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INTENSIVE CARE NURSES' KNOWLEDGE, ATTITUDES AND PRACTICES OF ORAL CARE FOR PATIENTS WITH ORAL ENDOTRACHEAL INTUBATION

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A research report submitted to the

Faculty of Health Sciences, University of the Witwatersrand, Johannesburg

in partial fulfilment the requirements for the degree

of

Master of Science in Nursing

Johannesburg, 2016

DECLARATION

I, Esther Tembo, declare that this report is my own work and is being submitted to the faculty of Health Sciences, as a requirement for the fulfilment of a master's degree in Nursing. This report has never been submitted or published for any other degree or purpose before.

Signature :.....

.....day of.....2016

Protocol no: M131109

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Thanks are to God Almighty who has kept me well throughout my study period at the university and to Dr Shelley Schmollgruber my supervisor for assisting me with research procedure. To all nurses who took part in this research and to my family, same as all my friends at the university for their support during the research period.

To God be all the Glory

ABSTRACT

Oral hygiene is the basic nursing care activity that promotes health, comfort and pleasant environment that everyone needs. Studies have shown that oral care is not only influenced by knowledge but also the characteristics of the environment. Providing effective oral hygiene in ICU can be challenging due to patient's medical conditions, treatment, equipment and consciousness level of these critically ill patients. Oral care that is evidence based has proved to overrule this challenge. Studies have shown that the mouth of critically ill patients become colonized with bacteria within 48 hours of admission (Garcia et al. 2009; Grap et al. 2009; Sole et al. 2002). Evidence-based oral care interventions can assist in the prevention of colonization of the mouth by bacteria capable of causing serious and often fatal respiratory infections, such as ventilator associated pneumonia.

The purpose of this study was to investigate ICU nurses knowledge, attitudes and practices related to oral care for intubated patients with the associated factors of the same. The intention of the study was also to make recommendations for clinical practice and education of ICU nurses.

A non-experimental, quantitative, descriptive and cross-sectional design was used to evaluate ICU nurses knowledge, attitudes and practices regarding evidence-based guidelines and recommendations about oral care for intubated critically ill patients. Data were collected from ICU nurses who were purposively selected using a validated questionnaire (Lin, Chang, Chang and Lou, 2011) to obtain the quantitative results on their knowledge, attitudes and practices of oral care for intubated patients. Data analysis was done by means of descriptive and inferential statistics using graphs, frequency distributions, means and standard deviations and Spearman's rank order correlation coefficient (rho) and Kruskahl Wallis H test. Testing was done at the 0.05 level of significance.

The knowledge, attitudes and practices of 81 nurses working in 5 adult ICUs from one university-affiliated, public sector hospital and tertiary level institution in Johannesburg was tested using the data collection instrument. Knowledge, attitude and practices of trained ICU nurses working in the ICUs were found to be lacking in the evidence-based practice guidelines and recommendations. Of the 81 participants, the mean score for knowledge, attitudes and practices were 31.84%, 60.02% and 52.25%, respectively. A higher level of qualification and years of intensive care experience were not significant factors related to knowledge and the frequency of performing oral care. Although, ICU nurses learning from multiple sources about oral care will improve knowledge and increase the frequency with which they provide oral care for patients. In this study, the correlation coefficients were small; therefore the implications of these findings should be viewed with caution. Overall the findings show that ICU nurses lack knowledge on best practice in the implementation of oral care for patients with endotracheal intubation.

Recommendations to address this lack of knowledge were made for ICU nurses to learn more about oral care using a combination of different educational strategies, which will enhance knowledge and improve their practice.

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CHAPTER ONE

OVERVIEW OF THE STUDY

1.0 INTRODUCTION

Oral hygiene is considered a basic aspect of nursing care (Berry and Davidson, 2006:320; Jones, Newton and Bower, 2004). Intensive Care Unit (ICU) patients are totally dependent on nursing staff for personal and oral care activity. Providing this kind of practice in ICU is difficult due to several challenges, which include mechanical obstacles, perception of importance, patient perception of oral care activity, feeling of discomfort during the procedure and finally, communication barriers (Berry and Davidson, 2006:321).

