

Teaching Strategies to Reduce VAP at Mulago Hospital: A Capstone Project

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### Abstract

Mulago National Referral Hospital (Mulago), in the sub-Saharan African country of Uganda, is one of the largest hospitals in East Africa. Continuing education requirements for nurses working in the ICU at Mulago are not formalized, and teaching preferences for nurses here are not well-understood. Ventilator associated pneumonia (VAP) is a global problem, but the incidence and prevalence of the disease is not well-documented in the developing world. Undoubtedly, nursing interventions play a significant role in the prevention of VAP, but education on evidence-based bundle approaches in countries such as Uganda is not well-understood. Active teaching methods, such as posters and lectures, and passive teaching methods, such as posters alone, have been used to teach evidence-based practices to numerous populations, but their application for teaching VAP prevention in Uganda has not been documented. By using Kurt Lewin's Theory of Planned Change (TPC) to guide an educational change, nursing experts from western countries will identify future change agents, deliver active education through posters and lectures, solicit buy-in from stakeholders, and evaluate change for evidence-based practice changes for VAP prevention at Mulago through a pre-test/post-test design. By implementing this Capstone project, Mulago ICU nurses have the potential to drive change and influence future continuing education efforts in this unique and challenging clinical setting.

*Keywords:* pneumonia, prevention and control; continuing education, nursing; east Africa

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### **Introduction**

Within the realm of nursing education, there are numerous teaching methods that have been studied for transferring knowledge in various clinical and academic settings. Adult learners working in the clinical setting differ from nursing students in how they learn; opportunities to teach based on adult learning methods are increasing in settings where staff development and continuing education occur (Candela, 2012). The concept of *continuing education* has been used to educate nurses working in the developed world (Sauter, Nightingale-Gillespie, & Knepp, 2012), but nurses working in developing countries may not have the same educational needs and may learn in different ways. Mulago National Referral Hospital (Mulago) in the sub-Saharan African country of Uganda is one setting where nursing continuing education practices are not well understood. These practices should be critically examined to determine current expectations, specific challenges, and to apply evidence-based teaching methods for knowledge transfer based on priority clinical needs.

### **Description of Setting**

Mulago is one of the largest hospitals in East Africa. With a 1,500 bed capacity, Mulago is the main public teaching hospital for Uganda; it currently functions as both a primary care center and general specialty hospital, and only to a limited extent as a tertiary care facility (Kizza et al., 2011). The main intensive care unit (ICU) at Mulago was started in the late 1990s with a foreign donation, and was initially managed by a United Kingdom anesthesiologist. The unit is currently staffed by several Ugandan intensive care physicians who received training in higher income countries, and approximately 20 registered nurses (Kwizera, Dunser, & Nakibuuka, 2012). Most of the ICU nurses at Mulago receive training from local Ugandan schools of

nursing, with the most common being from the Makerere University College of Health Sciences (MakCHS), which is adjacent to Mulago. Registered nurses at Mulago are mostly women, are between the ages of 21-30, and have a nursing diploma (Mwebaza, Katende, Groves, & Nankumbi, 2014).

The main ICU at Mulago can provide mechanical ventilation, inotropic infusions, post-operative care, intermittent hemodialysis, peritoneal dialysis, and basic neurocritical care (Kwizera, et al., 2012). The equipment available is limited and antiquated; power outlets are scarce, and power surges happen frequently. Disposable, single-use items are often cleaned and reused on the same patient and in some cases, between different patients. Cardiac and pulse oximetry monitoring is accomplished with portable monitors placed at each bedside, and no centralized monitoring or alarm system exists. Suction is available through portable suction machines, and some devices are used often between multiple patients. Personal protective equipment and hand hygiene products are limited. In 2012, Kwizera et al. (2012) reported that the main ICU at Mulago had 12 beds, and was only able to mechanically ventilate six patients at one time; no unit in Mulago is able to adequately ventilate infants or neonates.

### **Identification of the Problem**

According to Grzeskowiak (2013), ventilator-associated pneumonia (VAP) is one of the most common and frequent types of hospital-acquired infections in the world, accounting for more deaths than urinary tract infections, central line infections, or surgical site infections. Ventilator Associated Pneumonia is the most common infection in ICUs, and the leading cause of infection-related mortality (Alp et al., 2012). In general, the overall incidence of VAP is higher in developing countries than in developed countries (Alp et al., 2012), but in the developing world of sub-Saharan Africa, specific data about the incidence of hospital-acquired

infections are generally lacking; few studies focus on nosocomial infections in developing countries across this region (Scherbaum et al., 2014). Despite the lack of data specific to this region, VAP is attributed to a 30% - 50% mortality globally (Alp et al., 2012). VAP undoubtedly creates significant problems in developing countries such as Uganda, with maintenance being a challenge due to a marked lack of resources.

Like many sub-Saharan African countries, Uganda faces health challenges that significant stress the country's healthcare system. Uganda has only one trained health worker per 1,818 people, with no clear guidance on how to best train these and future additional workers (Kizza et al., 2011). Unlike in developed countries, continuing education for nurses in Uganda is not mandated by employers or the Uganda Nurses and Midwives Council, the professional nursing licensing body (Muliira, Etyang, Muliira, & Kizza, 2012). Subsequently, no clear data is available on whether any continuing education is provided to nurses working at Mulago, or how often they receive training on managing care. Nursing interventions have a significant impact on the incidence and prevalence of nosocomial infections such as VAP (Micik et al., 2013), but the current teaching strategies for nurses in this environment is unclear.

### **Specific Data**

Rothe, Schlaich, and Thompson (2013) have reported the lack of published studies focusing on the incidence of hospital-acquired pneumonia in sub-Saharan Africa. What is known is that 8% - 14.5% of all hospital-acquired infections in this region stem from lower-respiratory infections. Although specific nosocomial infection rates are not reported for Mulago, the mortality rate in the ICU is 40.1% (Kwizera et al., 2012). Kwizera et al. (2012) discussed that early deaths are common here, and postulate that this can be attributed to the lack of trained staff and resources needed to provide adequate care for patients with serious diseases and conditions.

Nursing care given to patients in developing countries is often informal, uncoordinated, and relatively low as compared to that in developed countries (Baker, 2009). Variation in how nurses are credentialed may contribute to poor quality of care. Both “nursing certificates” and “nursing diplomas” exist as methods for credentialing nurses to practice in Uganda, with certificates representing much less rigorous curricula. A Registered Nurse diploma is earned by enrolling in an additional set of courses following the required nursing certification curriculum (Mengo Hospital, 2014). According to some nursing educational leaders, certificate-level nurses are not competent enough to deliver the quality of care that is needed (Birungi, 2015). At Mulago, nurses also reportedly have a suboptimal alignment with continuing education efforts and lifelong learning practices (Birungi, 2015). Suboptimal continuing education could be as a result of significant barriers such as heavy workloads, lack of access to a medical library, lack of computer skills, and lack of professional conference attendance (Muliira et al., 2012). With a documented high mortality rate in the ICU at Mulago and a lack of continuing education, a need exists for simple, accessible, and point of care training, based on evidence-based teaching practices, for improved clinical outcomes.

### **Mission and Strategic Plan**

The combined mission of MakCHS and Mulago Hospital is to “Improve the health of the people of Uganda and beyond and promote health equity by providing quality education, research, and health services” (Kizza et al., 2011, p. 2). This mission ties directly to the needs and goals of providing staff education for essential nursing care. “Quality education” is also directly stated in the mission; providing continuing education to the nurses should be considered fundamental to the goals of the institution. Although the organizational mission is clear, implementation of quality, evidence-based training is challenged by a lack of educational and

staff development structure, combined with limited access to necessary equipment, medications, and technologies.

### **Relationship to Local and Global Trends**

The “bundle approach” to interventions for clinical care remains strongly embedded in evidence-based practices proven to be successful (Conway-Morris et al., 2011; Rello et al., 2012). Since the first ventilator bundle was proposed in 1999, several institutions have developed specific bundles with common elements woven throughout; numerous studies and case reports have been published outlining the success of this approach since the first bundle went into effect (Grzeskowiak, 2013). For example, Conway-Morris et al. (2011) described how head of bed elevation, oral chlorhexidine, sedation holds, and a weaning protocol are associated with statistically significant reduction in VAP. Regarding nursing interventions, Micik et al. (2013) described specific nursing sensitive indicators for reducing VAP. These interventions include limiting the use of mechanical ventilation, preventing aspiration of secretions, preventing nasal and oropharyngeal bacterial colonization, preventing the use of contaminated equipment, and early mobilization. Each of the general indicators includes specific set of interventions that collectively, create a nurse-sensitive bundle approach (Micik et al., 2013).

The area where healthcare information should most visible is at the immediate point of care; the room or area where patient care actually occurs (Lenz-Norman, Fargason, Strickland, & Clark, 2014). A point of care poster, displaying an evidence-based bundle focused on respiratory nursing interventions, could be used as a continuing education tool for the ICU nurses at Mulago. It is both an art and science to produce effective teaching materials, and a well-designed poster can be very useful for nurses working in an acute care setting (Riley, 2014). In general, these tools have been used widely for knowledge transfer, especially when combined with other more

active teaching strategies, such as lecture (Mollon & Fields, 2009). In this setting, however, using passive teaching methods such as posters alone may not be sufficient for knowledge transfer. Ilic and Rowe (2013) note that posters are accepted as a valid form of transferring knowledge, but the measured impact on posters alone on knowledge, attitudes, and behaviors is not fully understood. Because of the unique setting of the Mulago hospital ICU and the lack of any tangible tools for implementing evidence-based practice standards, an active, multi-modal teaching initiative combining posters and lectures may be valuable here.

### **PSCOT Question**

For the ICU nurses attending continuing education at Mulago Hospital in Kampala, Uganda (P), does a lecture and point of care poster describing a care bundle for VAP (S), compared to a poster on VAP prevention alone (C), affect knowledge and behavior, as evidenced by improved posttest scores (O) immediately following training (T), when compared to pre-intervention test scores?

## **Review of the Literature**

### **Search Protocol**

A search was initially conducted of the CINAHL Complete, Cochrane Database of Systematic Reviews, ERIC, and MEDLINE databases from January 2006 to May 2016 using the search terms (a) intensive care AND poster AND lecture, (b) staff nurse education AND poster AND lecture, (c) poster presentations AND knowledge transfer, (d) lecture AND knowledge transfer, (e) lecture AND posters, (f) point of care AND posters, (g) lecture AND posters AND knowledge, (h) in-service AND posters AND nurses, (i) Uganda AND nurse education, and (j) Mulago hospital AND nurse education. The inclusion criteria were: (a) peer reviewed, (b) written in the English language, and (c) human studies. Studies that focused on high-fidelity

simulation activities and not posters or lectures, or studies that discussed using lecture or posters set only in academia were excluded after abstracts were reviewed. Seven relevant articles were found addressing the PSCOT question. Since the number of relevant articles was low, the search was repeated from January 2001 to December 2005. Five more relevant articles were found during this timeframe; only three of these articles are included in the final Evidence Matrix, as two of the articles (Coppersmith et al., 2002; Babcock et al., 2004) are additional analyses of two studies already identified in the search, and added no new content. The Evidence Matrix is found in Appendix A.

### **Appraisal of Evidence**

Most of the publications in this timeframe are level IV observational studies comparing a poster alone to combining a poster with lecture or a study module, and testing the effects of knowledge transfer and change in practice (Hlabangana & Andronikou, 2015; Mollon & Fields, 2009; Morse & McDonald, 2009; Panhorta, Saxena, & Al-Arabi Al-Ghamdi, 2004; Sterman et al., 2013; Warren et al., 2003; Zack et al., 2002). Populations evaluated in these observational studies include a combination of physicians and nurses or technicians (Warren et al., 2003; Panhorta et al., 2004), nurses and respiratory therapists (Zack et al., 2002), junior physicians alone (Morse & McDonald, 2009), nurses and/or nursing assistants (Sterman et al., 2013; Mollon & Fields, 2009), and radiology technicians (Hlabangana & Andronikou, 2015). External validity is generally low in these publications, as all studies were conducted in single-centers and in a few instances (Panhorta et al., 2004; Mollon & Fields, 2009) in one nursing unit within one center. Internal validity is also lacking in some of the observational studies, as it is not clear from the reports how variables potentially affecting knowledge retention, such as maturation and the testing tools themselves, were accounted for. Reliability of the methods tested was high.

Only one level II observational study (Sterman et al., 2013) was a randomized controlled trial (RCT), and had the strongest internal and external validity. One level VII publication (Simpson & Gordon, 2007) used an anonymous survey questionnaire sent to subject matter experts to elicit experiences on which educational interventions had been most successful in changing evidence-based practice. There was one level III systematic review (Ilic & Rowe, 2009) published during this timeframe. This review looked at various settings and populations including both healthcare workers and consumers. Few studies addressed population-specific clinical teaching strategies, especially in the developing world. No publications discussed or studied the use of either lecture or posters on knowledge transfer for nurses working in Uganda, although one level VI qualitative study (Thompson, 2010) described the positive experiences of nurses following an active lecture presented in Uganda on critical thinking.

