvement intervention in nursing is to improve practice. The aim of this study is to examine critical care nurses’ knowledge of ventilator-associated pneumonia and to identify any changes in knowledge and clinical practice after related in-service education. Results of the study can be used to address areas of knowledge deficit or barriers in applying knowledge into practice.

Research Question

Education strategies are useful in both the community and hospital setting and can significantly impact healthcare professionals as well as the healthcare system. The three research questions under study are:

1. What is the baseline knowledge of ICU nurses regarding the basic concepts and interventions for VAP?
2. What is the impact of in-service education on ICU nurses’ knowledge on VAP bundles?

3. What is the impact of in-service education on ICU nurses’ compliance with VAP practices?

Theoretical Underpinnings

Nursing theories often provide the basis of nursing practice by generating further knowledge consistent with everyday observations. A useful theory makes logical assumptions about a behavior, health problem, or target population Croyle (2005). A well-defined theory is therefore of paramount significance in guiding nursing practice, especially if its application results in better patient care, enhanced professional status and guidance for research and evidence based practice.

This study’s theoretical framework is guided by Knowles, (1970) andragogy model for adult learning. Learning is a dynamic, continuous process that involves behavior alteration in order to produce change. Adult learning principles provide a good foundation for effective nursing education especially in the ICU setting where there are significant levels of stress and strict time constraints. According to Knowles, in order for learning to be effective, the adult must be ready and willing to learn. Adults have a strong sense of self-concept, are goal-oriented learners, and they like to make their own decisions. Any educational technique used in adult learning should emphasize the practical application of information whilst fully engaging the learner in the process. The manner in which adults learn and the techniques employed in adult education are different from those used with children.
Knowles (1970) outlines six conditions for optimal learning within the adult population. He noted that adults learn best when they (1) are motivated; (2) can apply or use what they have learned to their current situation; (3) have a reason for learning; (4) are self-directed; assuming that with or without the help of other people, a person is takes the initiative to identify their learning needs, design some goals for learning, select and apply appropriate learning strategies, and finally evaluate learning outcomes. (5) draw from past experiences; and (6) use a task, problem, or life-centered approach.

Nurses must have a good understanding of the adult learning theory in order to incorporate its concepts into the development and implementation of a plan of care that reduces risks while improving quality of care to the patients. This framework will be utilized in this study to design an educational in service that will be used to meet the learning needs of the participants.

Based on Knowles learning theory, the assumption is that the nurses in this study will be motivated to apply knowledge from the in-service to improve practice.

Operational Definitions

Andragogy

“The art and science of helping adults learn” (Knowles, 1980, p. 43)

Learning

A change in human disposition or capability over a period of time, often represented by a change in behaviour (Blais, Hayes, Kozier, & Erb, 2002, p. 127).
**Pneumonia**

An acute inflammation of the lung parenchyma that is caused by an infectious agent leading to alveolar consolidation (Urden, Stacy, & Lough, 2009).

**Nosocomial Pneumonia**

Pneumonia that is acquired while a patient is inside the hospital (Urden et al., 2009).

**Ventilator-Associated Pneumonia**

A nosocomial pneumonia in a patient on mechanical ventilator support by endotracheal tube or tracheostomy for more than 48 hours (Cason, et al., 2007).

**Bundle**

“A group of interventions related to a disease process that, when executed together, result in better outcomes than when implemented individually” (Institute for Health Improvement, 2007d).

**Qualifications of the Researcher**

This researcher is a Master of Science in nursing student at California State University, Chico. She has successfully completed the research course, which is a core requirement of the Masters in nursing program at Chico State University. She graduated with a Bachelor of Science degree in nursing from Jacksonville University and has been a registered nurse for the past 11 years. She is a pathophysiology and medical-surgical instructor for third semester nursing students at Yuba Community College in Marysville California.
Ms. Musvosvi has capacious clinical experience in intensive care nursing with profound interest in evidence-based nursing practice. During her seven years as a staff and charge nurse in the ICU at a level 3-trauma center in Northern California, she noticed a huge gap in knowledge and evidence-based practice among the nurses she worked with. She noticed a lack of adherence to established ventilator bundles in her workplace and the absence of VAP tracking, hence her heightened interest in this project.

This researcher has also worked in a number of outpatient clinics and home health settings as a staff nurse and supervisor. Her passion in nursing education is to enlighten nurses on ways to improve patient outcomes using evidence-based practice across the continuum.

Nurses play a vital role in infection control practices especially in the ICU. This role is linked to the amount of time nurses spend at the bedside caring for the critically ill patient as well as the numerous hands on procedures performed for the patients who are so sick that in some cases they can barely breathe on their own. The ventilated patient is at an increased risk for acquiring ventilator-associated pneumonia especially if the bedside nurse lacks the knowledge or neglects infection control practices and established guidelines for preventing VAP. According to Tolentino et al., (2007), educational reinforcements can help to ensure improvements in knowledge and nursing practices in a sustained manner.

This study will help identify the impact of continuous in-service education on ICU nurses’ knowledge and adherence to VAP practices. The following chapter will provide a literature review on what is currently known regarding VAP and approved interventions for prevention.
CHAPTER II

LITERATURE REVIEW

Chapter I provided an overview of the aim and goals of this research. VAP and other key words relating to the research have already been defined. Knowledge relating to preventive measures for VAP is continuously developing and expanding. Nursing knowledge in the clinical setting also needs to grow. The literature reviewed suggests that either a gap in nursing knowledge of VAP or a failure to translate knowledge into practice may augment the development of VAP among mechanically ventilated patients. An evaluation of nursing knowledge and application of current research into clinical setting is an important component for achieving excellence and quality care delivery to patients.

The main database used for this study was CINHAL Plus, accessed through the California State University, Chico Library. PubMed, Academic Search, and Wiley Online Library were also used. ‘Ventilator-associate pneumonia’, ‘nurses’ knowledge’ and ‘ventilator bundles’ were used as search terms. Related articles were reviewed and monthly alerts for key articles were established in order for this researcher to stay current with literature updates on the subject.

Reviewing the literature is of particular relevance and importance in the study of VAP. VAP is associated with high costs, high morbidity and mortality rates. This chapter will review what is currently known through research about VAP and existing
bundles of care to prevent it. Although the literature reviewed for this study yielded numerous studies assessing nurses’ knowledge of VAP, most if not all of these studies addressed single elements and not specific VAP bundles.

A full understanding of VAP is important when considering the assessment and caring for the ventilated patient. In order to provide the reader with that understanding, an overview of the pathogenesis of VAP, current protocols in use and preventive strategies will be discussed. Finally, implications for nursing practice will be explored.

Pathogenesis of VAP

Mechanical ventilation has been a mainstay of both adult and pediatric critical care for almost half a century (Rose & Nelson, 2006). Along with other various treatment approaches in the ICU’s, there are many intricacies associated with mechanical ventilation as a treatment approach. These complications include, but are not limited to, lung trauma from large pressure volumes, oxygen toxicity, and increased risk of aspiration and lung colonization by bacteria, which often results in pneumonia (Kindirli, Kavaz, Talaki, & Burcu, 2006).

VAP can be attributed to a broad spectrum of bacterial pathogens. These pathogens range from gram-negative bacilli, gram-positive cocci, to methicillin resistant staphylococcus aureus (Urden et al., 2009). These bacterial pathogens migrate into the respiratory system primarily through colonization of the oral cavity, trachea, sinuses or stomach. If left untreated, the bacteria can further migrate into the lower airways through aspiration. According to Hunter (2006) “the oropharengeal flora changes from the usual
gram-positive streptococci to mostly gram-negative organisms that are more destructive within 48 hours of intubation.” When this happens, a diagnosis of early onset VAP is made. Late onset VAP is when the infection occurs after 4 days of mechanical ventilation.

