EFFECT OF COACHING ON KNOWLEDGE AND PRACTICE AMONG NURSES IN THE USE OF VENTILATOR CARE BUNDLE IN THE PREVENTION OF VENTILATOR-ASSOCIATED PNEUMONIA IN THE CRITICAL CARE UNITS OF THE UGANDA HEART INSTITUTE A SPECIALIZED HOSPITAL IN KAMPALA

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Declaration

This is to declare that the work presented in this dissertation is my personal work and that it has not been submitted to any other institution of higher learning or university for any academic award. Where other people's work has been referred to, this has been acknowledged.

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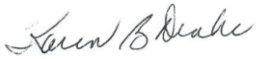
Signature…  …… Date…04 July 2025

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Abstract

Introduction: Ventilator-associated pneumonia (VAP) is one of the most commonly encountered hospital-acquired infections in the intensive care units worldwide. In Uganda, VAP is one of three infections that account for all nosocomial infections. The ventilator care bundle (VCB) is widely proposed and implemented in most hospitals, especially in developed countries, as an effective preventive measure against VAP. However, lack of knowledge and practice by nurses has hampered the implementation of the VCB guidelines for VAP prevention in Uganda, despite its availability in the ICUs. Studies elsewhere suggest that clinical coaching improves clinical knowledge, practices and decisions of nurses. There are no previous studies in Uganda that have investigated this linkage. Understanding this association can improve the delivery of positive patient care and outcomes.

Objective: This study aimed to investigate the effect of coaching on clinical knowledge and practice among nurses on the use of ventilator care bundle in the prevention of ventilator-associated pneumonia in CCUs of the Uganda Heart Institute, a specialized hospital in Kampala.

Methods: The study utilized the quantitative one-group, pre-test and post-test quasi-experimental design. Data were gathered using structured survey questionnaires from 36 nurses working in the critical care units of the Uganda Heart Institute. The survey participants were selected using the Krejcie and Morgan (1970) formula for determining sample size. Data were entered and prepared for analysis in IBM SPSSv25.

Results: Of the 36 nursing participants, 69% were female and 31% were male. The paired t-test showed that there was a statistically significant difference between

knowledge of nurses before coaching (m = 16.1, sd = 3.2) and knowledge of nurses after coaching (m = 30.2, sd = 2.5), $p < .001$. The Wilcoxon signed ranks test indicated that there was a statistically significant difference between practice of nurses before coaching (m = 3.62, sd = .29) and practice of nurses after coaching (m = 4.14, sd = .23), $p < .001$. The change in the nurses' mean knowledge levels was greater than the change in the practice levels.

Conclusion: Coaching was a useful intervention for improving the knowledge and practice levels of nurses in using VCB to prevent VAP.

Recommendations: CCUs in Uganda should conduct regular coaching or related education initiatives for nurses in order to maintain an optimum standard of knowledge and practices of using VCB to prevent VAP.

Keywords: Effect of coaching, ventilator care bundle, ventilator-associated pneumonia, Uganda Heart Institute, critical care units, knowledge and practice, knowledge, practice, nurses.

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List of Acronyms and Abbreviations

ARDS	Acute Respiratory Distress Syndrome
CCU	Critical Care Unit
DVT	Deep Vein Thrombosis
DVTP	Deep Vein Thrombosis Prophylaxis
HAI	Hospital Acquired Infection
HAI	Hospital-Acquired Infections
ICU	Intensive Care Unit
MDROs	Multidrug Resistant Organisms
MOH	Ministry of Health
PUD	Peptic Ulcer Disease
UHI	Uganda Heart Institute
VAP	Ventilator-Associated Pneumonia
VCB	Ventilator Care Bundle

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Chapter One: Introduction

Ventilator-associated pneumonia (VAP) is one of the most frequently encountered hospital-acquired infections in the critical care setting such as the intensive care units (Keyt, Faverio, & Restrepo, 2014). VAP is pneumonia occurring 48 hours after the commencement of mechanical ventilation on critically ill patients (Kalovwe, 2020). It is acquired while patients are mechanically ventilated. The mortality rate of VAP in some situations was reported as high as 76% (Goutier, et al., 2014; Hart, McNeill, Maclean, Hornsby, & Ramsay, 2020; Mazwi, Van Blydenstein, & Mukansi, 2023; Orion Market Reports, 2020).

The ventilator care bundle (VCB) has been proposed as a preventative measure to reduce the incidence and/or mortality rates of VAP during hospitalization. The VCB is considered a key strategy for preventing VAP because it combines several evidence-based interventions, which when implemented together consistently, have a substantially greater effect on reducing VAP incidence than when applied individually. This approach addresses multiple risk factors for VAP simultaneously through a structured, multidisciplinary process (Prakash, Rajshekar, Cherian, & Sastry, 2017). The success of the VCB strategy in preventing VAP depends on the level of VCB and VAP knowledge and practice by the nurses. However, poor VCB and VAP knowledge and practice by the nurses often hamper the implementation of the VCB guidelines for VAP prevention (Cengiz & Kanan, 2019; Gomes, 2010; Kunzmann, Dimitriades, Morrow, & Argent, 2016). This situation is compounded by lack of educational support which can lead to several challenges associated with providing care to patients on ventilators (Al-Tamimi, Refaat, & Bani Issa, 2022). In Uganda, research findings assert that the VCB approaches are not well-understood and their application

for prevention of VAP has not been documented (Agaba, Tumukunde, Tindimwebwa, & Kwizera, 2017; Marzuola, 2016).

In order to address the aforesaid gaps in the level of VCB knowledge and practice in preventing VAP, educational strategies such as coaching, staff education and continuous in-service education linked to the prevention of VAP have been successful in developed countries like the USA, UK and Australia (Al-Sayaghi, 2020; Jansson, 2014; Lawrence & Fulbrook, 2011). Specifically, coaching is shown to be a powerful tool in enhancing the success of healthcare organizations in terms of team building, adaptation to changes, career planning and professional development (Narayanasamy & Penney, 2014). In Uganda, however, there is a dearth of similar studies (if at all any) directly linking coaching and the level of knowledge and practice of nurses in the use of VCBs to prevent VAP. Therefore, this study explored the aforementioned link in the context of critical care units of the Uganda Heart Institute a specialized hospital in Kampala.

Background to the Study

Worldwide, statistics show that 86% of nosocomial pneumonias are associated with mechanical ventilation commonly termed as ventilator-associated pneumonia (VAP (Kumari, Choudhary, & Jat, 2016; Othman & Abdelazim, 2017). VAP is one of the most common hospital acquired infection (HAIs) with a mortality rate varying from 3% to76 % in some situations depending on the specific patient population and the pathogens involved (Goutier, et al., 2014; Hart, McNeill, Maclean, Hornsby, & Ramsay, 2020; Khan, et al., 2016; Mazwi, Van Blydenstein, & Mukansi, 2023; Orion Market Reports, 2020; Papazian, Klompas, & Luyt, 2020). Ventilator-associated pneumonia is also associated with increased length of stay in intensive care units

(ICUs) (29.9%), increased duration of mechanical ventilation and related cost burden among patients (Kharel, Bist, & Mishra, 2021; Kollef, Hamilton, & Ernst, 2012).

In the developed countries, the mortality rate directly attributable to VAP is estimated to be approximately 10%, with rates varying from 3% to 17% (Papazian, Klompas, & Luyt, 2020). For instance, in the United States alone, the mortality rate of VAP reached up to 13% (Kalil, et al., 2016). In Europe, statistics show that the mortality rate of VAP was 29.9% in 2016 alone (Martin-Loeches, Rodriguez, & Torres, 2018).

In the developing (low- and middle-income) countries (including Sub-Saharan Africa), the mortality rate of VAP ranges between 24% and 76% (Goutier, et al., 2014; Hart, McNeill, Maclean, Hornsby, & Ramsay, 2020; Mazwi, Van Blydenstein, & Mukansi, 2023; Orion Market Reports, 2020). In South Africa, for example, the prevalence ranges from 10% to 76% (BehariI & Kalafatis, 2015). In China, mortality of VAP was 23.8% (Ding, et al., 2017).

In Uganda, VAP is prevalent with an estimated infection rate of 38.3% (Namutebi & Kwizera, 2015). Recent studies have found out that VAP is one of the three types of infections that account for more than 60% of all nosocomial infections and more than 90% of pneumonias are acquired while patients are mechanically ventilated (Agaba, Tumukunde, Tindimwebwa, & Kwizera, 2017). VAP is associated with increased length of stay in the intensive care unit (ICU), increased duration on mechanical ventilation and associated cost burden among patients, and increased mortality rate (Agaba, Tumukunde, Tindimwebwa, & Kwizera, 2017).

Ventilator care bundles (VCBs) have been applied across many developed countries and their use has produced positive results in controlling VAP (Lawrence &

Fulbrook, 2011; Liu, et al., 2020). The positive results have been attributed to the nurses' knowledge of and compliance with guidelines on the use of the VCB to prevent VAP in all ICUs (Al-Sayaghi, 2020).

In Sub-Saharan Africa, several barriers related to the implementation of evidence-based guidelines by nurses have been identified. These include very little knowledge of the guidelines, unawareness of their importance, and at times non-compliance with them (Bankanie, Outwater, Wan, & Yinglan, 2021; Gomes, 2010; Kunzmann, Dimitriades, Morrow, & Argent, 2016). For instance, in South Africa, only 21.69% of nurses in ICU had knowledge on guidelines in the prevention of VAP (Gomes, 2010). In Kenya, at Kenyatta National Hospital 70.7% of the nurse's lacked knowledge on VAP (Malombe, 2015). A recent study conducted in hospitals in East Africa, concluded that vigorous and repeated training of nursing staff is required and compliance to preventive measures has to be monitored for prevention of VAP (Agarwal, Kakati, Mahalingam, & Rana, 2019).

In Uganda, although the VCB is available particularly in the ICUs in Kampala, they are not being put to use and no studies have been carried out on their use to prevent ventilator-associated pneumonia. Research finding at Mulago National Referral Hospital assert that nurses have not been educated on evidence-based approaches to prevent VAP (Marzuola, 2016). This situation shows that research is still needed to determine the effect of coaching on knowledge and practice among nurses on the use of the VCB to prevent VAP.

Different research findings have identified solutions to the increasing rates of VAP. Staff education, continuous in-service education and coaching are some of the strategies that were linked to VAP prevention, improvements in knowledge, skills and

clinical outcomes (Al-Sayaghi, 2020; Faithfull-Byrne, et al., 2017; Jansson, 2014; Lawrence & Fulbrook, 2011). For instance, in a study on the effect of a clinical coaching education on clinical faculty coaching behavior's, Kaldawi (2022) concluded that implementation of clinical coaching improves clinical practice and ensure that nurses make quality decisions that result in positive patient outcomes. A study by Faithfull-Byrne et al. (2017) on facilitating point of care workplace learning and development using clinical coaches in nursing and midwifery practice concluded that the adoption of the clinical coach roles implemented in Sunshine Coast Hospital and Health Service (SCHHS) achieved advancement in the quality and culture of nursing and midwifery care delivery. Therefore, coaching has been identified as a new strategy designed to promote personal and professional development of the nurses with the goal of improving patient care (Faithfull-Byrne, et al., 2017). In this research coaching was used as an intervention to determine its effect on knowledge and practice among nurses on the use of ventilator care bundle in the prevention of ventilator-associated pneumonia in the critical care units (CCUs) of a specialized hospital in Kampala.

Statement of the Problem

The VCB has been proposed and widely implemented in most hospitals in developed countries as a preventative measure against VAP (Liu, et al., 2020). Research studies have demonstrated that VCB dramatically reduces VAP rates and length of stay in ICUs, improves clinical effectiveness of interventions, decreases ventilator days and mortality rates (Khalfallah, Alquwez, & Ibrahim, 2024; Liu, et al., 2020). Despite the fact that the VCB is available in the ICUs in Uganda, research findings demonstrate that they are not well-understood and applied in the prevention

of VAP. Studies also show that success in the application of VCB depends on the nurses' level of knowledge of and adherence to practices about the use of VCB to prevent VAP (Al-Sayaghi, 2020). In addition, studies conducted elsewhere suggest that clinical coaching improves clinical knowledge, practice and quality of the nurses' and midwifery decisions that result in positive patient care delivery and outcomes (Eid, Hamdy, & Ramadan, 2021; Mogyoródi, et al., 2023). Similar studies, however, are lacking in Uganda. Consequently, this research was conducted to contribute towards filling this gap. This study used the coaching intervention to determine its effect on knowledge and practice among nurses on the use of ventilator care bundle in the prevention of ventilator-associated pneumonia in the critical care units (CCU) of a specialized hospital in Kampala.

Purpose of the Study

The purpose of the study is to determine the effect of coaching on knowledge and practice among nurses on the use of ventilator care bundle in the prevention of ventilator-associated pneumonia in CCUs of the Uganda Heart Institute, a specialized hospital in Kampala.

Research Question

What is the effect of coaching on knowledge and practice among nurses on the use of the ventilator care bundle in the prevention of ventilator-associated pneumonia in CCUs of the Uganda Heart Institute, a specialized hospital in Kampala?

Objectives

1. To identify the effect of coaching on clinical knowledge among nurses on the use of the ventilator care bundle in prevention of pneumonia in CCU**s** of a specialized hospital in Kampala.

2. To determine the effect of coaching on clinical practice among nurses on the use of the ventilator care bundle in prevention of pneumonia in CCUs of the Uganda Heart Institute, a specialized hospital in Kampala.

Significance of the Problem

Findings of the study may demonstrate that coaching enhances the nurses' knowledge, and practice on the use of ventilator care bundle to prevent VAP in ventilated patients in the CCUs. This may increase their confidence in the use of VCB while nursing ventilated patients, improve their practice in nursing care by making quick decisions so as to prevent VAP, carry out their duties with minimal supervision and follow-up on ventilated patients.

The findings may enable the nurse supervisors to improve their role on the use of VCB, offer management support to the nurses caring for ventilated patients, establish systems and provide resources. The findings may acquaint the nurse administrators with the concept of coaching as a way to improve problem areas in nursing.

It is likely that the patients will also benefit from the findings of this study. The information generated may minimize length of stay in CCUs, minimize the cost of treatment, improve quality of patient care, minimize complications and mortality among CCU patients.

Theoretical Framework

The theoretical and conceptual framework in Figure 1 that was used to inform this research is the Clinical Coach Framework by Faithfull-Byrne et al. (2017). This Clinical Coach Framework was developed after the implementation of the clinical coach role across a health service in Queensland, Australia. Coaching as a concept originated from sports and has been used by clinical coaches to enhance both the

personal and professional development of the nurses and midwives to enable them perform their tasks efficiently at the point-of-care. The clinical coach framework comprises four major areas that include context of coaching, purpose for clinical coaching, clinical coaching skills, and the framework outcome for clinical coaching.

Context of coaching.

The locations where the coaching will take place needs to be identified. The location can be a point of care where coaching can be implemented. In the clinical coaching framework, the context of coaching comprises three areas and these include: actual clinical site/context, real time educational intervention, and infrastructure to clinical educator roles (Faithfull-Byrne, et al., 2017).

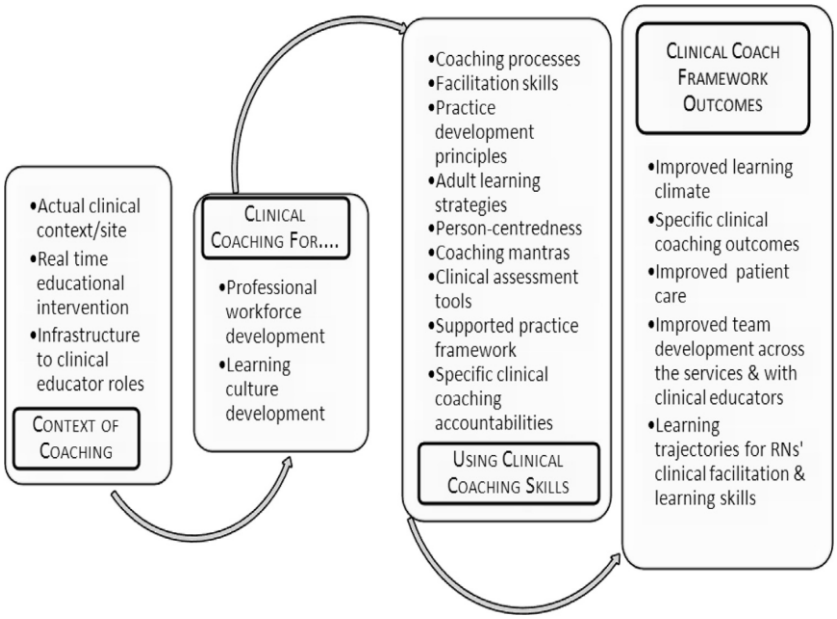

Figure 1. Clinical Coach Framework (Faithfull-Byrne et al., 2017, p. 405 with permission, see Appendix A)

Actual clinical site.

The place where the coaching session activity is to occur constitutes the actual clinical site. In the clinical coach framework, it denotes the exact healthcare facilities

where the nurses and midwives work. Clinical coaching can also be implemented in specified clinical locations inside the health facility (Faithfull-Byrne, et al., 2017).

Real-time educational intervention.

Coaching is carried out at the point of care where the nurses and midwives perform their normal clinical duties. Clinical coaches provide point of care educational interventions to achieve clinical skill and practice development for nurses and midwives. Coaching is implemented to ensure that mandatory training requirements are met, safe and competent practices are maintained (Faithfull-Byrne, et al., 2017).

Infrastructure to clinical educator role.

The clinical coach role is one of the key infrastructures required to ensure personal and professional development of the nurses and midwives with the overall goal of enhancing their knowledge and practice. This will help unlock the nurses and midwives' potentials to maximize their own performance (Faithfull-Byrne, et al., 2017).

Purpose for clinical coaching.

The purpose of clinical coaching is to increase nurses' knowledge and build their skills. In the clinical coaching framework, the purpose of coaching includes, clinical coaching for professional workforce development and clinical coaching for learning culture development (Faithfull-Byrne, et al., 2017).

Coaching for professional workforce development.

Professional workforce development is referred to as employment initiatives by the employers offering training, development opportunities, and continuing education programs to their employees to maximize their job success and career pathway. According to Faithfull-Byrne et al. (2017), the coaching concept advanced the

professional development for nurses and midwives. This was in response to the changing practices and new demand for quality care that required nurses and midwives to rescript how service delivery should be conducted. The aim was to gain new skills that could help create, sustain, and retain a viable nursing workforce.

Learning culture development.

Learning culture development relates to an environment that demonstrates and encourages individual and organizational learning, and where the focus is on developing a set of values, practices, and processes that prioritize education, sharing knowledge, employee development, and individual improvement (Mills, 2024; Trovas, 2022). The environment can be a clinical setting such as a hospital or a point of care such as the bedside. According to Faithfull-Byrne et al. (2017), learning culture development is key to provoke the nurses and midwives to research for up-to-date evidence that supports the general practice that is critical. They may embrace the motivation of researching their learning as part of their career development. The framework was aimed as a thought-provoking process for the midwives and nurses to adopt a continuous learning mindset under the supervision of clinical educators, and this should occur in their traditional clinical work areas (Faithfull-Byrne, et al., 2017).

Clinical coaching skills.

A clinical coach must have specific skills to enable her/him to coach effectively. These skills foster a collaborative relationship between the coach and the coachee. In the framework, a number of clinical coaching skills have been outlined and they include: coaching processes, facilitation skills, practice development principles, adult learning strategies, person-centeredness, coaching mantras, clinical assessment tools,

supported practice framework, and specific clinical coaching accountabilities (Faithfull-Byrne, et al., 2017). Each of the coaching skills is described below.

Coaching processes.

Coaching processes require that the coach and the coachee collaborate to achieve the set goals. The coach needs to prepare for the coaching session, analyse and explore the situation in a specific clinical environment to have a clear understanding on how to help the coachee. This involves setting goals, maintaining motivation, monitoring progress towards goals, asking potent questions and promoting self-awareness (Faithfull-Byrne, et al., 2017). During the coaching session, the coach and coachee work together to identify common goals, establish objectives, and determine the mode of assessment. The coach provides feedback and offers support to enable the coaching participants succeed within their clinical units.

Facilitation skills.

A clinical coach is required to have specific abilities to enable him/her to facilitate the coaching session. The coach focuses more on asking the right questions, listening, encouraging self-discovery, and challenging the coachee to learn and achieve their set goals. The clinical coach needs to listen, prioritize learning, use genuine rapport and act in a facilitative manner through fostering situations in which the coaching participants feel comfortable, are able to consider new ideas, and are not threatened by other factors (Faithfull-Byrne, et al., 2017). In principle, the clinical coach partners with the coachees to assist them to take responsibility for their own learning, have input into the learning through their own insights and experiences and use self-evaluation to maximize their potential to solve problems or achieve significant outcomes.

Practice development principles.

The clinical coach works towards improving and increasing effectiveness in patient centered care by empowering nurses and midwives to identify values and examine current practices at a local unit level. The identification of values and examination of current practices provides a basis to transform the workplace culture, transform the context of care, and facilitation of new ways of working that are values and evidence-based. The coaches use the principles of practice development to guide them in translating research into practice, as well as enlighten, empower and liberate others towards local action within their clinical units (Faithfull-Byrne, et al., 2017).

Adult learning strategies.

Adult learning strategies focus on how to impart information in a meaningful way to meet the educational needs of the adult learner. The principles of adult learning are defined by learner-centeredness, self-directed learning, personal and professional development (Faithfull-Byrne, et al., 2017). Learner centeredness is the principle that refers to how the learner's needs and wants are central to the process of teaching. Self-directed learning touches on the responsibility and involvement of learners in their education. Personal and professional development is based on the premise that adult learners seek to gain more advanced knowledge and develop valuable skills that can help them improve their career prospects (Faithfull-Byrne, et al., 2017).

Person-centeredness.

Person-centeredness is an approach that is intended to guide the interactions between the clinical coach and the coachees. The approach focuses on the unique needs and preferences of individual persons. Clinical coaches use it as a strategy to

identify the coachees' individual needs, values and preferences, and then use them as a guide to provide support during the coaching sessions. Person-centeredness also stimulates the coachee to audit their learning, identify personal learning needs, address knowledge and practice gaps. The clinical coaches support the coachees to set personal goals and work with them towards achieving those goals within a facilitative interpersonal relationship (Faithfull-Byrne, et al., 2017).

Coaching mantras.

A mantra is a word or phrase used repeatedly to express strong belief and motivation (Cambridge Dictionary, 2017). Coaching mantras were adopted to enable the clinical coaches to guide the learners but not to be the sole expert in the provision of information on specific subjects. Mantras can be used in the clinical situation or environment to engage the learners within their clinical practice and skills development. This assists the coach and learners to focus on the aim and objective of clinical coaching to achieve their personal, professional and clinical development goals (Faithfull-Byrne, et al., 2017).

Clinical assessment tools.