Clinicians working in healthcare settings are studying best teaching practices to improve clinical outcomes for proper and safe care (Hlabangana & Andronikou, 2015; Mollon & Fields, 2009; Morse & McDonald, 2009; Panhorta et al., 2004; Sterman et al., 2013; Warren et al., 2003; Zack et al., 2002). Although there is a growing interest and body of literature on knowledge translation, little evidence exists specifically evaluating the poster medium (Ilic & Rowe, 2013). This is somewhat surprising as well-designed poster interventions have been used for many years as a means of transferring knowledge in the clinical setting (Morse & McDonald, 2009).

When used in isolation, passive education with posters alone has been found to be ineffective in transferring knowledge and changing clinical practice. Ilic and Rowe (2013) found that, as standalone interventions, posters were unanimously unsuccessful in knowledge transfer when presented at conferences, in the clinical settings, and when targeting healthcare consumers. Similarly, Morse and McDonald (2009) found a poster intervention for compliant labeling of

peripherally inserted venous catheters (PVCs) to be ineffective for improving compliance amongst junior physicians working in a tertiary care setting. Observations of compliance were audited before and after the poster intervention; although compliance did improve for labeling PVCs in those patients who had increased risk factors for blood stream infections, the posters themselves reportedly had no significant impact on overall compliance (Morse & McDonald, 2009). Because of this, educators looking to make the greatest impact on hospital staff, including nurses, should consider whether passive education through posters alone is sufficient for transferring critical data about clinical care.

When studying the effects of teaching pain management skills to nurses working in various units of one American hospital, both posters and lecture independently were found to be equally successful in their ability to transfer knowledge when evaluating familiarity of material through a pre-test/posttest design (Serman et al., 2013). Serman et al (2013) have published the only RCT comparing these two teaching methodologies, and both internal and external validity were strong. Although this is a single-center study and the total sample size is somewhat low, it provides some rationale for how posters themselves can be successful in transferring knowledge to nurses working in a clinical setting.

In various instances, the multi-modal approach of combining posters with lectures or study modules can be successful for transferring knowledge and improving awareness of newly presented material. (Hlabangana & Andronikou, 2015; Mollon & Fields, 2009; Panhorta et al., 2004; Warren et al., 2003; Zack et al., 2002). The active use of multiple teaching techniques can improve test scores on posttests following education interventions. The improvement in posttest scores can directly tie to an improvement in clinical outcome when certain behaviors, such as using proper patient identifiers (Mollon & Fields, 2009) and reducing adverse events such as

radiologic errors (Hlabangana & Andronikou, 2015), catheter associated blood stream infections (CABSI) (Warren et al., 2003; Coppersmith et al., 2002), and VAP (Zack et al., 2002; Babcock et al., 2004) are tested. For knowledge to remain strong, multi-modal educational interventions should not occur only once, but should be repeated regularly (Hlabangana & Andronikou, 2015). When evaluating the success of an educational intervention without a pre-test or retrospective analysis, lecture and posters combined can promote compliance, over time, with basic clinical workflow tasks such as proper handwashing (Panhorta et al., 2004). The active, multi-modal approach of using posters with lecture or in-servicing is successful when compared to using posters alone (Ilic & Rowe, 2013). Subject matter experts who have used these techniques to change evidence-based practice report through survey that no technique is ineffective, and that multi-modal approaches are preferred for educating clinicians (Simpson & Gordon, 2007). The success of the multi-modal approach transcends various settings, populations, and regions; because of this, its generalizability specifically to nurses working in critical care settings is low. One study (Mollon & Fields, 2009) looked at the use of lectures and posters together for nursing education in the acute setting, but no studies have focused on these educational interventions for nurses working in sub-Saharan African countries such as Uganda.

Few data exist on the effects of using posters for teaching nurses in the clinical setting, and little to no data is specifically available on preferred learning styles for nurses working in sub-Saharan African countries like Uganda. One qualitative study (Thompson, 2010) considered Ugandan nurses' reactions to different educational sessions focusing on various aspects of clinical care. Nurses in Uganda were observed reacting positively to lectures that included case studies, especially on topics previously unfamiliar to them (Thompson, 2010). This positive response shows that lectures presented to Ugandan nurses do elicit some positive feedback, and

that this form of active education may be preferred to passive methods alone. In general, a lack of data exists regarding the proper tools needed for knowledge transfer to Ugandan nurses as part of continuing education, and if any education translates to changes in practice and improved clinical outcomes in this setting. This supports the need for attention to be placed on teaching methods that have shown to be successful in other parts of the world. In doing so, proven best practices can be applied to nursing in Uganda and potentially, the rest of the developing world.

### **Literature Summary**

There is limited data within the last 15 years that discusses the use of posters as a possible means of providing knowledge transfer to nurses working in clinical settings. Publications on how posters alone impart knowledge more successfully than other more active teaching interventions are generally lacking. Within the observational data that do exist, posters used as passive teaching interventions alone have not proven to be successful in transferring knowledge or changing clinical outcome. Although observational studies are weak in both internal and external validity (Ilic & Rowe, 2013; Hlabangana & Andronikou, 2015; Mollon & Fields, 2009; Panhorta et al., 2004; Warren et al., 2003; Zack et al., 2002), findings do support utilizing an active, multi-modal educational approach, which includes posters used with other forms of teaching such as lecture and study modules, to teach various populations in several settings. One RCT (Serman et al., 2013) showed that there was no difference between posters and lecture when the methods were implemented independently, suggesting that in some cases, posters themselves may be adequate.

Further research is needed comparing posters and lectures as continuing education teaching techniques for nurses working in clinical settings. A gap exists in current knowledge regarding the best teaching methodologies for nurses specifically working in Ugandan hospitals,

and it is unclear if application of best practices from other areas of the world will be successful in Uganda. This gap emphasizes the importance of testing proven teaching methodologies, such as an active multi-modal approach consisting of both lecture and poster presentation, on nurses working in the ICU at Mulago. This review supports a multi-modal approach, including a short lecture detailing simple respiratory care practices for VAP prevention, supplemented by a poster discussing bundled nursing interventions that can be placed in the point of care area, to teaching about VAP prevention in the ICU at Mulago Hospital.

### **Action Plan**

#### **Description of the Change**

Beliefs regarding the importance of continuing education need to reflect that of a culture where staff development activities become an integrated part of improving care. Grounding these beliefs, while creating a culture where continuing education is valued, allows lectures to be presented and posters to be distributed to educate on interventions for VAP prevention in this setting. Nursing leadership at Mulago must buy-into the need for this educational change and the methodology driving the plan. This change will not happen immediately nor easily, stressing the need to use a change theory as guidance. The action plan begins with nursing experts from western countries observing practices and becoming assimilated in the culture of the ICU. The active education will begin with administering a 30-minute lecture to the ICU nurses, and a poster will be presented that details step-by-step implementation of key interventions. The poster will then be displayed in the unit to reinforce the knowledge gained. The long-term goal is to empower and mentor leaders and change agents at Mulago to continue these education efforts.

### **Evidence to Support the Need for Change**

Continuing education on evidence-based practices has been shown to improve morbidity and mortality for patients receiving care throughout hospitals in high-income countries, and to reduce unnecessary variations in care in these settings (Melnyk & Fineout-Overholt, 2012). Although this is true of the developed world, there are little to no data describing how continuing education and staff development are provided in countries such as Uganda. No defined education requirements exist, and there are no data detailing the effects any limited education has on improving practicing nurses' knowledge in this setting. This gap exists partly due to the fact that continuing education is not mandated by the Uganda Nurses and Midwives Council (Muliira et al., 2012). Despite this lack of specific data, there is moderately strong evidence that a multi-modal approach to continuing education, employing both lecture and poster media, can have positive effects on transferring knowledge in the clinical setting (Hlabangana & Andronikou, 2015; Mollon & Fields, 2009; Panhorta et al., 2004; Warren et al., 2003; Zack et al., 2002).

Best practices from higher-income countries can be introduced with setting-specific challenges in mind. Evidence shows that interactive learning methods, with sequenced sessions over time, focused on practice-based support, are effective means of transferring knowledge (Nakiboa et al., 2012). Because the mortality rate in the ICU at Mulago is high (Kwizera et al., 2012) with nosocomial infections likely being a contributing variable, there is a need for continuing education that is provided on a formal and continuing basis. Lectures and posters together are a proven multi-modal approach for point of care learning, but for the gained knowledge to be successful in changing practice, the importance of continuing education in the ICU at Mulago must become a valued standard.

**Environmental Characteristics**

Unlike in the ICUs of many developed countries, the ICU at Mulago does not have a full-time nurse educator or clinical nurse specialist. Several experienced nurses attend professional conferences when funding is available, and help to provide informal education from the advice and direction of western volunteer nurses who have spent time at Mulago. Karen S. March, MN, RN CNRN, is a clinical nurse specialist and nursing leader in neurocritical care and sub-Saharan Africa nursing education. K. S. March has volunteered as an educator in the ICU at Mulago for 8 years. K. S. March notes that Mulago has one Chief Nursing Officer, a Director of Nursing who manages the ICU, and a few key nursing supervisors, all of whom value volunteer nursing education from western countries and encourage nurses to participate in such trainings when they occur (personal communication, June 13, 2016). Two key staff nurses currently provide ongoing education in the ICU at Mulago, and act as leaders and change agents for new continuing education efforts. By targeting these nurse leaders and mentoring them to be future educators, the content taught for VAP reduction can continue on a regular basis.

Another driver for educational change is the recent addition of weekly classes for ICU nurses to focus on various topics related to patient care in the critical care setting (K. S. March, personal communication, June 13, 2016). The weekly classes provide an established forum for education to be administered, and the scheduled regular time shows the value the institution is starting to place on continuing education efforts. Contrarily, one example inhibitor to change is that nurses working in the ICU are frequently asked to cover other units of the hospital and are not valued as “critical care nurses.” Despite the benefits gleaned from new education provided, reinforcement of knowledge may be limited due to this staffing model, and newly acquired skills

may be lost if nurses are not permitted to work consistently in the ICU (K. S. March, personal communication, June 13, 2016).

### **Description of Change Theory**

Mitchell (2013) notes that Kurt Lewin is likely considered by most to be the pioneer in change theory. Lewin's theory has become known as the Theory of Planned Change (TPC), and is used as a strategic resource to motivate the human aspect of change (Shirley, 2013). Lewin's TPC argues that individual behavior is a function of the group environment; the environment consists of a number of interrelated forces, and is time-dependent (Batras, Duff, & Smith, 2016). Analysis of these forces is termed *force field analysis* (FFA), and this is used as a framework for identifying and examining the specific factors influencing a situation (Shirley, 2013). Lewin postulated that forces are either driving or restraining change and that ultimately move towards a particular goal (Shirley, 2013). Restraining forces cannot be removed, but can only be countered by increasing the driving forces (Mitchell, 2013). This framework culminates in what Lewin described as three stages through which change agents must proceed (Mitchel, 2013).

**Unfreezing.** In the Unfreezing stage, dissatisfaction is created with the status quo; there is realization that the potential benefits of change outweigh the risks (Batras et al., 2016). A change agent recognizes a problem and mobilizes others to see the need for change (Shirley, 2013); problems are diagnosed and resources are assessed (Mitchell, 2013). This is also the stage where forces for and against the change are identified (Shirley, 2013).

**Moving.** In the Moving stage, the implementation and trialing of the change occurs (Batras et al., 2016). Individuals react to change and move towards a new way of being (Shirley, 2013). Interest amongst members is heightened (Mitchell, 2013); roles and responsibilities may need reassigned (Batras et al., 2016). This stage requires a detailed plan of action for engaging

people to try the change; coaching and clear communication are needed to avoid losing sight of the desired target (Shirley, 2013).

**Refreezing.** In the Refreezing stage, organizational norms, cultures, and practices realign with the new change (Batras et al., 2016). Leaders accentuate the driving forces and counteract the restraining forces, while producing a new equilibrium in the system (Shirley, 2013). Change is adopted in the system and becomes permanent (Mitchell, 2013). The change is now recognized as a norm or higher level of performance expectation (Shirley, 2013).

### **Change Theory Application**

Because there is no formal staff development or continuing education process at the Mulago ICU, content will initially be disseminated to the identified change agents, key nurse leaders, and staff nurses by the nursing experts from western countries outside Uganda during the unfreezing stage. The fact that current nursing interventions for respiratory care are inadequate will be realized; the need for education on a bundle approach will be understood. Nursing experts from western countries will observe care practices, meet with nursing leaders such as the Chief Nursing Officer, Director of Nursing, and nursing supervisor, and jointly identify both the barriers and drivers for change. Observation of nurses' response to suggestions and leadership reactions will help to determine what specific barriers exist, and who the key individuals will be to promote the change.

During the moving phase, the educational intervention will be administered. The education will focus on care provided by registered nurses; there are approximately 20 registered nurses working in the ICU here (Kwizera et al., 2012), allowing for five sessions that have approximately 6 nurses in attendance to be conducted. A smaller class size will allow for enough nurses to still work on the unit providing patient care, while others are receiving the

education. To empower the change agents to continue the process here, the first 1-2 lectures should be provided by the outside nurse expert, with the subsequent lectures being taught, through coaching, by the identified subject matter experts. This method helps to further redefine roles and responsibilities and ensure the change continues after the initial intervention. Nursing leaders should be invited to view the training and are expected to attend, further signifying the importance leadership places on the value of continuing education. This will also show the importance of developing critical care nurses through specialized peer to peer training, and ideally minimize the number of nurses being transferred to other units in the future.