However, oral care interventions should be provided for all patients in ICU especially those patients on mechanical ventilation in order to clean and moisten the respiratory tract thereby preventing hospital acquired infections, such as ventilator associated pneumonia (VAP) (Jones, et al. 2004: 70). A lack of recognition of oral care interventions can be attributed to the fact that there is limited knowledge and attitude related to the importance of oral care in reducing oropharyngeal colonisation which results in ventilator associated pneumonia (VAP) (Jones et al. 2004: 70). Hence this study will look at ICU nurses knowledge, attitudes and practices related to oral care for intubated critically ill patients.

1.1 BACKGROUND OF THE STUDY

Oral care is a basic nursing activity that promotes health, comfort for patients and also prevents hospital acquired infections. Ventilated associated pneumonia occurs in 9% to 28% of patients treated with mechanical ventilation (Berry, Davidson, Masters and Rolls, 2007: 553; Cutler and Davis, 2005: 390).

Providing effective oral hygiene in ICU units, according to a review of literature by Jones, *et al.* (2004: 69) and Berry and Davidson (2006: 321), may be challenging due to medical condition, treatment, equipment and the consciousness level of the patient. The presence of an endotracheal tube and oro-gastric tube makes it even more difficult to perform oral care.

The mouth, according to Halm and Armola (2009: 275) and Munro, Grap, Elsiwick, Mckinney, Curtis and Hummel (2006: 454), also contains normal flora. A change in the oral enzymes of a critically ill patient causes the normal flora to change to pathogens capable of causing pneumonia within 48 hours. The accumulation of oral microorganisms and reduction in saliva also lead to tenacious adherence of a biofilm on the teeth, commonly known as dental plaque. This serves as a reservoir for the growth of micro-organisms when oral care is inadequate. Dental plaque, according to a study conducted by Munro *et al.* (2006:453), increases the risk of VAP in severely ill patients. A reduction in the amount of saliva and lactoferrin enhances the risk for the development of VAP.

In addition, the presence of an endotracheal tube reduces saliva production. This change in salivary production, according to Vollman, Garcia and Miller (2005: 13), leads to a decrease in the number of normal flora in the mouth and creates a media for the growth of bacteria. Colonisation of tissues in the mouth is followed by an accumulation of secretions, which, when aspirated, is a media rife for development of infection.

Oral care removes these biofilms by cleaning, debriding, suctioning and moisturising the oral cavity. This is supported by a study conducted at Brookdale University Medical Center in New York, as cited by Vollman *et al*. (2005: 13), in which the rate of VAP among patients in the medical ICU unit decreased after implementation of a comprehensive oral care programme. This shows that oral care based on best research evidence promotes health and wellness by reducing hospital acquired infections.

This means it involves the use of best research evidence to support clinical decisions. Best research evidence, according to Burns and Grove (2009:11), *"Is the summary of the highest quality, current empirical knowledge in the specific area of health care that is developed from a synthesis of quality studies (quantitative, qualitative)."* Strong evidence depends on the quality of research studies in a particular field. According to these authors, research evidence assists in health care planning of *"health outcomes for patients, families, and communities"* (Burns and Grove 2009: 26). Therefore, *"Encouraging nurses to learn more about oral care using diverse educational resources will enhance their knowledge and improve their practice"* (Lin, Chang, Chang and Lou, 2011: 3204). Research evidence also helps in the development of policies, protocols and hospital guidelines. Nursing

administrators need to design policies and procedures which guide provision of oral care within the hospital with the aim of improving nursing care in ICU (Lin et al. 2011: 3204).

American Association of Critical Care Nurses (AACN) guidelines for patients in Critical Care Units and acute care settings, recommends that the teeth, gums and tongue should be brushed at least twice a day using a paediatric or soft tooth brush to remove plaque and moisturiser should be added to oral mucosa and lips every 2 to 4 hours (Vollman, 2010). In addition, chlorhexidine (0.12%) rinse should be used twice a day during the pre-operative period for patients undergoing cardiac surgery.