Clinical coaches use clinical assessment tools in nursing and midwifery education to assess the effectiveness of the nurses and midwives in their roles. They focus their assessment specifically on pre-performance preparatory teaching, clinical skill performance, post-performance critical analysis, self-assessment and peer review. Clinical assessment tools are widely used to facilitate learning and help to achieve learning objectives during the coaching process. Clinical coaches use these tools to put emphasis on key steps that must be followed during the coaching session to facilitate learning. The clinical assessment tools are also used as the standard to assess

whether the coachees have gained mastery of the clinical competencies and skills required to work in specialized areas to achieve safe and quality care (Faithfull-Byrne, et al., 2017).

Supported practice framework.

A clinical coach uses supported practice framework to improve the coachee's individual competence, performance or practice. Supported practice framework can be standards and workplace expectations that must be adhered to by all staff to enable them to perform at levels appropriate to their role and appointment. Professional bodies or organizations set these standards and expectations when there is need to improve knowledge and skills, adjust to new evidence that necessitate change in clinical practice or improve their technical capacity to deliver care at the expected professional and workplace standard. The coach uses this supported practice framework to guide the coachees to set their learning goals based on the agreed performance standards and workplace expectations (Faithfull-Byrne, et al., 2017).

Specific clinical coaching accountabilities.

The framework identifies specific accountabilities that align with the responsibilities of the clinical coach and the coachee. The clinical coach's responsibility is to ensure that learning has taken place at the workplace and the learning goals have been achieved. The coach is accountable for the outcomes that must be achieved at the end of the coaching process. The accountabilities include ensuring that mandatory training requirements are in place to aid the learning process, learning goals have been achieved and the learners have acquired the necessary skills for safe professional practice. The coach is also accountable for the safety of the

learners and the patients at the point of care during the coaching session (Faithfull-Byrne, et al., 2017).

Clinical coach framework outcomes.

In the clinical coaching framework, the clinical coach framework outcomes comprise five areas and these include: improved learning climate, specific clinical coaching outcomes, improvement of patient care, improve team development across the service and with the clinical educators, and learning trajectories for graduate nurses' clinical facilitation, and learning skills.

Improved learning climate.

The learning climate constitutes a learning environment where learners feel involved and responsible for their learning as well as feel comfortable enough to fully participate in group and individual activities. The framework identifies the learning environment as the point of care within the clinical setting that fosters a positive learning culture and leads to better learning outcomes. In the clinical setting, the coach can identify how the learning environment has improved in regard to safe and quality clinical care services, and organizational learning culture (Faithfull-Byrne, et al., 2017).

Specific clinical coaching outcomes.

Clinical coaching is used as an ongoing intervention usually aimed at improving healthcare practices and patient outcomes. The outcomes may include knowledge acquisition and refinement, clinical skill development and improved patient care. The clinical coach can focus on helping the nurses and midwives working in specialized areas attain clinical skills and competencies to enable them to achieve and maintain safe and quality care (Faithfull-Byrne, et al., 2017).

Improvement of patient care.

Clinical coaching focuses on the quality of care and safety advancement within the health service. It aims at improving patient care with the overall objective of achieving a high degree of patient satisfaction. The improvement in the quality of patient care and outcomes is essentially determined by the quality of training and competence of personnel. Clinical coaching advocates for mandatory training to enhance personal and professional development of nurses and midwives with the aim of improving patient care in practice settings such as the intensive care units (Faithfull-Byrne, et al., 2017).

Improve team development across the service and with the clinical educators.

Clinical coaching was adopted to coach staff, assess their learning and competency in the healthcare setting. The main role of the clinical educator was to sustain the culture of learning, build teams of highly skilled professional workforce that work collaboratively to enhance patient safety and improve clinical performance within the healthcare service. It is envisaged that the collaboration between the clinical educator and the health care teams can result in individual personal and professional development, improve efficiency and patient outcomes at the point of care (Faithfull-Byrne, et al., 2017).

Learning trajectories for graduate nurses' clinical facilitation, and learning skills

Clinical coaching enabled the nurses and midwives who were employed as coaches to develop an interest in becoming clinical nurse educators. They have taken advantage of opportunities provided by clinical facilitation to advance their

professional development as one of the main outcomes of the clinical coach framework (Faithfull-Byrne, et al., 2017).

Operationalization of the Model to this Study

The conceptual framework in Figure 2 illustrates the effect of coaching on knowledge, and practice among nurses towards the use of ventilator care bundle in the prevention of ventilator-associated pneumonia. It focuses on four key areas: context of coaching, clinical coaching for professional workforce development, clinical coaching skills and clinical coach framework effect. This was applied in the study.

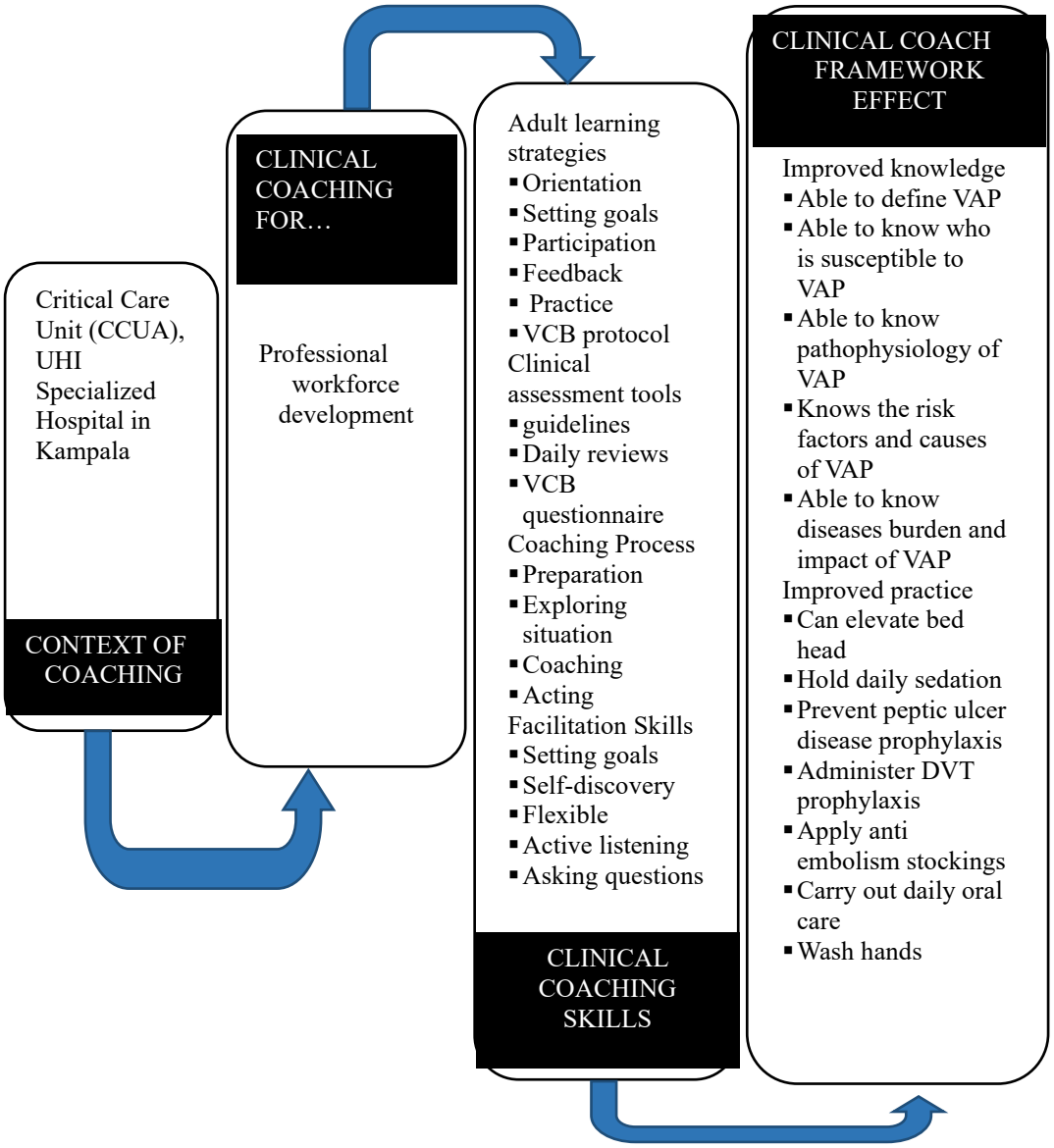

Figure 2: Operationalized Conceptual Framework. Adapted with permission (Appendix A)

Context of coaching.

In the adapted conceptual framework, the actual site that constitutes the context of coaching is the critical care units and the point of care workplace in a specialized hospital in Kampala. The nurses working in the critical care unit are the recipients of coaching as an educational intervention to prevent VAP. This is a necessity because VAP is a major complication of mechanical ventilation and nurses need to be coached on the best-practices of VAP prevention bundle.

Clinical coaching for professional workforce development.

In the adapted conceptual framework, the nurses constitute the professional workforce. Clinical coaching may help the nurses become better critical care nurses especially in the use of the VCB in care of patients on ventilators and in the prevention of VAP.

Clinical coaching skills.

In the adapted framework, adult learning strategies, clinical assessment tools, coaching process and facilitation skills have been identified as clinical coaching skills that were applied in the study. Each is elaborated in the respective subsection below.

Adult learning strategies.

Adult learning strategies focus on helping mature learners gain content knowledge, competence and skills that are relevant to immediate application (Johnson, 2022). In this study, strategies such as orientation, setting goals, participation, feedback and practice was used to improve the nurses' knowledge and practice in the use of the VCB at the point of care to prevent VAP.

Clinical assessment tools.

Clinical assessment tools are designed to evaluate nurses' knowledge and practice regarding the use of the VCB to prevent VAP (Immonen, et al., 2019; Krautscheid, Moceri, Stragnell, Manthey, & Neal, 2014). Some of the clinical assessment tools include the VCB protocol guidelines, daily reviews, small group discussion using pre-determined questions, charts of mechanically ventilated patients in the CCU and Ventilator Care Bundle Compliance Checklist (Abad, Formalejo, & Mantaring, 2021). The purpose of using these tools is to predict how much the nurses know about the VCB and whether their knowledge aligns with evidence-based practice in the prevention of VAP.

Coaching process.

During the process of coaching, the focus was on setting goals, maintaining motivation, monitoring progress towards goals, asking potent questions and promoting self-awareness. The process of coaching encompasses four steps. These include preparation by both the coach and the coachee, exploring the situation, coaching, and acting. The coach prepares by gathering all the information about the coachee, so as to have a clear understanding of the coachee and the coachee's goals. The coachee also prepares by gaining an understanding of how coaching can help them. The exploration focuses on the coachee's situation, challenge, problem, goals, knowledge level and practice that may help them to progress. During the coaching session, purposeful and powerful questions, coaching tools, coaching techniques, feedback, and teaching concepts are used by the coach. Acting involves creating an action plan, setting milestones and goals, identifying roadblocks that might get in the way, holding coachees accountable and ensuring they have the tools needed to act.

When the coach implements these four steps during the coaching session, positive results may be achieved, and change will be fostered. The coaching process will enable the coachee to align knowledge and practice regarding use of the VCB to prevent VAP in a clinical setting.

Facilitation skills.

A clinical coach is required to have specific abilities to enable him/her to facilitate the coaching session. The coach focuses more on asking the right questions, listening, encouraging self-discovery, and challenging the coachee to learn and achieve their set goals. The clinical coach needs to listen, prioritize learning, use genuine rapport and act in a facilitative manner through fostering situations in which the coaching participants feel comfortable, are able to consider new ideas, and are not threatened by other factors (Faithfull-Byrne, et al., 2017). In principle, the clinical coach partners with the coachees to assist them to take responsibility for their own learning, have input into the learning through their own insights and experiences and use self-evaluation to maximize their potential to solve problems or achieve significant outcomes.

Clinical coach framework effect on knowledge and practice in the use of the ventilator care bundle,

In the adapted framework, improved knowledge and practice have been identified as outcomes of the clinical coach framework effect. Each is expounded in detail in a separate subsection below.

Knowledge of the nurses on utilization of the VCB to prevent VAP.

Knowledge refers to the awareness of ventilator care bundles among the nurses regarding the prevention of ventilator-associated pneumonia acquired through

experience or education. Prevention of VAP is influenced by the knowledge and practices of nurses (Bhandari, Sharma, & Shrestha, 2021).

In this study, knowledge on the awareness of what constitutes the VCB for prevention of VAP was measured. Nurses working with ventilated patients in the critical care units (CCUs) are expected to be aware of the recommended practices to prevent and treat VAP (Aziz, et al., 2020). The study also ascertained whether the nurses were knowledgeable about the elements of the VCB and why they are used. The elements include, elevation of the head of the bed to 30-45 degrees to minimizes micro aspiration, daily 'sedation vacation' and daily assessment of readiness to extubate in order to decrease length of stay in the hospital, peptic ulcer disease prophylaxis to minimizes complications and length of stay, venous thrombo-embolism prophylaxis to minimize complications and length of stay and hand washing before touching the patient or ventilator to prevent the spread of the germ that causes pneumonia.

Practice of the nurses on utilization of the VCB to prevent VAP.

Practice refers to actual application of the elements of VCB to prevent VAP. This study relates practice to utilization of the essential elements of the ventilator care bundle by the nurses in CCU to prevent VAP. These elements include head-of-bed elevation, daily interruptions of sedative infusions, daily spontaneous breathing trials, thromboembolism prophylaxis, stress ulcer prophylaxis, oral care with chlorhexidine gluconate and hand washing with soap and water or alcohol hand rub (Hassan & Elsaman, 2022; Klompas, Li, Kleinman, Szumita, & Massaro, 2016). In the adapted framework, clinical coaching was used as an intervention to enhance practice. In the study, the focus was on assessing whether nurses were using the main components of

the VCB in their nursing practice to prevent VAP. Improved practice assessed whether nurses could apply these components in a clinical setting. A pre-coaching questionnaire was used to find out whether the nurses had used components of VCB in their practice and the post coaching evaluation was used to establish whether they had put into practice the components of VCB in a clinical setting.

Additional Concepts Embedded in Research

There are a number of concepts embedded in the study and these include coaching, knowledge, practice and CCU Nurse as well as ventilator care bundles, ventilator-associated pneumonia and critical care units. Coaching, knowledge and practice have been defined above.

Critical care units.

This study was carried out in the critical care units (CCUs) because it is where patients are often exposed to invasive mechanical ventilation which can result in VAP, the most common infections in patients requiring invasive mechanical ventilation. The critical care units included the cardiac intensive care unit, the cardiac high dependence unit and coronary care unit.

CCU nurses.

In this study, the focus was on critical care nurses, that is, nurses who work in three of the critical care units (cardiac intensive care unit, the cardiac high dependence unit and coronary care unit). These nurses play an important role in the prevention of VAP and are in the best position to put VCB into practice as they are at the patient's bedside 24 hours a day (Mannava, Nayak, Uppoor, Naik, & Maddi, 2020). Some of them are highly specialized and trained healthcare personnel while others have been trained on the job to provide nursing care to patients with life-threatening illnesses or

conditions. They provide specialized experience, knowledge, and skills that critically ill patients who are connected to a ventilator need to survive.

Ventilator care bundle.

The VCB is a group of eight evidence-based procedures which when clustered together and implemented as an 'all or nothing' strategy, may result in positive clinical outcome (Lawrence & Fulbrook, 2011). These procedures include head-of-bed elevation, daily interruptions of sedative infusions, daily spontaneous breathing trials, thromboembolism prophylaxis, stress ulcer prophylaxis, oral care with chlorhexidine gluconate, hand hygiene and oral pharyngeal suctioning (Hassan & Elsaman, 2022; Klompas, Li, Kleinman, Szumita, & Massaro, 2016). This study focused on the nurses' knowledge of the current ventilator care bundle items and their actual application of the items when caring for patients (practice).

Ventilator-associated pneumonia.

VAP is a nosocomial lung infection associated with endotracheal tube use in ventilated patients. VAP is considered the most frequent life-threatening nosocomial infection in intensive care units (Lawrence & Fulbrook, 2011; Timsit, Esaied, Neuville, Bouadma, & Mourvllier, 2017).

Aziz et al (2020) asserts that the prevention and control of VAP is dependent on the nurses' knowledge and practices of the VCB. This study was, therefore, conducted to find out if the intensive care unit nurses were familiar with the pathophysiology, risk factors, causes, disease burden and impact of VAP as well as their level of knowledge and practice of VCB in a specialized hospital in Kampala.

Summary

This chapter covered the introduction, the background, the problem statement and purpose of the study. The chapter also included the research questions, the objectives of the study, the theoretical/conceptual framework and how the theoretical/conceptual framework was adapted. Chapter two covers the literature review and chapter three focuses on the methodology that was employed to conduct the study. Chapter four presents the results from an analysis of the data that were collected, which are discussed in chapter five.

Chapter Two: Literature Review

The discussion in this chapter is around the following. The first topic ventilator-associated pneumonia is a worldwide concern. The second topic is that the ventilator care bundle is critical in the prevention of ventilator-associated pneumonia. The third is knowledge and practice of nurses is critical on the use of the ventilator care bundle. Lastly, coaching is shown to improve on knowledge and practice**.**

Ventilator-Associated Pneumonia is a Worldwide Concern

Worldwide, VAP is currently considered one of the most frequent ICU-acquired infections and a leading cause of death among patients in intensive care units (Hammouda, Ahmed, Moawad, & Kandeel, 2022; Kharel, Bist, & Mishra, 2021; Shetty, 2025; Wu, Wu, Zhang, & Zhong, 2019). VAP is defined as pneumonia that occurs 48 hours or more after endotracheal intubation (Sethi, 2024). It is caused by microorganisms that invade the lower respiratory tract and lung parenchyma through intubation that allows oral and gastric secretions to enter the lower airways. The infection is prevalent in both the developed and developing countries with infection rates of up to 52% and in some places reaching as high as 76% (Azizullah, et al., 2022).

Patients in critical conditions are put on mechanical ventilation, a form of life support that is often used for patients with low oxygen levels or severe shortness of breath from infections like pneumonia (Fan, et al., 2016). Statistics show that 86% of nosocomial pneumonias are associated with mechanical ventilation commonly termed VAP. This high incident rate occurs due to microaspiration or macroaspiration in seriously ill patients especially among immunocompromised, surgical, and elderly

patients on mechanical ventilation. (Belay, Zewale, Amlak, Abebe, & Hailu, 2022; Kharel, Bist, & Mishra, 2021; Othman & Abdelazim, 2017; Xie, et al., 2018).

Globally, the prevalence of VAP is associated with an increased risk of hospital morbidity, mortality, longer length of stay in the ICU, and associated cost burden among patients. Patients affected with VAP are also susceptible to complications like severe sepsis, septic shock, acute respiratory distress syndrome (ARDS), atelectasis, and infection with multidrug resistant organisms (MDROs), which in turn increase cost, morbidity, and mortality (Belay, Zewale, Amlak, Abebe, & Hailu, 2022; Kharel, Bist, & Mishra, 2021; Xie, et al., 2018).

The incidence rate of VAP ranges from 7% to 70% and attributable mortality rate from 13% to 76% depending on the study population (Alp & Voss, 2006; Khan, et al., 2016; Timsit, Esaied, Neuville, Bouadma, & Mourvllier, 2017).Wang et al. (2020) estimate the incidence of VAP in Europe at 25%, which is relatively higher than that of North America (16%), Asia (20%) and other regions (12%). Specifically, in the United States alone, the mortality rate of VAP reached up to 13% (Kalil, et al., 2016). In Europe, statistics show that the mortality rate of VAP was 29.9% in 2016 alone (Martin-Loeches, Rodriguez, & Torres, 2018), while in China, mortality of VAP was 23.8% (Ding, et al., 2017; Wu, Wu, Zhang, & Zhong, 2019).

In Sub-Sahara Africa, VAP is one of the most common causes of hospital morbidity and mortality. The mortality rate of VAP is between 24% and 76% in low- and middle-income countries (Goutier, et al., 2014; Hart, McNeill, Maclean, Hornsby, & Ramsay, 2020; Khan, et al., 2016, p. 320; Mazwi, Van Blydenstein, & Mukansi, 2023; Orion Market Reports, 2020). For instance, in South Africa, the prevalence ranges from 10% to 25% and can reach 76% (BehariI & Kalafatis, 2015). In a study

conducted in Kenyatta National Hospital Intensive Care Unit, Kenya, mortality rates were found to be notably high in patients with nosocomial pneumonia, ranging up to 60%, depending on the severity of the underlying disease (Waweru-Siika & Chokwe, 2015).

In Uganda, VAP is prevalent. A study carried out by Namutebi and Kwizera (2015) discovered that the infection rate of VAP was 38.3%. Recent studies have found out that VAP is one of the three types of infections that account for more than 60% of all nosocomial infections and more than 90% of pneumonias are acquired while patients are mechanically ventilated (Agaba, Tumukunde, Tindimwebwa, & Kwizera, 2017). Ventilator-associated pneumonia is associated with increased length of stay in the intensive care unit (ICU), increased duration on mechanical ventilation and associated cost burden among patients, and increased mortality rate (Agaba, Tumukunde, Tindimwebwa, & Kwizera, 2017).

In summary, ventilator acquired pneumonia is a major healthcare problem with a high morbidity and mortality rate worldwide. At present it is the most common nosocomial infection in patients hospitalized in the intensive care unit where it has been associated with mechanical ventilation. Patients that acquire pneumonia via mechanical ventilation after 48 hours are infected with what has come to be termed as ventilator-associated pneumonia. Patients who develop VAP have higher mortality, longer hospital stays, higher antibiotic usage, and costlier treatment than those without VAP.

The Ventilator Care Bundle is Critical in the Prevention of Ventilator-Associated Pneumonia

The VCB is defined as a group of evidence-based interventions that when applied together will reduce VAP in patients who are on mechanical ventilation (Bankanie, Outwater, Wan, & Yinglan, 2021; Cal, 2015; Mohamed, 2013). These interventions include: elevation of the head of bed (HOB) to 30°–45°, daily "sedation vacation" and assessment of readiness to extubate, peptic ulcer disease (PUD) prophylaxis, deep vein thrombosis (DVT) prophylaxis and daily oral care with chlorhexidine (Ismail & Zahran, 2015; Institute for Healthcare Improvement, 2012; Khan, et al., 2016; Lim, et al., 2015; Mastrogianni, Katsoulas, Galanis, Korompeli, & Myrianthefs, 2023; Resar, Griffin, Haraden, & Nolan, 2012).

The prevention of VAP requires imbedding all elements of the VCB into practice (Ladbrook, Bouchoucha, & Hutchinson, 2019; Radhakrishnan, et al., 2021). These elements are evidence-based VAP prevention interventions that focus on care and treatment of patients on ventilators and have been applied across many developed regions with positive results in controlling VAP (Liu, et al., 2020). These elements include; head of bed elevation (HOBE) to 30-45 degrees, daily sedation vacation and daily assessment of readiness for extubation, peptic ulcer disease (PUD) prophylaxis, deep vein thrombosis (DVT) prophylaxis, daily oral care with chlorhexidine, hand hygiene, and endotracheal and subglottic suctioning.