There are numerous risk factors associated with increasing the chances of developing of VAP in the mechanically ventilated patient. According to (Berenholtz et al., 2004; O'Keefe-McCarthy, Santiago, & Lau, 2008; Pruitt & Jacobs, 2006), Colonization of the oropharynx, with subsequent aspiration of secretions into the lower respiratory system is the single most important cause for VAP. In addition, Rubin, Dhand, Ruppel, Branson, and Hess (2011) noted: that the presence of an endotracheal tube provides a direct route for colonized bacteria to enter the lower respiratory tract. Because oral and upper airway secretions can pool above the endotracheal tube cuff and form a biofilm which may harbor large amounts of bacteria, bacteria is can be easily transmitted into the lower respiratory airways during periods of ventilator-induced breaths.

Mechanically ventilated patients often require sedation in order to facilitate adequate ventilation, decrease work of breathing, discomfort, and stress (Urden et al., 2009). Sedation however decreases the patient’s ability to clear oropharyngeal secretions by depressing both the gag and cough reflexes. Again, this predisposes them to aspiration and colonization of the lungs by bacteria.

A commonly favored practice in the ICU is early enteral nutrition. Nutritional needs of the mechanically ventilated patient are often met via gastric tube feedings. This practice certainly contributes to improved patient outcomes, while providing significant
prophylaxis against the development of gastric stress ulcers (Anderson, 2000). Although this route for providing nutrition to the ventilated patient is preferred over the intravenous route, it often poses complications with aspiration especially when the patient assumes a supine position while receiving feedings (Joseph et al, 2010). Recommendations are yet to be established by the CDC regarding the frequency for checking residual volumes or modifications in feeding procedures to prevent VAP (Tolentino et al., 2007).

Intubated patients are often prescribed gastric ulcer prophylaxis, due to the high risk of bleeding secondary to gastric ulceration in critically ill patients. Gastric alkalinization with the use of H2 receptor blockers is a significant risk factor for VAP (Flanders, Collard, & Saint, 2006). Other factors increasing susceptibility to VAP include poor oral and nasal hygiene, poor infection control measures during endotracheal suctioning, extended periods of intubation, poor hand washing practices, and supine or semi-recumbent position especially when the patient is receiving enteral feedings (Hunter, 2006; Pruitt & Jacobs, 2006). ICU nurses who work with mechanically ventilated patients need to adopt and implement strategies aimed at preventing VAP.

Diagnosis

The accurate diagnosis of VAP is difficult and controversial. Some studies have advocated for a diagnosis based on clinical and radiological findings (Augustyn, 2007), while others, Rello, Diaz, and Rodriguez (2005), have proposed for more invasive testing such as quantitative bronchoscopy samples which account for a more accurate diagnosis. According to Porzecanski & Bowton (2006), in addition to new or worsening lung infiltrates on the chest x-ray, other clinical findings such as fever, leukocytosis, and
purulent secretions are often the mainstay for the diagnosis of VAP. Because of VAP’s high morbidity and mortality rates, Shorr (2006) suggested that reaching a universal criterion for diagnosis should not be the main focus; instead, emphasis should be placed on identifying and implementing preventative strategies. Early intervention and treatment are critical to reducing infection rates.

Current Protocols/Bundles to Prevent VAP

Bundled strategies for preventing VAP were developed in order to promote the delivery of evidence-based care in a more standardized and deliberated fashion (Crunden, Boyce, Woodman, & Bray, 2005). A bundle of care is defined as “individual interventions or best practices for a specific disease process that when grouped together have an even greater positive impact on the patient outcome” (Lawrence, Good, & Carlson, 2009, p. 166). According to Youngquist et al. (2007) bundled practices correlate with a significant reduction in VAP.

Numerous bundles of care have been documented in literature. These bundles include anywhere from sepsis bundles, cardiovascular disease risk reduction bundles, infection prevention and VAP bundles (Cooke & Holmes, 2007; Poe et al., 2007; Smith, 2007). Ventilator bundles are among a list of those that have been effective in improving compliance to changes in clinical nurses’ practice and consequently a reduction in the incidence of VAP (Brilli, Wells, & Shaw, 2006). Lawrence and Fulbrook (2011) noted that among all the known care bundles, the ventilator care bundle is the most widely implemented. Based on the risk factors contributing to the development of VAP outlined earlier in this literature review, ventilator bundles have been put in place in hospitals
around the world. In 2004, the Canadian Critical Care Trials group developed guidelines to prevent VAP using bundles of care.

Other organizations have followed suit in issuing guidelines to prevent VAP. In 2004, the American Association of Critical Care Nurses [AACN] issued the VAP practice alert. Their guidelines included head of the bed elevation between 30 and 40 degrees, continuous aspiration of sub-glottis secretions and minimal changes of the ventilator circuit. The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) also developed a ventilator bundle composed of head of the bed elevation, daily weaning trials from sedation, gastric ulcer and deep vein thrombosis prophylaxis (Institute for Healthcare Improvement, 2006).

Significant reduction in the incidence of VAP with strict adherence to the bundles has been documented (Arlene, Tolentino-DelosReyes et al., 2007). Although these ventilator bundles are different from one hospital to another, use of these bundles has yielded substantial success in reducing the incidence of VAP (Gallagher 2012).

Richens, Rycroft-Malone and Morrell (2004) noted that the most commonly used ventilator bundles are comprised of interventions for peptic ulcer prevention, deep vein thrombosis prophylaxis, head of the bed elevation and sedation vacation. In 2003 the US Centers for Disease Control and Prevention provided recommendations for nursing actions to prevent VAP. These recommendations include head of the bed elevation to at least thirty degrees if not contraindicated, oral care, hand washing and changing the ventilator circuit when it is visibly soiled.
Current Studies Assessing Knowledge

This literature review yielded several studies with widespread findings regarding nurses’ knowledge of VAP. Due to the wide variations in VAP bundles from one hospital to another, findings regarding knowledge varied significantly. There is no current literature to endorse the use of one specific bundle over another. Furthermore, few studies have incorporated the use of educational intervention strategies to assess nurses’ knowledge and behavioral change in their practice.

Studies have demonstrated nurses’ knowledge deficit regarding measures to prevent VAP. Labeau et al. (2007) conducted a survey of 638 ICU nurses in Lebanon regarding their knowledge of established measures for preventing VAP. Results of this study in particular yielded a mean score of 41.2% of correct answers. On the other hand, El-Khatib, Zeineldine, Ayoub, Husari, and Bou-Khalil, (2010) conducted a survey on “Clinicians’ knowledge of evidence based guidelines for preventing VAP” in the ICU unit of a 450 bed university hospital in the USA. In this study, 41 nurses working in the ICU participated. Knowledge regarding patient positioning, use of open versus closed suctioning systems, and frequency of circuit changes was assessed using a questionnaire consisting of 9 knowledge based questions. There was no evaluation of oral care or hand washing as preventative measures. Each participant was given an average of 15 minutes to answer all the questions. Results of that study showed a mean total score of 78.1% for correct answers among nurses.

In a more recent study, Apisarnthanarak, Warren and Fraser (2011) conducted a study to evaluate the “Long term outcome of a multifaceted intervention to reduce ventilator associated pneumonia” at Thammasat University Hospital in Thailand. A total
of 2925 mechanically ventilated patients were enrolled in the study over a 5-year period in two phases (from 2004-2009). Elements of the ventilator bundle in this study included daily weaning, hand hygiene, aspiration precautions, and prevention of circuit contamination during phase 1. A reduction of 79% in VAP was noted (20.6 to 4.2 per 1000 ventilator days). Oral care was added to the bundle in phase 2 of the study. Oral care reduced the VAP incidence from 4.3 to 3.36 per 1000 ventilator days, indicating a 37% reduction in VAP rate.