The AACN (2006) guidelines also recommends assessment of the oral cavity and lips every 8 hours for build-up of dental plaque and the potential for infection related to oral abscesses. Oral swabs with 1.5% hydrogen peroxide solution should be used to clean mouth every 2 to 4 hours. Suctioning of the oral cavity/pharynx should be done frequently to avoid the risk of aspiration.

According to the Mosby dictionary as quoted by Human and Bell (2007: 61), oral care also includes cleaning the mouth with a toothbrush to remove food particles and massaging gums. Furthermore, Elliott, Aitken and Chaboyer (2007) state that effective oral care prevents pressure sores from devices such as endotracheal tubes and prevent oral lesions from grinding of teeth and biting of tongue (Elliott, et al. 2007; Jones, et al. 2004:70).

In South Africa, Gomez (2010) conducted a study, in both private and public hospital settings, which investigated the evidence of prevention of Ventilator Associated Pneumonia (VAP). The results showed that nurses lacked knowledge on evidenced-based practice in relation to prevention of VAP (Gomez, 2010).

Although the methodology used in the study was correct, this study (Gomez, 2010) had a limitation as oral care was not included in this VAP prevention bundle. However, this indicates that without knowledge it is unlikely that these nurses would follow a VAP prevention protocol, let alone oral care. It also means that providing evidence-based oral care guidelines to ICU nurses would promote the likelihood that these nurses comply with evidenced-based practices.

Not much has been studied about oral care in South Africa. This study will be conducted in a South African ICU and the focus will be on oral care, oral care practices, knowledge and attitudes of ICU nurses.

1.2 PROBLEM STATEMENT

Oral care is perceived as an unpleasant and basic nursing activity and hence it is mostly not a priority than other aspects of care (Berry and Davidson, 2006; Cutler and Davis, 2005; 006). Apart from promotion of comfort and pleasant smell, oral care interventions also address three important ventilator associated risk factors. These are oro-pharyngeal colonisation, oral secretions which can migrate to the sub glottal area and removal of dental plaque.

Studies have shown that nursing activities that are performed under evidenced based practice improve patient outcomes. Evidenced based practice, according to Burns and Grove (2009:11), *"is the integration of best research evidence with clinical expertise, patient needs and values in the delivery of quality, cost effective health care."* This means it involves the use of best research evidence to inform clinical decision making. Patient's oral hygiene that is evidenced-based helps to activate host defences against invading microorganisms therefore, this study will look at ICU nurses' knowledge, attitudes and practices related to oral care for intubated patients.

The study attempted to answer the following research questions:

- Do ICU nurses have **knowledge** on evidence-based guidelines for oral care for intubated patients?
- Are the evidence-based guidelines being implemented in the ICUs, and what are the **attitudes** of nurses toward the implementation of the evidence-based guidelines for oral care for intubated patients?
- Do training, age and years of experience in ICU influence knowledge levels of ICU nurses on evidence-based guidelines for oral care for intubated patients?

1.3 PURPOSE OF THE STUDY

The purpose of the study is to investigate ICU nurses knowledge, attitudes and practices related to oral care for intubated patients with the same associated factors. The intention of the study is to make recommendations for clinical practice and education of ICU nurses.

1.4 RESEARCH OBJECTIVES

The objectives of the study are:

- To determine and describe ICU nurses' knowledge, attitudes and practices related to oral care for intubated patients in ICUs.
- To establish if there is a relationship between selected demographic data of participants and their knowledge, attitudes and practices related to oral care for intubated patients in ICUs.

1.5 SIGNIFICANCE OF THE STUDY

Oral care assists in removing microorganisms which accumulate in the mouth and are capable of causing VAP. This is done by removing biofilms which adhere to the teeth. This study will look at knowledge of nurses on the importance of oral care and their attitude related to this practice. *"Nurses who have resources of learning about oral care have greater knowledge about it and provide oral care to intubated patients more frequently which will improve their practice"* (Lin, et al. 2011: 3204). This assists in improving the quality care rendered to ICU patient, consequently promoting comfort, reducing mortality rates, length of hospital stay and cost.