In the refreezing stage, the newly identified subject matter experts will continue providing this education initiative to new nurses hired in the ICU, and to other units at Mulago. The posters will remain in the unit as reminders and reinforcement for the nursing care needed to prevent VAP. Because nursing leaders will have been invited to witness the lectures and view the posters, the importance of providing continuing education throughout the hospital will ideally be instilled within the culture at Mulago. Increasing the knowledge on nursing interventions for reducing VAP will lay the foundation for not only reducing the overall incidence and prevalence of the condition, but also for creating a culture where continuing nursing education is valued and leads to the development of specialized critical care nurses at Mulago.

### **Implementation Plan**

According to Trewet and Fjortoft (2013), continuing education efforts are more successful in both learning and practice change if educational activities include the following components (followed by a direct application to this project plan):

- In an area of interest (critical care nursing)
- Related to daily practice (respiratory interventions)

- Selected in response to an identified need (high rates of nosocomial infections)
- Interactive (active teaching)
- Use more than one intervention (lectures and posters)
- Are self-directed (peer to peer education)
- Focus on specific outcomes or objectives (improved knowledge)
- Use reflection (included evaluations)
- Include a commitment by the learner to continue the change (secure commitment by nursing leaders).

The lack of any continuing education structure, combined with the staffing and resources challenges present at Mulago, emphasize the need to recognize the forces both for and against change. Appendix B details the anticipated timeline for this plan with the associated expected outcomes and responsible parties.

### **Unfreezing**

Considering Lewin's TPC, entering the unfreezing stage will be the most involved step of this process and require the most support.

**Initiation.** Due to a lacking continued education structure or local educators at Mulago, nursing experts from developed countries will initiate the change process by spending time in the ICU to observe, assess, plan, and present suggestions for change. Over the course of one week, the nursing experts will participate in interdisciplinary rounds, help care for patients, and assess overall respiratory care and nursing interventions provided. Because resources differ from those in developing countries, current practices must be linked to resource availability versus a lack of education alone. During this time, nursing experts will identify change agents, 1-2 staff nurses in the ICU who are leaders amongst their peers, to help drive change into the next phase. It is

important to identify the change agents early, as they mobilize others to see the need for change (Shirely, 2013).

**Presentation.** During the week of observation, the nursing experts and change agents will present a 15-minute PowerPoint to the Chief Nursing Office, Director of Nursing, and nursing supervisor at Mulago Hospital. This presentation will focus on the problem of VAP in developing countries such as Mulago, the lack of continuing education offerings here, and the plan for change. The presentation will highlight the review of the literature showing the benefits of a multi-modality educational approach consisting of both lectures and posters, and will emphasize the importance of leadership involvement in driving this change.

### **Moving**

**Execution.** After the first week of assessment, identification of change agents, and securing buy-in from stakeholders, the multi-modality educational intervention will be delivered. The intervention will highlight appropriate nursing interventions, utilizing an evidence-based bundle approach, that can be implemented at Mulago, and will consist of both a lecture and posters. The lecture will last 30 minutes, and the posters, being displayed throughout the unit, will emphasize key concepts discussed in the lecture. As the lecture will only be 30 minutes, nurses will be able to receive the training while already present for work. Nursing leaders will be asked to attend at least one session.

**Transfer.** The lecture will be delivered twice by the nursing experts, with the local nurse change agents finishing the process by providing the final lectures. This is a critical step, as the identified change agents must continue the process after the nursing experts depart Mulago. By initiating the responsibility of transfer early, nursing experts will ensure that the education will

be delivered appropriately prior to leaving the institution. The entire education process will occur over a full week duration. The lecture and poster are found in Appendix C.

### **Refreezing**

The final phase involves both improving knowledge transfer of nursing interventions to reduce VAP, and to change practices in the ICU that allow for better educational offerings and staff development initiatives in the future. Assessment of material learned will be completed through an evaluation process before and following the education. A commitment to change will also be asked of the nurses and nursing leaders here. ICU nurses will remain working in the ICU as the need for specialized nursing skill will be recognized. Goals and objectives, project outcomes, and timelines must be defined early for all of these steps to occur successfully, while providing clear evidence when progression to the next step in the process is appropriate.

### **Goals and Objectives of Education Project**

Goals and objectives early must be defined early in project implementation. Using Bloom's Taxonomy, the expectation is that nurses will be able to apply knowledge they have gained through education to patient care situations (Boland, 2012). If the time for teaching and evaluation is limited, objectives may need to be written at a lower level (Oermann & Gaberson, 2014). When combining these concepts, goals of the teaching initiative are simple, are attainable and relevant to the setting, and can be assessed through evaluation over time using Blooms Taxonomy as a guidance:

- Knowledge: Nurses define VAP and other respiratory care concepts immediately following lecture
- Comprehension: Nurses describe the contributing factors leading to VAP immediately following lecture

- Application: Nurses apply evidence learned from lectures and poster for preventing VAP to patient care in the weeks following education activity
- Analysis: Nurses analyze their current care practices and how they may contribute to patients acquiring VAP immediately following lecture
- Synthesis: Nurses develop a care bundle using available resources for VAP prevention based on evidence-based practice in weeks following education activity
- Evaluation: Nurses evaluate the educational initiative on their ability to improve patient care for the prevention of VAP following lecture and poster dissemination

Ultimately, nursing leaders will require continuing education for the nurses, which will be an initial step towards creating a specialized ICU nursing staff. Stakeholder responsibilities include: The Chief Nursing Officer and Nursing Director will require continuing education on various topics, and will schedule specific time for this to occur. The nursing supervisor will require ICU staff to attend future educational initiatives, and will follow-up on evaluation criteria from this project. The change agents will continue to provide education on VAP prevention, and will assist in the evaluation process. Implementation of this multi-modality education initiative and evaluation of knowledge transferred will be evaluated immediately after the intervention, and further evaluated after 6 months following the project to assess the success of this approach for future education at Mulago.

### **Evaluation Plan**

To determine if the active educational approach of combining a lecture with a poster to transfer knowledge is appropriate, a pre-test/post-test evaluation tool will be used to assess understanding. The tool will be administered before delivering the education to assess any prior knowledge the nurses may have (pre-test), immediately after the lecture is delivered and posters

are administered, and again 6-months after practice changes have been implemented (post-test). Key stakeholders will utilize data gathered from these evaluations to assess preferred learning styles, evaluate the effectiveness of this change on activity, and to improve continuing educational initiatives.

### **Evaluation Tool**

Boyas, Bryan, and Lee (2012) discuss how the pre-test/post-test method is an evaluation tool often used to measure student learning. Learners are given a test prior to a learning activity to assess mastery of learning objectives. At the end of the activity, the same assessment is administered, with the expectation that performance will improve, presumably as a result of the activity-related requirements (Boyas et al., 2012). Pre-tests can be used to assess knowledge prior to instruction, enabling the instructor to gear the education to the learner's needs (Oermann & Gaberson, 2014). The use of a pre-test can also allow instructors to determine prior knowledge and to adjust content over time (Boyas et al., 2012).

Mulago ICU nurses have an unknown ability to understand basic respiratory anatomy, intubation assistance and management skills, and overall care of the patient on mechanical ventilation support. Having an assessment of these concepts, as well as basic understanding of VAP principals and care bundles, will guide nursing leaders and change agents on how best to focus time during the 30-minute scheduled lecture. Administering the same test immediately following the lecture will help the instructors determine what concepts need to be addressed in more detail through the poster administration. By reviewing test results after the education is delivered, instructors can identify areas in which students did or did not learn particular content (Oermann & Gaberson, 2014). After results are reviewed with the nurses through discussion, reiteration of material will be provided through poster dissemination. Conducting post-test

discussions can be an opportunity to reinforce learning, correct misinformation, and solicit input from test-takers for improvement (Oermann & Gaberson, 2014). Once a review is complete, commitment to implement practice changes will be obtained from each nurse to reinforce the importance of practice changes.

### **Outcome Evaluation Criteria**

Criterion-referenced tests are evaluations that are constructed and interpreted according to specific learning outcomes (Twigg, 2012). Test questions for this evaluation are based on broad learning objectives set-forth in the project, with specific test items stemming from content delivered in the lecture and poster. A 15-item multiple-choice pre-test/post-test will be administered as the evaluation tool for this activity. Multiple-choice tests are used for assessing learning at the knowledge, comprehension, application, and analysis levels, making them adaptable for a wide range of learning outcomes (Oermann & Gaberson 2014). Nurses must process complex cognitive processes during care but despite this, most multiple-choice test items only test the knowledge or comprehension levels (Tarrant & Ware, 2012). The evaluation centers mostly on the knowledge and comprehension domains related to background anatomy, intubation procedural information, and causes of VAP, as well as the application and analysis of bundled nursing interventions to reduce the incidence of VAP. Because of the short allotted lecture time and 15-items on the evaluation test, the knowledge and comprehension levels will be the primary domains tested. The post-test will be administered immediately after the lecture and 6 months following the activity to evaluate long-term retention of knowledge transferred.

The validity of test items and applicability of information to the population will be evaluated through a peer-review exercise conducted the month prior to travel to Uganda. Nursing experts will review and tailor test items based on the evaluation with faculty peers who

have experience with education in Africa. Peer review by additional content experts helps to ensure suitable test quality and that items test a higher cognitive domain when appropriate (Tarrant & Ware, 2012). Once the tests are administered, evaluation of outcomes will be determined by an improvement in scores between the pre-test and post-test administrations; same or improved scores between the immediate post-test and 6-month post-test are considered an indication of successful knowledge retention. The evaluation tool to be administered as both a pre-test and post-test, with test items categorized according to Bloom's Taxonomy, is found in Appendix D.

### **Relationship of Activity to Posters Alone**

The primary goal of this project is to compare the success of an active teaching method (a lecture combined with a poster), to passive education (a poster alone) as a means of knowledge transfer on VAP prevention to nurses working in the ICU at Mulago. As continuing education efforts are not fully understood or formalized in Ugandan hospitals (Muliira et al., 2012), no current educational poster can be used to compare methods proposed through this education initiative. By spending two weeks in the Mulago ICU, the nursing experts intend to provide the full, active educational activity to all registered nurses, thereby eliminating the opportunity of some nurses to be educated by the posters alone. Although the lack of a comparison group is true of this project, the activity does not prevent the local stakeholders from implementing future continuing education activities that may consist of a poster alone, and comparing knowledge retention to that obtained through this project.

Although most evidence supports a multi-modality approach as a successful method for knowledge transfer in the clinical setting, one RCT (Sterman et al., 2014) showed no difference between posters and lecture when implemented independently as teaching strategies. This data

suggests that in certain instances, posters themselves may be adequate for continuing education. To fully assess their independent utility in teaching nurses in the ICU at Mulago, future education projects will need to be conducted that utilize the poster method alone, and similar pre-test/post-test evaluations will need to be administered to test this method accordingly. Nurses working in the ICU will be asked their opinions of the effectiveness of these teaching methods. This activity should be done in the six months following this education activity, so that the methods can be compared when the six-month post-test on VAP prevention is administered.

### **Timeline and Stakeholder Roles**

After the first week of observing practice behaviors, obtaining buy-in from stakeholders, and identifying appropriate change agents, the 30-minute lecture will be delivered and posters will be disseminated over the course of the second week. Prior to beginning the lecture series, the nursing supervisor and change agents together will disseminate the pre-test to all nurses working during this week at the beginning of their shifts, allowing 15 minutes to complete each test. Results will not be discussed, but tests will be provided back to nursing experts. The nursing supervisor will then be responsible for scheduling the nurses to attend the lectures based on work schedules, and will be responsible for ensuring that all nurses attend. Forty-five-minute time slots will be scheduled to ensure enough time for evaluation following the lectures.

Nursing experts will provide the first 30-minute lectures, and change agents will continue providing the lectures during the second week. Post-tests will be administered immediately following each lecture, and results will be discussed as a group. Comparison to of post-test scores to pre-test scores will be part of this review, and results will be recorded. When all lectures are complete, results will be discussed with the Chief Nursing Officer and Director of Nursing in the third week. Nursing experts and change agents will also discuss specific scores

during this week, and make any modifications to the curriculum and evaluation tool as needed.

A commitment for change from all nurses will be secured by the nursing supervisor at this time.

Also during the third week, a plan will be developed between the nursing experts, change agents, and nursing supervisor to direct nurses' focus to the posters that were disseminated throughout the ICU, and to re-administer the evaluation at 6-months following this activity. The nursing supervisor will be responsible for overseeing this final evaluation, and for tracking the incidence of VAP in the ICU during this time. Although tracking the incidence of VAP rates is not part of the evaluation criteria, tracking this data is intended to highlight the importance of the activity, assess the impact of the activity itself, and re-affirm adherence to practice changes. Additionally, the Chief Nursing Officer and Director of Nursing will initiate a plan to add at least one additional continuing education activity in the six months following this project, and determine if posters alone or posters with lecture will be used.