Although these recommendations are evidence-based and are in place in most hospitals, non-adherence to them has been reported. For example, according to Creedon (2005) healthcare workers seldom exceed a compliance rate of 50% with hand washing. In a separate study, nursing staff was consistent with hand washing only after contact with patients and not prior to touching the patients (Tolentino-DelosReyes et al., 2007). Such observations raise questions on whether nurses are knowledgeable about actions to prevent infections. This lack of compliance may be due to knowledge deficit regarding the guidelines for preventing VAP.

The three elements of the ventilator bundle discussed in this literature review are: head of bed elevation at least 30 degrees, if there are no contraindications, oral decontamination, and hand washing with each patient contact. These guidelines are part of the recommended list put in place by the CDC since 2003.

Head of the Bed Elevation

Head of the bed elevation is a simple and cost-free intervention, which has been proven to reduce the risks of VAP. Benefits of elevating the head of the bed are well
documented. Wip and Napolitano (2009) noted that head of the bed elevation to at least 30 degrees is the single most important element that is directly associated with a reduction in VAP. Vincent (2004) also noted that the semi recumbent position facilitates easy diaphragmatic descent, better ventilation and a decreased risk of aspiration.

This intervention is relatively easy to implement given the special electronic beds found in virtually all ICU units. For the most part, it is a matter of pushing a button on a bed in order to elevate the head of the bed. Previous literature indicated the significance of non-adherence with rates up to 50% among ICU nurses (Bouadma et al, 2010; Scales, 2011). Wolken, Woodruff, Smith, Albert, and Douglas (2012) conducted a study in a 24-bed medical ICU at a 477-bed university teaching hospital in Denver to evaluate head of bed elevation adherence over a 7-month period in 2007. In this study, three hundred and thirteen patients were monitored for a total of 1,373 ventilator days. This study showed a 24% non-adherence rate for head of the bed elevation in mechanically ventilated patients at this hospital.

In an earlier study of 170 randomly selected ICU patients by Grap, Munro, Bryant, & Ashtiani, (2003), results showed a mean backrest elevation of 19 degrees for patients. Almost 70% of the patients in this study were found to be supine with mechanically ventilated patients having a lower backrest elevation than non-ventilated patients. Findings from these studies strongly suggest a gap in knowledge or failure to follow guidelines regarding the importance of head elevation in preventing VAP.
Oral Decontamination

Pathogens responsible for VAP are often located in the oral mucosa. Oral hygiene plays a significant role in preventing nosocomial infections. If performed in a timely and consistent manner, good oral care practices can reduce the number of bacteria in the oral cavity thereby reducing risks of lung colonization and ultimately the development of VAP (Chan, Ruest, Meade, & Cook, 2007). Munro and Grap (2004, p. 27) also noted “Reducing the number of microorganisms in the mouth reduces the pool of organisms available for translocation to and colonization of the lung”. In a randomized controlled trial study at a university hospital in Bangkok, Thailand, the use of 2% chlorhexidine solution for oral decontamination had a VAP incidence of 4.9% compared to 11.9% in the control group (Tantipong, Morckchareonpong, Jaiyindee, & Thamlikitkul, 2008).

Chan and Hui-Ling (2010) conducted a descriptive cross-sectional study in Singapore in order to assess local nurses’ knowledge of oral care of the critically ill patient. In that study, only 29.3% of the 244 nurse participants indicated that good oral care significantly impacts patients’ outcomes. 33.7% indicated that they did not have adequate training regarding proper oral care practices for the mechanically ventilated patient. Additionally 65.8% of the total participants also indicated an essential need to attend a proper training session on oral care in addition to the need for more information and education on “research proven oral care standards.” Results of Chan and Hui-Ling’s study showed that a majority of Singapore nurses working in the critical care setting lacked or had outdated knowledge regarding good oral care practices for the ventilated patient hence they were ill equipped to meet the oral hygiene demands of these patients.
In the United States, a multisite study of oral care practices by Cutler and Davis (2005) showed that over 50% of the hospitals in the country have not established specific oral care protocols for mechanically ventilated patients. In the United Kingdom, results from a survey by Sedwick et al. (2012), also revealed that only 56% of hospitals in the United Kingdom had established oral care protocol for their hospitalized patients.

These studies highlight a paramount need for further inquiry or the need for ICU nursing education on the significance of providing good oral care in preventing VAP.

Hand Washing

Improper hand washing techniques, which result in the cross-contamination of patients, have been identified as the biggest nurse-related risk factor for VAP (Augustyn, 2007). Nurses do not always adhere to proper hand washing guidelines, although their compliance rate is higher than physicians’ 73.9% vs. 52.5% for physicians (Hand Hygiene Australia, 2011). Current studies also show that if at all they do, nurses wash their hands more after the completion of a procedure than before touching a patient.

Hand decontamination before and after patient contact, is one of the important measures to reduce the spread of germs. Hand hygiene includes one of the following: washing hands with soap and water if there is visible dirt or soiling with body fluids or using an alcohol-based antiseptic for in the absence of soiling.

In a recent study on hand washing practices among 1200 ICU nurses, Sedwick et al. (2012) found that only 82% of nurses washed their hands between patient care. This translates to a noncompliance rate of 18% with hand hygiene practices when caring for
patients. Creedon (2006) also noted similar results in an observational study to assess compliance with of 73 healthcare workers with hand washing after implementing a multifaceted hand hygiene program. A 32% increase in compliance was noted, again translating to about 83% conformity. Results from these studies clearly indicate performance at below optimum requirements for preventing VAP.

Education

The goal-oriented nature of ventilator bundles calls for a highly organized and well-coordinated team approach in order to ensure successful implementation. Youngquist et al. (2007) noted that a team approach facilitated a structural change to the process of implementation. Although prevention of VAP should involve a multidisciplinary approach, nurses play a pivotal role in preventing modifiable risk factors for VAP (Augustyn, 2007). Nurses can facilitate optimal delivery of patient care if they kept up to date with current literature and prevention strategies for VAP (Kleinpell, 2009).

One of the greatest challenges for educators is to find the best ways to assess knowledge and understanding. Education interventions can help to reduce the rate of hospital-acquired infections especially if it is conducted with a multifaceted quality improvement approach. The first evidence-based step in any VAP best practice program is education. Although numerous approaches for preventing VAP have been documented in literature, there is a substantial limitation in data regarding nurse’s knowledge prevention strategies for VAP as well as a high the degree of non-adherence to established protocols. Llaurado et al. (2011) assessed knowledge on evidence-based
guidelines for preventing VAP among ICU nurses in six Southern European countries. Findings of this study revealed an average score of 45.1% for knowledge, which was rated “poor” although significantly better than in the pan-European countries (Llaurado et al., 2011).

Blot, Lisboa, Angles, & Rello (2007) noted that although knowledge may not always guarantee adherence to established guidelines, a lack of knowledge could significantly impact compliance in practice. Hockenberry, Brown, Walden, and Barrera, (2009) also noted that an understanding of the importance of established or recommended practices increases the likelihood of adherence. Staff education has also proved to significantly decrease VAP incidence. A study at Baines-Jewish Hospital in St. Louis revealed a reduction in VAP incidence of 6.9 per 1,000-ventilator days post a self-study module (Barnes-Jewish Healthcare, 2003).