1.6 RESEARCHER'S ASSUMPTIONS

Assumptions are specific ways of structuring reality (Brink, 2006: 27). It is the general view of the world and the nature of research which the researcher holds; it is the mental window through which the researcher sees the world. The research study was based on the following meta-theoretical, theoretical and methodological assumptions:

1.6.1 Meta- theoretical Assumptions

This is a term used to designate theory with a process creating steps in theory (Brink, 2006: 19). *"It does not address the sustentative content of health sciences, except to define the types of theory appropriate within a discipline"* (Brink, 2006: 19). Its focus is on broad areas which include the purpose, type of theory that is needed, proposal and critique of the way the theory has been development (Brink, 2006). According to this research, meta-theory is based on the following assumptions:

- **Person**

Oral care involves brushing to remove the mouth of residue and debris, massaging the gums to promote circulation (Mosby dictionary as quoted in Human and Bell, 2007). This prevents mouth sores caused by devices in ICU; it also prevents trauma from grinding of teeth and tongue biting. As such, the patient has a pleasant smell which attracts family and visitors and gives the patient the feeling of being well cared for. The healthcare personnel are expected to provide quality care to the patient.

- **Environment**

The ICU environment contains patient who are critically ill. Most of these patients are intubated, unconscious and delirious (Berry and Davidson, 2006:321). This situation makes oral care more difficult to perform. Inadequacy of oral care causes accumulation of microorganism in the mouth and the devices also result in reduction of saliva. This causes media for growth of bacteria leading to a foul smell and an unpleasant environment. Oral care promotes health, comfort and a pleasant environment.

- **Health**

Evidence-based oral care assists nurses to comply with effective methods that are effective in reducing ventilator associated pneumonia. Oral care reduces bacterial load in the mouth and sub glottal region and promotes improved health. According to Florence Nightingale,

health is not only to be well, but to be able to use whatever power we have (Vollman, 2006). VAP is a causative factor of increased hospital stay in ICU. Prevention promotes quick recovery, quality health and reduces nurses' workload.

- **Nursing**

Oral care is on one of the fundamentals of nursing (Lin, et al. 2011: 3204). Performing oral care interventions in ICU is challenging due to equipment, unconscious level of patients and treatment. Oral care prevents hospital acquired infections including VAP, which results in increased length of hospital stay, cost and mortality rate. Hence nurses work load is increased, therefore poor provision of care and more critically ill patients.

1.6.2 Theoretical Assumptions

"Theory is a systematic abstraction of reality that serves a purpose" (Brink, 2006: 19). Systematic means a specific pattern, abstraction illustrates the method of representing reality and purposes defines *"description, explanation and prediction of phenomena as well as control of some reality"* (Brink, 2006). According to the author, theory systematically summarises a particular phenomenon in a well organised manner which can be tested in real world.

Definitions for the purpose of this study are as follows:

- **Intensive Care Unit (ICU)**

A special area in a hospital where critically ill patients who need close observation and frequent ministrations can be cared for by highly qualified, specifically trained staff working under the best possible conditions.

- **Critically ill patient**

This is a patient who is in a critical situation and needs close observation and is dependent on the nurse for activities of daily living and also nursed in a high dependency unit.

- **Intensive Care nurse**

An ICU nurse is a clinical nurse who functions at an advanced level of patient care in a multidisciplinary nursing environment – she/he may be formally trained – a registered nurse with no formal ICU qualification, or formally trained. According to the South African Nursing Council (SANC), a critically trained nurse is a registered nurse who obtains an additional (post basic) qualification in critical care nursing (R212 of 1985 and amended: 119:2) (De Beer, Brysiewicz and Bhengu 2011:6). In this study, an ICU nurse is one who has had training at a SANC (1985) approved learning facility (university or college) under the R212, or informal training through orientation and in-service training.

- **Oral Care**

This is a basic nursing activity which involves cleaning, debridement, suctioning and moisturising the entire oral cavity, hence preventing pressure ulcers from oral intubation devices. It also involves massaging the gums with a paediatric soft tooth brush.