Head of bed elevation (HOBE) to 30-45 degrees.

Head-of-bed elevation (HOBE) is a standardized evidence-based position in which the patient on mechanical ventilation (MV) sleeps in a semi-sitting position of 30-45 degrees to prevent VAP (Iannella, et al., 2022; Spooner, et al., 2014). This position, as

highlighted by some studies, is associated with the prevention of ventilator-associated pneumonia because it helps prevent the potential for gastric reflux and aspiration of contaminated orogastric/oropharyngeal secretions into the airways and this causes a decrease in VAP among patients on mechanical ventilation in the ICU (Güner & Kutlutürkan, 2022; Kallet, 2019; Li Bassi & Torres, 2011). The use of 30 degrees HOBE as a minimum and 45 degrees as maximum is standard practice and posting cues on HOBE in the patient rooms to remind the ICU nurses has been recommended as preventive measures against VAP in mechanically ventilated patients (Grap, Munro, Unoki, Hamilton, & Ward, 2012; Güner & Kutlutürkan, 2022; Khan, et al., 2016; Liu, et al., 2020; Spooner, et al., 2014). Güner & Kutlutürkan also emphasized that intensive care nurses' compliance with HOBE can contribute to improving the VAP rates and outcomes when they place and keep the patients in the correct position.

Daily sedation vacation and daily assessment of readiness for extubation.

Daily sedation vacation is described as a short-term suspension, discontinuation, cessation, or interruption of intravenous sedatives and analgesic medications in mechanically ventilated patients so that they can be weaned off the ventilator (Burry, et al., 2014; Hogue & Mamula, 2013; Liu, et al., 2020; Sharma, Hashmi, & Valentino III, 2024). Studies have shown that the application of daily sedation vacation can lower the risks of mortality and complications associated with ventilator-associated pneumonia, decrease the number of days for being attached to ventilator from 7.3 to 4.9 days and shorten-the length of stay in the ICU from 9.9 to 4.9 days (Frontera, 2011; Hooper & Girard, 2011; Kress, Pohlman, O'Connor, & Hall, 2000; Liu, et al., 2020; Luetz, Goldmann, Weber-Carstens, & Spies, 2012; Roberts, Haroon, & Hall, 2012; Shahabi, Yousefi, Yazdannik, & Alikiaii, 2016; Smith, 2012).

Researchers in developed countries have recommended putting in place a computerized physician order entry system to process all sedation orders and a nurse-led sedation vacation protocol created by the VAP team. The system would also produce patient's daily flow sheet to confirm whether sedation was interrupted. In addition, the system would produce respiratory therapy notes to assess daily readiness for extubation as soon as the patient meets the extubation requirement to reduce ventilation use time (Khan, et al., 2016; Liu, et al., 2020).

Peptic ulcer disease (PUD) prophylaxis and ventilator-associated pneumonia prevention.

Critically ill patients in the ICU are at risk of getting peptic ulcer disease (PUD), a condition in which painful sores or ulcers develop in the lining of the stomach caused by bacterium Helicobacter pylori infection, long-term use of nonsteroidal anti-inflammatory drugs such as ibuprofen and naproxen sodium (Malik, Gnanapandithan, & Singh, 2023). Peptic ulcer disease prophylaxis is defined as a process of guarding against the development of a specific disease including VAP by a treatment or action that affects pathogenesis. This may include using drugs such as proton pump inhibitors or H2 blockers, sucralfate or histamine H2-receptor antagonists to prevent gastric ulcers and lessen gastrointestinal bleeding by increasing gastric pH.87 thus reducing VAP. It is, therefore, essential that ICU nurses should regularly start prophylaxis for peptic ulcer disease on all patients admitted in the ICU. The nurses should also ensure that this VCB element is followed by checking whether the patients have PUD prophylaxis ordered on the medication administration record (MAR), and that they are actually mandated on the admission orders for all ICU patients (Kallet, 2019).

Deep vein thrombosis (DVT) prophylaxis.

Deep vein thrombosis prophylaxis (DVTP) is one of the components of VCB that should be administered to patients in the ICU to prevent VAP (Khan, et al., 2016). Deep vein thrombosis (DVT) is the formation of blood clots called thrombus that forms inside one of the veins or arteries and remains there. The patients admitted in the ICU tend to be inactive. Their recovery, while ventilated, is sedentary in nature and this increases the risk of developing DVT (Azab, et al., 2013; Badireddy & Mudipalli, 2023). This makes it a necessity for the patients to receive DVT prophylaxis. According to Institute for Healthcare Improvement (2012), the implementation of all elements of the Ventilator Bundle, including DVTP, decreases the rates of VAP in hospitals. DVT prophylaxis has been widely accepted in practice as an intervention in the general care of mechanically ventilated patients because its application decreases the risk of DVT, mortality and morbidity associated with VAP. Khan et al (2016) asserted that some form of DVT prophylaxis was obligatory for all patients admitted to the ICU. Prophylactics such as heparin or enoxaparin, antiembolic stockings, pneumatic sequential devices (or sequential compression devices) and anticoagulant therapy are considered sufficient DVT prophylaxis for prevention of DVT while patients are on complete bed rest.

Daily oral care with chlorhexidine.

Daily oral care with chlorhexidine is an essential element of the VCB and has been linked to the reduction in the rate of VAP. According to the Institute for Healthcare Improvement (2012), VAP can be caused by respiratory pathogens that colonize the dental plaque biofilms on the teeth of patients that are mechanically ventilated. Chlorhexidine has been recommended because it has proved to be effective in oral

care for the prevention of VAP in patients admitted in ICUs (Golzari & Mahmoodpoor, 2014; Liu, et al., 2020; Singh, Kennedy, & Stupans, 2022; Tran & Butcher, 2019).

Studies have noted that critically ill patients on prolonged mechanical ventilation in ICU are at greater risk of developing VAP caused by endotracheal intubation and microaspiration of bacteria that colonize the oropharynx and upper airways in seriously ill patients (Buterakos, et al., 2022; Sethi, 2024). The use of VCB as a multidisciplinary approach aims to prevent aspiration, decrease colonization in the upper respiratory tract, decrease the length of mechanical ventilation and improve the patient's clinical outcomes in the ICUs (Hassan & Elsaman, 2022; Ladbrook, Bouchoucha, & Hutchinson, 2019; Rahimi-Bashar, Gohari-Moghadam, & Vahedian-Azimi, 2021).

Hand hygiene and ventilator-associated pneumonia prevention.

Hand hygiene is an essential element of preventing VAP because it has a direct connection to infection decrease by decreasing pathogens' burden in the respiratory tract (Lim, et al., 2015; Liu, et al., 2020). It is defined as any action of hygienic hand antisepsis generally performed either by hand rubbing with an alcohol-based hand rub or handwashing with water and antimicrobial soap to reduce transient microbial flora (Centers for Disease Control, 2016; Centers for Disease Control, 2019). It is regarded as the most basic, effective, simplest, and most cost-effective measure to reduce, prevent and control the risk of health care-associated infections including ventilator-associated pneumonia (Arai, et al., 2022; Hoffmann, et al., 2020; Liu, et al., 2020). Studies have acknowledged the effectiveness of hand hygiene in preventing VAP, but it is still the least practiced action of the VCB and compliance among health care

workers is poor (Alves, Peña-López, Rojas, Marti, & Rello, 2018; Rao, Datta, & Kar, 2015).

Several previous studies have reported that hand hygiene can significantly reduce the risk of VAP and have advocated for the inclusion of hand hygiene to core practices (Kallet, 2019; Liu, et al., 2020; Mastrogianni, Katsoulas, Galanis, Korompeli, & Myrianthefs, 2023). Rosenthal et al. (2012) studied the effectiveness of a multidimensional approach to reduce ventilator-associated pneumonia in pediatric intensive care units of 5 developing countries. They found that an increase in implementing hand hygiene from 48.9% to 67.1% decreased the incidence rate of VAP by 31%. The pre-intervention VAP rate was 11.7 per 1,000 ventilation use days and 8.1 per 1,000 ventilation use days post-intervention. Subsequent studies have shown statistically that the practice of hand hygiene alone decreased the incidences of VAP by up to 65.5% (Rello, et al., 2013; Shaolei, et al., 2014; Su, et al., 2017). Studies by Al-Abdely et al. (2018), Dolibog, Kierszniok and Pawlicki (2022), Safavi, Molavynejad, Rashidi, Asadizaker and Maraghi (2023) and Yekefallah, Shafaei and Dehghankar (2019), on strategies for the prevention of VAP showed that hand hygiene, whether hand rubbing or hand-washing can reduce the risk of or can prevent VAP.

Some studies have also registered poor compliance of hand hygiene among critical care nurses (Tabaeian, Yazdannik, & Abbasi, 2017). Alves et al. (2018) in a study on whether zero hospital-acquired pneumonia can be achieved pointed out that compliance among health care workers, including critical care nurses, was poor. Shahrbabaki, Dehghan, Ahmadinejad, jabarpour and Mazallahi (2021), in the study on barriers to hand hygiene compliance in intensive care units, concluded that hand

hygiene was not fully practiced by healthcare workers, particularly the nurses in the ICU. Arai et al. (2022), in a study on factors influencing nursing adherence to hand hygiene, observed poor compliance with hand hygiene in all sectors of care, including the intensive care units. The most recent study by Safavi et al. (2023), on infection control guidelines for prevention of VAP showed that only about 56% of ICU staff adhered to the hand hygiene protocols and this increased to 65.5% after the educational intervention. This implies that about 35% to 44% did not practice hand hygiene.

Current guidelines, therefore, recommend that critical care nurses should be able to perform hand hygiene correctly and at the right time because they are involved in direct or indirect inpatient care in the ICU. Arai et al. (2022), emphasized that all healthcare professionals, including critical care nurses, must improve their knowledge and practice of hand hygiene which can play an important role in improving the quality and safety of care.

Endotracheal and subglottic suctioning, and ventilator-associated pneumonia prevention.

Endotracheal tube suctioning is defined as a procedure commonly used to clean airway secretions in patients under mechanical ventilation (Ardehali, Fatemi, Rezaei, Forouzanfar, & Zolghadr, 2020). This procedure is synonymous with subglottic suctioning, a procedure that involves the removal of secretions from above the cuff of the endotracheal tube (Weston Smith & Spivey, 2021). These procedures involve the insertion of a catheter through the endotracheal tube to remove secretions from the airway and ensure airway patency for adequate ventilation and oxygenation. This reduces the incidence of VAP through preventing micro aspiration of oropharyngeal

secretions in patients with cuffed endotracheal airways (Agency for Healthcare Research and Quality, 2017; Weston Smith & Spivey, 2021). However, previous study findings had noted that endotracheal and subglottic suctioning were not widely implemented in ICUs and remain underused, compliance with the criteria of suctioning was unacceptably low, and that the nurses did not fully understand the potential benefits of these procedures in preventing ventilator-associated pneumonia (Lacherade, Azais, Pouplet, & Colin, 2018; Mao, et al., 2016; Tabaeian, Yazdannik, & Abbasi, 2017).

Current research findings have proposed that endotracheal and subglottic suctioning be included in the VAP care bundles because of their close association with prevention of VAP (Burja, et al., 2018; Kallet, 2019; Mao, et al., 2016; Marini, Khan, & Mundekkadan, 2016; Mastrogianni, Katsoulas, Galanis, Korompeli, & Myrianthefs, 2023; Russell, Shiroishi, Siantz, Wu, & Patino, 2016). For instance, studies by Lacherade et al. (2018) and Muscedere et al. (2011) revealed that the implementation of subglottic suctioning resulted in a 45% reduction in VAP infection, shortened patient length of stay in ICUs by 1.5 days as well as shortened the length of mechanical ventilation needed for patients by 1.1 days. The use of these procedures has been found to lower the risk of VAP up to a 50% which has significantly decrease mortality among critically ill patients in the ICU (Papazian, Klompas, & Luyt, 2020; Pozuelo-Carrascosa, et al., 2020). Research findings also assert that if these two procedures are not performed by critical care nurses to remove accumulated pulmonary secretions and keep the airways open according to evidence-based practice, it may lead to ventilator-associated pneumonia (Alkubati, et al., 2022).

The VCB has been widely adopted and embraced by most hospitals around the world to prevent morbidity associated with patients on mechanical ventilation (Berenholtz, et al., 2011; Hassan & Elsaman, 2022; Institute for Healthcare Improvement, 2012; Klompas, Li, Kleinman, Szumita, & Massaro, 2016; Lawrence & Fulbrook, 2011; Wasserman, Messina, & Bearman, 2018). This has been attributed to the nurses' knowledge of and compliance with guidelines on the use of the VCB to prevent VAP in all ICUs (Al-Sayaghi, 2020; Liu, et al., 2020).

Several studies and case reports have been published outlining the success of the VCB approach in decreasing VAP in the Intensive Care Units (Alsadat, et al., 2012; Grzeskowiak, 2013; Lawrence & Fulbrook, 2011). According to Lawrence and Fulbrook, the use of VCB can result in greater reduction in VAP rates with the lowest and highest being 34% and 85% respectively. This is supported by studies carried out in developed countries such as France, USA and China where the use of VCB in the ICUs of their hospitals led to a significant decrease in VAP rates from 86% to 13%. In some cases, an increase in implementation of VAP bundle intervention from 82.06% to 96.88% decreased the VAP infection rate from 32.72% to 24.60% (Bouadma, et al., 2010; Ding, et al., 2017; Gao, et al., 2015; Kalil, et al., 2016; Liu, et al., 2020; Martin-Loeches, Rodriguez, & Torres, 2018; Mastrogianni, Katsoulas, Galanis, Korompeli, & Myrianthefs, 2023; Wu, Wu, Zhang, & Zhong, 2019). These research studies attest to the fact that the better the adherence to the VCB, the greater the reduction in VAP incidence and ventilator days.

In the low- and middle-income countries of Sub Sahara Africa, the VCB has not been applied to prevent VAP which has been reported to be the most significant hospital acquired infection (Rosenthal, et al., 2023; Xie, et al., 2018). This is

attributed to lack of knowledge, unawareness or insufficient compliance with evidence-based guidelines associated with the VCB that has been observed in clinical practice among nurses (Kunzmann, Dimitriades, Morrow, & Argent, 2016). For instance, in South Africa, only 21.69% had knowledge on guidelines and practice in prevention of VAP (Gomes, 2010). In Kenya, a study conducted by Malombe (2015) at Kenyatta National Hospital discovered that 70.7% of the nurses lacked knowledge on VAP and did not follow protocol.

In Uganda, ventilator-associated pneumonia is a common infection in ICUs and the risks of acquiring the infection exist, but no conclusive study has been carried out on VAP prevention bundles (Agaba, Tumukunde, Tindimwebwa, & Kwizera, 2017; Namutebi & Kwizera, 2015). In a study on "Teaching Strategies to Reduce VAP at Mulago Hospital", Marzuola (2016) concluded that the VCB approaches are not well-understood and their application for prevention of VAP has not been documented.

In summary, patients on mechanical ventilation are at risk of acquiring VAP which increases mortality and length of stay in in the intensive care units among ventilated patients. VAP prevention bundles are needed as effective preventive measures to reduce the morbidity related to VAP. Various studies in developed countries have shown that the implementation of VCB has been successful in decreasing the incidence of VAP infection in patients hospitalized in the intensive care units. In developing countries, VAP prevention has been hampered by inadequate knowledge and implementation of evidence-based practices associated with the VCB guidelines. Nurses need to be equipped with knowledge of the VCB to enhance their nursing practice and care of mechanically ventilated patients in the CCU.

The Knowledge and Practice of Nurses is Critical to the Use of the Ventilator Care Bundle

Research studies regarding the use of VCB in the prevention of VAP have been conducted in different parts of the world. These studies show different results related to knowledge and practice of the VCB in the ICUs of hospitals around the world.

The VCB has been used in the ICUs of most hospitals in developed countries to prevent VAP among patients on mechanical ventilation. This has attributed to the nurses' knowledge and practices of the VCB to prevent and control VAP (Aziz, et al., 2020). In the USA, Europe and Asia, the implementation of VCB has significantly reduced incidences of VAP. For instance, in Spain, the nationwide implementation of a bundle of measures reduced VAP incident rates in the ICUs by more than 50% (9.83 to 4.34 per 1000) (Álvarez-Lerma, et al., 2018). In the USA, an increase in the implementation of the VCB techniques from 32% to 84% led to a reduction in the overall incidence rate of VAP from 5.5% to 0.0% among mechanically ventilated patients admitted in 112 Michigan ICUs (Alsadat, et al., 2012; Berenholtz, et al., 2011; Liu, et al., 2020; Grzeskowiak, 2013). In Taiwan, the use of VCB reduced the incidence of VAP from 0.495 to 0.281 cases per 1000 ventilator days (Zeng, et al., 2015). These findings confirm the premise that knowledge and practice in the use of VCB is effective in reducing VAP rates.

In some developed countries, knowledge on the use of the VCB seems to be lacking amongst intensive care nurses. For instance, in Finland, Saunders (2015) documented that nurses were deficit in VCB knowledge as the majority of nurses had never heard of the term the VCB. In Turkey, ICU nurses' knowledge about ventilator-associated pneumonia, prevention, and implementation rate of the standard preventive

measures related to VAP was poor (Akın Korhan, Hakverdioğlu Yönt, Parlar Kılıç, & Uzelli, 2014; Okgün Alcan, Demir Korkmaz, & Uyar, 2016). In Australia, nurses lacked knowledge of evidence-based guidelines for the prevention of ventilator-associated pneumonia (Madhuvu, Endacott, Plummer, & Morphet, 2020).

In developing countries of Asia, knowledge and practice on the use of the VCB also seems to be lacking amongst intensive care nurses. In India, the majority of nurses (96.6%) were found to have inadequate knowledge and unsatisfactory practice regarding prevention of ventilator-associated pneumonia (Busi & Ramanjamma, 2016; Kapoor, 2017; Mishra & Rani, 2020). In Pakistan, two studies; Zeb et al (2018) in Peshawar and Aziz et al. (2020) in Lahore both concurred that ICU nurses possessed poor knowledge of VCB, demonstrated substandard practices of VCB, and applied the VAP preventive strategies only partially. Their practices did not meet standard criteria, and the nurses were not aware of VAP bundle protocol or its significance in reducing VAP rates in ICU. The same situation exists in Iran where the researchers discovered that ICU nurses' knowledge about ventilator- associated pneumonia prevention and implementation rate of the standard preventive measures related to VAP was poor (Akın Korhan, Hakverdioğlu Yönt, Parlar Kılıç, & Uzelli, 2014; Okgün Alcan, Demir Korkmaz, & Uyar, 2016). In the Philippines, a study at the Acute and Critical Care Institute (ACCI) and Institute of Neurological Science (INS) discovered that ICU nurses lacked knowledge of key components of VAP prevention guidelines (Abad, Formalejo, & Mantaring, 2021).

In Sub-Sahara Africa, the situation is similar. In South Africa, only 21.69% of the nurses had knowledge on the guidelines in prevention of VAP (Gomes, 2010). These statistics suggests that the majority of the nurses (78.31%) lack knowledge and

practice on the use of VCB which another South African study described as a huge barrier to the implementation of evidence-based guidelines for VAP prevention (Kunzmann, Dimitriades, Morrow, & Argent, 2016). A study in Egypt among critical care nurses at Cairo University Hospitals revealed that more than three fourth of nurses had low knowledge regarding components of VCB practices in preventing ventilator-associated pneumonia (Ali, 2013). In Sudan, three studies assessed knowledge and practice of the ICU nurses in VAP prevention in major governmental hospitals (Al Khader, 2012; Al Shameri, 2017; Osman, 2014). They all concurred that the Sudanese nurses had a poor knowledge regarding international guidelines for VAP prevention. Getahun et al (2022) in Ethiopia revealed that the knowledge of intensive care nurses about ventilator-associated pneumonia prevention was not sufficient. In East Africa the situation is not any different. For instance, at Kenyatta National Hospital in Kenya 70.7% of the nurses lacked knowledge of VAP (Malombe, 2015) while in Tanzania, the average knowledge level and compliance regarding the evidence-based guidelines for VAP prevention among ICU nurses was described as lower than the lowest ever reported elsewhere (Bankanie, Outwater, Wan, & Yinglan, 2021). At Mulago Hospital in Uganda, it was discovered that ventilator care bundle approaches and application for prevention of VAP were not well-understood and had not been documented (Marzuola, 2016). These research findings highlight the need for an intervention to enhance the knowledge and practice of ICU nurses because they play an essential role in the prevention of VAP.

Coaching Has Been Shown to Improve on Knowledge and Practice

Various strategies including coaching have been tried to improve nurses' knowledge and practice in the use of VCB to prevent VAP. Both Ali (2013) and Zeb et

al (2018) proposed in- service education as one of the strategies. Aziz et al (2020) and Marzuola (2016) recommended continuous nursing education (CNE) programs as another strategy that can be implemented to enhance nurses' knowledge and awareness of the current evidence-based practice. Abad, Formalejo and Mantaring (2021), Cengiz and Kanan (2019), Getahun et al., (2022) and Osti et al., (2017) all called for training, provision of education and interactive educational sessions to equip nurses with knowledge and practice to enable them to prevent VAP. Radhakrishnan et al. (2021) endorsed the use of interactive lectures and one to one communication to enhance health care professionals' awareness of prevention protocols and how to convert them into practice. Al Shameri, (2017) proposed the inclusion of mechanical ventilation care and prevention guidelines in the curriculum of nursing lectures, courses and workshops as strategies to improve the quality of healthcare services**.** The researchers did not include coaching as one of the strategies to enhance the knowledge and practice towards the use of the ventilator care bundle in the prevention of ventilator-associated pneumonia among nurses working in the ICUs of the hospitals where the studies were undertaken.

Coaching has been adopted in the nursing profession and is now considered one of a few strategies introduced to enhance deliberative professional development for working nurses, and supports them to reach their full potential, establish goals and ways of attaining them, as well as to strengthen their knowledge and skills. Coaching as an educational intervention can be applied to nurses, nurse leaders, nurse students and nursing care support with patients and their families (Costeira, Dixe, Querido, Vitorino, & Laranjeira, 2022; Dyess, Sherman, Opalinski, & Eggenberger, 2017; Flanagan, Post, Hill, & Di Palazzo, 2022; Hurley, Hutchinson, Kozlowski, Gadd, &

Vorst, 2020; Johansson, Torgé, & Lindmark, 2020; Kaldawi, 2022; Sezer & Şahin, 2021; Singh, Kennedy, & Stupans, 2022; Waldrop & Derouin, 2019; Yusuf, et al., 2018). The aim of coaching is to engage nurses in dialogs and interactions in order to improve their professional growth, career commitment, and practice (Barr & Tsai, 2021).