Biancofiore et al. (2007) also noted that prevention of VAP is greatly dependent on education and awareness of ICU regarding evidence based practice. The written examination is just one of the many ways of assessing knowledge (Wood, 2009). Recent studies have shown a direct collation between adherence to an established VAP protocol and a reduction in VAP rates. In 2004, a study by Babcock, reported a decrease in VAP rates from 8.75 to 4.74 cases per 1000 ventilator days after administration of an educational in-service. Other studies by Rello (2002) also concluded that there was a 46 to 57.6% reduction in VAP incidence following a staff education session.
Implications for Nursing Practice

Findings from this literature review indicate that the bedside nurse plays a pivotal role in preventing VAP or decreasing risk factors. Hand washing, head of the bed elevation, and oral care with suctioning, are among those activities that have been examined in this study. Neglecting some or all of these interventions increases a patient’s risk for developing VAP. Because the ICU nurse plays an integral role in providing care of the ventilated patient, it is their full responsibility to be knowledgeable of these preventative measures against VAP.

Regrettably, a large gap exists between published guidelines and actual practice (Babcock, 2004). A possible barrier in implementing these guidelines could be lack of knowledge among nurses. Biancofiore et al. (2007) concluded that nurses lack awareness of their actions at the bedside because they do not have a clear understanding and application of evidence based practice.

The next chapter will describe the research methodology used in this study to examine the impact of an educational in-service on ICU nurses’ knowledge and compliance with practices to prevent VAP. A description of the settings, samples, the instrument, and processes related to how the data was managed and analyzed will be presented. Ethical and cultural considerations will also be discussed.
CHAPTER III

METHODOLOGY

This study utilized a quasi-experimental research to examine nurses’ knowledge of VAP. Because of the ability to use statistics as a means to measure results, quantitative designs are a great way to prove or disqualify a hypothesis. This study employed the nonequivalent groups design (NEGD), which is comprised of a pretest and a posttest with a treatment and comparison group. This design is the most commonly used of classic quasi-experimental designs because of the ease with which they can be implemented. In the NEGD, the group under study is as similar to the control group although not equivalent. A pre and posttest was used with a 15-minute educational in-service in between (see Table 1).

TABLE 1

<table>
<thead>
<tr>
<th>Variables</th>
<th>Dependent Variable</th>
<th>Independent Variable</th>
<th>Dependent Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure Knowledge (pretest)</td>
<td>15-minute educational session</td>
<td>Measure Knowledge (posttest)</td>
<td></td>
</tr>
</tbody>
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The hypothesis for this study was that nursing knowledge of VAP will improve and behavior regarding adherence to elements of the ventilator bundle will
change after an educational in-service. A characteristic that was examined in this study is nurses’ knowledge of VAP and interventions to reduce its incidence (dependent variable). The independent variable is the educational in-service administered to the nurses.

Design

The study took place in two natural ICU environments in three phases. One ICU was used as the control and the other one as the experimental unit. The policies and procedures for ventilated patients are similar in both ICU units. Both units have the same patient bed capacity and nurses go through the same ICU orientation offered by the hospital.

Phase 1

The researcher observed three elements of the ventilator bundle (hand washing, head of the bed elevation, and oral care with sub glottal suctioning) in both the experimental and control groups prior to the educational session on at least 150 ventilator days. The relationships among the variables were identified in order to obtain a general idea of the phenomenon being examined: knowledge.

Phase 2

In phase 2, participants in the interventional group completed the 13-point multiple choice question (MCQ) assessment test before and immediately after an educational in-service on VAP. For purposes of this study, the independent variable was the educational in-service with emphasis on three specific items of the ventilator bundle
used by this particular institution: head of the bed elevation, hand washing and oral care with suctioning.

The intervention consisted of small group sessions of a 15-minute in-service on VAP and its prevention strategies in order to afford all nurses an equal opportunity to participate. Sessions were conducted for all the day and night shift nurses. The in-service was prepared and delivered by this researcher, a graduate nursing student at Chico State University. The presenter collaborated with the clinical nurse educators to design and put together handouts, a power point presentation and lecture notes for the participants.

The pretest was administered to all participants during their work hours. Small group educational sessions were given immediately following the pretest. Participants were afforded ample time to ask questions regarding subject material covered during the educational in service. A posttest was then administered at the end of the educational in-service.

Phase 3

An observation of VAP practice in the experimental ICU was conducted during this phase. This researcher performed the observation over a two-week period and results were collected and tallied. All participants were observed for hand washing practices before and after contact with patients, elevation of head of the bed, and oral care with suction for a total of 130 ventilated patient contact.

Sampling and Setting

This study utilized a convenience sample of 59 ICU/CVICU nurses from a rural hospital in northern California. Thirty-one nurses (from the CVICU unit) were in
the interventional group and the other 28 nurses (from the medical ICU unit) were in the control group. Burns and Grove (2010), consider convenience sampling a weak approach because of the limitation in control of biases. For this study however, convenience sampling was chosen because it is accessible, less expensive, and requires less time to acquire than other sampling methods. Kerlinger and Lee (2000) also noted that a convenience sample is probably adequate if it is used with reasonable knowledge and care in a study.

Inclusion criteria was all registered nurses with at least six months of current ICU/CVICU experience and at least six months working with mechanically ventilated patients. Exclusion criteria will be licensed practical nurses working in the ICUs, new graduate nurses with less than six months nursing experience and no prior experience with ventilators.

The setting for this study was two ICU units operated by the same hospital in a rural hospital in Northern California. Ventilator bundle, nursing policies and procedures are the same for both units. The ICU/CVICU setting was chosen because nurses working in these units are responsible for a larger population of mechanically ventilated patients than other nurses in an acute care hospital. A proposal of the study was presented to the hospital education department, medical executive committee and the ICU nurse educators.

**Instruments**

A modified 13-question multiple-choice question (MCQ) for the pre and posttest was designed by this researcher to assess nurses’ knowledge of VAP. In order to
ensure content validity of a study, it is essential to ensure that anyone reviewing the test questions is an expert in the subject matter and survey design. Coughlan, Cronin, & Ryan (2009) noted that in nursing, these experts could be clinical nurse specialists, or nursing educators. The input of 3 ICU clinical and infection control experts was sought in order to establish content validity. The three experts have almost fifty years of combined ICU nursing experience, a Master of Science degree in nursing, and special interest in infection control issues in the ICU.

The reviewers were asked to review clarity of all test questions, and make suggestions for changes. These changes and suggestions were incorporated in the final version of this study. The test questions were pilot tested by 4 ICU nurses in order to obtain any information pertaining to clarity or the terminology and wording used. Scantron sheets will be used to tally the answers.

The reviewers were asked if all the important areas are covered, if items are clear and understandable, and if they have any suggestions for changes. In order to maintain content validity, the expert reviewers evaluated relevance of the 13 questions to nursing practice. Changes were incorporated in the final version of the project.

Data Collection

Data collection was conducted over a four-week period. This relatively short time period was chosen because of currently high nurse turnover rates in the ICU setting. About 30% of the nurses are travelers and most of the regular staff was either part time or per diem.
Observation of nurses’ practice of hand washing, head of the bed elevation and oral care with suctioning were conducted by this researcher, one week prior to the educational session. Data was collected on how frequently the nurses adhere to the selected elements of the ventilator bundle. The actual study constituted a 13-question pretest given to all participants (both interventional and control groups) addressing general elements of VAP. The educational in-service was conducted in small group sessions to ensure quality delivery and one on one attention. Overview of ventilator knowledge was covered in the first five minutes and then ways to reduce VAP including the three elements assessed in this study (suctioning, head of bed elevation and hand washing) were covered in the last ten minutes. Nurses had the opportunity to ask questions for clarification of material covered at the end of the in-service.