- **Evidence-based practice guidelines**

Evidence-based practice is a set of systematically developed statements, usually based on scientific evidence, to assist practitioners and patient decision making about appropriate health care measures for specific clinical circumstances (Marquez, 2001:5). For this study, information based on evidence influences nurses performance of oral care practice, attitude and knowledge concerning the importance of the procedure, hence its priority against other activities.

- **Knowledge**

Knowledge is an essential body of information for nursing that can be obtained through multiple sources: for example personal experience, role-modelling and mentorship, intuition, reasoning and research (Grove, Burns and Gray, 2013). For the purpose of this study it portrayed nurses' understanding of oral care for patients with an endotracheal tube.

- **Attitude**

Attitude is a mental state organised through experience, exerting a directive influence upon the individuals response to all situations in which it was related (Van Achterberg, Schoonhoven and Grol, 2008). According to the Oxford Dictionary (2007:57), attitude is referred to the way one behaves towards somebody which showed how the person was thinking or feeling. For this study, attitude refers to nurses' thoughts or feelings about oral care for patients with an endotracheal tube.

- **Practice**

Practice refers to the actual application or use of an idea, belief or method. According to the Oxford Dictionary (2007:802), it is a way of doing something that was the usual or expected way in a particular organisation or situation. For the purpose of this study, practice refers to the nurses' direct participation and application of oral care for patients with an endotracheal tube.

1.6.3 Methodological Assumptions

Methodological assumptions, according to Brink (2006: 22), "are thoughts that guide and influence the researchers' investigation." It assists in constructing problems and directing the research study. "This assists the researcher to judge appropriate tools and evaluate quality of the research effort" (Brink, 2006). This concept is adopted based on reality of the result and its application to a discipline.

Health care professionals are currently under pressure to modify evidence based practice. According to Brink (2006: 13), *"Managers in the field worldwide accept the value of research and evidence based practice but are concerned about the limited extent to which health care professionals utilise and draw upon research findings to determine or guide their discussion about patient care in the past."*

Health care consumers usually do not question health care practice or make suggestions that protocols are not based on evidence (Brink, 2006: 13). *"Whether this acceptance had its source in trust or fear it is debatable"* (Brink, 2006). However, according to the author,

consumers are now becoming assertive and are adding the demand to base clinical practice on scientific evidence.

In order to practice evidence-based care, according to Brink (2006: 14), health care professionals are developing skills to access evidence and use it appropriately. *"Where evidence is not available, careful considered decisions should be made, but to ensure that clinical decisions are informed as far as possible there is need for evidence"* (Brink, 2006).

This research process followed an evidence-based process in which a problem was identified and best evidence to problem was sought. The evidence was evaluated for its veracity and usefulness based on its effectiveness of oral care that produces effective results to prevent VAP. The research was implemented based on the true evidence and the findings were evaluated.

1.7 OVERVIEW OF RESEARCH METHODOLOGY

This is a brief outline of the research methodology, to be discussed in greater detail in Chapter Three.

1.7.1 Research Design

The research design for this study was non-experimental, quantitative, descriptive and cross-sectional. This design was chosen because the study involved no manipulation of variables. An existing questionnaire survey was used for data collection.

1.7.2 Research Methods

Population

The population involved ICU nurses employed in five adult ICUs of the selected institution. An inclusion criterion was registered nurses currently working in an ICU.

Sample and sampling

A sample size was decided upon by a biomedical statistician, based on good representation of the population and validity of the study. Sampling was a non-probability purposive sampling method. The inclusion criteria were decided upon nurses who best represent the problem. This was based on experience and education level.

Data collection

Permission was sought from managers of the hospital in the form of a letter. Unit managers' permission was also sought to conduct a study in their unit. Data collection followed the recommended ethical procedure of a research study.

Instrument

A questionnaire developed by Lin, *et al.* (2011), was used. The instrument has five sections related to demographic data for nurses, knowledge, attitude and practices about oral care in intubated patients. This instrument was designed from literature and clinical experience and tested on an independent sample of 205 ICU nurses in China (Lin et al. 2011).