Evaluation of education initiatives is important for assessing transfer of knowledge and determining if educational goals were achieved, and also for understanding gaps and potential for future improvements. Evaluating the education of a nurse-sensitive bundle for VAP prevention at Mulago carries its own set of unique challenges: No validated evaluation tool currently exists, the nursing experts will only be present for a short amount of time, and continued implementation and success will become the responsibility of the local stakeholders. Accordingly, it is critical that change agents are identified early and that nursing leaders fulfill individual roles. Data gleaned from these evaluations should then be used to develop and improve continuing education and staff retention through the work of the identified experts there.

### **Conclusion**

Nursing care in the ICU at Mulago Hospital is inherently accompanied by its own set of unique, region-based challenges. Rates of nosocomial infections, including VAP, are not specifically documented, but the high rate of nosocomial infections in the region suggest that VAP is a valid concern for Mulago. Continuing education is not mandated for nurses, and the techniques for how education is provided, and which methods are preferred is not well understood. A multi-modal approach that consists of both a lecture and poster for continuing education has been shown to be successful in several settings, and is therefore a logical way to teach VAP prevention to nurses at Mulago. Lewin's TPC model is a logical theory of implementation of the teaching project, and careful progression through each step of the process is necessary to ensure proper adoption and effective implementation. Nursing experts from western countries will drive the educational change using Lewin's TPC, through obtaining hospital leadership buy-in, identifying and training local change agents, implementing an education plan, and utilizing proven evaluation tools to assess knowledge transfer. With adequate planning, careful implementation, and thorough evaluation that involves collaboration among both western and Ugandan nurses, nurse educators, and nursing leaders, continuing education in the ICU at Mulago can ultimately improve nursing care while facilitating the development of a specialized ICU nursing staff.

## References

- Alp, E., Kalin, G., Coskun, R., Sungur, M., Guven, M., & Doganay, M. (2012). Economic burden of ventilator-associated pneumonia in a developing country. *Journal of Hospital Infection*, *81*(2), 128-130. doi: 10.1016/j.jhin.2012.03.006
- Babcock, H. M., Zack, J. E., Garrison, T., Trovillion, E., Jones, M., Fraser, V. J., & Kollef, M. H. (2004). An educational intervention to reduce ventilator-associated pneumonia in an integrated health system: A comparison of effects. *CHEST Journal*, *125*(6), 2224-2231. doi: 10.1378/chest.125.6.2224
- Baker, T. (2009). Critical-care in low income countries. *Tropical Medicine and International Health*, *14*(2), 143-148. doi:10.1111/j.1365-3156.2008.02202.x
- Batras, D., Duff, C., & Smith, B. J. (2016). Organizational change theory: Implications for health promotion practice. *Health Promotion International*, *31*(1), 231-241. doi: 10.1093/heapro/dau098
- Birungi, S. J. (2015, July 31). Uganda: Phase out nursing certificate courses – experts. *The Monitor*. Retrieved from <http://allafrica.com/stories/201507310679.html>
- Boland, D. L. (2012). Developing curriculum: Frameworks, outcomes, and competencies. In D. M. Billings & J. A. Halstead (Eds.), *Teaching in nursing: A guide for faculty* (4th ed., pp. 138-159). St. Louis, MO: Elsevier Saunders.
- Boyas, E., Bryan, L. D., & Lee, T. (2012). Conditions affecting the usefulness of pre- and post-tests for assessment purposes. *Assessment & Evaluation in Higher Education*, *37*(4), 427-437. doi: 10.1080/02602938.2010.538665

- Candela, L. (2012). From teaching to learning: Theoretical foundations. In D. M. Billings & J. A. Halstead (Eds.), *Teaching for nursing: A guide for faculty* (4th ed., pp. 202-243). St. Louis, MO: Elsevier Saunders
- Conway-Morris, A., Hay, A. W., Swann, D. G., Everingham, K., McCollough, C., McNulty, J.,... & Walsh, T. S. (2011). Reducing ventilator-associated pneumonia in the intensive care: Impact of implementing a care bundle. *Critical Care Medicine*, 39(10), 2218-2224. doi: 10.1097/CCM.0b013e3182227d52
- Coppersmith, C. M., Rebmann, T. L., Zack, J. E., Ward, M. R., Corcoran, R. M., Schallom, M. E.,... & Fraser, V. J. (2002). Effect of an education program on decreasing catheter related bloodstream infections in the surgical intensive care unit. *Critical Care Medicine*, 30(1), 59-64. Retrieved from <https://www.researchgate.net/>
- Grzeskowiak, M. (2013). VAE is the new VAP: A CDC-led panel of health care experts has developed a new algorithm for identifying ventilator-associated events. *RT for Decision Makers in Respiratory Care*, 26(1), 8-13. Retrieved from [www.rtmagazine.com](http://www.rtmagazine.com)
- Hlabangana, L. T., & Andronikou, S. (2015). Short-term impact of pictorial posters and a crash course on radiographic errors for improving the quality of paediatric chest radiographs in an unsupervised unit: A pilot study for quality-assurance outreach. *Pediatric Radiology*, 45(2), 158-165. doi: 10.1007/s00247-014-3115-9
- Ilic, D., & Rowe, N. (2013). What is the evidence that poster presentations are effective in promoting knowledge transfer? A state of the art review. *Health Information and Libraries Journal*, 30(1), 4-12. doi: 10.1111/hir.12015
- Kizza, I. B., Tugumisirize, J., Tweheyo, R., Mbabali, S., Kasangaki, A., Nshimye, E.,... & Kennedy, C. E. (2011). Makerere University College of Health Sciences' role in

- addressing challenges in health service provision at Mulago National Referral Hospital. *BMC International Health and Human Rights*, 11(1), 1-10.. Retrieved from <http://www.biomedcentral.com/1472-698X/11/S1/S7>
- Kwizera, A., Dunser, M., & Nakibuuka, J. (2012). National intensive care unit bed capacity and ICU patient characteristics in a low income country. *BMC Research Notes*, 5, 475. Retrieved from <http://www.biomedcentral.com/1756-0500/5/475>
- Lenz-Norman, S., Fargason, C., Strickland, M., & Clark, E. (2014). Promoting patient safety with the use of information technology. In S. Alexander, K. H. Frith, & H. Hoy (Eds.), *Applied clinical informatics for nurses* (pp. 177-196). Burlington, MA: Jones & Bartlett.
- Melnyk, B. M., & Fineout-Overholt, E. (2012). The state of evidence-based practice in US nurses: Critical implications for nurse leaders and educators. *The Journal of Nursing Administration*, 42(9), 410-417. doi: 10.1097/NNA.0b013e3182664e0a
- Mengo Hospital (2014). School of nursing and midwifery. Retrieved from <http://mengohospital.org/education/school-of-nursing-and-midwifery/>
- Micik, S., Besic, N., Johnson, N., Han, M., Hamlyn, S., & Ball, H. (2013). Reducing risk for ventilator associated pneumonia through nursing sensitive interventions. *Intensive and Critical Care Nursing*, 29(x), 261-265. doi: 10.1016/j.iccn.2013.04.005
- Mitchell, G. (2013). Selecting the best theory to implement planned change: Improving the workplace requires staff to be involved and innovations to be maintained. *Nursing Management*, 30(1), 32-37. doi: 10.7748/nm2013.04.20.1.32.e1013
- Mollon, D. L., & Fields, W. L. (2009). Is this the right patient? An educational initiative to improve compliance with two patient identifiers. *The Journal of Continuing Education in Nursing*, 40(5), 221-227. doi: 10.3928/00220124-20090422-03

- Morse, L., & McDonald, M. (2009). Failure of a poster-based educational programme to improve compliance with peripheral venous catheter care in a tertiary hospital. A clinical audit. *Journal of Hospital Infection*, 72(3), 221-226. doi: 10.9999/00220124-20090422-03
- Muliira, J. K., Etyang, C., Muliira, R. S., & Kizza, I. B. (2012). Nurses' orientation toward lifelong learning: A case study of Uganda's national hospital. *The Journal of Continuing Education in Nursing*, 43(2), 90-96. doi: 0.3928/00220124-20111003-03
- Mwebaza, I., Katende, G., Groves, S., & Nankumi, J. (2014). Nurses' knowledge, practices, and barriers in care of patients with pressure ulcers in a Uganda teaching hospital. *Nursing Research and Practice*, 2014, 1-6. doi: 10.1155/2014/973602
- Nakiboa, S., Colebunders, R., Van Geertruyden, J. P., Willis, K. S., Kinoti, S. N., Kulubya, M. M.,... & Weaver, M. R. (2012). Design of a cluster randomized trial assessing integrated infections disease training and on-site support for midlevel practitioners in Uganda. *International Journal of Care Pathways*, 16(4), 152-159. doi: 0.1177/2040402613479342
- Oermann, M. H., & Gaberson, K. B. (2014). *Evaluation and testing in nursing education* (4th ed.). New York, NY: Springer.
- Panhorta, B. R., Saxena, A. K., Al-Arabi Al-Ghamdi, A. M. (2004). The effect of a continuous educational program on handwashing compliance among healthcare workers in an intensive care unit. *British Journal of Infection Control*, 5(3), 15-18. Retrieved from <https://bj.sagepub.com>
- Rello, J., Afonso, E., Lisbona, T., Ricart, M., Balsera, B., Roviera, A.,... & Diaz, E. (2012). A care bundle approach for prevention of ventilator-associated pneumonia. *Clinical Microbiology and Infection*, 19(4), 363-369. doi: 10.1111/j.1469-0691.2012.03808.x

- Riley, T. (2014). Assessing clinical staff learning needs, part 2: Clinical nurse specialist student outcomes. *Clinical Nurse Specialist*, 28(2), 115-118. Retrieved from <https://www.researchgate.net/publication/260120817>
- Rothe, C., Schlaich, C., & Thompson, S. (2013). Healthcare-associated infections in sub-Saharan Africa. *Journal of Hospital Infection*, 85(4), 257-267. doi: 10.1016/j.jhin.2013.09.008
- Scherbaum, M., Kusters, K., Murbeth, R. E., Ngoa, U. A., Kremsner, P. G., Lell, B., & Alabi, A. (2014). Incidence, pathogens and resistance patterns of nosocomial infections at a rural hospital in Gabon. *BMC Infections Diseases*, 14(1), 1-8. doi: 10.1186/1471-2334-14-124
- Shirley, M. R. (2013). Lewin's Theory of Planned Change as a strategic resource. *Journal of Nursing Administration*, 42(2), 69-72. doi: 10.1097/NNA.0b013e31827f20a9
- Simpson, F., & Gordon, S. D. (2007). The relative effectiveness of practice change interventions in overcoming common barriers to change: A survey of 14 hospitals with experience implementing evidence-based guidelines. *Journal of Evaluation in Clinical Practice*, 13(5), 709-715. doi: 10.1111/j.1365-2753.2006.00717.x
- Sterman, E., Ross, B., Russell, S. L., Aizley, C., Vielle, E. L., Suplicki, L.,...& Sciscione, P. (2013). Impact of different educational methods on nursing knowledge and satisfaction. *Journal for Nurses in Professional Development*, 29(1), 2-7. doi: 10.1097/NND.0b013e31827d0a69
- Sauter, M. K., Nightingale-Gillespie, N., & Knepp, A. (2012). Educational program evaluation. In D. M. Billings & J. A. Halstead (Eds.), *Teaching in nursing: A guide for faculty* (4th ed., pp. 503-549). St. Louis, MO: Elsevier Saunders.

- Tarrant, M. & Ware, J. (2012). A framework for improving the quality of multiple-choice assessments. *Nurse Educator*, 37(3), 98-104. doi: 10.1097/NNE.0b013e31825041d0
- Thompson, C. W. (2010). Teaching critical thinking to nurses in a Uganda hospital. *Home Health Care Management & Practice*, 22(5), 319-324. doi: 10.1177/1084822309353151
- Trewet, C. B., & Fjortoft, N. (2013). Evaluation of the impact of a continuing professional development worksheet on sustained learning and implementing change after a continuing pharmacy education activity. *Research in Social & Administrative Pharmacy*, 9(2), 215-221. doi: 10.1016/j.sapharm.2012.06.002
- Twigg, P. (2012). Developing and using classroom tests. In D. M. Billings & J A. Halstead (Eds.), *Teaching in nursing: A guide for faculty* (4th ed., pp. 464-484). St. Louis, MO: Elsevier Saunders.
- Warren, D. K., Zack, J. E., Cox, M. J., Cohen, M. M., & Faser, V. J. (2003). An educational intervention to prevent catheter-associated bloodstream infections in a nonteaching, community medical center. *Critical Care Medicine*, 31(7), 1959-1963. doi: 10.1097/01.CCM.0000069513.15417.1C
- Zack, J. E., Garrison, T., Trovillion, E., Clinkscale, D., Coppersmith, C. M., Faser, V. J., & Kollef, M. H. (2002). Effect of an education program aimed at reducing the occurrence of ventilator-associated pneumonia. *Critical Care Medicine*, 30(11), 2407-2411. doi: 10.1097/01.CCM.0000029194.64089.0B