A posttest was delivered soon after the educational exercise. The researcher remained in the ICU/ CVICU departments for the entire time that participants were answering the pre and posttest. This ensured that participants answer the tests completely without postponing the exercise for a later time or run the risk of not answering the questions at all.

Post education observation commenced immediately after all nurses have completed their posttest. The researcher observed and documented frequency of hand washing, head of bed elevation and oral care practices on all participants to ensure accuracy and consistency of data collection.
Data Analysis

Raw data was uploaded to an Excel spreadsheet for analysis using Statistical Package for the Social Sciences (SPSS) version 18. A statistician from the Chico State University math department was consulted for assistance with analyzing data. Descriptive and inferential statistics were used to examine ICU nurses’ knowledge of VAP and compliance with the ventilator bundle elements.

Protection of Human Subjects

There were no apparent ethical issues in this study. However, in order to address any issues regarding privacy, all pretests and post-tests materials were de-identified. While nurses were required to attend the VAP in-service as part of a mandatory educational requirement for the ICU staff, they are free to decline participation in the study.

An Institutional Review Board (IRB) approval is often required if results of the examination will be used for research purposes or if the results will be used to improve the internal quality of patient care or the work environment. Furthermore, Connelly (2009) noted that IRB approval is necessary if the findings will be reported in an article or presentation. Findings from this study might be used in future studies or be reported in other publications, therefore the Chico State IRB approval was sought and granted.

The study was clearly explained to the participants. Objectives were outlined. There was strict privacy and confidentiality. Participants were not required to provide their names on the pre or posttest papers. Participants were given the option to decline to
take part in the study or withdraw from it at any time without jeopardizing their relationship with the hospital. The results of the study were communicated to the participants upon completion of the entire study.

Before data collection, informed consents, surveys and questionnaires were included in the application form to the hospital’s education department and the Chico State University Institutional Review Board. Data collection did not begin until after approval from the board. An informed consent was given to each participant (see Appendix A for informed consent).
CHAPTER IV

FINDINGS

This chapter will present results and analyze the study findings. Validation of data collection instrument was done in phase 1 and discussed in chapter three. In phase 2, the researcher, tested nurses’ knowledge on evidence based guidelines for prevention of ventilator-associated pneumonia (VAP) using a 13-point multiple-choice question (MCQ) validated by ICU nursing experts. Results of the study were analyzed using descriptive and inferential statistics. Findings and discussion are presented in this chapter.

The three questions explored in this study were: what is the baseline knowledge of ICU nurses regarding the basic concepts and interventions for VAP? What is the impact of an educational in-service on ICU nurses’ knowledge of VAP? What is the impact of an educational in-service on ICU nurses’ compliance with established VAP protocols? Nurses were observed for compliance with the ventilator bundle before and after an educational in-service. A pretest and posttest were used to assess knowledge.

Sample Description

The demographic characteristics of the participants varied in gender (Figure 1), educational level (Figure 2), and ICU experience (Figure 3). Female participants in the study group accounted for 81% (n=25) and male nurses accounted for 19% (n=6).
Figure 1. Distribution of gender ($n = 31$).

Figure 2. Distribution of education level ($n = 31$).

There was no correlation between gender and performance on the test or compliance with clinical guidelines for VAP ($t = -1.87, p > .05 = .0858$).
Of the 31 participants, three nurses (9%) had an advanced degree, nineteen nurses (59%) had an associate’s degree and ten nurses (31%) had a bachelor’s degree in nursing. See Figure 4 for the distribution of education level of participants. All three nurses with a master’s degree answered all the questions correctly in both the pretest and posttest, suggesting a direct correlation between advanced level of training and knowledge of nurses on guidelines for VAP prevention. The pretest and posttest scores however, did not reveal any statistically significant difference between bachelors prepared nurses and associate degree prepared nurses ($t = .707, p = .5185 > .05$).

Years of experience in ICU also varied greatly among participants. There was an average of 1-5 years ICU experience among eighteen nurses (58%). Eleven nurses (35%) had over five years of ICU experience. Only two nurses had at least six months (but less than one year experience in ICU (Figure 3). The difference in the mean average pretest scores of nurses with over five years ICU experience and those with 1-5 years ICU experience.

*Figure 3. Distribution of ICU experience ($n = 31$).*
experience was very similar, demonstrating no statistically significant difference in the knowledge of the two groups of nurses ($t = 2.00, p = .116 > .05$).

**Pretest and Posttest Results**

Baseline data for VAP knowledge was obtained using a 13-point MCQ pre-test (applied to both the control and study groups). The same MCQ pre-test was also used as a posttest to evaluate knowledge of nurses in the interventional group post their educational in-service.

Pretest scores in the study group showed that 80.6% of the nurses ($n=25$) answered all questions correctly. Thirteen percent of the nurses ($n=4$) missed one question and 6.5% ($n=2$) missed two questions ($SD=0.58$).
The control group yielded similar results to the study group in pretest scores. Twenty-three nurses (82%) answered all questions correctly, two nurses (7.1%) missed one question and three nurses (10.7%) missed two questions ($SD=0.66$). These scores indicated that both the interventional group and the control group possessed a good baseline knowledge on Ventilator associated pneumonia (VAP).

The same 13-item MCQ pretest was used for assessing knowledge of nurses in the interventional group following a 15-minute in-service education session on VAP.

Test for Improvement in Paired Scores for Posttest versus Pretest Scores in the Study Group

One sample nonparametric testing was used to analyze data findings. A significance level of 0.05 was established for this study. The null hypothesis was that there will be no significant improvement in knowledge after an education in-service ($H_0$: median change is zero). The hypothesis in this study was that VAP knowledge of nurses will improve after an educational in-service ($H_1$: median change is greater than zero). Twenty-five nurses in the interventional group scored 100% in the pretest and had no room for improvement. This resulted in a statistically insignificant score increase ($p=.009$). The remaining six nurses who had missed questions in the pretest, scored 100% in the posttest (mean score increase of 1.33, $P < .05= 0.016$ which led to rejection of the null hypothesis. Results of this study showed that there is evidence to support the claim that an educational in-service improves knowledge of VAP among a group of ICU nurses.
Compliance with Ventilator Bundle

Descriptive statistics were used to analyze findings of compliance with ventilator bundle elements. Each element of the bundle was assessed before and after the educational in-service in both the control group (ICU) and interventional group (CVICU). A total of 130 ventilated patients were used at each level of assessment.

In the interventional group, pre-intervention observation revealed 87.1% (n=27) compliance with hand washing before and after contact with ventilated patients. There was an 80.6% (n=25) compliance with oral care practices and 90.3% compliance with head of the bed elevation (n=28). These findings are illustrated in Figure 4.

Post Intervention Observation

The last and final stage of the study involved an observation of nursing practice in adherence to the established VAP bundles. All nurses who participated in the educational in service were observed for hand washing, oral care and head of the bed elevation practices. A comparison was made with pre-intervention data. There was an increase in the number of nurses who were compliant with each of the bundle elements after the educational in service (Figure 4). There was a 3.2% improvement in hand washing, 6.4% improvement in oral care practice and 3.2% improvement in head of the bed elevation practice.