1.8 VALIDITY AND RELIABILITY OF THE STUDY

This study used an instrument developed by Lin, *et al.* (2011: 3207). These investigators ensured face and content validity in the sample of the original study. The instrument has been reviewed by local domain nursing experts in this field of study to see if the content of the instrument is applicable to the South African context.

A pilot test was done before the main study to ensure feasibility of the study and detect possible flaws in the instrument used. A prospective study will allow the investigation of usual or unexpected results during the data collection and investigate causes that yield such results.

Reliability was maintained by ensuing consistency and accurate recording of data. Data collection was only done by the researcher. An appropriate sample size was discussed with a statistician so as to be representative of the population of the study, taking into consideration possible refusal and sample mortality rates. Sample inclusion and exclusions was followed.

1.9 ETHICAL CONSIDERATIONS

The following ethical considerations were taken into consideration during and prior to commencement of the study:

- Protocols were submitted for peer review to the Department of Nursing Education to assess the feasibility of the proposed study.
- The protocol was submitted to the University Postgraduate Committee for permission to conduct the study.
- Clearance was obtained to conduct research from the Committee for Research on Human Subjects (Medical) of the University of the Witwatersrand.
- Permission was obtained to conduct the study from the Hospital Management and Department of Health to conduct research in the hospital.
- An information letter accompanied the data collection tool in order to inform the participant about the purpose of the study.
- Informed consent was obtained in writing from the respondents.
- It was explained to the participants in the study that participation was voluntary and they could decline to answer questions, as well as discontinue participation in the study at any time without incurring any penalty.
- Confidentiality and anonymity of the participants was ensured as code names were used instead of actual names during data collection and reporting.

1.10 PLAN OF THE STUDY

The study will be presented as follows:

- Chapter One: Overview of the study.
- Chapter Two: Literature review.
- Chapter Three: Research design and methods.
- Chapter Four: Data analysis and results.
- Chapter Five: Summary, conclusion and recommendations.

1.11 SUMMARY

This chapter has presented an outline of the study. The problem statement, purpose, research objectives and the significance of the study has been described. The assumptions of the researcher have been discussed and the operational terms defined. A brief overview has been given of the research methodology, validity and reliability of the study and the ethical procedures adhered to.

The following chapters will include a review of the literature, the methodologies, data analysis, the description and interpretation of research findings. The final chapter will present limitations of the study, as well as a summary of the study findings, conclusions and recommendations for future research.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter will discuss the literature reviewed in relation to the study. It will cover ventilator associated pneumonia, current guidelines, protocols and evidence based bundles, oral care, and nurses' knowledge, attitudes and practices related to oral care. The main purpose of the literature review is to help the researcher to build a logical framework for the study and set it within tradition of enquiry and context of related studies (De Vos, et al. 2005).

2.2 CONCEPT CLARIFICATION

The Intensive Care Unit (ICU) is a specialist area which provides for the needs of a critically ill patient, through continuous observation, treatment and support, so as to restore health and prevent complications (De Beer, et al. 2011:6) Patients in ICU are in a vulnerable state due to the critical illness itself, which results in dependence on nursing staff to provide assistance with activities required for daily living and reduce discomfort from treatments, dry mouth, secretions and growth of bacteria (Dale, Angus, Sinuff and Mykhalovsky, 2013:267). Amongst the problems that occur in ICU, ventilator associated pneumonia (VAP) is the main reason for provision of oral hygiene (Dale, et al. 2013:267).

Traditionally, oral care was viewed as a basic aspect of nursing care which focused on patient comfort but studies have revealed that VAP is preventable through implementation of certain interventions. Oral care is recognised as an important nursing intervention to prevent infections, including VAP. The Institute for Healthcare Improvement (IHI), Centre for Disease Prevention and Control (CDC) and the American Critical Care Nurses Association (AACN) have developed VAP bundles that recommend the implementation of three to four interventions to more effectively reduce the occurrence of VAP in mechanically ventilated patients. Beyond the interventions in the AACN bundle, in April 2010 the ACCN produced a practice alert entitled "Oral care for patients at risk of ventilator associated pneumonia," which describes the recommended oral care practices for

patients on mechanical ventilators. Thus oral care and VAP are viewed as interrelated interventions in the provision of care for mechanically ventilated patients.