In reference to several sources, Faithfull-Byrne et al. (2017) defines coaching as a "collaborative relationship formed between a coach and the coachee for the purposes of attaining personal development outcomes which are valued by the coachee" (p. 3). It is also viewed as a person-centered ideology that emphasizes the empowerment of the individual towards achieving personal goals within a facilitative interpersonal relationship (Faithfull-Byrne, et al., 2017). Whitmore (2017) defines coaching as an interactive relationship that helps people discover and acquire learning in order to broaden their professional performance. Kamarudin, Kamarudin, Darmi and Saad (2020) defines coaching as the ability of a coach to offer additional professional support in helping the coachees to exploit and increase their performance in certain subjects. Other sources define coaching as the processes of encouraging the individuals to improve their job and problem-solving skills; improve their knowledge and master new skills that benefit both the individual and the organization (Bittel & Newstrom, 1996; Hahne & Schultze, 1996; Schon, 1983).

Coaching is depicted as an educational intervention that directly affects knowledge and practice of nurses towards the use of ventilator care bundles in the prevention of ventilator-associated pneumonia in critical care units. Devine, Meyers and Houssemand (2013) described coaching as a powerful tool for personal change and learning. They asserted that coaching supports learning and development for students,

teachers, school leaders and their educational establishments. According to Nieuwerburgh, and Allaho (2018), there has been, in the last two decades, an explosion of interest in coaching with many hundreds of training organizations delivering coach training programs ranging from one-day short courses, online courses, week-long certificated programs to postgraduate level qualifications. Lovell (2018) noted that coaching is emerging as an increasingly appreciated resource in the medical education. Diak et al. (2020) acknowledged that coaching has been adopted in the nursing profession and is now considered one of a few solutions introduced to enhance deliberative professional development for working nurses, and supports them to reach their full potential, establish goals and ways of attaining them, as well as to strengthen their knowledge and skills.

Coaching has been used in clinical settings to enhance nurses' knowledge and practice. In both the USA and Australia's Sunshine Coast Hospital and Health Service (SCHHS), clinical coaching was used to train nurses as coaches and nurse educators to spearhead coaching education programs at the point of care. This resulted in clinical skill advancement, individual personal and professional development, improvements in all point of care education and development of a clinical education career pathway for aspiring registered nurses (Eppich, Mullan, Brett-Fleegler, & Cheng, 2016; Faithfull-Byrne, et al., 2017; Kaldawi, 2022).

Coaching has also been associated with prevention of VAP. Studies have shown that coaching can lead to positive outcomes. For instance, Eid, Hamdy and Ramadan (2021) and Assawapalanggool and Surimuang (2020) conducted similar studies on the effectiveness of coaching as an intervention. They all concurred that coaching nurses improves their knowledge, care practice, clinical outcomes and self-efficacy

associated with the prevention of VAP. Related studies (Mogyoródi, et al., 2023; Radhakrishnan, et al., 2021; Weheida, Omran, & Taha, 2022) emphasized that coaching can lead to significant improvement in total knowledge and practice, which results in the decrease of ventilator-associated pneumonia and increase in clinical benefits to patients. Such benefits may include decline in the number of days of ICU and hospital stay, the duration of mechanical ventilation, mortality and incidence of VAP.

Therefore, this study utilized coaching as an intervention to identify its effect on knowledge and practice on the use of ventilator care bundle in the prevention of ventilator-associated pneumonia among nurses in ICU at Uganda Heart Institute. Coaching focused on nurses' knowledge of what ventilator-associated pneumonia is, who are susceptible, risk factors and causes, diagnosis, disease burden and impact, and pathophysiology of ventilated associated pneumonia. It also focused on assessing the nurses' use of evidence-based procedures associated with VCB in the prevention of VAP. These include elevation of the head of bed (HOB) to 30°–45°, daily "sedation vacation" and assessment of readiness to extubate, peptic ulcer disease (PUD) prophylaxis, deep vein thrombosis (DVT) prophylaxis, daily oral care with chlorhexidine and hand hygiene (Ismail & Zahran, 2015; Khan, et al., 2016, p. 321; Lim, et al., 2015; Institute for Healthcare Improvement, 2012; Liu, et al., 2020; Mastrogianni, Katsoulas, Galanis, Korompeli, & Myrianthefs, 2023).

Summary

This chapter reviewed the prevalence of VAP worldwide, sub-Sahara and nationally. It also reviewed the use of the VCB in the prevention of VAP at global, sub-Saharan and national level. The chapter related this to the nurse's knowledge and

practice towards the use of VCB to prevent VAP. The chapter also discussed how coaching as an educational intervention directly affects knowledge and practice of nurses towards the use of ventilator care bundles in the prevention of ventilator-associated pneumonia in critical care units. Chapter three will describe the methodology of the study.

Chapter Three: Methodology

Introduction

This chapter describes the methodology that was used in the study to determine the effects of coaching on knowledge and practice of nurses towards the use of VCB to prevent VAP. This included the method and design, population, setting, sampling methods, size and rationale for the size. The chapter further described how sample size was determined, the inclusion and exclusion criteria, and how data were collected. The chapter also describes the validity and reliability of the research tool, how data were analyzed and ethical considerations.

Method and Design

The quantitative one-group, pre-test and post-test quasi-experimental design was used in the study. Quasi-experimental design is a correlation (non-experimental) design resembling (i.e., quasi) experimental research, but is not truly experimental research. Consequently, outcome causality in quasi-experimental research cannot be ascertained, instead associations between interventions and outcomes are made (Stratton, 2019).

Quasi-experimental design was the most suitable for this study because no control group was required. This design enabled the researcher to study a pre-existing target group to which an intervention would be applied, establish a cause-and-effect relationship between the independent and dependent variable, and obtain a high level of evidence without randomization (Stratton, 2019; Thomas, 2022). The intervention involved coaching nurses on use of the VCB to prevent VAP in the critical care units of a specialized hospital. The nurses were tested before and after coaching to enable

the researcher to determine their knowledge and practice in the use of VCB to prevent VAP.

Population

The target population for this study included all the nurses working in critical care units (CCUs) of Uganda who specialize in caring for patients with severe, life-threatening illnesses that require mechanical ventilation. In 2022, the total number of nurses in Uganda was 73,956 of which females constituted 73% of registered and 66% of enrolled nurses while the males consisted of 27% of registered and 34% of enrolled nurses (Musoke, 2024). As of 2020, there were about 171 nurses specifically working in ICUs in Uganda with only 13 (8%) of them having formal training in critical care nursing (Atumanya, et al., 2019). This population of nurses working in CCUs was targeted because they had on-the-job training, which enabled them to manage complex medical conditions in the critical care setting and to ensure that critically ill patients receive the specialized care they need to survive and recover from severe health conditions. However, due to logistical constraints, the accessible population was restricted to critical care nurses working in Uganda Heart Institute (UHI) numbering 94 nurses. This accessible population was selected for its convenience and cost effectiveness in conducting a thorough coaching session and follow-up assessment.

Setting

The study was conducted in Uganda Heart Institute (UHI) located within Mulago National Specialized Hospital. UHI is a specialized, public, tertiary care medical facility and the only National Referral Facility for heart diseases and cardiovascular services in Uganda. This institute was purposively chosen because of the availability

of the required respondents working in the three critical care units. There are 94 critical care nurses in those units. They have patients who are connected to ventilators, approximately three patients every week. The researcher ensured that the setting reflected the population of the study.

Sample

A sample is the specific group selected from a larger population to participate in the study and from whom data will be collected (Acharya, Prakash, & Saxena, 2013). In this study, all critical care nurses working in the critical care units (CCU) were invited to participate in the study. The nurses signed an informed consent before participating in the study.

Sampling method.

Consecutive sampling was applied because it is a non-probability method. This method aimed to capture every eligible nurse working the CCUs as they became available over the initial selection period, that is, before the administration of the pre-intervention survey questionnaire. This frame is used when researching a specific area of interest and the focus is on selecting participants of the same job or occupation (Nikolopoulou, 2022).

Sample size.

The sample size of the study consisted of 36 nurses working in the critical care units of UHI. The total population of nurses from the three critical care units who were eligible to participate in the study was 64. The Krejcie and Morgan (1970) table for determining sample size recommends a minimum sample size (s) of 52 for the study population (N) of 64 nurses. However, during data gathering 36 nurses

consented to participate, completed and returned the survey questionnaires. This sample size provided a relatively representative sample for the quantitative study.

The sample size values in the table are computed using the following Krejcie & Morgan's (1970, p. 1) formula.

$$s = \frac{X^2 NP(1-P)}{d^2(N-1) + X^2 P(1-P)}$$

Where:

s = required sample size.

X 2 = the critical value for the corresponding 95% confidence interval

N = the population size.

P = the estimated proportion of the outcome (assumed to be 0.50 since we don't have any previous conducted study in Uganda to estimate the proportion of nurses with implementation of VCB measures for preventing VAP).

d = is the level of significance for the study results which is set at 5%

Inclusion criteria.

The study recruited all nurses working in the critical care units of UHI. The inclusion criteria were that they work as bedside nurses in critical care units, are responsible for the pharmacological and non-pharmacological techniques used to prevent VAP and were available during the period of the study. These nurses were expected to strictly adhere to health and safety standards.

Exclusion criteria.

The nurses in leadership positions and intern nurses were excluded from participating in the study. They do not directly provide care to mechanically ventilated patients.

Description of the Tool

Data were collected using a researcher developed structured questionnaire (Appendix: C). The questions were adapted from other research studies with the same objective to suit the current study (Ali, 2013; Aziz, et al., 2020; Bokhary, Salem, & Al-Qahtani, 2021; Holmes, 2022; Kiyoshi-Teo, Cabana, Froelicher, & Blegen, 2014). Broad ideas were obtained from various research articles and some of the questions were modified based on the Institute for Healthcare Improvement (IHI) guidelines (Institute for Healthcare Improvement, 2012). The questionnaire was produced in the English language only since all the study participants were adequately literate.

Item analysis.

The questionnaire (Appendix: C) consisted of close ended questions set in three sections. The first section covered demographics, the second section covered knowledge of VAP and VCB, and the third section covered the practice on the use of VCB.

The demographic section had six questions (1-6) about the characteristics of the participants. In this section, items included questions on age, gender, level of qualification, training on the use of the VCB, years of experience working as a critical care nurse, and whether they had access to VCB policy and intervention guidelines.

The knowledge section had 12 questions (7 -19) that assessed nurses' knowledge about ventilator-associated pneumonia and the ventilator care bundle. In this section, multiple choice questions 9, 10 & 11 tested the participant's knowledge about VAP while questions 12 -21 tested their knowledge on the most updated measures of the VCB for the prevention of VAP (Appendix C). When the response was incorrect, it

was marked as “0” score and the correct response was scored as “1”. All that was added and converted to a percent score out of the total 100%.

The total knowledge scores of all the nurses were summarized into an overall knowledge score to determine the nurse’s knowledge level regarding VAP and VCB. The scores were converted to levels of knowledge categorized as 0% - 59.9% = *Poor*, 60% - 64.9% = *Fair*, 65%-74.9% =*Good*, 75% - 84.9%=*Very Good* and 85% -100%= *Excellent*. This was a standard required for nurses working in the CCUs since they were specialized nurses working on critically ill patients, and therefore inadequate knowledge was not acceptable in caring for such patients (Aboul-Fotouh, Megahed, Elnakib, Madany, & Abd El-Kareem, 2022).

The section on practice had 21 items (1-21) in a Likert scale assessing the extent to which the nurses were practicing the use of VCB to prevent VAP. Some research studies used the Likert scale to evaluate nurses’ practice. For instance, Gebremedhin, Abebe, Wondimu and Gizaw (2021) used a five-point Likert scale; *never, rarely, sometimes, often*, and *always*, to rate response options for his preventive practice questions. In this study, a five-point Likert scale; 0=*never*, 1=*rarely*, 2=*sometime*, 3=*mostly*, or 4=*always* was used to evaluate nurses’ responses on practice (Mcleod, 2023). The mean was calculated and categorized as 3.5-4=*excellent*, 3-3.4= *very good*, 2.5-2.9=*good*, 2-2.4= *fair* and below 2=*poor* (Perneger, Gayet-Ageron, Courvoisier, Agoritsas, & Cullati, 2013).

Pilot plan.

The questionnaire was piloted on a sample of 5 selected critical care nurses working in the critical care units of another national referral hospital who represented the target population. The researcher conducted the pilot test using the same approach

that was used for the main study. The researcher was able to get verbal feedback on time, difficulty, clarity and readability of the questions from an interactive question and answer session with the participants. The questionnaire was updated with the approval of my supervisor.

Validity.

The questionnaire was developed based on concepts of the British Thoracic Society (BTS)/Intensive Care Society (ICS) guidelines for the ventilatory management of acute hypercapnic respiratory failure in adults (Davidson, et al., 2016). The Lerma 2013 guidelines for the prevention of ventilator-associated pneumonia and their implementation (Álvarez Lerma, et al., 2014), the Institute for Healthcare Improvement (2012) and the support from my two supervisors were also used. The content validity was established by having the questionnaire reviewed by a critical care nurse and two critical care consultants. Their feedback was used to improve the questionnaire. This ensured that the results that were obtained from the study participants represented findings related to known standards of knowledge and practice (Middleton, 2023; Patino & Ferreira, 2018).

Reliability.

The questionnaire was pretested during a pilot study and again after the final data collection in order to measure its reliability. The reliability of the questionnaire was evaluated using Cronbach's alpha, which measures the internal consistency of a set of test items. Internal consistency refers to the degree to which the items of an instrument consistently measure the same characteristic (Polit & Beck, 2021). The questionnaire had internal consistency reliability Cronbach's alpha of 0.84, which was

good. The pre-test Cronbach's alpha before the study was 0.78, which was *acceptable* (George & Mallery, 2003, p. 231).

Data Collection

Data was collected using a questionnaire before introducing the VCB and also after the introduction of the VCB and carrying out the intervention. In the post intervention phase, the researcher evaluated the effect of the intervention on the achieved outcomes.

Pre-intervention.

After permission was granted, the researcher organized two meetings. For the first meeting, the researcher invited all the CCU nurses reporting for day shift and those off duty to meet in the boardroom and the second meeting included nurses on night shift after their handover. In both meetings, the researcher explained the purpose of the study and requested their participation. The researcher informed them that their participation in this study was entirely voluntary. As their overall supervisor, the staff may have felt coerced to participate in the study. To avoid this, the researcher solicited the help of a research assistant who was trained to follow the protocols established in this study. The researcher left the room to allow the research assistant to administer the consent form (Appendix B) so that the participants did not feel pressured by the researcher's presence. After the respondents signed the consent forms, the research assistant kept them sealed in an envelope.

The research assistant proceeded to administer the pre-intervention questionnaire (Appendix C) to the nurses who had consented to participate in the study. The research assistant used a master list containing names of the CCU nurses to assign

code numbers to those returning the filled-in questionnaires. The codes were used on the questionnaires instead of nurses' name to ensure anonymity. This master list was placed in an envelope and kept in the research assistant's locked cupboard. The completed questionnaires were given to the researcher who kept them in another locked cupboard that no other person had access to them until all data was collected at the end of the study.

Post-intervention.

The research assistant organized two post-intervention meetings in the boardroom for all the CCU nurses on day shift and those off duty, and the nurses on night shift after their handover. The research assistant ensured that all the participants who filled in the pre-intervention questionnaires participated in filling up the post-intervention questionnaire.

After receiving the filled-in post-intervention questionnaire from the participants, the research assistant made sure that the same codes were used by looking at the master list to ensure that the pre-intervention and post-intervention code numbers of the same participants are matched (Mcleod, 2023). The research assistant destroyed the master list after confirming that code numbers on the post intervention questionnaire corresponded with the codes on the pre intervention questionnaire of the same participants. The envelop with the second set of questionnaires was handed over to the researcher who then kept them in a locked cupboard waiting for data analysis.

Coaching Intervention

The coaching intervention (including the assessment of its effect) lasted five weeks. After the collection of pre-intervention data, the next four weeks was used by the researcher to coach the nurses and the fifth week to assess the effect of the

coaching intervention. The coaching intervention was for all nurses, not just those who agreed to be in the study.

Week 1: Orientation of Coachees

In the first week, the researcher held orientation discussions with the coachees to obtain feedback on where they were in the use of VCB to prevent VAP. A power point presentation was conducted twice in the boardroom; the first for all the CCU nurses on day shift and those off duty, and the second for the nurses on night shift after their handover (Appendix D). The researcher spent the next three weeks in UHI coaching the critical care nurses (CCNs) on the use of ventilator care bundle to prevent ventilator-associated pneumonia in the critical care units. The researcher used the duty rota to identify nurses who were working on day or night shift and planned to ensure that all received the protocol and coaching on equal basis. The researcher guided the coachees on setting goals (Appendix E) to help them to focus their efforts for achieving the desired outcomes out of their participation in the study.

The researcher used a variety of clinical coaching skills derived from adult learning strategies, clinical assessment tools, coaching process and facilitation skills to enhance the coachees knowledge and practice. In addition, the researcher oriented the coachees on the protocol of the VCB and how the nurse can practice it to take care of critically ill patients and guided them to develop a daily log of activities. The researcher also developed a Ventilator Care Bundle Compliance Checklist (see Appendix F) and shared it with the coachees.

Week 2: Commencement of Practice by the Study Participants

In the second week, the coachees began their practice at the bedside in the CCU. The researcher ensured that VCB protocols were displayed in the CCUs. The

reminder posters and visual aids to supplement the coaching were placed at various points within the units to remind the coachees of the right procedure and practice required to care for the patients.

Week 3 and 4: Practice by the Study Participants Continues

In the third and fourth weeks, practice on the use of VCB in the CCU continued. The researcher asked and entertained questions from the coachees during their practice, listened actively to their responses, offered instructions, guidance and objectivity as part of coaching**.** This was crucial because it helped to identify gaps in knowledge and practice that could be corrected during the coaching process. The researcher also conducted daily reviews at the end of each practice session to enable the coachees to reflect on their activities, achievements and challenges of the day. The researcher endeavored to be flexible and open minded to enable the coachees to adjust their approach when faced with unexpected challenges in the clinical setting, perform different tasks as needed and communicate effectively with different care providers in various clinical situations. All these aspects of the coaching sessions were designed to enable the coachees to improve their knowledge and practice to prevent ventilator-associated pneumonia among ventilated patients.

Week 5: Collection and Analysis of Post Intervention Data

In the fifth week, post-intervention clinical knowledge and practice data was gathered using the survey questionnaire, summarised, analysed and compared with the pre-intervention data. This enabled the researcher to assess the effect of the coaching intervention.

Data Management

Editing Data

Data editing commenced during questionnaire administration sessions and then at the end of each working day. Primarily, editing data at the time of administering the questionnaire aimed at reducing the incidences of missing data. The editing involved checking for completeness, accuracy, comprehensiveness, consistency, legibility and applicability of the data collected to the conceptual framework.

Data Entry

Questionnaire data were entered in SPSS (IBM Statistical Package for Social Science) version 25, using an entry template which had a definite structure that minimized entry errors.

Data Cleaning

After data were entered, they were checked for errors (i.e., cleaned) in preparation for analysis. This involved the following tasks:

- Checking and adjusting the data type and the measurement scale (i.e., nominal, ordinal, scale) for each variable of the dataset.
- summarizing the variables using frequencies in order to detect and address the structural issues in the data set such as e.g., typos, spelling errors, extra spaces and inconsistent capitalization. This also highlighted any values of variables falling out of the assigned range.
- Filling in missing values by reverting to the original survey questionnaires or field notes. In a few instances where there were a lot of missing values that could not be established, the cases were deleted from the dataset.

Data Storage and Sharing

The soft copies of the entered data were stored in password protected files in the researcher's personal work computer. The researcher protected the hard copies of the data from disclosure to unauthorized individuals or groups by keeping them in a locked cabinet. Soft copies were shared with only the data analysts. The data were retained throughout the period of data analysis and report writing. After the retention period passed, the hard copies were shredded. However, the soft copies were kept in case publishers require the data in future to facilitate their quality checks.

Data Analysis

Data was analyzed using the SPSS (IBM Statistical Package for Social Science) version 25. The three parts that were analyzed included the nurses' demographic data, the nurses' knowledge of VCB and the nurses' practice. Each individual participant's answer was entered into the software according to the established codebook.

The nurses' demographic characteristics.

The first part used descriptive statistics to analyze the nurses' demographic characteristics. The data obtained was presented in tables showing the frequency and percentages to describe the nurses' demographics characteristics. The data such as age and year of service was turned into categories for analysis.

The nurses' knowledge of VCB.

The second part analyzed the nurses' knowledge of VCB before and after the intervention. Each individual participant's overall score was calculated by percent and also by category. The overall pre-test and post-test scores were analyzed by looking at mean percentage and the distribution in categories by percentage. The data was analyzed using a paired-t test at significance level $\alpha = 0.05$ to compare the difference

in the means of knowledge in order to determine the difference before and after the coaching intervention. Each individual item was analyzed to understand what areas of knowledge were stronger or weaker before and again after the intervention.

The nurses' practice on the use of VCB.

The third part analyzed nurses' practice in preventing ventilator-associated pneumonia before and after implementing the VCB protocol. The answers from each individual participant were calculated according to mean and category. The overall group scores before and after the coaching intervention were evaluated by looking at the overall mean for the group and the distribution in categories and displayed in a table. The data was compared using the Wilcoxon test at significance level $\alpha = 0.05$ to test whether there is a significant difference in mean between the nurses' practice before and after the coaching intervention. Each individual item was analyzed to understand what areas of practice were stronger or weaker before and again after the intervention.

Ethical Considerations

In this study, the researcher adhered to ethical considerations when collecting data to protect the rights of the research participants. These aspects included ethical approval, informed consent, privacy and confidentiality. In addition, the benefits, risks, incentives, social cultural issues, and conflict of interest were described.

Ethical approval.

Administrative clearance from the management of UHI to access the area managers, CCUs in-charges and all the nurses working in the CCUs was given to me verbally. Permission to carry out the research was obtained from Uganda Christian University Research and Ethics Committee. I obtained a letter from the Department of

Nursing at Uganda Christian University Mukono to introduce me to the management of Uganda Heart Institute to secure their final approval.

Informed consent.

The researcher provided the respondents with all the relevant information about the purpose, benefits, risks, confidentiality, contact information and the institution's approval before they agreed or declined to participate. The researcher encouraged the respondents to ask questions and informed them that this study might improve their knowledge and practice. Since the researcher was the Head of Nursing Division, the researcher left the room, and the trained research assistant administered the informed consent to the respondents before they were involved in the study. If they agreed to participate, they signed the consent form (Appendix B). The research assistant collected the signed consent forms, put them in an envelope and sealed it. This was kept in a locked cupboard.

Privacy.

The researcher took steps to protect and prevent unauthorized disclosure of the respondent's personal information. In this study, the names of the respondents were not disclosed, nor details of their answers given to anyone. The research assistant assigned code numbers on the questionnaires using the same code on both the pre and post-test to anonymize personally identifiable data so that it was not linked to other data by anyone else.

Confidentiality.