Appendix A

Literature Review Matrix

Name of Author, Date, Title of Study, Journal	Level	Hypothesis, Question, Purpose	Independ. Variables	Depend. Variables	Theoretical Framework	Design	Sample: Size, demographics, inclusion and exclusion criteria	Data Collection Instruments Procedures including Reliability and Validity	Results/ Findings
Hlabangana, L. T., & Andronikou, S. (2015). Short-term impact of pictorial posters and a crash course on radiographic errors for improving the quality of paediatric chest radiographs in an unsupervised unit – a pilot study for quality-assurance outreach. <i>Pediatric Radiology</i> , 45(2), 158-165.	IV	Does the introduction of a poster accompanied by a short lecture improve the rate of technical errors in a radiology department unsupervised by radiologists in South Africa?	Posters displaying most common errors placed in strategic locations in department  Posters accompanied by a 30-minute lecture	Technical errors resulting in poorly diagnostic (4-5 errors) radiographic films.	None	Retrospective and prospective, observational quality improvement pilot study  Pre and post-intervention review  4 different groups of radiographs reviewed (immediate, 1 month, 2 months, 3 months after intervention)  Longitudinal	438 films reviewed; 92 films per review period required to yield power  All pediatric chest AP radiographs included  Radiographs with no patient identifiers or dates excluded from study	McNamara test comparing errors between baseline and after intervention  Fisher exact test used to compare errors  Bonferonni correction used to calculate <i>p</i> value; account for simultaneous comparing multiple dependent and independent statistics  Reliable, not externally generalizable	Total number of errors dropped in all groups as compared to pre-intervention. Lowest number of errors found in immediate post-intervention group (statistically significant), followed by second and then third months  Initial improvement following intervention, then progressive decline  The use of lecture and posters is effective; interventions should be on-going
Ilic, D., & Rowe, N. (2013). What is the evidence that poster presentations are effective in promoting knowledge	III	Systematic review to determine the effectiveness	N/A	N/A	None	State of the art literature review from 1946-2012	Studies that discussed using posters as a means of	Review of MEDLINE, Cochrane, Allied and Complimentary	6 studies evaluated posters as a stand-alone intervention, 6 integrated as part of a multi-modal

<p>transfer? A state of the art review. <i>Health Information and Libraries Journal</i>, 30(1), 4-12.</p>		<p>of poster presentations on knowledge transfer in health professionals and consumers.</p>					<p>knowledge transfer 51 reviewed, of which 15 meant inclusion criteria</p>	<p>Medicine, PsychINFO and ERIC databases Search terms strategy focused on healthcare knowledge with outcomes Systematic review; reliable</p>	<p>intervention, one trialed 2 different versions, 2 were opinions 12 studies focused on outcomes in consumers Posters as standalone interventions not successful; successful as part of multi-modal ed.</p>
<p>Mollon, D. L., &amp; Fields, W. L. (2009). Is this the right patient? An educational initiative to improve compliance with two patient identifiers. <i>The Journal of Continuing Education in Nursing</i>, 40(5), 221-227.</p>	<p>IV</p>	<p>Does a poster presentation, followed 2 months later by a mandatory lecture improve compliance with using two patient identifiers in rehab unit?</p>	<p>A poster presentation placed in medication room on unit Mandatory patient safety education 2 months following intro of poster</p>	<p>Staff compliance with using 2 patient identity</p>	<p>None</p>	<p>Prospective and retrospective, direct observational Observations 1 month before education, 1 month after poster placement, and 1 month after education in-service Longitudinal</p>	<p>30-bed rehabilitation unit 35 RNs, 1 LVN, 15 nursing assistants, 3 unit clerks. Patient interaction opportunities for all staff members audited to verify 2 patient identifiers</p>	<p>Data collection tool used during audit; training on audit tool by nurse manager (5-10 minute sessions) Tool reviewed by 2 experienced nurses in field to establish validity Strong reliability</p>	<p>For licensed nurses, the fully compliant rate prior to education was low at 23%, increasing to 30% after poster and 68% after in-service For CNAs, pre-education fully compliant rate was 50%, decreasing to 14% after poster; increasing to 67% after lecture Education lecture should be first, followed by posters</p>
<p>Morse, L., &amp; McDonald, M. (2009). Failure of a poster-based educational programme to improve compliance with peripheral venous</p>	<p>IV</p>	<p>Following the implementation of a poster-based educational</p>	<p>Posters reminding staff to date and time insertion of PVCs</p>	<p>Staff (junior doctor) compliance with recording</p>	<p>None</p>	<p>Retrospective and prospective, direct observational</p>	<p>All medical and all surgical inpatients with PVCs at facility</p>	<p>Data collected; pre and post-intervention phases compared using chi-squared test</p>	<p>For all methods combined, pre-poster data showed 13.4% compliance, post-poster data showed 16.1%</p>

catheter care in a tertiary hospital. A clinical audit. <i>Journal of Hospital Infection</i> , 72(3), 221-226.		program, does the prevalence of recording the date and time of insertion of peripheral venous catheters (PVCs) improve in a tertiary hospital setting?	placed in clear view in hospital units for a time period of 2 weeks.  Another poster attached to every IV trolley on those units	date and time of insertion of peripheral venous catheters		Compliance observed for 10 days prior; Posters placed for 2 weeks, compliance observed for 10 days following  Longitudinal	Patient, bedside chart, and medication charts all audited  1109 contacts recorded; 571 before and 538 after poster intervention	Subgroup analysis evaluating date and time for patients having specific risk factors for bacteremia also conducted  Moderate reliability and validity	compliance ( $p = 0.27$ , not significant).  Documentation at insertion site more common in patients with risk factors as compared to those without ( $\chi^2 = 3.58$ , $p = 0.03$ )  Poster intervention alone had no effect on documentation compliance
Panhorta, B. R., Saxena, A. K., Al-Arabi Al-Ghamdi, A. M. (2004). The effect of a continuous educational program on handwashing compliance among healthcare workers in an intensive care unit. <i>British Journal of Infection Control</i> , 5(3), 15-18.	IV	Does an educational intervention consisting of lectures and posters improve hand hygiene compliance of healthcare workers working in an ICU?	Educational intervention consisting of lecture and posters on evidence-based hand hygiene practices	Hand hygiene knowledge and compliance of healthcare workers	None	Prospective direct observational.  Longitudinal  Observation of handwashing in the year following education	Nurses, technicians, and doctors  1175 opportunities for handwashing observed	Handwashing technique observed during one year after education  Chi-squared to compare handwashing among groups  Statistical significance set at $p < 0.05$  Reliable, not generalizable	Handwashing compliance 72.8% post-intervention; nurse compliance 97.5%, technician 47.7%, doctor compliance 37.6%  Educational intervention significantly impactful for nurses and technical staff, but not for doctors
Simpson, F., & Gordon, S. D. (2007). The relative effectiveness of practice change interventions in overcoming common barriers to change: A survey of 14 hospitals with experience	VII	Determine the optimal combination of interventions needed to overcome barriers to	N/A	N/A	None	Best practices survey sent to prior site investigators in ICUs in Australia and New Zealand	13 sites who were previously randomized to implement a prior evidence-based guideline	Survey instrument sent by mail in a stamped response envelope; confidentiality assured Data presented using simple	No practice change interventions deemed to be ineffective  Large guideline posters and copies of guidelines at

implementing evidence-based guidelines. <i>Journal of Evaluation in Clinical Practice</i> , 13(5), 709-715.		practice change commonly encountered in the ICU through a survey approach.				Investigators ranked practice change interventions and barriers to change	Sites not randomized into this sample arm were excluded from survey	descriptive statistics	bedsides ranked lower than in-services or educational sessions  Multifaceted change strategies are recommended
Sterman, E., Ross, B., Russell, S. L., Aizley, C., Vielle, E. L., Suplicki, L.,...& Sciscione, P. (2013). Impact of different educational methods on nursing knowledge and satisfaction. <i>Journal for Nurses in Professional Development</i> , 29(1), 2-7.	II	Compare classroom lecture with poster presentations to determine the effect on nursing knowledge acquisition, retention, and satisfaction.	Poster presentation and classroom lecture for educating nurses on evidence-based practice standards for pain management.	Retention of nursing knowledge  Nursing satisfaction  Cofounding factors (age, years of nursing experience, type of unit, and shift worked) evaluated	None	Experimental; prospective, randomized controlled trial  Longitudinal	Sample size of 72 participants for power  Full-time and part-time RNs  Per diem, short term contract, and/or only worked weekend RNs excluded	15-item multiple choice test post-education; same test repeated one month later  Satisfaction survey also provided  Descriptive statistics; analysis of variance used to determine if scores differed between groups; Multiple regression analysis to determine if confounding factors significant to posttest scores  Strong reliability and validity	43 randomized to lecture and 48 to poster; groups similar for age, gender, shift, and/or years of experience  Scores similar between groups 1 month after (M= 89.6% lecture, 89.0% poster); no statistical difference  Analysis of variance; no difference immediately or 1 month after ( $p = .742$ )  No cofounding variables explained scores; satisfaction high for both methods
Thompson, C. W. (2010). Teaching critical thinking to nurses in a Uganda hospital. <i>Home Health Care Management &amp; Practice</i> , 22(5), 319-324.	VI	Will critical thinking skills of nurses in a Ugandan hospital	Lecture and case study presentation	Nurses knowledge of critical thinking and	None	Pre and post-intervention phenomenological	36-bed pediatric neurosurgery specialty hospital	Informal, one-on-one interactions following the educational session	Nurses observed seeking examples of critical thinking following lecture

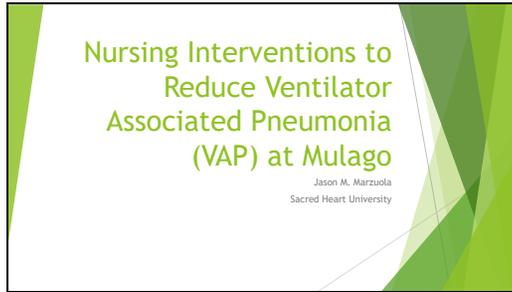
		increase following a lecture and case studies?		incorporation into practice			No sample size reported	Qualitative	Nurses showed attempts to incorporate critical thinking questions into practice
Warren, D. K., Zack, J. E., Cox, M. J., Cohen, M. M., & Faser, V. J. (2003). An educational intervention to prevent catheter-associated bloodstream infections in a nonteaching, community medical center. <i>Critical Care Medicine, 31</i> (7), 1959-1963.	IV	Will an education consisting of lecture and posters/handouts significantly reduce occurrence of catheter associated blood stream infections (CABSI)?	Educational intervention (lecture and posters/handouts)	Post-test scores  CABSI rates	None	Non-randomized, pre-post observational  Longitudinal	103 ICU nurses and 4 physicians  Patient inclusion criteria: All receiving a central venous catheter during study period	Fisher exact and chi-square tests for comparing categorical variables  Wilcoxon rank sum test for analysis of continuous variables  A <i>p</i> value <0.5 significant on two-tail tests  Moderate reliability and validity	2.1 cases of CABSI per 1000 catheter days post-intervention compared to 4.9 cases per 1000 catheter days pre-intervention; significant decrease in sepsis in post-intervention group  Education with both lecture and posters resulted in significant reduction of CABSI
Zack, J. E., Garrison, T., Trovillion, E., Clinkscale, D., Coppersmith, C. M., Faser, V. J., & Kollef, M. H. (2002). Effect of an education program aimed at reducing the occurrence of ventilator-associated pneumonia. <i>Critical Care Medicine, 30</i> (11), 2407-2411.	IV	Will an education consisting of a self-study module and lecture/in-service, significantly reduce the occurrence of VAP?	Educational intervention (self-study module and lecture/in-service)	Post-test scores  VAP rates	None	Non-randomized, pre/post-test observational  Longitudinal	114 respiratory care practitioners and 146 nurses	Rate of VAP between pre-intervention and post-intervention compared using Mann-Whitney  Test scores compared using paired <i>t</i> -tests; <i>P</i> < 0.5 = significant  Moderate reliability and validity	93% respiratory had the same or higher scores on post-tests than pre-test  Post-intervention scores for nurses statistically higher  VAP rates decreased 57.6% ( <i>p</i> < 0.001)

## Appendix B

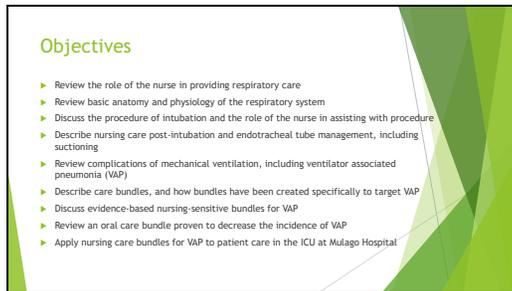
**Timeline, Outcomes, Responsible Parties**