2.2.1 Evidence based guideline

Evidence based practice (EBP), according to Vollman (2006), consists of an explicit combination of guidelines integrated in such a way that it is evidence-based on patient preferences and professional skills for health care practice. EBP is the synthesis of study findings addressing a particular clinical problem (Burns & Grove, 2009: 11).

Research evidence from various research studies assists in development of standard guidelines. According to Burns and Grove (2009:11), evidence based guidelines are rigorous steps designed for a clinical situation. These guidelines are mostly developed by a team or panel of expert researchers (Nurses and other health care practitioners). EBP has proven to be effective in producing good results, based on expert interventions.

Clinical expertise, according to Brink (2006:14) and Burns and Grove (2009: 11), refers to the skills, experience and knowledge of professional practitioners. According to EBP, Clinical expertise assists in provision of required oral care that result in good clinical outcome. Nurse's clinical expertise is determined by his or her years of practice, research literature and educational level (Burns and Grove, 2009:11).

Evidence-based oral care guidelines help to improve quality of care provided. In an article by Jones, et al. (2004: 69), oral care protocol was introduced into a study in the UK by the trust staff which assisted nurses to render oral care according to recommended methods. However a small number of nurses did not value oral care and so did not use the recommended methods.

EBP is purposed for efficient care to all patients (Brink, 2006:13). Patient values are most essential in EBP (Brink, 2006: 14). EBP looks at doing everything correctly. Patient's oral care is a key component of basic nursing care, but it is often considered as an intervention for patients' comfort. This is because it is not viewed as a priority compared to other lifesaving nursing activities.

2.2.2 Evidence based practice for orally intubated patient

VAP is a leading cause of death in ICUs. According to Berry et al. (2007: 553); Berry and Davidson (2006: 319); Cutler and Davis (2005), VAP occurs in 9% to 28% of intubated patients and mortality rates for VAP are from 24% to 50%. It may be even higher in immune-compromised patients.

Although nurses know this fact, suctioning of oro-pharyngeal secretion is not usually done in critical care (Berry, et al. 2007: 554). The condition of these patients overwhelms the desire to conduct the procedure. Oro-pharyngeal colonisation occurs together with other systemic diseases such as pulmonary oedema, chronic obstructive systemic disease (COPD) and VAP (Grap, Munro, Ashtiani and Bryant, 2003:113).

The endotracheal tube (ETT) provides direct entry of microorganisms into the lungs (Grap, et al. 2003: 113). Prolonged ventilation increases the risk of hospital acquired infection. ETT and its securing devices, according to Dale, et al, (2012: 269), cause lesions of the oral cavity. These authors indicate that patients refuse oral care because of this discomfort.

However the aim of oral care in ICU is to reduce discomfort (Sona, Schallom, Msweeney, McMullen, Doopersmith, Buschman, Mazuski and Schuerer, 2009: 55). Oral care is a basic nursing activity which promotes health and comfort to patients. Oral care guidelines have been developed by different agencies and are now available online (Burns and Grove 2009: 11). The American Association of Critical Care Nurses (AACN) Practice Alert (2007) developed a guideline for comprehensive oral care for critical care patients, which recommends the use of a soft toothbrush and mouth wash every 12 hours and application of oral moisturiser to lips every two to four hours (AACN Practice alert 2007).

According to supporting evidence by AACN Practice Alert (2007), Chlorhexidine mouth wash reduces infections during cardiac surgery, but literature refutes this claim. This shows Chlorhexidine only reduces VAP pathogens and not the incidence of respiratory infections. Evidence shows that infection is the main problem in patients who are intubated and mechanically ventilated; further evidence has proven that oral care overcomes this risk. Mortality rates in ICU can decrease if colonisation of bacteria is reduced, hence the reduction in hospital stay and cost.