Compliance with bundle elements in the control was somewhat similar to the interventional group at the beginning of the study (Figure 5). Twenty-five nurses (89.2%) were compliant with hand washing protocol. Twenty-four nurses (85.7%) adhered to established oral care protocols in the VAP bundle. Twenty-six nurses (92.8%) ensured a
minimum of 30 degrees head of the bed elevation (unless contraindicated). Surprisingly, compliance of the control group in the second observation with the same VAP bundle elements declined from the first observation. Compliance with hand washing declined to 87%, oral care compliance went down to 83% and compliance rates for head of the bed elevation slightly declined to 92%. This trend is opposite to what was observed in the interventional group where an in-service education improved nurses’ compliance with VAP practices.

**Transitional Statements**

Baseline nurses’ knowledge in this study demonstrated a very good understanding of VAP in both the study and control groups prior to the implementation of the educational in-service. In the study group, a mean score of 98% in the pretest and a
100% in the posttest was established. Post education scores however still improved in the study group ($p = .016$) indicating a positive impact of educational in-service on knowledge. Furthermore, a significant improvement in adherence to VAP practices was also observed as a result of improved knowledge.

Chapter 5 will discuss the study findings, implications for nursing practice, education and research, limitations and recommendations for further research.
CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

VAP is a serious complication of mechanical ventilation with high morbidity and mortality rates (Augustyn: 2007, Restrepo, Anzueto, Arroliga, & Afessa, 2010). ICU nurses’ knowledge and role in preventing VAP is paramount in reducing the occurrence of VAP. According to Vandijck, Labeau, Volgelaers and Blot (2012), knowledge is a primary condition for compliance with protocols for preventing VAP. This study therefore focused on assessing ICU nurses’ basic knowledge for VAP, and whether an educational in-service improved knowledge and changed practice. Although plenty of literature exists on VAP prevention and protocols (Youngquist et al. (2007, Lawrence & Fulbrook: 2011, Gallagher, 2012), fewer studies have focused on the impact of in-service education in increasing knowledge and improving clinical practices for VAP prevention (Tolentino-DelosReyes, Ruppert, & Shaio, 2007; Welch & Austin, 2008). Findings from this study showed that ICU nurses’ knowledge and clinical practice for VAP prevention improved after an educational in-service.

This study arose from the need to consider the impact of educational in-service on knowledge and nursing behaviors to prevent VAP. Although knowledge does not always guarantee safe clinical practice (Blot, Lisboa, Angles, & Rello, 2007), safe practice in the ICU unit cannot occur without basic knowledge. A self study module.
developed by Kollef’s group at a hospital in St. Louis reduced the VAP rate from 12.6 to 5.7 per 1,000 ventilator days, indicating a 57.6% decrease ($p < .001$) (Barnes Jewish Healthcare, 2003).

In another study, Tolentino-DelosReyes, Ruppert, and Shaio, (2007) conducted a clinical education project to evaluate critical care nurses' knowledge of the ventilator bundle in preventing ventilator-associated pneumonia. Results of that study showed that nurses performed better in the posttest after a 30-minute educational session ($P < .001$).

Other studies also provide evidence on the impact of knowledge in reducing rates of hospital-acquired infections after educational programs (Apisarnthanarak, Warren & Fraser, 2011; Berenholtz et al, 2004). Although this current study did not track VAP rates before and after the educational intervention, knowledge of VAP and nursing practice improved after education.

Significance of Study

One of the goals of research is to develop a body of knowledge that will advance nursing practice by delivering clinically effective care. Reed and Lawrence (2008) defined nursing knowledge as an awareness that is regarded as useful and significant to nurses and patients in understanding and facilitating human health processes. If education has the potential to improve knowledge, then nurses should be afforded the opportunity to advance their knowledge in the clinical setting through ongoing educational in-services. Post interventional observations suggest a strong coalition between knowledge and improved clinical practices. While compliance in the
interventional group increased after education, compliance in the control group actually declined.

These study findings have implications for improved patient outcomes. Clinical educators and clinical managers should incorporate evidence-based measures to prevent VAP and use ongoing learning opportunities in order to improve knowledge. This study adds to the body of knowledge and current findings in literature regarding the application of educational in-service to knowledge improvement and improved clinical practices.

Implications for Nursing Education

The importance of assessing nursing knowledge and behavioral practices aimed at preventing infection is essential to the delivery of quality care in ICU settings. Education and awareness play a significant role in improving outcomes. This study highlights the impact of nurses’ knowledge particularly in the context of reducing VAP and improving clinical outcomes. Therefore, it is recommended that VAP, its management and preventive measures be integrated more aggressively into undergraduate nursing education programs and in-services. Clinical nurse educators and managers should follow through with ensuring that this knowledge is translated into practice by ensuring that nurses understand the importance of adhering to established protocols.

Results of this study have the potential to provide guidance to nurses and other health care workers who are in the front line of the fight against VAP, allowing
them to improve clinical practice. In-service education and awareness allows ICU nurses to continue on a path leading to improved outcomes.

At the end of the study, the director of Critical Care and the Chief Intensivist both requested a consistent tracking of VAP rates from the infection control department. Results of this study will be communicated to the infection control team, ICU nurses and respiratory team in a scheduled in-service for infection control and used as an opportunity for discussion on further study and/or suggestions for change. This study adds to the growing evidence in research, the importance of educational in-services in improving nursing knowledge and consequently improves nurses’ clinical practices.

Implications for Research

Increasing the average level of knowledge has been the first step in successful multifaceted educational programs. Findings from literature (Salahuddin et al., 2004; Labeau et al., 2007) stress the importance of nursing knowledge and an evidence-based practice approach to VAP prevention. Labeau et al. (2008) conducted a study on knowledge levels on the evidence-based guidelines for prevention of VAP among European intensive care nurses. Results from that study showed an average score of 45.1% on a knowledge test among European ICU nurses. In comparison, nurses in this study were well knowledgeable about VAP compared to findings from other studies. This study is valuable, as it will generate questions and hypotheses that can be used to develop further research.
Limitations of the Study

This study addressed outcomes in only one hospital. The small sample size ($n=59$) does not necessarily represent all ICU nurses’ knowledge therefore the findings cannot be generalized to other ICU nursing populations. Replication of the study to include larger samples of critical care nurses from multiple ICU units can provide a more accurate assessment of knowledge for VAP amongst ICU nurses in general.

Currently, there is no form of VAP incidence tracking in this hospital although there is a ventilator bundle in place. Having a track record of VAP incidence would have helped evaluate the effectiveness of the educational intervention in reducing VAP incidence as well.

The observational phase in this study might have had inherent limitations. One obvious limitation is the effect of the ‘observer’ on the ‘observed’. Participants’ awareness of the fact that they were being observed might have elicited a change in behavior practices, introducing the Hawthorne effect bias.

Lastly, the most important limitation of this research was that the knowledge assessment tool was not formally assessed for content validity, as this was considered to be beyond the scope of the current study. However, face validity was achieved through reference to subject experts and the process of piloting as discussed in Chapter 3.

Recommendations for Further Research

The high morbidity, mortality, and costs of treating VAP remain a concern in nursing. This means that even small gains in preventive measures can translate into thousands of lives and millions of dollars saved in healthcare. This study produced
positive results indicating an overall improvement in knowledge and behavior regarding VAP after an educational in-service among a selected group of ICU nurses.

In order to stay current with knowledge and skills, ICU nurses need ongoing development and education. For this objective to be met, the following recommendations for clinical practice are made:

1. Continuing education in-services on VAP related topics must be maintained in order for ICU nurses to improve knowledge on prevention of VAP.

2. Orientation of new ICU nurses should include education on VAP prevention.

Further research with larger samples in multiple facilities is recommended to see if similar results will be attained.