<b>Timeline</b>	<b>Outcomes</b>	<b>Responsible Parties</b>	<b>Stage</b>
Jan 2-6, 2017	<ul style="list-style-type: none"> <li>Review evaluation tool with SMEs</li> </ul>	Nursing experts	Unfreezing
Feb 6-10, 2017	<ul style="list-style-type: none"> <li>Assessment of practice standards and behaviors at Mulago ICU</li> <li>Identification of 1-2 change agents</li> </ul>	Nursing experts	
	<ul style="list-style-type: none"> <li>Presentation to Chief Nursing Officer, Director of Nursing, Nursing Supervisor</li> <li>Develop a plan to provide education in following week and determine appropriate evaluation strategy</li> </ul>	Nursing experts/Change agent(s)	
Feb 13-17, 2017	<ul style="list-style-type: none"> <li>Schedule multiple 30-minute lecture times, covering all shifts throughout the week</li> <li>Ensure alignment with any already scheduled weekly class times</li> <li>Require registered nurses to sign-up for one lecture</li> </ul>	Nursing supervisor	Moving
	<ul style="list-style-type: none"> <li>Deliver 2 of the lectures and disseminate posters in unit</li> </ul>	Nursing experts	
	<ul style="list-style-type: none"> <li>Deliver final 2-3 lectures and train on poster content to peers in the ICU</li> </ul>	Change agent(s)	
	<ul style="list-style-type: none"> <li>Attend one of the 30 minute lectures to observe behaviors and evaluate effectiveness of intervention</li> </ul>	Chief Nursing Officer Director of Nursing Nursing supervisor	
	<ul style="list-style-type: none"> <li>Determine appropriate evaluation tool and disseminate to staff as needed</li> </ul>	Nursing experts/Change agent(s)	
Feb 20-24, 2017	<ul style="list-style-type: none"> <li>Review of evaluation scores and survey of educational activity</li> <li>Make modifications to curriculum based on information gleaned from evaluations</li> <li>Nursing experts will leave Mulago, handing-off future education to Change agent(s)</li> <li>Secure commitment for change from nursing and nursing leaders</li> </ul>	Nursing experts/Change agent(s)	Refreezing
July 10-14, 2017	<ul style="list-style-type: none"> <li>Further evaluation of knowledge transfer disseminated</li> <li>Discussion of furthering continuing educational offerings/specialized ICU staff</li> </ul>	Change agent(s)  Chief Nursing Officer Director of Nursing Nursing supervisor	

## Appendix C

**Lecture and Poster Deliverable**

My name is Jason and I am a critical care nurse who has worked in industry for Integra LifeSciences for the past 6 years. You may recall that I visited you all and spent a week doing volunteer work in the ICU a few years ago. Since that time, I have been working to complete my MSN degree from Sacred Heart University and through this endeavor, I have had the pleasure of researching a topic that that we will discuss today about your practice and patient outcomes here at Mulago.



*Read from slide*

The role of the critical care nurse in respiratory care



- ▶ Maintain adequate airway
- ▶ Ensure adequate ventilation
- ▶ Ensure adequate oxygenation

Let us start with the basics. As we all know, the role of the nurse in the care of the patient with respiratory compromise is to maintain an adequate airway, ensure adequate ventilation, and ensure adequate oxygenation. These are not new concepts for you all, and you perform these duties every day.

The Respiratory System: Function is gas exchange

- ▶ Upper airway
  - ▶ Nasal cavity
  - ▶ Pharynx
- ▶ Lower airway
  - ▶ Larynx
  - ▶ Trachea
  - ▶ Right and left mainstem bronchi, bronchioles, and alveoli
- ▶ Lungs
  - ▶ Left: two lobes
  - ▶ Right: three lobes

The main function of the respiratory system is gas exchange. If we review basic anatomy, we recall that the respiratory system has two main components: The upper airway and lower airway; the lungs themselves are part of the lower airway or respiratory tract. The upper airway consists of the nasal cavity and pharynx, whereas the lower airway starts with the larynx, moves to the trachea, and finishes with the right and left mainstem bronchi, the bronchioles, and alveoli of the lungs themselves. As a review, the left lung has two lobes and the right lung has 3 lobes (Johnson, 2005). Remember, the right mainstem bronchus is higher than the left, and the first branch of the lower respiratory tract. This becomes important when we look at potential complications of intubation.

**From the lower airway to the lungs**

- ▶ Trachea (wind pipe)
  - ▶ Approximately 5 inches
  - ▶ Spans between larynx & bronchi
- ▶ Bronchi divided into
  - ▶ Primary
  - ▶ Secondary
- ▶ Bronchioles: terminate with alveoli
- ▶ Alveoli: site of gas exchange in lungs (tiny air sacs)

Here are some more facts about the lower airway and lungs. Your trachea is approximately 5 inches, and spans a fairly sizeable length. Bronchi themselves are categorized as primary and secondary, and branch into the bronchioles. As you know, alveoli are the little air sacs the make-up lung tissue and are the site of gas exchange. Many respiratory conditions in our patients that we care for daily in the ICU are as a result of an issue in one or more areas here in the respiratory system.

**Intubation**

- ▶ Necessary if measures fail to provide adequate oxygenation and removal of carbon dioxide
- ▶ During intubation, nurse should:
  - ▶ Gather necessary equipment (laryngoscope with blades, suction, endotracheal tube (ETT), 10mL syringe for cuff inflation, adhesive tape or ties, oxygen source, pulse oximetry, manual resuscitation bag, sedation)
  - ▶ Position patient on back with small blanket under shoulder blades
  - ▶ Verify intact ETT cuff by inserting air
  - ▶ Confirm suction and oxygen working properly
  - ▶ Administer ordered medications
  - ▶ Gently open patient's mouth using a modified jaw thrust as needed
  - ▶ Assist with intubation
- ▶ Knowledgeable, aggressive nursing care is required to maintain airway patency, maximize therapeutic effects, and minimize damage to airway

So, let us assume that your patient now has a condition that requires endotracheal intubation. What do you need to be prepared for? The most important step in the process is to ensure all of the necessary equipment is readily available. You will need to provide the doctor with a laryngoscope and associated blades, you need to have portable suction if there is no wall suction, the actual ETT tube and a 10mL syringe for cuff inflation, a way to secure the ETT (tape or ties), oxygen source (if there is no oxygen from the wall), pulse oximetry, a manual resuscitation bag, and whatever sedation is requested. (Charlebois, Earven, Fisher, Lewis, & Merrel, 2005). You should position the patient with a small blanket under his/her shoulders to hyperextend the neck; this will be different in a trauma patient as the patient will have a cervical collar in place and you must be careful. You will help the doctor by verifying that the cuff is intact in the ETT but injecting and aspirating air. You will need to administer medications and when the doctor is ready, you will likely assist with keeping the patient's mouth/airway open and providing oxygen (Charlebois, Earven, Fisher, Lewis, & Merrel, 2005). It is important that you are prepared and comfortable with these interventions as your nursing skills will go far in ensuring a safe and successful patient intubation.

**Post-intubation nursing care**

- ▶ Observe chest movement
- ▶ Vital signs: Heart rate/EKG, blood pressure, O<sub>2</sub> saturation
- ▶ Insert orogastric (OG) tube for gastric decompression
- ▶ Obtain ventilator orders
- ▶ Restrain arms if necessary for safety
- ▶ Arterial blood gas when appropriate
- ▶ Documentation

After the patient has been intubated, there are several key nursing interventions for you to be aware of. First, you need to ensure equal bilateral chest movement; remember, the ETT likes to migrate down the right mainstem upon intubation. If possible, you can obtain a chest x-ray from the doctor’s orders to confirm ETT placement.

Observation, documentation, and notification of vital signs is imperative at this point. Since you want to promote gastric decompression and prevent aspiration, the patient will need an OG tube placed and set to low intermittent suction. I know that suction devices are limited here at Mulago, so they should be reserved for mechanically ventilated patients; you can use gravity drainage for the OG if suction is not present. You will obtain ventilator setting orders from your physician, and if blood gasses are available, you may need to obtain an ABG to verify optimal gas exchange. If your patient is awake, he/she is at risk for self-extubation, so soft arm restraints may be necessary (Charlebois, Earven, Fisher, Lewis, & Merrel, 2005).

**Endotracheal Tube (ETT) Care**

- ▶ Secure well
  - ▶ Tape/ties: Over the ears and not around the neck!
  - ▶ Change tape or endotracheal tube attachment device as needed
  - ▶ Verify and reposition oral ETT every shift
- ▶ Document
  - ▶ Centimeter marking at lip every shift
  - ▶ Date of insertion
- ▶ Ensure all emergency equipment available near bedside

Once everything has settled after the intubation, it is important that you consider and maintain patient safety while the ETT and mechanical ventilator are in place. You want to ensure safe and secure placement of the ETT tube itself; it can be taped or tied in place, but ties should be placed over the ears not around the neck! To maintain securement, tape and ties may need changed regularly, especially if the patient has many oral secretions. We will discuss this more later.

You can verify placement of the ETT by recording the centimeter marking on the tube at the patient’s lip, and this should be documented. You should always also document the date of insertion, and most importantly, ensure emergency equipment is in place at the bedside, which includes suction devices, suction catheters, extra oxygen, and mechanical bag for ventilation in the event that the ventilator fails.

**Endotracheal tube care: Suctioning**

- ▶ Suction as indicated by assessment
  - ▶ Visible secretions
  - ▶ Coughing
  - ▶ Rhonchi
  - ▶ High peak inspiratory pressure on ventilator
  - ▶ Ventilator alarm
- ▶ Procedures
  - ▶ Hyperoxygenate throughout procedure
  - ▶ Avoid normal saline instillation



Suctioning is essential to clear the airway. Both closed and open methods are used to suction ETT or tracheostomy; closed suction is most common in United States, but it is understood that closed suction is not necessarily available at Mulago. We will talk about ways to still help prevent infection from open suction later. The need for suctioning is determined by assessment (coughing, rhonchi, etc). To reduce stress on the patient, you should always hyperoxygenate prior to procedure; this can be done with the suction mode on ventilator. Avoid saline instillation during suctioning, as it is associated with hypoxemia and discomfort and is no longer recommended (Charlebois, Earven, Fisher, Lewis, & Merrel, 2005).

**Complications of intubation and mechanical ventilation**

- ▶ ETT dislodged or right mainstem bronchus intubation
- ▶ Laryngeal or tracheal injury
- ▶ Skin breakdown from tape and/or ETT holder
- ▶ Lung injury (barotrauma/volutrauma)
- ▶ Infection: Ventilator Associated Pneumonia (VAP)

Intubation of the critical care patient does not come without potential complications. The ETT may accidentally become dislodged, or go too far into the right mainstem bronchus. Intubation can cause injury to the larynx or trachea. Depending on how the ETT is secured, we can see skin breakdown from the tape and/or holder. Long-term ventilator support can cause injuries to the lungs themselves, such as barotrauma (injury from too much pressure) or volutrauma (injury from too much volume of air). And without a doubt, infection remains an ever-present concern for patients who are intubated and on mechanical ventilation. Ventilator Associated Pneumonia, or VAP, is the topic we will discuss further.

**VAP: A common nosocomial infection**

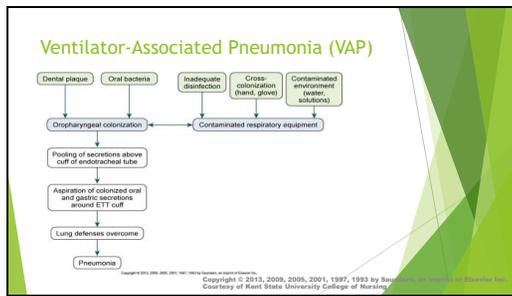
- ▶ Ventilator Associated Pneumonia (VAP) is the most common infection in ICUs
  - ▶ Accounts for more deaths than urinary tract infections, central line infections, or surgical site infections
  - ▶ Incidence of VAP is higher in developing countries
- ▶ Data about the incidence of hospital acquired infections in the sub-Saharan Africa region are generally lacking
- ▶ Despite a lack of specific data in this region, VAP is attributed to 30-50% mortality globally

Ventilator associated pneumonia, or VAP, is a common nosocomial infection throughout the world, and actually causes more deaths than other nosocomial infections such as urinary tract infections, central line infections, and surgical site infections (Grzeskowiak, 2013). Although we are unsure of the specific incidence of VAP in Uganda and other sub-Saharan African countries due to the lack of data here (Scherbaum et al., 2014), we do know that in general, the incidence of VAP has been shown to be higher in developing countries than in higher-income countries (Alp et al., 2012). VAP is the leading cause of infection-related mortality in hospitals across the world, accounting for 30-55% of deaths from nosocomial infections (Alp et al., 2012). So clearly, this is an important topic to consider here at Mulago and as nurses, we should further discuss ways to prevent this from occurring.

**Ventilator-Associated Pneumonia (VAP)**

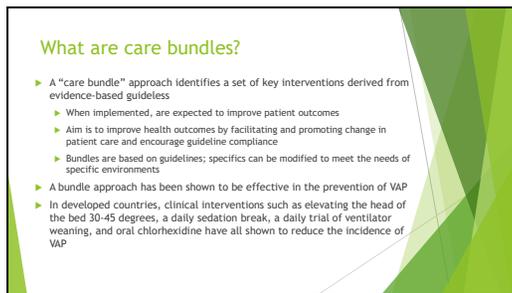
- ▶ Aspiration of bacteria into the respiratory tract
- ▶ Oropharyngeal colonization, gastric colonization, and aspiration are all associated factors
- ▶ Combination of radiologic, laboratory, and clinical findings
- ▶ Controversies about best way to diagnose; new data moving towards more specific categorization associated with diagnosis, including "ventilator associated events" and "ventilator associated conditions"

In general, VAP begins with aspiration of bacterial into the respiratory tract. Bacteria can colonize in the oropharyngeal region, or bacteria can make their way towards the respiratory tract through aspiration of gastric contents (which is why we discussed the OG tube). When they make their way into the bronchi and lungs of the respiratory system, bacteria can colonize further and create a pneumonia (Charlebois, Earven, Fisher, Lewis, & Merrel, 2005). Methods for diagnosing a patient with VAP historically have included evaluation of a patient's sputum, and assessing changes in patient chest x-ray (including presence of new or persistent infiltrate) (Grzeskowiak, 2013).