The researcher assured the nurses that any information collected during the course of the study would be maintained on a confidential basis and access was restricted to people conducting the study. The researcher protected the data from disclosure to

unauthorized individuals or groups by keeping all signed consent forms and filled in questionnaires in a locked cabinet. The researcher retained the data through the period of data analysis and report writing, and once the retention period had passed, the paper copies of the questionnaire were shredded. The soft copies of the data and other materials such as scanned consent forms that were stored on the computer were password protected and archived.

Benefits.

The nurses' knowledge, and practice on the use of ventilator care bundle to prevent VAP in ventilated patients in the CCUs may have been enhanced through coaching. This may have increased their confidence in the use of VCB while nursing ventilated patients, improved their practice in nursing care to prevent VAP and work with minimal supervision.

Risks.

There were minimal risks to participants in this study. The researcher mitigated the risks by ensuring confidentiality and taking steps to keep the identity of the participants anonymous.

Incentives.

There were no incentives in the study. In order to show my appreciation for their time commitment, I offered the study participants a pen at the beginning of the pre-intervention data collection to enable them fill in the questionnaire. At the commencement of the coaching sessions, I offered a pen and notebook to each participant in order to take notes. In between breaks, a soft drink and snack was provided. At the end of the study each participant received a token of appreciation of

ten thousand shillings (10,000/-) and a certificate of participation to all those who had participated in the intervention.

Social cultural issues.

Being the head of the nursing division, the participants might have felt coerced to participate in the study out of fear of the researchers' position. This may have had negative outcomes on the study participants such as anxiety, distress, fear of loss of employment and misrepresentation of their responses. To eliminate this concern, the researcher used a research assistant. The research assistant was trained on confidentiality, communication skills, record keeping and organization.

Conflict of interest.

In this study, there were no conflicts of interest.

Summary

This chapter presented the methods that were used in the course of this study. The study design, the study setting, study population, sampling and sample size calculation, inclusion and exclusion criteria for the study participants were elaborated. Data collection procedure, data collection tools, pilot plan, validity and reliability, data analysis, ethical consideration and patients' rights were also described. The following chapter four will present the results of the study that were generated from analysis of the data gathered using the above methodology.

Chapter Four: Results

Introduction

This chapter presents results from analysis of the data collected. It is divided into three parts. The first part is demographics, which describes the characteristics of participants. The second part is the effect of coaching on knowledge of nurses towards the use of VCB in the prevention of VAP and the third part is the effect of coaching on practices of nurses towards the use of VCB in the prevention of VAP.

Demographic Characteristics

The demographic characteristics of the study participants are detailed in Table 1. These include age, gender, formal education attainment, training in VCB and critical care experience.

The sample of 36 nurses were enrolled and completed the coaching program. They consisted of 69% female and 31% male nurses. The mean age of the study participants was 32 years with a standard deviation of 11.2. All of them were still working in the critical care area after completion of the post-test. The majority (83%) of nurses had a bachelor's degree, and 67% of the nurses had not received training on VCB by the time of the study. Of the 36 participants, 81% of the nurses had experience of 1 to 3 years working in the critical care area.

Table 1

Demographic Characteristics of Participants (N=36)

Category	Frequency (f)	Percentage (%)
Age (years)		
20-29	14	39
30-39	12	33
40-49	10	28
Gender		
Male	11	31
Female	25	69
Education		
Bachelor's	30	83
Masters	6	17
Training on VCB		
Yes	12	33
No	24	67
Critical care experience		
1-3 years	29	81
4-5 years	1	3
>5years	6	17

Effect of Coaching on Knowledge of Nurses Towards the Use of VCB

This section presents results of the study consistent with the first objective, "to identify the effect of coaching on clinical knowledge among nurses towards the use of the ventilator care bundle in prevention of pneumonia in CCU**s** of a specialized hospital in Kampala". It presents the data arising from the descriptive and inferential statistical analysis that was performed as well as an analysis of nurses' performance by each questionnaire knowledge question.

Descriptive statistics.

The raw scores and the corresponding percentages of clinical knowledge for each of the 36 participant nurses before and after the intervention are presented in Appendix G (pre-intervention) and Appendix H (post-intervention) respectively. The pre-intervention mean percent for knowledge for all the study participants was 44%.

Post-intervention, the mean percent knowledge for all the study participants was 84%. This shows improvement in the mean percent for knowledge was 40%.

The knowledge levels of the nurses were categorized into *very good*, *good* and *poor*. Table 2 shows that these categories corresponded to the raw scores ranges of ≥ 80%, 60-79% and ≤ 59% respectively. Scores obtained by the nurses before and after the coaching intervention were grouped into these categories and compared to ascertain the change in the knowledge levels among the nurses.

Table 2 shows a comparison of nurses' knowledge levels before and after the coaching intervention and the resulting change in knowledge levels. The results revealed that at the beginning of the coaching intervention none of the nurses had their knowledge level categorized as *very good.* At the end of the coaching intervention, the knowledge level of *very good* had risen to 72%. In addition, the knowledge level *good* improved from 22% to 25%, while the knowledge level *poor* dropped from 78% to 3%.

A comparison analysis of the effect of coaching on knowledge of each study participant was performed. The resulting raw scores and percentages at pre-intervention and post-intervention are summarised in Appendix I.

Table 2

Comparison of Nurses' Knowledge Levels by Categories (N=36)

	Pre-Test		Post-test	
Categories	Frequency (f)	Percentage (%)	Frequency (f)	Percentage (%)
Very good (≥ 80%)	00	0%	26	72%
Good (60-79%)	08	22%	9	25%
Poor (≤ 59%)	28	78%	1	3%

Inferential statistics.

The paired t-test was performed to evaluate whether there was a significant difference between the knowledge of nurses before coaching and their knowledge after coaching. Table 3 shows the results of the t-test. The results indicated that there was a statistically significant difference between knowledge of nurses before coaching (m = 16.1, sd = 3.2) and knowledge of nurses after coaching (m = 30.2, sd = 2.5), $t(35) = 20.8$, $p < .001$, with a 95% confidence interval.

Table 3

Comparing Mean of Knowledge Before and After the Coaching Using Paired t-test (n=36)

Knowledge	Mean (%)	SD	P- value
Before coaching	16.1 (45)	3.2	
After coaching	30.2 (85)	2.5	< 0.001

Analysis of performance of knowledge items.

Nurses were asked specific knowledge questions on the effect of coaching on the use of VCB to prevent VAP in CCUs. Appendix J shows the changes in knowledge levels after the coaching intervention per knowledge item. The knowledge items in the table are ranked starting with the item with the lowest pre-intervention raw score down to the one with the highest pre-intervention raw score. Knowledge items with the same pre-intervention raw score also share the rank number (e.g. three items share rank number 8).

All the knowledge elements of the VCB are very important in nursing ventilated patients and reducing VAP. Although, the results showed improvement in the nurses' knowledge in all the studied knowledge items after coaching, there were two areas with highest improvement in knowledge, namely using bed-head elevation of 30-45%

to reduce gastric reflux and subsequent risks of VAP (55% increase) and the primary causes of VAP (50% increase). The latter is particularly noteworthy. Before the coaching intervention, knowledge of the primary causes of VAP was the poorest of the knowledge items with a knowledge percentage of 33% among study participants. After the coaching intervention, it was the area with the second highest ranked knowledge area with a knowledge percentage of 83%, signifying one of the areas of strength. Similarly, knowledge of using bed-head elevation of 30-45degrees to reduce gastric reflux and subsequent risks of VAP was the second poorest before the coaching intervention with a knowledge percentage of 42% among study participants. After the coaching intervention, it was the highest ranked knowledge area with a knowledge percentage of 97%.

As regards areas of weakness, there were two that remained after the coaching intervention, namely knowledge of the *definition of VAP* (32% increase) and *knowledge of bacteria colonization and overgrowth in the oral mucosa and VAP* (36% increase). These two areas were among the five knowledge items with the lowest raw score both before and after the coaching intervention.

Effects of Coaching on Practice of Nurses Towards the Use of VCB

This section presents results of the study consistent with objective two, "to determine the effect of coaching on clinical practice among nurses on the use of the ventilator care bundle in prevention of pneumonia in CCUs of the Uganda Heart Institute, a specialized hospital in Kampala". It presents the data arising from the descriptive and inferential statistical analysis that was performed as well as an analysis of nurses' performance by each questionnaire practice question.

Descriptive statistics.

The raw scores and the corresponding percentages of clinical practice for each of the 36 participant nurses before and after the intervention are presented in Appendix K (pre-intervention) and Appendix L (post-intervention) respectively. The pre-intervention mean percent for practice for all the study participants was 72%. Post-intervention, the mean percent practice for all the study participants was 80%. This shows improvement in the mean percent for practice was 8%.

The practice levels of the nurses were categorized into *good practice* for those with raw scores above 4, *moderate practice* for scores from 3.0 to 3.9 and *poor practice* for scores below 3 (Table 4). The scores obtained by the nurses before and after the coaching intervention were grouped into these categories and compared to ascertain the change in the practice levels among the nurses. A negative change means that the post percentage is less than the pre percentage and represents a drop in the practice level.

In addition, Table 4 also shows a comparison of nurses' practice levels before and after the coaching intervention and the resulting change in practice levels. The results revealed that at the beginning of the coaching intervention the practice level of 22% of the nurses was categorized as *good.* At the end of the coaching intervention, the practice level of *good* had risen to 75%. The practice level of *moderate* dropped from 64% to 22%, while the practice level of *poor* dropped from 25% to 3%.

Table 4

Comparison of Proportions of Nurses' Practice by Categories (N=36)

	Pre-Test		Post-Test		Change
Category of Practice	Frequency (f)	Percentage (%)	Frequency (f)	Percentage (%)	%
Good practice (≥4)	08	22	27	75	+53
Moderate practice (≥3.0- 3.9)	23	64	08	22	-42
Poor practice (<3.0)	09	25	01	3	-22

Inferential statistics.

The Wilcoxon signed ranks test was performed to evaluate whether there was a significant difference between the practice of nurses before coaching and their practice after coaching. Table 5 shows the results of the Wilcoxon test. The results indicated that there was a statistically significant difference between practice of nurses before coaching (m = 3.62, sd = .29) and practice of nurses after coaching (m = 4.14, sd = .23), $p < .001$, with a 95% confidence interval.

Table 5

Comparing Mean of Practice Before and After the Coaching Using Wilcoxon Signed Ranks Test (n=36)

Practice	Mean (%)	SD	P- value
Before coaching	3.62	0.29	
After coaching	4.14	0.23	< 0.001

Analysis of performance of practice items.

Nurses were also asked specific questions before and after the coaching about their practices on the use of ventilator care bundle to prevent ventilator-associated

pneumonia in CCUs. Appendix M shows the changes in practice levels after the coaching intervention per practice parameter.

The results revealed that coaching had mixed effects on the practice of nurses towards the use of VCB to treat VAP. Coaching had a positive effect on some practices of nurses and also had a negative effect on others. For instance, the reported practice statement “I perform ETT and subglottic suctioning to keep removing secretions” had a negative mean change (-2.8). This statement also had the smallest performance mean score (1.7) after the coaching intervention. The reported practice statement “I don’t use antimicrobial soap to wash my hands” had the biggest positive mean change (2.6). This statement also had the biggest performance mean score (4.9) after coaching alongside the reported practice statements “I wash/sanitize my hands before entering in critical care unit” (4.9) and “I start prophylaxis for peptic ulcer disease on all patients admitted in the ICU” (4.9).

In addition, before the coaching intervention the reported practice statement “I do not adhere to good oral hygiene to reduce VAP” had the smallest practice mean score of 1.9. After the coaching intervention its mean score was 4.3. On the other hand, the reported practice statements “I wash/sanitize my hands before patient touching” and “I wash/sanitize my hands after touching patient” had the biggest practice mean score of 4.7 before the coaching intervention. After the coaching intervention, the practice mean scores were 4.8 for both reported practice statements.

Further, the reported practice statements “I have treated ventilator-associated pneumonia patients in the Critical Care Unit” and “I do not use alcohol-based hand rubs to sanitize my hands” were categorised as *poor* before the coaching intervention and they remained in the *poor* category after the coaching intervention. The reported

practice statement “I perform ETT and subglottic suctioning to keep removing secretions” was categorised as *good* before the coaching intervention but was categorise *poor* after the intervention.

Summary

This chapter has presented results from analysis of the data collected on the knowledge and practice of nurses about the use of VBC to prevent VAP. It presented the results without any attempt to explain the meaning. Results were summarised into frequency tables to aid comparisons between the pre and post intervention knowledge and practice levels. The next chapter five will discuss the results presented in this chapter.

Chapter Five: Discussion of Results, Recommendations and Conclusions

This chapter presents a discussion of the results presented in chapter four. The discussion is divided into three parts. The first part is demographics, which presents a discussion of the characteristics of study participants. The second part is the effect of coaching on knowledge of nurses towards the use of VCB in the prevention of VAP and the third part is the effect of coaching on practices of nurses towards the use of VCB in the prevention of VAP. After a discussion of the results, chapter five presents application of the theoretical framework, the limitations of the study, areas for further study, recommendations, plans for dissemination of findings and conclusions.

Demographic Characteristics

The sample of 36 nurses that participated in this study consisted of 69% females and 31% males. The comparable percentages for the study population is 70% female and 30% male nurses at the Uganda Heart Institute (Uganda Heart Institute, 2024). It should be noted that the study sample was dominated by female nurses just as it is in the overall population of nurses in the country. At the national level, about 73% of registered and 66% of enrolled nurses were female, that is, only 27% of registered and 34% of enrolled nurses are male in 2022 (Musoke, 2024). In as far as gender is concerned, therefore, the study sample was similar and representative of the study population.

The majority (83%) of nurses who participated in this study had a bachelor's degree and 17% had a master's degree. This is consistent with the study population reported in related literature. For instance, at least 75% of nurses that work at the Uganda Heart Institute possessed a bachelor's degree in nursing or a related field such as palliative care and 8% had a post graduate qualification (Uganda Heart Institute,

2024). This study's sample was more highly educated compared to the average nurse in Uganda where 47% of nurses were certificate holders, 45% had diploma, 7% had a bachelor's degree and 1% had a master's degree (Okuonzi, et al., 2023). This was primarily because UHI has a policy of only hiring staff with Bachelor of Nursing and above. In this regard, the study sample was not similar to and not representative of the study population.

The findings of this study showed that only 33% of the nurses who participated in this study had received training in VCB, which is often used in CCUs. This finding is consistent with comparable training reported in related literature (Atumanya, et al., 2019; Ministry of Health, 2024). For instance, at the national level, "34% of ICU staff across the assessed facilities had received specialized training in critical care" in Uganda in 2024 (Ministry of Health, 2024). This was an improvement from only 8% of nurses in Uganda who had some formal training in critical care nursing in 2019 (Atumanya, et al., 2019). Elsewhere, Ali (2013) reported that all critical care nurses at Cairo University Hospitals had unsatisfactory knowledge about VAP bundle preventive measures, that is, VCB. This finding, therefore, not only showed that the study sample was representative of the study population in Uganda but was also consistent with previous studies from elsewhere.

About 81% of this study's participants had 1-3 years' experience of working in the critical care area. Related literature shows longer work experience for study participants. For example, 71% of study participants working in the ICU at Mulago Hospital had work experience ranging from 3 months to 28 years, with an average of 10 years (Baker & Jungnelius, 2018).

In summary, the demographics of the present study highlighted above indicate that the study participants were representative of the study population that I set out to study and adequately qualified to provide relevant data upon which the conclusions of the study were drawn. Although academically the majority of study participants had a bachelor's degree in nursing, most of them had not received training on the use of VCB prior to their participation in this study.

Effect of Coaching on Knowledge of Nurses Towards the Use of VCB

The findings of the current study revealed that nurses working in CCUs of the Uganda Heart Institute, a specialized hospital in Kampala, possessed poor knowledge of using VCB to prevent VAP before the intervention in this study. The findings are in line with similar previous studies, which reported that nurses were ignorant of VCB bundle protocol and/or its significance in reducing VAP rates in ICUs (Aziz, et al., 2020; El-Razeq, Ibrahim, & Fahim, 2025; Gerida, El-Sheikh, & Abdelraouf, 2022; Zeb, Hasnain, Ahmad, Khan, & Ali-shah, 2018). It is worth noting that the aforesaid studies were conducted in other countries. Similar studies on this topic have not been previously studied in Uganda.

On coaching vis-à-vis knowledge of nurses, the findings of the current study revealed that coaching of nurses working in CCUs of the Uganda Heart Institute, a specialized hospital in Kampala, significantly increased their mean knowledge level of VCB to almost twice the pre-intervention mean level. This finding is congruent with earlier studies that reported the use of coaching in developing the knowledge of nurses (Richardson, Wicking, Biedermann, & Langtree, 2023). Coaching, for instance, resulted in positive changes to self-perceived knowledge of nursing assistants (Douglas & MacPherson, 2021, p. 4), staff nurses' knowledge about basic

life support (Taie, 2009), and nurses knowledge of percutaneous nephrostomy tubes, a critical component of nursing management (Mohamed, Al Awamleh, Ahmed, Abdelal, & Abdelaal, 2024). I did not find any previous studies specific to the effect of coaching on knowledge of nurses towards the use of VCB to prevent VAP. However, this finding is consistent with similar earlier studies that reported the use of related VCB knowledge improvement interventions for nurses other than coaching. Such reported interventions included: in-service skills demonstration sessions (Khalfallah, Alquwez, & Ibrahim, 2024), continuous nursing education (CNE) programs (Aziz, et al., 2020; Marzuola, 2016), training, interactive educational sessions (Abad, Formalejo, & Mantaring, 2021; Cengiz & Kanan, 2019; Getahun, et al., 2022; Osti, Wosti, Pandey, & Zhao, 2017), one to one communication (Radhakrishnan, et al., 2021), lectures, courses and workshops (Al Shameri, 2017; Radhakrishnan, et al., 2021). Nonetheless, existing studies (such as cited above) that link coaching to improvement of nurses' knowledge in areas other than the use of VCB to prevent VAP suggested a similar link between coaching and increase in knowledge of nurses towards the use of VCB. The present study supports such a link.

Analysis of findings by performance of knowledge items revealed a noteworthy improvement of knowledge in the primary causes of VAP. Before the coaching intervention, knowledge of the primary causes of VAP was the poorest of the knowledge items among nurses. After the coaching intervention, it was one of the areas with the highest improvement in knowledge, signifying a crucial area of strength. It may be that with such superior knowledge levels in the primary causes of VAP, it is easier to prescribe treatment and to develop or enhance other VAP preventive clinical practices.

Effects of Coaching on Practice of Nurses Towards the Use of VCB

The current study findings revealed that nurses working in CCUs of the Uganda Heart Institute, a specialized hospital in Kampala, demonstrated above average standard practice of VCB before the intervention in this study. Consequently, this finding is congruent with studies reporting that nurses manifested good VCB practices (Ya'acob, Ahmad, Kunjukunju, Mustafa, & Chukari, 2023). This finding, however, is inconsistent with studies that classify VCB practices of intensive care nurses as poor (Alja'afreh, Mosleh, & Habashneh, 2018; El-Razeq, Ibrahim, & Fahim, 2025) or beginner (Gerida, El-Sheikh, & Abdelraouf, 2022).

The findings of the current study also revealed that coaching of nurses working in CCUs of the Uganda Heart Institute significantly improved their mean practice level of VCB. This finding is consistent with previous studies that reported the use of coaching in translating knowledge of nurses into clinical practice(s) (Richardson, Wicking, Biedermann, & Langtree, 2023). Coaching, for instance, resulted in higher levels of practices by nurses in the area of care for patient undergoing percutaneous nephrostomy tubes, which is a critical care area of nursing (Mohamed, Al Awamleh, Ahmed, Abdelal, & Abdelaal, 2024). There was a dearth of studies that were specific about the effect of coaching on practices of nurses towards the use of VCB to prevent VAP. However, this finding is in harmony with previous studies that reported the use of related VCB practices improvement interventions for nurses – other than coaching – such as: in-service skills demonstration sessions (Khalfallah, Alquwez, & Ibrahim, 2024), simulation (Jeengar, et al., 2021), training (Cengiz & Kanan, 2019), interactive lectures and one to one communication (Radhakrishnan, et al., 2021). These studies that linked coaching to improvement of nurses' practices in areas other than the use of

VCB to prevent VAP also indirectly suggested the possible effect of coaching on positive changes on nurses' practices towards the use of VCB, which the present study confirms.

Analysis of findings by performance of practice items revealed notable practices of nurses. Before the coaching intervention, the reported practice statement "I perform ETT and subglottic suctioning to keep removing secretions" was categorised as *good*. After the coaching intervention, it was categorised *poor*, signifying a crucial area of concern. This arose because most patients spent less than eight hours on the ventilator and were extubated earlier. Consequently, some nurses were not able to practice ETT and subglottic suctioning during the coaching period. In addition, the reported practice statements "I have treated ventilator-associated pneumonia patients in the Critical Care Unit" and "I do not use alcohol-based hand rubs to sanitize my hands" were categorised as *poor* before the coaching intervention and they remained in the *poor* category after the coaching intervention. Besides, the latter question was worded in the reverse and the participating nurses may not have read it properly. In my observation, it was a common practice for the nurses to sanitize their hands.

Although not a primary objective of the current study, it is important to recognise some possible influence of other factors (besides coaching) on the clinical practice of nurses before and/or after the coaching intervention. First and on a positive note, availability of proper and state-of-the-art equipment is one noteworthy factor that may have favoured the reported good VCB practices among nurses working in CCUs of the Uganda Heart Institute (UHI). The UHI uses advanced equipment for diagnostics (e.g., Echo, Stress tests, ECG, Holter), interventions (Intravascular Echo, new AI-powered Cath Lab, Impella Assist Device), and surgery (ventilators, heart-lung

machine), UHI also has state-of-the-art theatres (including a hybrid) with expanded capacity for advanced cardiac care. Further, sundries and drugs were in adequate supply at the UHI during the period of the study (Uganda Heart Institute, 2024). Secondly, it is possible that burnout (or compassion fatigue) mainly as a result of demanding shifts negatively affected the clinical practice of nurses at the CCUs of the UHI (Tumwesigye, Twinomujuni, Akampumuza, Abeneitwe, & Niyonzima, 2025). Besides the emotional and psychological stress of constantly caring for critically sick patients, nurses in the CCUs of the UHI are organized into 12 hours shifts as opposed to the standard 8 hours in other government health facilities (Naturinda, 2021). Even then, the long shifts are retained by policy in order to optimize the positive outcomes of continuity of patient care such as recovery and reduced critical care bed stay.

Application of Theoretical Framework

This study applied the Clinical Coach Framework by Faithfull-Byrne et al (2017). Specifically, adult learning strategies, clinical assessment tools, coaching process and facilitation skills were the clinical coaching skills that were applied in the study.

Adult learning strategies.