At this Northern California hospital, VAP education for all medical personnel who have direct contact with ventilated patients is recommended; this includes respiratory therapists and nurses’ aides. Continued assessment of the effectiveness of currently established ventilator bundle elements should be enforced. The critical care educator and the infection control team should pursue ongoing education related to VAP prevention and best-practice measures.

In conclusion, nursing knowledge regarding VAP preventive measures significantly increased post-intervention. In particular, the results obtained show that this educational intervention improved ICU nurses' scientific knowledge about VAP and ultimately improved practice measures to prevent VAP. Ongoing studies with different and larger sample populations will continue to add to these findings.
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doi.org/10.1016/S0964-3397(03)00028-4


doi: 10.3928/00220124-20090101-08


CONSENT TO PARTICIPATE IN A RESEARCH STUDY

Principal investigator:

Ennies Musvosvi, RN, BSN

California State University (Graduate Nursing Student)

(530) 123-4567

Title of study:

Impact of In-service Education on ICU nurses Knowledge of Ventilator-Associated Pneumonia (VAP)

Purpose of study:

Assess knowledge of nursing interventions to prevent VAP.

Procedure:

Participation in this study will be during your scheduled work time. A pre and posttest will be administered before and after a 15 minute educational session. Please do not write your name on either the pretest or the posttest

Potential risks:

No risks have been identified for participating in this study. However, should any unexpected emergencies arise during the time you are under study, you will be attended to accordingly.
Compensation:
There is no compensation for participation. A potential benefit for taking part in this study might be an addition of knowledge base regarding VAP. The results of the study will be used to revise and refine current VAP protocols within the ICU as well as add to current literature.

Confidentiality:
All information obtained in this study will be solely used for educational purposes and your identity will not be revealed (Please do not include your name on the test papers). Results from this study will most likely be published for future research and educational purposes.

Participation:
Your decision to participate in this study is voluntary. Should you decide to withdraw from the study, you may do so at any point without penalty. Your decision to leave the study will have no future impact on your relationship with this researcher or the hospital. Should the researcher decide to end this study for whatever reasons, you will be automatically removed from the study.

Your decision to participate in this study is voluntary. By signing below, you are agreeing that you have read the information provided above and you are willing to take part in this study.

Participant’s signature ___________________________ Date ____________

Investigator’s signature ___________________________ Date ____________
California State University, Chico
Chico, California 95929-0875
Office of Graduate Studies
530-898-6800
Fax: 530-898-3342
www.csuchico.edu/graduatestudies

January 16, 2013

Ennies Musvosvi
1820 Royo Ranchero Drive
Yuba City, CA 95993

Dear Ennies Musvosvi,

As the Chair of the Campus Institutional Review Board, I have determined that your research proposal entitled "THE IMPACT OF IN-SERVICE EDUCATION IN ICU NURSES' KNOWLEDGE AND COMPLIANCE WITH PRACTICES IN PREVENTING VENTILATOR ASSOCIATED PNEUMONIA" is exempt from full committee review. This clearance allows you to proceed with your study.

I do ask that you notify our office should there be any further modifications to, or complications arising from or within, the study. In addition, should this project continue longer than the authorized date, you will need to apply for an extension from our office. When your data collection is complete, you will need to turn in the attached Post Data Collection Report for final approval. Students should be aware that failure to comply with any HSMC requirements will delay graduation. If you should have any questions regarding this clearance, please do not hesitate to contact me.

Sincerely,

[Signature]
John Mahoney, Ph.D., Chair
Human Subjects 

Attachment: Post Data Collection Report

cc: Mohammad Asia (200)
APPLICATION FOR HUMAN SUBJECTS
IN RESEARCH CLEARANCE

Submission Checklist
APPLICATION FOR HUMAN SUBJECTS
IN RESEARCH CLEARANCE

The attached form is to be completed by those using human subjects in research. Please refer to the attached "Requirements for Research Using Human Subject", to help define the category of exemption that you are applying for. If, after reading the attached information you have questions, contact Marsha Osborne 898-5413 or HS&AC@csuchico.edu. Return your completed application to Marsha Osborne, Student Services Center (SSC), Room 460. Each of the items below must be included on your form. Please mark each item on the checklist below when it is completed.

1. Application Category
   ☒ a. Exempt
   ☐ b. Expedited
   ☐ c. Joint Review
   ☐ d. Full Board Review
   ☐ e. Psychology

2. ☑ Copy of Survey or Research Instrument attached
3. ☑ Copy of Informed Consent form attached
4. ☑ Obtain (Page 5) signature of the Department Chair, or thesis committee chair for thesis project, or faculty supervisor for group or individual class project(s) or other campus unit supervisor for research originating in non-academic units.

NOTE: Incomplete applications will not be processed. Incomplete forms will be returned for the required information before any further processing, which may result in a delay of clearance.

You will be notified when your application is approved, at which time you may proceed with data collection. A Post Data Collection Questionnaire will be mailed to you along with your letter of approval. After completing data collection, you will need to fill out and return the Post Data Collection Questionnaire in order to be fully cleared. Failure to provide this may result in academic delay.

__________________________________________  ________________________
Signature                                      Date

__________________________________________
Name (print)

This application is also available on-line: http://www.csuchico.edu/resp/forms/diploma/orderhsre/hsrapplication.doc
APPLICATION FOR HUMAN SUBJECTS IN RESEARCH CLEARANCE

Complete **ALL** items below: If an item does not apply, indicate N/A. Incomplete and unsigned applications cannot be processed.

Primary Investigator: Ennis Musvosvi
CSU Chico Portal ID# 004952468

Select a, b, c or d:

- □ a. Undergraduate
- ☑ b. Graduate
- □ c. Faculty
- □ d. Staff

**If a is selected:** Faculty Advisor, N/A

**If b is selected:**
Graduate Coordinator: Irene Morgan PhD
Thesis Chair: Mohammad Asia PhD

**If c is selected:** Application is required for a grant or proposal? Yes [ ] No ☑

If Yes—Name of Funding Source: N/A

College/Department of Primary Investigator:

College _Natural Sciences_ / Dept. Nursing

Home Address of Primary Investigator: 1820 Rayo Ranchero Dr
City Yuba City / State CA / Zip 95993
Street Address or P.O. Box
Home Phone: 530 554-1959 Work Phone: 530 749-4300 Email: enivco@yahoo.com

Secondary Investigator: Mohammad Asia PhD
(Faculty Advisor or Theses Chair is required to be Secondary Investigator if a student is primary investigator)

College: _Natural Sciences_ / Dept. Nursing
Application Category: Exempt

Project Title: The Impact of In-service Education in ICU nurses’ Knowledge and compliance with Practices in Preventing Ventilator Associated Pneumonia

Briefly describe the project purpose and methodology: The purpose of this study is to examine critical care nurses’ knowledge of ventilator-associated pneumonia and to identify any changes in knowledge and clinical practice after related in-service education. This is a quasi-experimental research with a nonequivalent groups design (NEGD). There will be a pretest and a posttest with an intervention (educational inservice) to the experimental group. A convenience sample of approximately 50 ICU/CVICU nurses will be assigned to the two groups based on the two ICU departments. The Medical ICU nurses will be the control group and the Cardiovascular ICU nurses will be assigned to the experimental group.

Project’s: Beginning Date Dec 24 2012 Ending Date April 30 2013
Begin date can’t precede approval mm/dd/yy

Select one: ☑ New Project □ Modification □ Substudy

If Modification or Substudy, please list project title and name of primary investigator from previous study.
Complete all sections (If a section is not applicable to your project, indicate N/A)

Subject population: Intensive Care Nurses

Subject source: Local Hospital in Northern California

Number of subjects: 50

How subjects will be contacted: 60

Note: In most research, subjects MUST give written (usual), oral (sometimes), or written AND oral informed consent. A copy of your Informed Consent form must be attached to this application. (See page 4 of the attached, Requirements for Research Using Human Subjects, for detailed information about Informed Consent requirements.) Specify types of instruments to be used (e.g., tests, questionnaires, interview guides, etc.)