As you can see, there are several factors that can lead to the development of VAP. Both dental plaque and naturally-occurring oral bacteria can lead to oropharyngeal colonization. Pooling of secretions above the cuff of the ETT can promote further bacterial growth, and if these secretions enter the respiratory tract through aspiration, pneumonia can develop. These conditions are heightened due to the poor lung defenses and immunity often found in our critical care patients. Beyond these conditions, contaminated respiratory equipment can also lead to VAP. This can occur from inadequate disinfection, cross-contamination of products, and contaminated environmental conditions such as water or other solutions.

Unfortunately, here at Mulago you must break the ventilator circuit to preform ETT suctioning due to a lack of in-line suction equipment. Ideally, every time this procedure is performed you would use a new, sterile suction catheter. But because we realize there are not enough suction catheters to maintain single-use practices, we need to consider techniques to prevent colonization of bacteria on equipment and create a situation of cross-contamination.



The idea of “care bundles” has been used in developed countries for many years to improve patient outcomes. Bundles are developed through a comprehensive survey of the current evidence to create care guidelines (Rello et al., 2012). Although not all resources recommended within guideline care bundles may be available for all environments, certain key concepts can and should translate across all settings. Bundle approaches have been shown to be effective in the prevention of VAP. There are a number of interventions that have generally been found to be beneficial, when implemented in a bundle approach for VAP prevention. These include elevating the head of the bed, employing daily sedation holidays, daily trials of ventilator weaning, and oral care with chlorhexidine solution (Conway-Morris et al., 2011).

**Evidence-Based VAP prevention**

- ▶ Elevate head of bed 30 to 45 degrees
- ▶ Prevent drainage of condensate back to patient
- ▶ Hand hygiene & universal precautions
- ▶ ETT with subglottic suction capability
- ▶ Aspirate secretions from above ETT
- ▶ Prevent transmission
  - ▶ Drain any condensate *AWAY* from patient
  - ▶ Avoid normal saline during suctioning
- ▶ Oral hygiene program

To re-iterate, there have been several key interventions that have been identified to reduce VAP (Charlebois, Earven, Fisher, Lewis, & Merrel, 2005). Head of bed elevation is important to help expand the lungs, prevent aspiration, and facilitate optimal coughing and expelling of secretions. We must elevate the heads of the beds of our patients in the ICU here at Mulago! Also, ventilator tubing can sometimes accumulate humidity and water; it is important that we always consider the position of our ventilator tubing to prevent water from entering the patient’s respiratory system. Hand hygiene is extremely important, and gloves should be worn at all times, especially when suctioning your patient. If you have ETT tubs with subglottal suction capabilities, they will allow removal of secretions that may have settled above the ETT cuff. As mentioned earlier, we no longer use saline lavages routinely when suctioning our patients. Many of the care bundles suggested are driven by basic nursing care, which is what we will discuss next in detail.

**Prevention of VAP: Nurse-sensitive bundle**

- ▶ Limit the use of mechanical ventilation
  - ▶ Daily sedation holiday followed by wean assessment
  - ▶ Vigilance to avoid accidental extubation as re-intubation carries VAP risk
- ▶ Prevent aspiration of secretions
  - ▶ Maintain HOB 30 degrees
  - ▶ Gastric decompression
  - ▶ Used cuffed ETT, and maintain pressure of at least 20cm H2O
- ▶ Prevent nasal and oropharyngeal colonization
  - ▶ Nasal antibiotic ointment for 5 days
  - ▶ Oral hygiene with tooth brushing and oral swabs impregnated with chlorhexidine 0.12%
  - ▶ Simple oral assessment performed during oral care for early identification of issues

Micik and colleagues published a nurse-sensitive bundle in 2013 that can be used to reduce the incidence of VAP. Of course, reducing the amount of time a patient is on mechanical ventilation reduces the probability that he/she may develop an infection because of this intervention. When neurologically stable, the patient should have sedation held daily to assess opportunity to be weaned; this is typically done during medical rounds. As nurses, it is important that we do everything possible to avoid accidental extubation. This includes not only restraints, but also includes properly securing the ETT which we discussed earlier. To prevent secretions, keep that head of the bed 30 degrees or more, place an OG tube for gastric decompression, and obtain cuffed ETTs which will help to prevent accidental aspiration of oropharyngeal secretions (Micik et al., 2013). To help prevent colonization of bacteria in the nasal cavity, antibiotic ointment can be placed here every 5 days. Oral care is an important nursing activity, and diligent tooth brushing and use of mouth swabs is a simple intervention we can do to help prevent VAP (Micik et al., 2013). We will talk more about oral care later, but if chlorhexidine solution is not available, we can use other solutions to help prevent oral bacterial colonization.

**Prevention of VAP: Nurse-sensitive bundle**

- ▶ Prevent use of contaminated equipment
  - ▶ Hand hygiene in compliance with infection control practices
  - ▶ Closed system suction
  - ▶ Adherence to recommended change of filter every 48 hours, breathing circuit only if soiled, single-use yankeur sucker,
  - ▶ Humidification only with tenacious secretions
- ▶ Early mobilization
  - ▶ Mobilize patient; out of bed if stable, sitting upright or in a chair

One of the most significant nursing interventions to consider here at Mulago is the prevention of use of contaminated equipment. We all know that much of the equipment here is re-used, and we can brainstorm more about this later. In general, the most important intervention is to maintain compliance with hand hygiene by washing hands frequently and using alcohol-based hand rubs between care activities and patients. We should maintain a closed system as much as possible, but if the system must be opened for suctioning, we need to consider the best ways to prevent bacterial growth. Humidification is not really available here but because of this, we need to keep watch of the ventilator tubing and of the filters in place within the system (Micik et al., 2013).

One of the most important activities we can do as nurses is to mobilize our patients early (Micik et al., 2013). This may seem difficult or even impossible for you but with practice and patience, we should be able to sit our patients up and even occasionally move them to chairs if they are awake enough to cooperate.

**Prevention of VAP: What about oral care?**

- ▶ Oral cavity contains both normal flora and potentially infections microbes; normally kept in-check by immune system
- ▶ Mouth often serves as a home for pathogens and plaque, which disrupts oral hygiene, and can increase the risk for VAP
- ▶ Oral care is highlighted often as a simple nursing intervention that should be included in care bundles for VAP prevention
  - ▶ Not only reduces oral bacteria burden, but also stimulate flow of saliva, which further aids in the removal of plaque and contains protective immunoglobulins
  - ▶ Routine oral care can remove microorganisms in cavities, reducing the likelihood of aspiration into the lungs
  - ▶ Oral care can reduce the incidence of VAP by 46% to 90%

Proper oral care is one intervention we can certainly work to improve here at Mulago. Oral care is important, as our mouths contain many microorganisms which, because of our immune systems, usually stay in-check. The plaque on our teeth can become a home for pathogens, however, and this can lead to increased risk for VAP. Proper oral care not only reduce these bacteria, but also stimulates the flow of saliva; saliva will help to remove this plaque and it also contains natural immunoglobulins. In our patients with oral cavities, there is even a great risk for bacterial growth, so oral care is especially important in these patients. Oral care has been shown to reduce the incidence of VAP by 46 to 90 percent (Booker, Murff, Kitko, & Jablonski, 2013).

**Oral care bundle**

1. Wash hands and apply gloves
2. Assess oral cavity
3. Suction the mouth with normal suction device
4. Brush the patient's teeth for 3-4 minutes
5. Rinse mouth with sterile water
6. Suction mouth again, and suction subglottic secretions
7. Moisturize the lips and oral mucosa after and in between brushings
8. Maintain ETT cuff pressure between 20-30 cm H2O and change position of the tube after brushing and suctioning
9. Discard swabs and brushes, and/or rinse and store reusable tools in a dry, clean container
10. Remove gloves and other protective equipment and wash hands
11. Document oral care

\*\*This process should be repeated every 8 hours, with routine oral suctioning every 2 hours or as needed

Here is an oral care bundle based on evidence-based practice that we should implement here at Mulago. Regardless of equipment constrains, we can perform every task listed here. We should always wash our hands and apply gloves prior to performing any care. Let's first start with an assessment of the oral cavity to look for sores, mucous plugs, or anything else that requires the doctors' attention. We should first suction the mouth with a dedicated suction catheter; NEVER use the same catheter to clean the mouth as we plan to use for suctioning the ETT. Then, we rinse the patients mouth with a little sterile water on a swab. If we don't have sterile water, it is okay to use bottled water but of course, we would never use water from the tap. We should suction the mouth again, and then use the subglottal suction to clear those sections.

We should moisturize the lips and mucosa. Once this is done, it is then safe to check the pressure on the ETT cuff and change its position as needed, as oral microbes should now be removed. The recommendation is to discard all single-use devices but if this is not possible here, we can rinse them clean and then store in a clear dry container. We NEVER want to store these items in a wet environment as this will grow bacteria. Then, remove your gloves and document care. (Booker et al., 2013).

You should repeat teeth brushing every 8 hours, but routine mouth care with suctioning should be done every 2. We can look at other ways to do this when we look more at a bundle for Mulago.

**VAP prevention: Mulago**

- ▶ Head of bed elevated 30 degrees; out of bed when possible
- ▶ Use OG tube to low intermittent suction
- ▶ Awaken daily (sedation holiday) and assess readiness to wean from ventilator
- ▶ Stress ulcer prophylaxis; turn every 2 hours and use pillows to remove pressure points
- ▶ Deep vein thrombosis (DVT) prophylaxis; if no sequential compression devices are available, use venous compression wraps and range of motion (ROM) to prevent DVT
- ▶ Oral care: Brushing teeth as described every 8 hours/use of chlorhexidine swabs intermittently
  - ▶ If no chlorhexidine is available, use diluted hydrogen peroxide and sterile/bottle water for mouth rinses with suction
  - ▶ No cross-contamination of oral and ETT suction catheters
    - ▶ Store catheters in a clear, dry container between uses
- ▶ Proper securement of ETT and subglottal suction/repositioning after oral care

So here are the basic actions we need to consider in a bundle approach for reducing VAP here at Mulago. Head of bed elevation is important, as is waking the patient periodically to assess readiness to wean (this will be done through doctors' orders and is usually performed during rounds). Let us think about how we can get our patients out of bed earlier. The doctor should order an OG tube and we should place to low intermittent suction. We need to be mindful of turning the patient every 2 hours and helping to prevent the formation of DVTs. Oral care is a key nursing intervention that we have described already; make sure we brush the patient's teeth every 8 hours and do routine mouth care every 2 hours. Do not use the same catheter for both ETT and oral care, and store catheters in a dry, covered, clear container between use. If we do not have chlorhexidine, we can create a very diluted hydrogen peroxide solution and use swabs. Proper securement of the ETT is also very important, and we should manage subglottal secretions and perform oral care prior to manipulating the ETT.

**Mulago-specific interventions: Let us attempt to implement our own bundle**

- ▶ Always perform good hand hygiene and wear gloves prior to care
- ▶ HOB should always be elevated 30-45 degrees; mobilize patient early!
- ▶ Turn patient every 2 hours and prop with pillows
- ▶ DVT prophylaxis: wrap legs and perform ROM
- ▶ OG tube to low intermittent suction
- ▶ Use tape or ETT ties to secure ETT tube
  - ▶ Tie above the ears, not around the neck
  - ▶ Assess skin integrity
- ▶ Use ETTs with subglottal suction capabilities when possible
- ▶ Maintain a closed respiratory system if at all possible
- ▶ Always hyperoxygenate when performing in-line suction and avoid saline flushes

So, if we were to create our own nursing bundle here at Mulago, what would it include? Let's review the list together and brainstorm ideas of how to improve this or make it applicable to your care in the ICU here. These points will also be available in a poster that will be placed throughout the unit after our lectures are complete.