The adult learning strategies guided this study to focus on what the nurses' needed in order to improve their knowledge and practices towards the use of VCB in treating VAP. Consequently, during the coaching intervention, the nurses participated in developing their knowledge and practice needs/gaps in relation to the use of VCB to treat VAP. In addition, they set individual learning objectives in line with the overall goals of the coaching intervention in order to address the knowledge and practice gaps. Since the nurses were often organised to work in pairs, at least two nurses shared specific objectives. The participating nurses also identified specific tasks

and/or activities that they thought would enable them achieve the set objectives. The nurses had the lee-way to adjust the tasks/activities in order to achieve the specific objectives if they deemed it necessary. They would mainly consult with the coach on sensitive matters any time throughout their shift period.

To help track daily activities/tasks, the nurses developed their individual ventilator care bundle compliance checklists using the information in the charts of mechanically ventilated patients and Ventilator Care Bundle Compliance Checklist (Appendix F) in the CCU. The completed checklists partly formed the basis for the daily feedback group discussions at the end of their shifts.

Although feedback was continuously provided throughout the course of each day, the small group discussions using pre-determined questions and the completed compliance checklists were used to share practice experiences. The discussions emphasized sharing the nurses' observations of the benefits of using the VAP bundle. Outstanding performers were publicly commended during the group discussions as a way to motivate all participants. I also provided further feedback to the nurses individually and collectively aimed at addressing the knowledge gaps and practice issues that were identified by both the participating nurses and I myself as the coach. The nurses' participation, feedback and practice during the coaching were aimed at achieving the individual and overall intervention goals. All the nurses had an opportunity to practice and apply two or three elements of the bundle on the patients as needed. Nurses with long-stay in patients had the opportunity to apply all the elements of the bundle.

Clinical assessment tools.

The clinical assessment tools that were used included the individual ventilator care bundle compliance checklists, which were developed by all participating nurses to help guide and remind them of what to do at every stage. Another clinical assessment tool was my expertise for I kept observing the nurses' practice, offering help where needed, asking guiding questions that enabled them apply the bundle. Besides the VCB compliance checklist, I used VCB protocol guidelines, daily reviews and adhered to the VAP prevention evidence-based guidelines.

Coaching process.

As part of the process of coaching I identified the categories of coachees namely those on night shift, dayshift and off duty. This enabled me to schedule the coaching activities in line with the nurses' normal routine. Next, I created two teams of coachees from the said categories. Thereafter, I worked with each group separately. After introducing the VCB, I guided each group to set daily coaching goals and identify specific practice tasks (e.g., completing the daily VCB compliance checklist) for the rest of the coaching day. During the coaching sessions, the participating nurses were encouraged to focus on answering why the items in VCB chart were important and how to best implement the VCB (e.g., the best angle of bed elevation). All of this aimed at aligning knowledge and practice of nurses regarding use of the VCB to prevent VAP in a clinical setting.

Facilitation skills.

The facilitation skills that I used included moderating the daily small group discussions. During these group meetings, the VCB compliance checklists that were completed by the participating nurses were discussed. The ideas generated from the

group discussions informed adjustments that I made to improve the coaching process aimed at benefitting all the participants. In addition, individual and collective challenges were also addressed during the group discussions.

Limitations of the Study

This study used only one data gathering method, survey questionnaire administration, to gather data from nurses. The questionnaire used multiple choice questions, which often exclude insights outside of the choices provided. Open ended questions would address this limitation. Data triangulation was, therefore, not possible. This may have limited the quality of data collected since the method may have omitted insightful perspectives from respondents, which could have been captured by other methods.

The survey questionnaire was researcher developed. It is, therefore, possible that a less diverse range of responses were solicited than would have been if a standardized questionnaire was used. Besides that, the wording or structure of the questionnaire may have influenced responses. This may have potentially skewed the results and conclusions reached, hence limiting the validity of the findings.

Further, the geographical study scope was limited to Uganda Heart Institute (UHI), which has only three ICUs out of over 14 in the country. This was primarily because of resource (time and financial) constraints. Therefore, the findings and conclusions that were reached may not accurately reflect some of the situations in the other ICUs that were not sampled.

The sample size for the study was small even though experts and piloting were used to ensure validity and reliability respectively. This may have reduced the strength of the conclusions reached in this study. Selecting participating nurses from additional

CCUs would have increased the sample size. Statistical tests often require a larger sample size to ensure that the statistical results that are generated can be used to draw stronger conclusions and make generalization of the findings to a larger population.

Similarly, the educational differences between the study sample and the average nurse in other ICUs or health facilities in the country at large may reduce the applicability of the conclusions drawn to the average nurse. All study participants had a bachelor's or higher degree, while only 7% of nurses in Uganda hold a bachelor's degree and a mere 1% hold a post graduate qualification.

Not all the nurses had an equal opportunity to practice and apply the elements of the bundle on the patients. It was only the nurses with long-stay in patients who had the opportunity to apply all the elements of the bundle on the patients. This may have affected the quality of the data that was collected.

The study was conducted for a short time due to the time constraints imposed by the academic program. It is possible that if the time had been longer, the study findings may have been different.

Areas for Further Study

This study investigated the association between coaching interventions and improvement in nurses' knowledge and practices of VCB in preventing VAP. The study, however, did not factor in the frequency of the coaching exercises and the duration in between the coaching interventions over the working tenure of a typical nurse. Such a study would ascertain the optimum number of coaching interventions in order to sustain an optimum level of VCB knowledge and practices among nurses that would enable them to effectively manage VAP. Future research may consider investigating this area.

The study also revealed that participating nurses working in CCUs of the Uganda Heart Institute possessed poor knowledge of using VCB to prevent VAP and that the majority of the nurses had not received training on VCB prior to the study. The study didn't investigate why this was the case. This is another potential area for further research. Specifically, the orientation of new nurses, ongoing education and follow up teaching of nurses working in critical care areas could be targeted to investigate whether these activities include VCB and VAP themes.

The duration of this study was short and didn't provide adequate opportunities for participants to practice all the elements of the VCB. Therefore, another study conducted for a longer period of time would be more conclusive.

The study was conducted in only the CCUs of the UHI at Kampala City. Future studies, therefore, may target more CCUs across the country in order to generate more conclusive results.

Recommendations

The Uganda Heart Institute should conduct regular coaching or related educational initiatives (e.g. structured mentorship programs, workshops, refresher courses, simulation-based training) for nurses and midwives working in CCUs. This would sustain an optimum level of quality knowledge and practices of using VCB to prevent VAP. In addition, the Institute should provide nurses with adequate, relevant and accessible VCB information materials such as guidelines, checklists and evidence-based literature on VCB and VAP prevention. This will promote consistent adherence to all VCB steps during patient care.

For the Ministry of Health (MOH) it is recommended that it incorporates VCB protocol in policy so as to prevent VAP in all CCUs in Ugandan Hospitals. It should

also perform regular audits to assess VCB compliance and identify improvement opportunities. Both the MOH and health facility administrators should recognize and incentivize nurses who excel in VCB implementation in order to encourage widespread adoption.

Plans for Dissemination of Findings

After completing the final draft of this dissertation, I presented it to the viva committee of the Directorate of Post Graduate Studies of Uganda Christian University. After making adjustments in view of the remarks of the committee and submitting the final dissertation, I will develop and submit an article for publication in one of the recognized journals that publish nursing-related research. I will also present the findings to the Uganda Heart Institute and at relevant workshops or conferences at local, national or international levels.

Conclusions

The VCB is globally promoted as an effective preventative measure against VAP. Although, VCB is available in the ICUs in Uganda, evidence suggests that they are not well-understood and applied in the prevention of VAP. Studies also indicate that clinical coaching improves the quality of clinical knowledge and practice of nurses and midwives, and ultimately the quality of patient care and health outcomes.

In view of the above, this study set out to investigate the linkage between coaching, as an educational intervention, and the level of knowledge and practice among nurses on the use of ventilator care bundle in the prevention of ventilator-associated pneumonia. The study objectives were achieved. The chosen methods of the study were sufficient to address the research problem. The study findings showed that although participating nurses had poor pre-intervention knowledge levels about

the use of VCB to prevent VAP, their VCB practices were above average standard. In addition, the study revealed that coaching was a useful intervention for improving the knowledge and practice levels of nurses in using VCB to prevent VAP. It is recommended that CCUs in Uganda conduct regular coaching or related education initiatives for their nurses so as to maintain an optimum standard of knowledge and practices of using VCB to prevent VAP.

The study findings have substantial implications for at least three areas, namely, policy, nursing practice, and future research. First, policy issues may include decisions on whether healthcare policies should mandate regular, ongoing VCB/VAP prevention training and coaching sessions for all critical care nurses and other relevant healthcare providers. Another consideration is for policy makers to standardize evidence-based VCB guidelines across all critical care units to ensure uniformity of care. In addition, VCB compliance and VAP rates should be considered as part of the key quality indicators in hospital performance evaluations, with clear metrics for success and accountability. Second, implications for nursing practice includes issues such as nurses integrating VCB components into daily routine workflow and documentation practices, utilizing checklists to ensure no step is missed. Another consideration is implementing peer coaching and close clinical supervision to help sustain high compliance levels and address individual practice barriers in real-time. Third, there is need to consider future research to evaluate the long-term sustainability of the positive effects of coaching interventions on VCB compliance and / VAP rates, as compliance often wanes over time without sustained effort.

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Appendix A: Permission to use the Clinical Coach Framework

<jenny.jaspers@health.qld.gov.au>, <a.welch@cqu.edu.au>, <m.williamson@cqu.edu.au>, <wendy.cross@monash.edu>, <cheryle.moss@monash.edu>

Dear Faithful-Byrne and your associates,
Greetings to you all.
My name is Anna Noland Oketayot. I am a Registered Nurse currently working with Uganda Heart Institute. I am a student at Uganda Christian University, Mukono, Uganda, East Africa, affiliated to Bethel University, Minnesota, USA. I am pursuing a Masters Degree in Nursing Science. I have been studying for the last two years, and am in my final year of study.
Currently I am working on my Research Dissertation. My research topic is "Effect of Coaching on Knowledge,Attitude and Practice of Nurses towards the Use of Ventilator Care Bundles in Prevention of Ventilator Associated Pneumonia in ICU at Uganda Heart Institute". I read the article you and your associates authored with a title "Clinical coaches in nursing and midwifery practice: Facilitating point of care workplace learning and development", and I was impressed with the conceptual framework you used in your research work.

The purpose of this email is to request for your permission to adopt your conceptual framework and use it in my research. Looking forward to your positive response.

Best regards,
Anna Noland Oketayot
Masters In Nursing Science Student
jaikolnola@gmail.com
+256772428177/700371494

Gmail **Anna Nolan Jaikol <jaikolnolan@gmail.com>**

Clinical Coach Framework request for permission

3 messages

Annette Faithfull-Byrne <annettefbyrne@outlook.com> Sun, Nov 7, 2021 at 2:18 PM
To: "jaikolnolan@gmail.com" <jaikolnolan@gmail.com>

Dear Anna,

We are happy for you to utilise our framework and wish you all the best with your studies.

Regards

Annette Faithfull-Byrne

Sent from Mail for Windows

Anna Nolan Jaikol <jaikolnolan@gmail.com> Sun, Nov 7, 2021 at 3:02 PM
To: Annette Faithfull-Byrne <annettefbyrne@outlook.com>

It's great to receive your response to my email. Although I have not met you physically, your permission to allow me use your frame work has inspired me now to work even more harder.
Thank you so much, may God Bless you.
Best Regards,
Anna Noland
[Quoted text hidden]

Anna Nolan Jaikol <jaikolnolan@gmail.com> Fri, Oct 14, 2022 at 8:26 PM
To: Karen Drake <drakar@bethel.edu>

Find forwarded the reply i received from Byrne
Anna Noland
[Quoted text hidden]

Appendix B: Informed Consent Form

Title of research study:

Effect of Coaching on Knowledge and Practice among Nurses in the use of Ventilator Care Bundle in the Prevention of Ventilator-Associated Pneumonia in the Critical Care Units of The Uganda Heart Institute a Specialized Hospital in Kampala.

Principle investigator, contact information and affiliation:

This study is for completion of a master of nursing science degree from Uganda Christian University. Oketayot Anna Noland Jaikolnolan@gmail.com Uganda Christian University, P. O. Box 4, Mukono. 0772428177/0700371494

Introduction and purpose of study:

The purpose of the study is to determine the effect of coaching on knowledge and practice regarding the use of ventilator care bundle among nurses in the prevention of Ventilator-Associated Pneumonia in CCUs. The research aims to initiate intervention measures and recommendations regarding nursing practice, education and further research.

Description of the research: Interventional Research

Subject participation:

The study will recruit all nurses like you who are working in the critical care units of UHI. You are directly responsible for many non-pharmacological and pharmacological techniques to avoid VAP. You provide specialized experience, knowledge, and skills that patients on mechanical ventilation need to survive. As a CCU nurse, you are expected to be familiar with VAP and the current evidence-based guidelines for its prevention.

Potential Benefits:

You will benefit from Participating in the study. Your knowledge and practice on the use of ventilator care bundle to prevent VAP in ventilated patients in the CCUs will be enhanced. At the end of the study, you will receive a token of appreciation of ten thousand shillings (10,000/-) and a certificate of participation.

Potential Risks and Discomforts:

There are potential risks anticipated. These may include anxiety and distress when your knowledge and competence is tested, fear of loss of employment, misrepresentation or identification of your name in published papers by yourself or others. The researcher will mitigate the risks by ensuring confidentiality and taking steps to keep your identity anonymous.

Confidentiality:

The researcher will assure you that any information collected during the course of the study will be maintained as confidential and access will be restricted to people conducting the study. Your name will not be disclosed, nor will details of your answers be given to anyone during data analysis, in future presentation and publication.

Rights of participants:

The researcher will inform you of your right to know all the details pertaining to your participation in the study. These will include the right to know the purpose of the study, your obligations, freedom from coercion, the right to refuse to participate and benefits from the participation.

Contact information for ethical concerns or to withdraw consent:

The study has been approved by UCU REC.

Supervisors:

1. Karen Drake, +1 (763)242-5695

Email. drakar@bethel.edu

▪

2. Elizabeth Namukombe Ekong +256 702741911/+256752817166

Email. Ekongelizabeth@yahoo.com

Authorization statement:

I have read this consent form and I agree to be a participant in this study. I have been given the opportunity to ask questions regarding the study, and I have received answers to my questions. I acknowledge that I am aware of what this study involves, that I am at least 18 years old, and that I have received a copy of this Informed Consent form.

Signature lines and dates for:

Participant:

Sign: ……

Date: ……

Researcher:

Sign: …….

Date: …….

Appendix C: Survey Questionnaire

Section A: Items on demographic characteristics of the respondents

NURSE DEMOGRAPHICS (Tick one box)

1. What is your age?	Mention age: ……
2. What is your gender?	☐ Male
	☐ Female
3. What is your highest qualification earned in nursing?	☐ Diploma
	☐ bachelors
	☐ Masters
	☐ Ph. D
4. Have you had any Critical care training on the use Ventilator Care Bundle (VCB)	☐ YES
	☐ NO
5. If YES, when was the last training you had on how to use VCB?	
6. How long have you been working as a critical care nurse	Mention number of months/years: ……

Section B: Knowledge of participants on Ventilator-Associated Pneumonia (VAP) and VCB. Circle one response that represents your answer for each question

7. VAP is defined as

a) Pneumonia that develops in an intubated patient after 12 hours or more of mechanical ventilation support
b) Pneumonia that develops in an intubated patient after 24 hours or more of mechanical ventilation support
c) Pneumonia that develops in an intubated patient after 48 hours or more of mechanical ventilation support
d) Pneumonia that develops in an intubated patient after 72 hours or more of mechanical ventilation support

8. What is the primary cause of VAP in patients receiving mechanical ventilation?

a) Endotracheal intubation and subglottic suctioning
b) Gram-negative bacilli and Staphylococcus aureus
c) The Ventilator machines
d) Daily sedation of patients on mechanical ventilation

9. Which of the following is the primary cause for VAP?

a) Unwashed hands
b) gram-negative bacilli
c) oropharynx and gastrointestinal tract
d) mechanical ventilation

10. VCB is best described as.....

a) Guidelines used to reduce the risk of atelectasis
b) A checklist used as a protocol of care for mechanically ventilated patients
c) A collection of interventions to treat malignancies of lungs
d) A bundle used to treat lung infection

11. Compliance to VCB tends to be associated with:

a) Increased risk of VAP in mechanically ventilated patients
b) High mortality and morbidity in mechanically ventilated patients.
c) Reduced morbidity and mortality in in mechanically ventilated patients
d) None of the above

12. The increase in bacteria colonization in the oral mucosa can cause VAP if .....

a) Bacterial overgrowth is not reduced
b) Endotracheal tube is not inserted
c) Oral hygiene care is provided

d) Oral mucosa standard prevention strategies are observed

13. Secretions that accumulate in ventilated patients can cause VAP when it is not

▪ removed using....

a) Endotracheal tube through the mouth
b) Endotracheal and subglottic tube positioning
c) Endotracheal and subglottic suctioning
d) Extubation and intubation

14. Gastric reflux and subsequent risks for VAP can be reduced when the

nurse.....

a) Elevates the head of bed between 10 – 25 degrees
b) Elevates the head of bed between 25 – 30 degrees
c) Elevates the head of bed between 30 – 45 degrees
d) Elevates the head of bed between 45 – 50 degrees

15. The intentional interruption of intravenous sedative and analgesic medication in

mechanically ventilated patients to wean them off the ventilator is best referred to

as.....

a) daily sedation drug infusion and assessment of readiness to extubate
b) daily sedation orders and assessment of readiness to extubate
c) daily sedation holiday and assessment of readiness to extubate
d) daily drug infusion and assessment of readiness to extubate

▪

16. Acidic suppression predisposes ventilated patients to developing VAP by raising

gastric PH levels and allowing bacterial overgrowth. This can be best prevented

by.....

▪

a) Gastropathy ulcer disease prophylaxis
b) Gastrointestinal ulcer prophylaxis
c) Deep vein thrombosis prophylaxis
d) Peptic ulcer disease prophylaxis

▪

17. Blood clots in patients on mechanical ventilation can be best prevented by a

process called....

a) Venous thromboembolism prophylaxis
b) Deep vein thrombosis prophylaxis
c) Pulmonary embolism prophylaxis
d) Blood clot prevention prophylaxis

18. The **most** essential preventive measure that nurses can implement to prevent VAP in mechanically ventilated patients is.....

a) Rubbing hands with lotion
b) soap Washing hands with water and antimicrobial
c) Using antiseptics for hand hygiene
d) Applying hand sanitizer after contaminating hands

19. A nurse caring for a ventilated patient is required to wash hands

a) Before oral and ETT suctioning
b) After oral and ETT suctioning
c) Before and after oral / ETT suctioning
d) None of the above

SECTION C: Practice of Participants on the use of Ventilator Care Bundle to prevent Ventilator-Associated Pneumonia

No	Practice	Never	Rarely	Sometimes	Often	Always
1	I use the VCB to take care of ventilated patients					
2	I refer to the ventilator-associated pneumonia policy /guideline in the Critical Care Unit when caring for ventilated patients….					

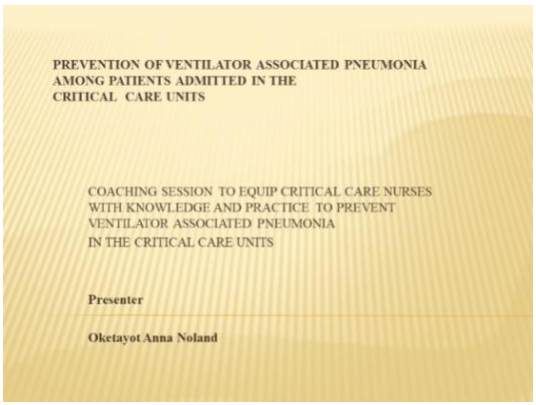
No	Practice	Never	Rarely	Sometimes	Often	Always
3	I have treated ventilator-associated pneumonia patients in the Critical Care Unit					
4	I position the ventilated patient in a supine positioning rather than semi-recumbent positioning					
5	I perform daily short-term interruption of intravenous sedatives and analgesic medications in mechanically ventilated patients to wean them off the ventilator					
6	I use the physician order treatment chartto process all sedation orders					
7	I check patient's daily flow sheet to confirm whether sedation was interrupted and respiratory therapy notes to assess daily readiness for extubation.					
8	I use drugs such as proton pump inhibitors or H2 blockers, sucralfate or histamine H2-					

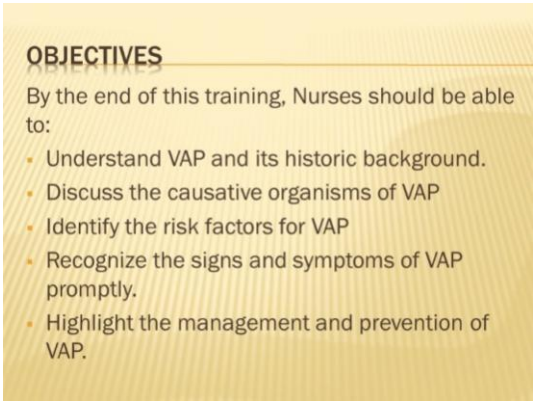
No	Practice	Never	Rarely	Sometimes	Often	Always
	receptor antagonists to prevent gastric ulcers and thus reduce VAP					
9	I start prophylaxis for peptic ulcer disease on all patients admitted in the ICU					
10	I use the medication administration record (MAR) to check whether the patients in CCU have PUD prophylaxis ordered.					
11	I use PUD prophylactis while patients are on complete bed rest.					
12	I include PUD prophylactics as part of CCU order admission set and ventilator order set.					
13	I use chlorhexidine as part of the CCU order admission set and ventilator order set.					
14	I adhere to all oral care protocol; use chlorhexidine oral rinse, washing/sanitizing hands, clean mouth using toothbrush or					

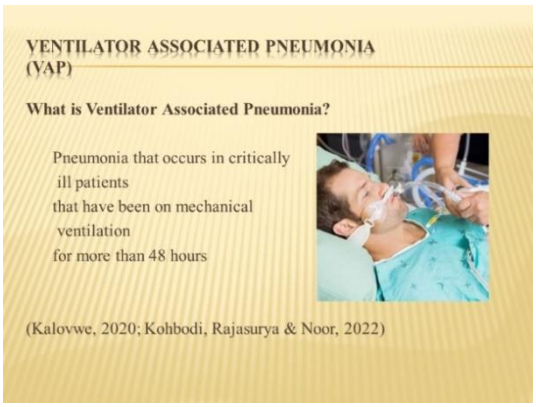
No	Practice	Never	Rarely	Sometimes	Often	Always
	moistened gauze, rinse mouth with a clean swab etc					
15	I do not adhere to good oral hygiene to reduce ventilator-associated pneumonia.					
16	I perform endotracheal and subglottic suctioning as recommended to remove accumulated pulmonary secretions and keeping the airways open					
17	I wash/sanitize my hands before entering in critical care unit					
18	I wash/sanitize my hands before patient touching					
19	I wash/sanitize my hands after touching patient					
20	I don’t use antimicrobial soap to wash my hands					
21	I do not use alcohol-based hand rubs to sanitize my hands					