Tests

A copy of all instruments to be used must be attached. If they have not been completely developed, please attach a draft.

How administered: □ Phone □ Mail □ Face-to-face □ Email □ Internet

Length of subject participation: 30 minutes

Frequency of subject participation: 2 times

Data will be recorded using (check all that apply):

☑ Written Notes ☐ Photography
☐ Audio tape ☐ Film
☐ Video tape ☑ Computer
☐ Other (Please describe N/A)

Subjects’ confidentiality must be preserved. This requires that their identity and the fact and the nature of their responses be kept in confidence. Please indicate all measures you will take to insure the protection of subjects’ confidentiality including where all data will be stored and when it will be destroyed:

1. Participants will be instructed to NOT put their names on the pre test and post test
2. Participants will NOT be required to sign in for the in-service
3. The principal investigator will ensure that data collection and processing will be kept confidential and secured in a password-protected electronic source that is only known by the principal investigator
4. Data will be destroyed soon after the study is completed and thesis is approved for graduation
Please check (X) each category of data, which will be collected, and place a star (*) after each category of data which will be reported in your study.

Subjects
- [ ] Names of People
- [ ] Addresses
- [ ] Phone Numbers
- [ ] Ages
- [ ] Sex Categories
- [ ] Ethnicity
- [ ] Marital Status
- [ ] Types of Employers
- [ ] Incomes
- [ ] Job Titles
- [ ] Names of Employers

Other
- [ ] Codes Linked To Subjects' Names By Separate Code Key
- [ ] Codes Not Linked To Subjects' Names
- [ ] Other Unique Information About Individuals
  Specify None

Will existing data be used?  [x] yes  [ ] no
(Specify Data collection will be initiated at the beginning of the study. No previous data will be used in this study)

Will there be interventions or manipulations of subjects or their environments?
(Specify A 15 minute educational in-service will be administered and a post test will be given immediately following the inservice)

Will the research involve?  Psychological Stress?  [ ] yes  [x] no
Physical Hazards?  [ ] yes  [x] no

If yes, please specify.

Will there be debriefing of subjects?  [x] yes  [ ] no
If yes, please describe (Prior to commencement of the study, participants will be given a general overview of the study and concluding remarks will also be given at the end of the inservice immediately before the post test)

Will data reporting be  [x] aggregated?  [ ] anecdotal?
Data will be used for (check all that apply):

Data will be used for
- [x] Publication
- [ ] Evaluation
- [ ] Needs Assessment
- [ ] Conference presentation
- [ ] Degree Requirement
- [ ] Class report (written/oral)
Other (Please describe). N/A

RECOMMENDATION
This activity has been reviewed in accordance with Federal regulations, including its relevant subparts. In compliance with these guidelines,

☑️ I concur  ☐ I do not concur

that this project is exempt from review of the Institutional Review Board or the Unit Regulatory Body.

Department Chair or other Supervisor (Faculty & Staff)  Date

Faculty Supervisor or Thesis Chair (Students)  Date

☐ I concur  ☐ I do not concur

that this project is exempt from review of the Institutional Review Board or the Unit Regulatory Body.

Chair, Institutional Review Board  Date

Comments:

☐ Human subjects are involved, but this activity qualifies for an Expedited Review.

Chair, Institutional Review Board  Date

Comments:

Full Board Review

☐ I concur  ☐ I do not concur

that this project has gone through the Institutional Review Board or the Unit Regulatory Body and the required modifications have been completed.

Chair, Institutional Review Board  Date

Comments:
APPENDIX C
DATA COLLECTION INSTRUMENT VALIDATION

Kindly review the attached test and answer the following questions:

Face Validity

Is the questionnaire clearly worded?

Are the questions well explained?

Content Validity

Kindly evaluate relevance to nursing, questions 1 through 13 using a scale of 1 to 3:

1 = not relevant
2 = relevant, but not necessary
3 = absolutely necessary

Question 1:
Question 2:
Question 3:
Question 4:
Question 5:
Question 6:
Question 7:
Question 8:
Question 9:
Question 10:
Question 11:
Question 12:
Question 13:
MODIFIED PRETEST AND POSTTEST

1. When caring for a mechanically ventilated patient, hand decontamination is indicated
   (a) Before each patient contact only
   (b) After each patient contact only
   (c) Before and after each patient contact
   (d) Hand washing is not indicated as long as the nurse wears gloves on

2. The main route for bacterial colonization of the lower respiratory system for a
   ventilated patient is through
   (a) Aspiration of oral secretions during periods of ventilator breaths
   (b) Compromised immune system
   (c) Presence of multiple diagnoses for the ventilated patient
   (d) Strict adherence to ventilator protocols.

3. How often should you perform oral care with suction on ventilated patients?
   (a) Once in a 12 hour shift
   (b) Twice every 12 hours
   (c) Every 2 hours
   (d) As needed

4. How do you rate the role of hand washing in preventing VAP?
   (a) Very important
   (b) Important
   (c) Not important
5. When caring for a ventilated patient, which one of the following patient positions is recommended for decreasing the risk of VAP?
   
   (a) Supine positioning is recommended  
   (b) Semi-recumbent positioning is recommended  
   (c) The position of the patient does not influence the risk of VAP  
   (d) I do not know

6. Which of the following is a cause for concern when a diagnosis of VAP exists?
   
   (a) Increased hospital costs  
   (b) Increased hospital length of stay  
   (c) Increased mortality  
   (d) All of the above

7. Personnel related risk factors for development of VAP include all of the following except
   
   (a) Improper hand washing practices  
   (b) Failure to adhere to established VAP protocols  
   (c) Knowledge deficit  
   (d) Strict adherence to VAP protocols

8. A well-designed educational program aimed at the prevention of VAP will have which of the following effects:
   
   (a) Provide more time for nursing procedures  
   (b) Improved outcomes and reduced costs  
   (c) Better patient care and fewer ICU admissions  
   (d) More justification for staffing pattern revision
9. Best Practice is defined in this program as “Any key point which will prevent or reduce both oropharyngal colonization and
   (a) Use of antibiotics
   (b) Aspiration
   (c) Hypoventilation
   (d) Mortality

10. Reducing colonization of the oropharyngeal area and aspiration precautions are major elements of preventing downward migration of pathogens into the lungs.
   (a) True
   (b) False

For question 11 and 12 Indicate “A” in the space provided if the key point prevents or reduces colonization and “B” if it prevents or reduces aspiration.

11. Hand washing

12. Reverse Trendelenburg’s position

13. Head of the bed for a ventilated patient should be elevated to a minimum of ...(as clinically tolerated) at all times to reduce aspiration of contaminated oropharyngeal secretions and subsequent development of ventilator-associated pneumonia (VAP)
   (a) 10 degrees
   (b) 20 degrees
   (c) 30 degrees
   (d) 40 degrees
Demographics

1. Select your gender
   a. Male
   b. Female

2. Select your highest level of nursing education
   a. Diploma
   b. Associate degree
   c. Bachelor’s degree
   d. Master’s degree

3. Select the number of your ICU/CVICU nursing experience
   a. 3 - 6months
   b. 6 - 12months
   c. 1 - 5years
   d. Over 5 years

4. How many in services on VAP related topics have you attended in the last 12 months?
   a. None
   b. One
   c. More than one

5. Which shift do you work?
   a. Day
   b. Night