*Read bullets one by one and discuss.*

**Mulago-specific interventions: Let us attempt to implement our own bundle**

- ▶ Keep suction catheters covered and dry when not in-use
- ▶ Do NOT use the same suction catheters for oral and ETT suction!
- ▶ Do not allow water condensed in ventilator tubing to be aspirated by patient
- ▶ Perform oral care every 2 hours and brush teeth every 8 hours
  - ▶ If no chlorhexidine is available, use very diluted hydrogen peroxide and sterile water with swabs
  - ▶ Never use tap water! Bottled water is sufficient if no sterile water available
- ▶ Oral care should be performed prior to manipulating cuff pressure and adjusting ETT position
- ▶ Document ETT position and oral/respiratory assessments frequently; notify doctors as needed

*Read bullets one by one and discuss.*



*Let's talk about any further questions you may have.*

**References**

- ▶ Alp, E., Kalin, G., Coskun, R., Sungur, M., Guven, M., & Doganay, M. (2012). Economic burden of ventilator-associated pneumonia in a developing country. *Journal of Hospital Infection, 81*(2), 128-130. doi: 10.1016/j.jhin.2012.03.006
- ▶ Booker, S., Murff, S., Kitko, L., & Jablonski, R. (2013). Mouth care to reduce ventilator-associated pneumonia: Why good oral hygiene is critical to infection control. *AJN The American Journal of Nursing, 113*(10), 24-30. doi: 10.1097/01.NAJ.0000435343.38287.3a
- ▶ Charlebois, D. L., Earven, S. S., Fisher, C. A., Lewis, R., & Merrel, P. K. (2005). Patient management: Respiratory system. In P. G. Morton, D. K. Fontaine, C. M. Hudak, & B. M. Gallo (Eds.) *Critical care nursing: A holistic approach* (8th ed., pp. 517-565). Philadelphia, PA: Lippincott, Williams, & Wilkins.
- ▶ Conway-Morris, A., Hay, A. W., Swann, D. G., Everingham, K., McCollough, C., McNulty, J., ... & Walsh, T. S. (2011). Reducing ventilator-associated pneumonia in the intensive care: Impact of implementing a care bundle. *Critical Care Medicine, 39*(10), 2218-2224. doi: 10.1097/CCM.0b013e3182227d52
- ▶ Grzeskowiak, M. (2013). VAE is the new VAP: A CDC-led panel of health care experts has developed a new algorithm for identifying ventilator-associated events. *RT for Decision Makers in Respiratory Care, 26*(1), 8-13. Retrieved from [www.rtmagazine.com](http://www.rtmagazine.com)

## References

- ▶ Johnson, K. (2005). Anatomy and physiology of the respiratory system. In P. G. Morton, D. K. Fontaine, C. M. Hudak, & B. M. Gallo (Eds.) *Critical care nursing: A holistic approach* (8th ed., pp. 477-491). Philadelphia, PA: Lippincott, Williams, & Wilkins.
- ▶ Micik, S., Bescic, N., Johnson, N., Han, M., Hamlyn, S., & Ball, H. (2013). Reducing risk for ventilator associated pneumonia through nursing sensitive interventions. *Intensive and Critical Care Nursing*, 29(4), 261-265. Retrieved from <http://dx.doi.org/10.1016/j.iccn.2013.04.005>
- ▶ Rello, J., Afonso, E., Lisboa, T., Ricart, M., Balsara, B., Roviera, A., ... & Diaz, E. (2012). A care bundle approach for prevention of ventilator-associated pneumonia. *Clinical Microbiology and Infection*, 19(4), 363-369. doi: 10.1111/j.1469-0691.2012.03808.x
- ▶ Scherbaum, M., Kusters, K., Murbeth, R. E., Ngou, U. A., Krensmeyer, P. G., Lell, B., & Alabi, A. (2014). Incidence, pathogens and resistance patterns of nosocomial infections at a rural hospital in Gabon. *BMC Infections Diseases*, 14(1), 1-8. doi: 10.1186/1471-2334-14-124

# Mulago Ventilator Associated Pneumonia (VAP) Prevention

**Intubation: All the right equipment!**

- Laryngoscope with blades
- Suction
- ETT, 10mL syringe
- Adhesive tape/ties
- Oxygen source
- Pulse oximetry
- Manual resuscitation bag
- Sedation

**Intubation: Be ready!**

Position patient on back with blanket under shoulders; Verify intact ETT by inserting air into cuff; Confirm suction and oxygen working properly; Administer medications; Gently open patient's mouth; Assist with procedure

**Post-Intubation Nursing Care!**

- Observe chest movement (right mainstem intubation)
- Vital signs
- Insert OG tube for gastric decompression
- Obtain ventilator orders
- Restrain arms if necessary
- ABG when appropriate
- Document

**Proper way to secure ETT!**



**Suctioning: Guided by Assessment!**

- Visible secretions
- Coughing
- Ventilator alarm

**Hyperoxygenate! No normal saline instillation!**

**No mixing oral and ETT suction catheters!**



**Keep suction catheters covered and dry; no saline baths!**

**Care Bundles!**

Key care interventions driven by evidence-based practice guidelines

A bundle approach has been shown to be effective in the reduction of VAP in developed countries

**VAP**

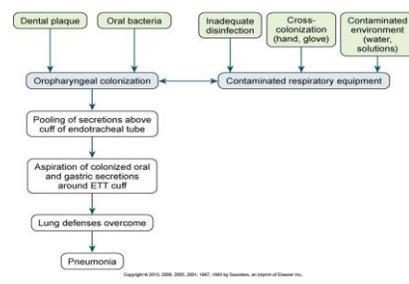
The most common infection in ICUs

30-50% mortality globally

Aspiration of bacteria into the respiratory tract

Oropharyngeal colonization, gastric colonization, and aspiration

Combination of radiologic, laboratory, and clinical findings



**Mulago ICU VAP Bundle!**

- Always perform good hand hygiene and wear gloves
- HOB should always be elevated 30-45 degrees mobilize patient early!
- Turn patient every 2 hours and prop with pillows
- DVT prophylaxis: wrap legs and perform ROM
- OG tube to low intermittent suction
- Use tape or ETT ties to secure ETT tube
  - \*\*Tie above the ears, not around the neck
- Use ETTs with subglottal suction capabilities when possible
- Maintain a closed respiratory system if at all possible
- Keep suction catheters covered and dry when not in-use
- Do not allow water condensed in ventilator tubing to be aspirated by patient
- Perform oral care every 2 hours and brush teeth every 8 hours
  - \*\*If no chlorhexidine is available, use very diluted hydrogen peroxide and sterile water with swabs
  - \*\*Never use tap water! Bottled water is sufficient if no sterile water available
- Oral care should be performed prior to manipulating cuff pressure and adjusting ETT position
- Document ETT position and oral/respiratory assessments frequently; notify doctors as needed

## Appendix D

**Evaluation Tool**

Instructions: Please circle the single best response to each question. You will have 15-minutes to complete this test.

1. The lower airway consists of the lungs, bronchioles, trachea, and
  - a. Bronchi & Pharynx
  - b. **Bronchi & Larynx**
  - c. Pharynx & Larynx
  - d. Alveoli & Pharynx
  
2. The nurse should prioritize tasks in preparing for intubation. What is the proper order of tasks for intubation preparation?
  - a. Position patient on back with blanket under shoulders, administer medications, gather equipment (ETT, suction, oxygen, blades), confirm suction is working
  - b. Gently open the patient's mouth, confirm suction is working, position patient on side, verify ETT cuff is intact
  - c. **Gather equipment (ETT, suction, oxygen, blades), position patient on back with blanket under shoulders, verify ETT cuff is intact, confirm suction and oxygen are working**
  - d. Administer medications, verify ETT cuff is intact, confirm suction and oxygen are working, position patient on side

Knowledge: Identifies basic anatomy

Knowledge: Identifies the proper order of events

3. The patient is now intubated. The nurse observes for bilateral chest movement, as he/she knows that the most common place for the ETT to migrate is the:
  - a. **Right mainstem**
  - b. Left mainstem
  - c. Stomach
  - d. Larynx

Comprehension: Predicts common adverse event following intubation

4. What is the immediate purpose of the orogastric tube following intubation as it relates to ventilator associated pneumonia (VAP)?
  - a. Provide nutrition
  - b. Check specimens
  - c. Administer medications
  - d. **Gastric decompression**

Application: Applies principals of gastric decompression to aspiration prevention

5. The nurse is preparing to secure the ETT on a newly intubated patient. How best should the ETT tube be secured to prevent movement or aspiration?
- Ties or tapes should be over the ears or around the face, not around the neck
  - Ties or tapes should be as tight as possible; around the neck is ideal for comfort
  - Ties or tapes should be kept loose for easy readjustment and patient comfort
  - The ETT should be secured however the doctor orders

Comprehension: Describes proper method for securing ETT

6. The nurse's respiratory assessment shows that the patient needs suctioned. What is the proper order of tasks to suction the ETT?
- Disconnect ETT from ventilator tubing, instill normal saline down ETT, insert suction catheter into ETT and suction, reconnect ventilator tubing, return suction catheter to a saline bath, reassess
  - Don gloves, provide 100% O<sub>2</sub>, disconnect ETT from ventilator tubing, insert suction catheter into ETT and suction, reconnect ventilator tubing, clean suction catheter with saline and suction and return to a dry place, reassess
  - Don gloves, disconnect ETT from ventilator tubing, provide 100% O<sub>2</sub>, insert suction catheter, reconnect ventilator tubing, clean suction catheter with saline and suction and return to a dry place, reassess
  - Disconnect ETT from ventilator tubing, provide 100% O<sub>2</sub>, don gloves, insert suction catheter into ETT and suction, instill normal saline down ETT, reconnect ventilator tubing, clean suction catheter with saline and suction and return to dry place, reassess

Knowledge: Identifies the proper order of events

7. The nurse is preparing to perform a respiratory assessment on his intubated patient. Which of the following is not a complication of intubation and mechanical ventilation?
- Laryngeal or tracheal injury
  - Ventilator Associated Pneumonia (VAP)
  - Malnutrition
  - Skin breakdown

Knowledge: Identifies proper complications

8. VAP is the most common infection in the ICU, associated with \_\_\_\_ % to \_\_\_\_ % mortality globally.
- 10-20%
  - 70-90%
  - 50-60%

- d. 30-50%

Knowledge: Recognizes the proper incidence of VAP mortality

9. The nurse is preparing for respiratory care and oral hygiene. She knows that oropharyngeal colonization, which is associated with increased incidence of VAP, mostly develops from a combination of what?
- Dental plaque and oral bacteria
  - Dental plaque and inadequate equipment disinfection
  - Oral bacteria and inadequate equipment disinfection
  - Inadequate equipment disinfection and cross-contamination

Application: Applies goals of oral care to VAP reduction

10. While performing oral care, the nurse considers that oropharyngeal colonization can directly lead to this, which contributes to an increased likelihood of developing VAP?
- Dental plaque development
  - Pooling of secretions above cuff of endotracheal tube (ETT)
  - Contaminated respiratory equipment
  - Cross contamination

Application: Applies goals of oral care to VAP reduction

11. Care bundles, when implemented properly
- Have not necessarily been shown to improve patient outcomes
  - Aim to improve outcomes through new research
  - Are based on evidence-based practice to meet the needs of specific environments
  - Are guideline-based but do not necessarily intend to change practice

Knowledge: Recognizes the purpose of care bundles

12. The nurse is attempting to provide respiratory care in a bundled approach. When following an appropriate VAP bundle, he will complete all of the following interventions except?
- Head of bed elevation of 30 to 45 degrees
  - Aspiration of secretions above ETT
  - Oral hygiene which involves brushing teeth
  - Normal saline instillations to clear secretions from ETT

Comprehension: Distinguishes between proper and improper VAP bundle interventions

13. Nurses working with patients in the ICU should do which of the following activities early to help prevent VAP?

- a. Feed the patient
- b. Mobilize the patient
- c. Sedate the patient
- d. Wash the patient

Comprehension: Distinguishes between proper and improper VAP bundle interventions

14. An oral care bundle includes which of the following steps in the proper order?

- a. Wash hands and apply gloves, suction mouth, check and maintain ETT cuff pressure at 20-30 cmH<sub>2</sub>O, brush the patient's teeth for 3-4 minutes, return equipment to normal saline bath
- b. Wash hands and apply gloves, suction mouth, brush the patient's teeth for 5-6 minutes, check and maintain ETT cuff pressure at 20-30 cmH<sub>2</sub>O, return equipment to normal saline bath
- c. Wash hands and apply gloves, suction mouth, brush the patient's teeth for 3-4 minutes, check and maintain ETT cuff pressure at 20-30cm H<sub>2</sub>O, rinse equipment and return to dry covered place
- d. Wash hands and apply gloves, suction mouth, check and maintain ETT cuff pressure at 20-30 cmH<sub>2</sub>O, brush the patient's teeth for 3-4 minutes, rinse equipment and return to dry covered place

Knowledge: Identifies the proper order of events

15. Which of the following scenarios displays the best VAP bundle for patient care at Mulago?

- a. Head of bed is elevated 30 degrees. OG tube is to low intermittent suction. Patient is awakened at least once daily. Patient is turned every 2 hours. Range of motion is implemented. Teeth are brushed every 8 hours with hydrogen peroxide/bottled water, catheters are stored in dry containers, ETT is tube secured over ears and repositioned after oral care.
- b. Patient is laying mostly flat. OG tube is to low intermittent suction. Patient is awakened once every other. Patient is turned every 2 hours. Range of motion is implemented. Teeth are brushed every 8 hours with hydrogen peroxide/bottled water, catheters are stored in dry containers, ETT is tube secured over ears and repositioned after oral care.
- c. Head of bed is elevated 30 degrees. OG tube is to low intermittent suction. Patient is awakened at least once daily. Patient is turned every 4 hours. Range of motion is implemented. Teeth are brushed every 4 hours with hydrogen peroxide/bottled water, catheters are stored in dry containers, ETT is tube secured over ears and repositioned after oral care.
- d. Head of bed is elevated 30 degrees. OG tube is to low intermittent suction. Patient is awakened at least once daily. Patient is turned every 2 hours. Range of motion is implemented. Teeth are brushed every 8 hours with hydrogen peroxide/bottled water, catheters are stored in saline baths, ETT is tube secured over ears and repositioned after oral care.

Synthesis: Combines concepts learned in lecture to develop environment-specific bundle for VAP prevention