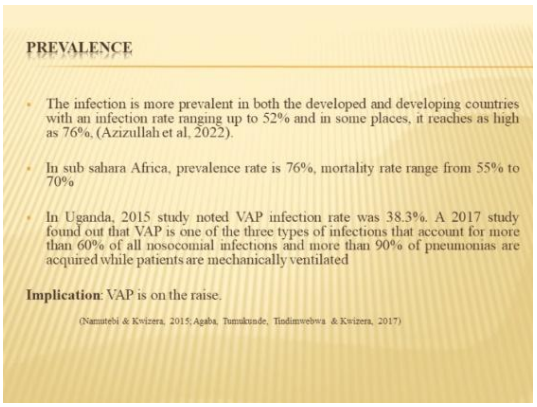
Appendix D: Coaching PowerPoints and Activities

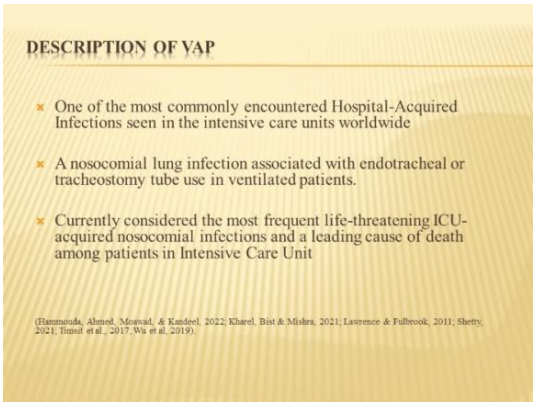
Prevention of Ventilator-Associated Pneumonia Among Patients Admitted in the Critical Care Units

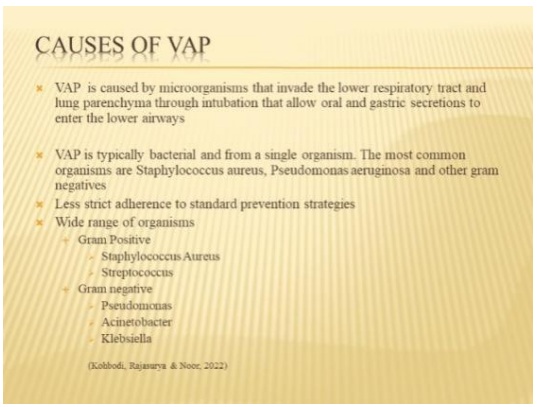












MAJOR PATHOGENS

- Staphylococcus aureus
- Pseudomonas aeruginosa
- Klebsiella and Enterobacter species
- Enterococcus species
- Streptococcus, Enterobacteriaceae, and Acinetobacter species

Passage: Artificial airways become colonized with pathogenic bacteria soon after intubation or tracheostomy (Kohbodi, Rajasurya & Noor, 2022)

CLINICAL SIGNS AND SYMPTOMS

They include:

- Purulent tracheal discharge
- Fevers
- Respiratory distress
- Presence of microorganisms.
- Changed white blood cell count
- Altered sputum characteristic

(Kohbodi, Rajasurya & Noor, 2022; Luo, Xing & Wang, 2021)

IMPACT OF VAP ON PATIENTS

- Longer duration of mechanical ventilation
- Longer stays in the ICU and hospital
- Increased healthcare costs
- Increased risk of disability and death.
- Increased risk of hospital morbidity, and mortality
- Susceptibility to complications like severe sepsis, septic shock, Acute Respiratory Distress Syndrome (ARDS), atelectasis, and infection with MDR organisms

(Khanel, Bist, & Mishra, 2021; Belay et al, 2021; Xie et al, 2018)

WHO ARE AT RISK?

- patient who have numerous comorbidities
- older patients
- Children with artificial airways, such as a tracheostomy tube for management of chronic respiratory failure or an endotracheal for acute airway management (Kohbodi, Rajasurya & Noor, 2022)
- Diabetics
- those with COPD
- smokers

RISK FACTORS FOR VENTILATOR-ASSOCIATED PNEUMONIA

- Treatment factors that promote colonization of oropharynx or stomach
- Factors that promote gastric reflux and aspiration like depressed mental status, supine position, nasogastric tubes,
- Duration of intubation and mechanical ventilation
- Factors that interfere with adequate pulmonary toilet, thoracic or abdominal surgery or immobilization.

(Kohbodi, Rajasurya & Noor, 2022)

PREVENTION OF VAP

- Ventilator Associsted Pneumonia can be prevented using Ventilator care bundles (VCB)
- VCB has been applied and has produced positive results in controlling VAP
- The positive results have been attributed to nurses' knowledge and practice in the use of VCB to prevent VAP

Al-Sayaghi, 2020; Lawrence & Fulbrook, 2011; Liu et al., 2020

Use of Ventilator Care Bundle to Prevent Ventilator-Associated Pneumonia Among Patients Admitted in the Critical Care Units

USE OF VENTILATOR CARE BUNDLE TO PREVENT VENTILATOR ASSOCIATED PNEUMONIA AMONG PATIENTS ADMITTED IN THE CRITICAL CARE UNITS

TRAINING SESSION TO EQUIP CRITICAL CARE NURSES WITH KNOWLEDGE ON VCB.

Presenter

Oketayot Anna Noland

OBJECTIVES

By the end of the session, nurses should be able to:

- Understand the ventilator care bundle
- Discuss the different elements of the ventilator care bundle.

Ventilator Care Bundle (VCB)

- What is a Ventilator Care Bundle?
- A set/group of evidence-based interventions grouped together to improve patient outcome.
- When critical care nurses apply these evidence-based interventions together, they will reduce VAP in patients who are on mechanical ventilation
- (Bonkarsa et al, 2021; Cid, 2015; Mohamed, 2013).

Evidence-Based Interventions

- Elevation of the head of bed (HOB) to 30°–45°
- Daily sedation vacation and assessment of readiness to extubate
- Peptic ulcer disease (PUD) prophylaxis
- Deep venus thrombosis (DVT) prophylaxis
- Endotracheal and Subglottic suctioning
- Daily oral care with chlorhexidine
- Hand Hygiene

Elevation of the head of bed (HOB) to 30°–45

What it is.

- A standardized evidence-based position in which the patient on mechanical ventilation (MV) sleeps in a semi-sitting position of 30-45 degrees to prevent VAP.

Purpose:

- Prevent the potential for gastric reflux and aspiration of contaminated orogastric/oropharyngeal secretions into the airways and this causes a decrease in VAP among patients on MV in the ICU

Elevation of the head of bed (HOB) to 30°–45, CONT……

Practice:

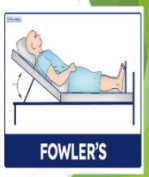
- Maintain continuously patient's position in (30°-45°) if not contraindicated
- Posting cues on HOBE in the patient rooms to remind the ICU nurses

HOBE/Fowler's position/semi-sitting position: a bed position where the head of the bed is elevated 30 TO 45 DEGREES

Promotes lung expansion. The position is used for patients who have difficulty breathing. The gravity pulls the diaphragm downward, allowing greater chest and lung expansion.

Useful for NGT. This position is useful for patients with cardiac, respiratory, neurological problems or for patients with a nasogastric tube.

Prevents poor neck alignment. This is done by placing an overly large pillow behind the patient's head to promote the development of neck flexion contractures.. (Vera, 2024)



Daily sedation vacation and assessment of readiness to extubate

What it is:

- A short-term suspension, discontinuation, cessation, or interruption of intravenous sedatives and analgesic medications in mechanically ventilated patients so that they can be weaned off the ventilator

Purpose:

- Lower the risks of mortality and complications associated with VAP Decrease the number of days for being attached to ventilator
- Shorten the length of stay in the ICU and dependence on the ventilator
- Reduce exposure to sedative agents

Daily sedation vacation and assessment of readiness to extubate, CONT…….

- Allow assessment of neurological status
- Assess readiness for extubation.
- Reduce duration of mechanical ventilation

Practice:

- Create a nurse-led sedation vacation protocol in conjunction with the VAP team.
- Check patient's daily flow sheet to confirm whether sedation was interrupted.
- Check respiratory therapy notes to assess daily readiness for extubation.

CONT……..

6) Notify respiratory therapist to proceed to spontaneous breathing trial protocol when patient open eyes to verbal stimulation or follow simple commands

7) If patient does not meet any failure criteria after 4 hours of a sedation vacation, consider patient to tolerate the sedation vacation.

8) Discuss with provider discontinuation of continuous infusion orders in electronic medical record and provider to consider ordering intermittent boluses as needed.

Deep venus thrombosis (DVT) prophylaxis

What it is:

- DVT prophylaxis refers to using medications and mechanical methods to prevent DVT (Badireddy & Mudipalli, 2023).
- It is an appropriate intervention in all critically ill patients who are sedentary/inactive
- The formation of blood clot called thrombus that forms inside one of the veins or arteries and remains there.

Critically ill Patients tend to be inactive, their recovery while ventilated is sedentary in nature. This increases the risk of developing DVT

Aziz et al, 2013; Badireddy & Mudipalli, 2022

Deep venus thrombosis (DVT) prophylaxis

Purpose: Decreases the rates of VAP in hospitals, risk of DVT, mortality and morbidity associated with VAP

Practice:

- Apply anti-embolic stockings or sequential compression

Aziz et al, 2013; Badireddy & Mudipalli, 2022; Badireddy & Mudipalli, 2023

PROTOCOL FOR Deep venus thrombosis (DVT) prophylaxis

Mechanical therapy

Treatment/Prevention can include use of compression devices or stockings, venous filters

1) After surgery, elevating the legs and avoiding prolonged immobility,
2) Combine use of compression stockings with other preventive measures
3) Use Intermittent pneumatic compression (IPC) to cyclically inflate and deflate hollow plastic leggings to provide external compression to the lower legs and sometimes thighs.

PROTOCOL FOR Deep venus thrombosis (DVT) prophylaxis, CONT.....

4) For patients who are at very high risk of DVT and bleeding (eg, after major trauma),use IPC until the bleeding risk subsides and anticoagulants can be given.

NOTE: Do not use inferior vena cava filters unless DVT has been confirmed.

Pharmacologic therapy

1. This can include treatment/prevention with low-dose unfractionated heparin, low molecular weight heparins, warfarin, fondaparinux, direct oral anticoagulants

Peptic ulcer disease (PUD) prophylaxis

What it is:

- A process of guarding against the development of a specific disease including VAP by a treatment or action that affects pathogenesis.

Purpose:

- Guarding against the development of a specific disease including VAP by a treatment or action that affects pathogenesis.

Peptic ulcer disease (PUD) prophylaxis, CONT.....

Practice:

- Regularly start prophylaxis for peptic ulcer disease on all critically ill patients admitted.
- checking whether the patients have PUD prophylaxis ordered on the medication administration record (MAR)
- Ensure all critically ill patients receive PUD prophylaxis

(Kallet, 2019; Malik, Gnanapandithan& Singh, 2023)

Endotracheal and Subglottic suction

What it is:

- Endotracheal tube suctioning is a procedure used to clean airway secretions in patients under mechanical ventilation.
- It is synonymous with subglottic suctioning, a procedure that involves the removal of secretions from above the cuff of the endotracheal tube.

Purpose: Reduce incidence of VAP by;

- Removing secretions from the airway
- Ensuring airway patency for adequate ventilation and oxygenation.
- preventing micro aspiration of oropharyngeal secretions in patients with cuffed endotracheal airways

Endotracheal and Subglottic suction. CONT.....

Practice:

- use Saline/ distilled water prior to suctioning
- replace the solution used for suction
- continuous aspiration of sub glottic secretions if ventilator more than 48 hours

(AHRQ, 2017; Ardehali et al, 2020; Smith & Spivey, 2020).

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Endotracheal and Subglottic suction. CONT.....

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(AHRQ, 2017; Ardehali et al, 2020; Smith & Spivey, 2020).

Daily oral care with chlorhexidine

What it is:

- Daily oral care is the practice of keeping the patient's mouth clean and disease-free.
- Chlorhexidine is an antiseptic agent that has been widely included in different hospitals' protocols for oral care in intubated patients.
- Daily Oral Care with Chlorhexidine is an essential element of the VCB and has been linked to the reduction in the rate of VAP.

Purpose:

- Keep Patient's mouth clean and disease-free
- Destroys harmful micro-organisms in the mouth i.e. pathogens that colonize the dental plaque biofilms on the teeth of MV patients

Daily oral care with chlorhexidine

Practice:

- perform oral hygiene with antiseptic mouth wash
- use topical antimicrobial agents for oral decontamination regularly

(IHI, 2012; Golzari & Mahmoodpoor, 2014; Liu et al, 2020;; Singh et al, 2022; Tran & Butcher, 2019).

Hand Hygiene

What it is:

- Any action of hygienic hand antisepsis performed either by hand rubbing with an alcohol-based hand rubs or handwashing with water and antimicrobial soap to reduce transient microbial flora

Purpose:

- To reduce, prevent and control the risk of health care-associated infections including Ventilator associated pneumonia

Hand Hygiene

Practice:

- Clean your hands before touching a patient
- Clean your hands immediately before accessing a critical site with infectious risk for the patient
- Clean your hands as soon as the task involving an exposure risk to body fluids has ended
- Clean your hands when leaving the patient's side, after having touched the patient
- Clean your hands after touching any object or furniture when living the patient surroundings, without having touched the patient.

Five moments of hand hygiene

Moment 1

. Before touching the patient

Why?

- Prevent the patient from being colonized with healthcare-associated microorganisms

Risk factors:

- Before shaking hands, helping a patient to move around, clinical examination.

Moment 2

Before a clean/aseptic procedure

Why?

- Prevent health care associated infection (HCAI)

Risk factors:

- Before wound dressing, catheter insertion, preparation of food, medications.

Moment 3.

After body fluid exposure risk

Why?

- Reduces both Nurses' risk of being colonized or infected by infectious agents, and the risk of transmitting microorganisms from a "colonized" to a "clean" body site within the same patient.

Risk factors:

- After drawing and manipulating blood, clearing up urine, feces, handling waste.

Moment 4.

After touching a patient

Why?

- Minimize the risk of dissemination to the healthcare environment.
- Protects the health care provider by significantly reducing contamination of their hands with the flora from the patient.

Risk factors:

- After shaking hands, helping a patient to move around, clinical examination.

Moment 5.

After touching patient surroundings

Why?

- Exposure to patient objects, even without physical contact with the patients, is associated with hand contamination

Risk factors:

- After changing bed linen, perfusion speed adjustment etc.

CASE STUDY

- A 35 -year -old patient has undergone open heart surgery and is in the ICU, ventilated and sedated. As a CCN on duty what will be your action or what steps will you take in order to prevent VAP.

1. Bed position
2. Peptic ulcer disease prophylaxis (drugs, food, DVT PROPHYLAXIS
3. Mouth care

CONT.....

4. Extubation
5. Hand washing; before and after
6. ETT, care

- In groups of 3 members, what will your action be for each bundle?

Conclusion

- Ventilator-associated pneumonia (VAP) is one of the most frequent ICU-acquired infections.
- Ventilator-associated pneumonia (VAP) can be prevented by a combination of multiple prevention strategies
- These multiple preventive strategies include a set of evidence-based interventions known as Ventilator Care Bundle (VCB)
- Knowledge and practice of VCB as a component of nursing care among CCU nurses can decrease incidence rate of VAP in the ventilated patient.

Appendix E: Coaching Intervention Activities.

Name of the Coach: Oketayot Anna Noland

Coachee: Critical Care Nurses

Number: 30 (Thirty)

Subject/Topic: Use of Ventilator Care Bundle to Prevent Ventilator-Associated Pneumonia

Objectives for Coaching in the Critical Care Units:

1) Equip critical care nurses with knowledge and skills on the use of ventilator care bundle to prevent ventilator-associated pneumonia
2) Enable critical care nurses incorporate intensive care infection prevention initiatives in their management of patients on ventilation.
3) Enhance critical care nursing expertise in the use of evidence-based practice approach to VAP prevention

WEEK	PURPOSE	COACH'S ACTIVITIES	COACHEES' ACTIVITIES	MEETING DATES	FEEDBACK	WAY FORWARD
1	Orientation	Orientation Sharing relevant documents Setting individual goals Allocating participants in working groups Asking questions Listening actively Orient coachees on: Protocol of the VCB Purpose of VCB Components of VCB daily log of activities Develop a practice checklist Share checklist	Attendance Active listening Note taking Asking questions Giving feedback	All Groups All Groups All Groups All Groups	Review: VCB Protocol Components of VCB VCB practice checklist	Practice in CCU

2	Practice at the bedside in the CCU	Display VCB protocols in the CCUs Place reminder posters and visual aids to at various points within the units Listening actively Asking questions	Begin practice at the bedside in the CCU Attendance Listening actively Note taking Asking questions Giving feedback	Group 1 …../...../… Group 2 …../...../… Group 3 …../...../… Group 4 …../...../… Group 5 …../...../…	Adhere to VCB protocol Practice use of VCB components on patients in CCU Identify gaps in knowledge and practice	Practice in CCU
3	Practice on the use of VCB in the CCU will continue	The researcher will: Ask questions Listen actively Offer instructions, guidance and objectivity Identify gaps in knowledge and practice Conduct daily reviews	Review activities, achievements and challenges Adjust their approach Perform different tasks as needed communicate with different stakeholders Attendance Listening actively Note taking Asking questions Giving feedback	Group 1 …../...../… Group 2 …../...../… Group 3 …../...../… Group 4 …../...../… Group 5 …../...../…	Adhere to VCB protocol Practice use of VCB components on patients in CCU Identify gaps in knowledge and practice	
4	Practice on the use of VCB in the CCU will continue	Ask and entertain questions Listen actively Offer instructions, guidance and objectivity Identify gaps in knowledge and practice Conduct daily reviews	Review activities, achievements and challenges Adjust their approach Perform different tasks as needed Communicate with different stakeholders	Group 1 …../...../… Group 2 …../...../… Group 3 …../...../… Group 4 …../...../…	Adhere to VCB protocol Practice use of VCB components on patients in CCU Identify gaps in knowledge and practice	

				Group 5 …../...../… …../...../… to …../...../…		

Appendix F: Ventilator Care Bundle Compliance Checklist

(Individual Patient)

Patient Name: …….. Bed Number:

……

Date of admission: ……...

No	VENTLATOR CARE BUNDLE		PRACTCIE	Yes	No	comments
1	Head of Bed Elevation (HOBE) to 30-45 degrees	(i)	Maintain the head of the bed elevated between 30-45 degrees unless contraindicated			
		(ii)	Contraindication documented			
2	Daily sedation vacation and daily assessment of readiness for extubation	(i)	Conduct daily sedation interruption to assess neurological function.			
		(ii)	Evaluate the patient daily for readiness to wean and extubate			
		(iii)	Contraindication documented			
3	Peptic ulcer disease (PUD) prophylaxis	(i)	Administer prescribed peptic ulcer prophylaxis medications (e.g., proton pump inhibitors, H2 blockers).			
		(ii)	Contraindication documented			
4	Deep vein thrombosis (DVT) prophylaxis	(i)	Provide prescribed pharmacological DVT prophylaxis (e.g., anticoagulants).			
		(ii)	Utilize mechanical prophylaxis (e.g., compression devices) if			

			pharmacological methods are contraindicated.			
		(iii)	Contraindication documented			
5	Daily oral care with chlorhexidine	(i)	Conduct oral hygiene with chlorhexidine 0.12% solution every 12 hours.			
6	Hand hygiene	(i)	Wash/sanitize hands before entering in critical care unit			
		(ii)	wash/sanitize hands before touching a patient			
		(iii)	Wash/sanitize hands before a procedure			
		(iv)	Wash/sanitize hands after a procedure or body fluid exposure risk			
		(v)	wash/sanitize hands after touching a patient			
		(vi)	Wash/sanitize hands after touching a patient's surroundings			
7	Endotracheal and subglottic suctioning	(i)	Use a closed suctioning system to maintain sterility and reduce infection risk.			

END

Appendix G: Nurses' Knowledge of the Use of VCB Pre-Intervention

S/N	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Raw Score	% Score
1	1	1	0	0	1	0	0	1	1	0	1	0	1	7	53.8
2	1	0	0	0	1	0	1	0	1	0	1	0	1	6	46.2
3	0	1	0	1	1	0	0	1	1	1	0	1	1	8	61.5
4	0	1	0	1	1	1	1	0	1	0	1	1	1	9	69.2
5	1	1	0	1	1	0	0	1	1	1	1	0	0	8	61.5
6	0	0	1	0	1	0	1	0	1	0	1	1	1	7	53.8
7	1	1	0	1	1	0	0	1	1	1	1	0	0	8	61.5
8	0	1	0	0	1	1	1	0	0	0	1	1	1	7	53.8
9	1	0	1	1	1	0	0	0	1	1	1	0	0	7	53.8
10	0	0	1	0	1	1	0	0	1	0	0	0	1	5	38.5
11	0	1	0	1	1	0	0	0	1	0	0	0	0	4	30.8
12	0	0	0	0	1	1	1	1	1	1	1	1	1	9	69.2
13	0	0	0	1	1	0	0	0	0	0	0	0	0	2	15.4
14	0	1	1	1	0	1	0	0	0	1	0	1	1	7	53.8
15	0	1	0	0	0	0	1	0	0	0	0	0	0	2	15.4
16	1	0	1	1	1	1	0	1	0	1	0	0	0	7	53.8
17	0	0	0	0	0	0	1	0	1	0	1	1	0	4	30.8
18	0	0	0	1	1	1	0	0	0	1	0	0	0	4	30.8
19	1	1	1	0	0	0	0	1	0	0	0	0	1	5	38.5
20	0	1	0	1	0	1	1	0	0	0	0	0	0	4	30.8
21	0	0	1	0	1	0	1	1	1	0	0	0	1	6	46.2
22	1	0	0	0	0	1	0	0	0	1	0	1	0	4	30.8
23	0	0	1	0	0	1	1	1	0	0	0	0	1	5	38.5
24	0	1	0	1	1	0	0	0	1	0	1	1	0	6	46.2
25	1	0	1	0	1	1	1	1	1	1	0	0	1	9	69.2
26	0	0	0	0	1	0	0	1	1	0	1	1	0	5	38.5
27	1	0	0	1	1	0	1	0	0	1	1	0	1	7	53.8
28	1	1	1	0	0	1	0	1	0	0	0	0	0	5	38.5
29	0	0	0	1	0	0	0	0	0	0	0	1	1	3	23.1
30	1	1	1	0	1	1	1	1	1	0	0	0	0	8	61.5
31	0	0	0	1	1	0	1	0	1	1	1	1	1	8	61.5
32	0	0	0	0	1	1	0	1	1	1	0	0	0	5	38.5
33	0	0	1	1	0	0	1	0	0	0	0	1	0	4	30.8
34	0	1	0	0	1	0	0	0	1	0	0	0	0	3	23.1
35	1	0	0	1	0	0	0	0	1	0	0	0	0	3	23.1
36	1	0	0	0	0	0	1	1	0	1	0	1	0	5	38.5
Mean															
Mean %															44.0

Appendix H: Nurses' Knowledge of the Use of VCB Post-Intervention

S/N	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Raw Score	% Score
1	0	1	1	1	1	1	1	1	1	1	1	0	1	11	84.6
2	0	1	0	1	1	1	1	1	1	1	1	1	1	11	84.6
3	1	1	1	1	1	1	1	1	1	1	0	1	1	12	92.3
4	0	1	1	1	1	1	0	1	1	1	1	1	1	11	84.6
5	1	1	1	1	1	1	0	1	1	1	1	1	0	11	84.6
6	0	1	1	1	1	1	1	1	1	1	0	1	1	11	84.6
7	1	1	1	1	1	1	1	1	1	1	1	1	1	13	100.0
8	1	1	1	1	1	1	1	1	1	1	1	1	1	13	100.0
9	1	1	1	1	0	0	1	1	0	0	1	1	1	9	69.2
10	1	1	1	1	0	1	1	1	1	1	1	1	1	12	92.3
11	1	1	1	1	1	1	1	1	1	1	1	1	1	13	100.0
12	1	1	1	1	1	0	1	1	1	1	1	1	1	12	92.3
13	1	1	0	1	1	1	1	1	0	1	1	1	1	11	84.6
14	0	0	1	1	1	1	1	1	0	1	0	0	1	8	61.5
15	1	1	1	1	1	1	1	1	0	1	1	0	1	11	84.6
16	1	0	1	1	1	1	1	1	1	1	1	1	1	12	92.3
17	1	1	1	1	1	1	1	1	1	1	1	1	1	13	100.0
18	0	0	0	1	1	1	1	1	1	1	1	1	1	10	76.9
19	1	1	1	1	1	1	1	1	1	1	1	0	1	12	92.3
20	1	1	1	1	1	1	1	1	1	0	1	1	1	12	92.3
21	1	1	1	1	1	0	1	1	0	1	1	1	1	11	84.6
22	1	1	1	1	1	1	1	1	1	1	1	1	1	13	100.0
23	1	1	1	1	1	1	1	1	1	1	1	1	1	13	100.0
24	1	1	1	0	1	1	1	1	1	1	1	0	1	11	84.6
25	1	1	0	1	1	1	1	1	0	1	1	0	1	10	76.9
26	1	1	1	1	1	1	1	1	1	1	0	1	1	12	92.3
27	1	1	1	1	1	1	1	1	1	0	0	1	1	11	84.6
28	0	0	1	0	0	0	0	1	1	1	0	1	1	6	46.2
29	0	1	1	1	1	1	1	1	1	0	1	1	1	11	84.6
30	0	0	0	1	1	1	1	1	1	1	1	1	1	10	76.9
31	1	1	1	1	1	0	1	1	1	1	1	1	1	12	92.3
32	1	1	1	1	1	0	1	1	0	0	1	1	0	9	69.2
33	1	0	1	1	1	0	1	1	1	1	1	1	1	11	84.6
34	0	1	0	1	0	1	1	0	1	1	0	1	1	8	61.5
35	0	1	1	1	0	0	1	1	0	1	1	0	1	8	61.5
36	1	1	1	0	1	0	1	1	0	0	1	1	0	8	61.5
Mean														10.9	
Mean %															84

Appendix: I: Effect of Coaching on Knowledge of Nurses about VCB and VAP by Individual Study Participants (n=36)

	Pre-Intervention		Post-Intervention		
S/N	Raw Score	Percent	Raw Score	Percent	% Change
1	7	53.8	11	84.6	30.8
2	6	46.2	11	84.6	38.4
3	8	61.5	12	92.3	30.8
4	9	69.2	11	84.6	15.4
5	8	61.5	11	84.6	23.1
6	7	53.8	11	84.6	30.8
7	8	61.5	13	100.0	38.5
8	7	53.8	13	100.0	46.2
9	7	53.8	9	69.2	15.4
10	5	38.5	12	92.3	53.8
11	4	30.8	13	100.0	69.2
12	9	69.2	12	92.3	23.1
13	2	15.4	11	84.6	69.2
14	7	53.8	8	61.5	7.7
15	2	15.4	11	84.6	69.2
16	7	53.8	12	92.3	38.5
17	4	30.8	13	100.0	69.2
18	4	30.8	10	76.9	46.1
19	5	38.5	12	92.3	53.8
20	4	30.8	12	92.3	61.5
21	6	46.2	11	84.6	38.4
22	4	30.8	13	100.0	69.2
23	5	38.5	13	100.0	61.5
24	6	46.2	11	84.6	38.4
25	9	69.2	10	76.9	7.7
26	5	38.5	12	92.3	53.8
27	7	53.8	11	84.6	30.8
28	5	38.5	6	46.2	7.7
29	3	23.1	11	84.6	61.5
30	8	61.5	10	76.9	15.4
31	8	61.5	12	92.3	30.8
32	5	38.5	9	69.2	30.7
33	4	30.8	11	84.6	53.8
34	3	23.1	8	61.5	38.4
35	3	23.1	8	61.5	38.4
36	5	38.5	8	61.5	23
Mean		44.02			0
Mean %	5.7	44.0	10.9	83.8	39.8

Appendix: J: Effect of Coaching on Knowledge of Nurses about VCB and VAP by Knowledge Item (n=36)

Knowledge Item/Parameter	Pre-Intervention	Post-Intervention	Percent Change
	Raw Score (%)	Raw Score (%)	
Which of the following is the primary cause for VAP?	12(33)	30(83)	50
Knowledge of bed elevation	13(39)	29(83)	44
Knowledge of bacteria colonization and overgrowth in the oral mucosa and VAP	14(39)	27(75)	36
Knowledge of deep venous thrombosis (DVT) prophylaxis	14(39)	29(81)	42
Definition of VAP	14(40)	26(72)	32
Primary cause of VAP in patients receiving mechanical ventilation	15(42)	30(83)	42
Reducing gastric reflux and subsequent risks of VAP using bed-head elevation of 30-45 degrees	15(42)	35(97)	55
Accumulation of secretions in ventilated patients and VAP	16(44)	33(92)	47
Knowledge of hand hygiene	16(44)	33(92)	47
Description of ventilator care bundle (VCB)	17(47)	33(92)	45
Knowledge of peptic ulcer disease (PUD) prophylaxis	18(50)	30(83)	33
Knowledge of sedation vacation	21(58)	27(85)	27
Factors associated with compliance to VCB:	24(67)	31(86)	19
Average scores	16.1(**45**)	30.2(**85**)	40

Appendix K: Nurses' Practices on the Use of VCB Pre-Intervention

Qn/no	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	Raw Score	Percent Score
1	4	3	3	5	5	5	3	5	5	5	5	5	4	5	1	5	4	4	5	1	1	**4.0**	**83**
2	4	2	3	1	3	4	5	5	5	3	5	5	3	4	1	5	5	5	5	1	1	**3.6**	**75**
3	5	1	4	5	5	5	5	3	5	5	5	5	2	5	4	5	5	5	5	1	5	**4.3**	**90**
4	2	1	3	2	2	4	4	3	3	4	2	4	4	4	1	4	4	4	4	2	2	**3.0**	**63**
5	4	3	4	4	4	4	5	5	2	5	1	1	1	3	2	5	5	5	5	1	1	**3.3**	**70**
6	3	4	1	4	4	5	5	5	5	4	3	4	4	4	1	4	4	4	4	2	2	**3.6**	**76**
7	5	3	1	5	2	1	3	4	4	3	2	1	3	3	1	4	5	5	5	2	1	**3.0**	**63**
8	4	3	4	3	4	4	3	4	5	4	5	4	4	4	3	2	5	5	5	5	4	**4.0**	**84**
9	3	2	1	5	5	5	5	4	5	5	5	5	4	4	1	5	4	5	5	1	1	**3.8**	**80**
10	3	4	5	5	5	5	5	5	5	5	5	5	5	5	1	5	5	5	5	1	1	**4.3**	**90**
11	2	1	2	4	4	4	2	3	4	1	2	1	1	4	4	5	3	5	5	5	5	**3.2**	**67**
12	4	3	4	4	3	5	4	5	4	5	3	3	4	5	2	3	5	5	5	2	2	**3.8**	**80**
13	4	3	3	1	5	5	5	5	5	5	5	5	4	5	1	5	4	5	5	2	2	**4.0**	**84**
14	4	3	3	3	3	5	5	5	5	5	3	4	5	5	2	5	5	5	5	2	2	**4.0**	**84**
15	5	1	3	4	2	4	5	4	5	1	4	4	4	5	1	5	5	5	5	1	1	**3.5**	**74**
16	5	1	5	5	3	5	3	5	3	3	3	3	3	5	1	5	5	5	5	3	3	**3.8**	**79**
17	5	3	2	3	4	5	4	5	5	3	4	4	5	4	1	5	5	5	5	2	2	**3.9**	**81**
18	5	1	4	1	4	5	5	5	4	5	5	5	4	5	1	5	5	5	5	1	1	**3.9**	**81**
19	3	4	4	4	2	5	1	4	5	2	3	2	3	3	3	5	4	5	4	3	3	**3.4**	**72**
20	3	2	5	2	3	3	3	3	5	2	3	2	4	4	2	2	3	5	5	2	2	**3.1**	**65**
21	5	1	4	4	2	5	1	5	3	3	4	4	3	4	3	5	3	4	5	4	3	**3.6**	**75**
22	4	3	4	2	3	3	3	5	4	3	4	4	3	4	1	4	5	5	5	1	1	**3.4**	**71**
23	3	2	4	1	4	4	3	5	4	5	4	4	3	3	1	5	5	5	5	3	1	**3.5**	**74**
24	5	1	3	1	5	4	4	5	1	4	3	3	4	3	2	5	4	4	4	2	2	**3.3**	**69**
25	2	1	1	4	2	5	5	5	2	4	3	4	3	4	1	5	5	5	4	1	5	**3.4**	**71**
26	3	1	1	1	3	3	3	4	3	4	4	4	4	5	1	5	5	5	5	1	1	**3.1**	**66**
27	4	3	4	5	4	3	3	4	4	2	4	3	2	3	2	4	4	4	4	2	2	**3.3**	**70**
28	4	5	2	5	1	2	2	5	4	2	5	4	3	3	4	5	4	4	4	4	4	**3.6**	**76**
29	2	1	1	1	1	1	1	1	1	1	1	1	1	1	2	3	5	5	5	5	1	**2.0**	**41**
30	5	3	3	5	3	5	5	5	5	5	5	3	3	5	2	5	5	5	5	2	4	**4.2**	**88**
31	4	2	2	3	4	4	2	4	4	3	3	3	3	3	2	4	4	4	3	2	2	**3.1**	**65**
32	3	4	4	4	2	5	1	4	5	2	3	2	3	3	3	5	4	5	4	3	3	**3.4**	**72**
33	2	1	2	4	4	4	2	3	4	1	2	1	1	4	4	5	3	5	5	5	5	**3.2**	**67**
34	2	1	3	2	2	4	4	3	3	4	2	4	4	4	1	4	4	4	4	2	2	**3.0**	**63**
35	4	5	2	5	1	2	2	5	4	2	5	4	3	3	4	5	4	4	4	4	4	**3.6**	**76**
36	3	1	1	1	3	3	3	4	3	4	4	4	4	5	1	5	5	5	5	1	1	**3.1**	**66**
Mean	**3.7**	**2.4**	**3.0**	**3.4**	**3.4**	**4.2**	**3.6**	**4.5**	**4.2**	**3.7**	**3.9**	**3.8**	**3.6**	**4.4**	**2.3**	**5.0**	**4.9**	**5.2**	**5.2**	**2.8**	**2.9**	3.51	
Mean Percent	**133**	**85**	**108**	**122**	**121**	**151**	**131**	**162**	**152**	**134**	**140**	**136**	**131**	**157**	**83**	**179**	**176**	**188**	**187**	**102**	**104**		71.65

Appendix L: Nurses' Practices on the Use of VCB Post-Intervention

Qn/no	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Raw Score	Percent Score
1	1	3	1	2	1	3	4	3	5	4	4	4	4	4	5	1	5	5	5	5	1	1	3.4	71
2	1	5	1	3	3	5	5	5	5	4	4	4	3	4	5	1	5	5	5	5	2	3	4.0	83
3	5	5	4	3	1	5	5	5	5	5	5	5	5	5	5	2	5	5	5	5	2	2	4.5	94
4	2	5	1	5	4	5	5	5	5	5	5	4	5	2	4	1	5	5	5	5	1	1	4.0	85
5	1	4	3	1	5	4	5	3	5	5	5	3	4	5	5	1	5	5	4	4	1	1	3.8	79
6	2	3	2	4	2	4	5	4	5	5	4	4	4	4	5	1	5	5	4	5	1	1	3.8	79
7	1	5	5	4	1	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4.8	101
8	4	5	1	5	5	5	4	5	5	5	5	5	5	5	5	1	5	5	5	5	1	1	4.4	92
9	1	5	1	5	5	5	5	5	5	4	5	4	4	4	4	1	5	5	5	5	1	1	4.0	85
10	1	3	3	3	2	4	2	4	2	4	1	2	3	3	3	4	4	4	3	3	4	3	3.1	65
11	5	4	2	3	2	4	5	5	5	5	5	5	5	5	5	1	5	4	5	4	3	2	4.2	89
12	2	5	3	3	3	5	5	3	5	5	4	5	5	5	5	1	5	5	5	5	1	1	4.1	86
13	2	5	2	5	5	4	5	4	5	5	3	5	4	5	4	2	5	5	5	5	1	1	4.1	87
14	2	4	2	4	1	3	4	2	5	5	4	5	5	2	2	2	5	5	4	5	3	5	3.8	79
15	1	4	3	2	4	5	5	2	5	5	5	4	4	3	5	1	5	5	5	5	1	1	3.8	80
16	3	4	3	1	2	2	5	2	5	5	4	5	4	3	4	1	5	5	5	5	1	1	3.6	75
17	2	5	4	3	2	2	5	2	5	5	4	5	5	3	3	1	5	3	3	5	2	5	3.8	79
18	1	3	1	3	1	5	5	5	5	3	4	2	2	4	5	5	5	5	5	5	1	1	3.6	76
19	3	5	3	3	1	4	5	5	5	3	1	5	3	5	4	1	5	5	5	5	2	2	3.8	80
20	2	4	2	3	1	3	5	4	5	5	4	5	4	2	2	1	5	5	5	5	1	1	3.5	74
21	3	4	1	3	4	5	4	1	5	5	5	4	3	1	4	1	5	5	4	5	1	1	3.5	74
22	1	3	1	3	1	2	4	2	5	5	5	5	5	2	5	1	5	5	5	5	1	1	3.4	72
23	1	5	4	4	3	3	5	2	5	5	5	5	5	3	4	2	4	5	4	5	2	1	3.9	82
24	2	5	1	3	5	5	5	5	5	5	5	5	5	3	5	1	5	5	5	5	1	1	4.1	87
25	5	5	1	3	3	4	4	4	4	4	2	3	2	3	4	2	4	5	5	5	4	2	3.7	78
26	1	5	1	5	3	5	5	5	5	5	5	4	5	2	4	1	5	5	5	5	1	1	4.0	83
27	2	5	2	4	4	3	4	4	5	3	3	2	3	4	4	1	5	5	5	5	2	1	3.6	76
28	4	4	1	5	5	3	5	5	5	5	4	4	4	4	4	5	5	5	5	5	5	4	4.6	96
29	1	3	2	3	3	2	5	5	5	5	5	5	5	3	5	1	5	5	5	5	1	1	3.8	80
30	4	5	1	2	1	4	4	4	5	5	5	4	4	4	4	1	4	4	5	5	1	1	3.7	77
31	2	5	4	3	1	5	5	5	5	5	5	5	5	5	5	2	5	5	5	5	2	2	4.3	91
32	3	5	3	3	1	4	5	5	5	3	1	5	3	5	4	1	5	5	5	5	2	2	3.8	80
33	5	4	2	3	2	4	5	5	5	5	5	5	5	5	5	1	5	4	5	4	3	2	4.2	89
34	2	5	1	5	4	5	5	5	5	5	5	4	5	2	4	1	5	5	5	5	1	1	4.0	85
35	4	4	1	5	5	3	5	5	5	5	4	3	4	4	4	5	5	5	5	5	5	4	4.5	95
36	1	5	1	5	3	5	5	5	5	5	5	4	5	2	4	1	5	5	5	5	1	1	4.0	83
Mean	**2.3**	**4.4**	**2.1**	**3.4**	**2.8**	**4.0**	**4.7**	**4.0**	**4.9**	**4.6**	**4.2**	**4.3**	**4.2**	**3.6**	**4.3**	**1.7**	**4.9**	**4.8**	**4.8**	**4.9**	**1.9**	**1.8**	3.92	
Mean Percent	**83**	**158**	**74**	**124**	**99**	**144**	**169**	**145**	**176**	**167**	**150**	**153**	**151**	**130**	**154**	**61**	**176**	**174**	**171**	**175**	**68**	**65**		80.19

Appendix M: Performance of Nurses *on the Use of VCB Pre and Post Coaching* against Each Practice Parameter(n=36)

	Pre-intervention								Post-intervention								
	Frequency (%)					Mean	SD	Category	Frequency (%)					Mean	SD	Category	Change (+ or –)
Practice Parameter / Statement or Question	Never	Rarely	Sometimes	Often	Always				Never	Rarely	Sometimes	Often	Always				
I use the VCB to take care of ventilated patients	0(0.0)	6(17)	9(25)	12(33)	9(25)	3.7	1.04	Moderate	13(36)	11(31)	4(11)	4(11)	4(11)	2.3	1.37	Poor	-1.4
I refer to the VAP guideline in the CCU when caring for ventilated patients	14(39)	5(14)	11(31)	4(11)	2(6)	2.3	1.26	Poor	0(0)	0(0)	6(17)	10(28)	20(56)	4.4	0.77	Good	2.1
I have treated ventilator-associated pneumonia patients in the Critical Care Unit	7(19)	6(17)	9(25)	11(31)	3(8)	2.9	1.27	Poor	16(44)	8(22)	7(19)	4(11)	1(3)	2.1	1.17	Poor	-0.8
I position the ventilated patient in a supine positioning rather than semi-recumbent positioning	8(22)	4(11)	4(11)	10(28)	10(28)	3.3	1.54	Moderate	2(6)	3(8)	17(47)	5(14)	9(25)	3.4	1.13	Moderate	0.1
I perform daily short-term interruption of iv sedatives and analgesic med ventilated patients to wean them off the ventilator	3(8)	8(22)	9(25)	10(28)	6(17)	3.2	1.22	Moderate	11(31)	6(17)	7(19)	5(14)	7(19)	2.8	1.52	Poor	-0.4
I use the physician order treatment chart to process all sedation orders	2(6)	2(6)	5(14)	11(31)	16(44)	4.0	1.16	Good	0(0)	4(11)	7(19)	10(28)	15(42)	4.0	1.04	Good	0

I check patient's daily flow sheet to confirm whether sedation was interrupted and assess daily readiness for extubation	4(11)	5(14)	10(28)	5(14)	12(33)	3.4	1.38	Moderate	0(0)	1(3)	0(0)	8(22)	27(75)	4.7	0.62	Good	1.3
I use drugs e.g. PPI or H2 blockers, antihistamines to prevent gastric ulcers and thus reduce VAP	1(3)	0(0)	6(17)	10(28)	19(53)	4.3	0.94	Good	1(3)	6(17)	3(8)	7(19)	19(53)	4.0	1.25	Good	-0.3
I start prophylaxis for peptic ulcer disease on all patients admitted in the ICU	2(6)	2(6)	6(17)	11(31)	15(42)	4.0	1.16	Good	0(0)	1(3)	0(0)	1(3)	34(94)	4.9	0.52	Good	0.9
I use the medication administration record to check whether the patients have PUD prophylaxis ordered.	11(31)	8(22)	7(19)	8(22)	11(31)	3.4	1.38	Moderate	0(0)	0(0)	4(11)	5(14)	27(75)	4.6	0.68	Good	1.2
I use PUD prophylactics while patients are on complete bed rest	2(6)	5(14)	10(28)	8(22)	11(31)	3.6	1.23	Moderate	3(8)	1(3)	2(6)	11(31)	19(53)	4.2	1.21	Good	0.6
I include PUD prophylactics as part of CCU order admission set and ventilator order set.	5(14)	3(8)	6(17)	15(42)	7(19)	3.4	1.30	Moderate	0(0)	3(8)	3(8)	12(33)	18(50)	4.3	0.94	Good	0.9
I use chlorhexidine as part of the CCU order admission set and ventilator order set.	4(11)	2(6)	13(36)	14(39)	3(8)	3.3	1.09	Moderate	0(0)	2(6)	6(17)	11(31)	17(47)	4.2	0.92	Good	0.9
I adhere to all oral care protocol; chlorhexidine oral rinse, washing hands, clean mouth using toothbrush or gauze, rinse mouth with a clean swab etc.	1(3)	0(0)	10(28)	13(36)	12(33)	4.0	0.94	Good	1(3)	7(19)	8(22)	9(25)	11(31)	3.6	1.20	Moderate	-0.4

I do not adhere to good oral hygiene to reduce VAP	18(50)	9(25)	4(11)	5(14)	0(0)	1.9	1.09	Poor	0(0)	2(6)	2(6)	16(44)	16(44)	4.3	0.82	Good	2.4
I perform ETT and subglottic suctioning to keep removing secretions	0(0)	2(6)	2(6)	7(19)	25(69)	4.5	0.85	Good	25(69)	6(17)	0(0)	1(3)	4(11)	1.7	1.33	Poor	-2.8
I wash/sanitize my hands before entering in critical care unit	0(0)	0(0)	4(11)	13(36)	19(53)	4.4	0.69	Good	0(0)	0(0)	0(0)	4(11)	32(89)	4.9	0.32	Good	0.5
I wash/sanitize my hands before patient touching	0(0)	0(0)	0(0)	10(28)	26(72)	4.7	0.45	Good	0(0)	0(0)	1(3)	4(11)	31(86)	4.8	0.45	Good	0.1
I wash/sanitize my hands after touching patient	0(0)	0(0)	1(3)	10(28)	25(69)	4.7	0.54	Good	0(0)	0(0)	2(6)	5(14)	29(81)	4.8	0.55	Good	0.1
I don't use antimicrobial soap to wash my hands	12(33)	13(36)	4(11)	3(8)	4(11)	2.3	1.32	Poor	0(0)	0(0)	1(3)	3(8)	32(89)	4.9	0.42	Good	2.6
I do not use alcohol-based hand rubs to sanitize my hands	13(36)	11(31)	4(11)	4(11)	4(11)	2.3	1.37	Poor	20(56)	8(22)	3(8)	2(6)	3(8)	1.9	1.28	Poor	-0.4
Average percentage scores	14	12	18	25	32				12	8	11	19	51				