2.2.3 Importance of evidence based practice in ICU

Colonisation of microorganisms occurs more often in ICU than in other hospital settings (Sona, et al. 2009: 55). This is because patients are mechanically ventilated. Oral care that is evidence-based is effective in reducing bacterial load and preventing VAP. According to Munro and Grap (2004: 28), the interaction of bacterial plaque, which is a reservoir of pathogens causing VAP, is now well understood that oral care is an effective way to reducing VAP.

Munro and Grap (2004) illustrate two ways of eliminating dental plaque - mechanical (tooth brushing) and pharmacological or chemical (mouthwash). However there are difficulties in performing these methods of oral care. This is complemented by Sona, et al. (2009: 55) who state that mechanical removal of plaque involves brushing the teeth using a toothbrush or swabbing the mouth with or without toothpaste, even though, despite the evidence that brushing the teeth is more effective than swabbing the mouth, toothbrushes are not preferred in ICU.

Munro and Grap (2004: 29), describe oral care as inconsistent, with no proper guidelines which mostly focuses on comfort rather than reducing hospital acquired infection. However a review of literature by Sona, *et al.* (2009: 55) recommended the pharmacological method (0.12% Chlorhexidine) as a broad spectrum antibiotic capable of reducing infection such as VAP. Solutions such as sodium bicarbonate and hydrogen peroxide counteract plaque formation but cause oral irritation (Munro & Grap, 2004: 29). Munro and Grap (2004) state that lemon and glycerine swabs contain acidic components and also cause dry mouth.

According to a review of literature, oral care that is evidence-based improves health by preventing infection and also promotes comfort. *'EBP aims to deliver appropriate care in an efficient manner to every patient'* (Brink 2006: 13). Hence health care staff put more effort into implementing and improving EBP. As health care researchers ensure quality standards of EBP by developing protocols and guidelines through EBP process that guides provision of oral care in ICU, nurses deliver oral care based on guidelines for critically ill patients that lead to quality patient outcome.

2.2.4 Evidence-based practice process and research process

EBP is a set of guidelines from research evidence outlined in an orderly manner relating to a subject. Literature should be well organised to select best evidence from research findings (Polit and Beck 2004: 692). To improve nursing care through research, there is need for brainstorming and arranging several nursing care activities (Polit and Beck, 2004: 687).

The EBP process, according to Brink (2006: 14), consists of five steps. Step one involves formulation of a research question or problem concerning patient care, diagnosis, disease process, treatment, its outcome or health delivery system. The topic should be relevant to clinical practice and relate to problems nurses commonly face in their day to day practice for the nurses to be interested and should be applicable to a health care setting (Polit and Beck, 2004: 687). The type of problem identified does not have a bearing on the success of the research study but consideration should be done to involve health care managers who will implement the project (Polit and Beck, 2004: 688).

When the question has been formulated, according to Brink, (2006: 14), step two is to find the background of the problem. This could be the literature relating to the problem identified. This determines why the problem was identified and its usefulness to current clinical practice.

Step three is structuring an implementation plan (Polit and Beck 2004: 690). The researcher determines the feasibility of the study. Evidence relating to the topic at hand is searched for its importance and truthfulness. It is necessary to document a research plan for the research study to avoid any flaws which might occur while undertaking the study. This can also be used as an evaluating tool of the research project.

Step four, according to Brink (2006: 14), is conducting the study. Depending on the success of the study criteria, a pilot study is undertaken. According to Polit and Beck (2004: 692), the following activities should be included:

- Plot a pilot study (determine sample and sampling criteria to be included in the study),

- Formulate hypothesis (outcome of the study) and a check list to countercheck the study.
- Formulate a questionnaire/guideline based on literature.
- Pilot testing. This is done in a similar setting to where the study will be conducted.
- Evaluate the pilot study (the setting, participants' interest, the relevance of the guideline and problems encountered during the study).

The fifth step is the evaluation of the study (Brink, 2006: 14). A series of research methods can be used for evaluating a research study; the results are then communicated to a wider community. For EBP to be successful, nurses need intelligence and skills to be able to seek required evidence. Where there is no evidence, they should be able to suggest alternative ways to solve the problem.

The research process starts with a problem and ends with a solution (Brink, 2006: 50). The broad framework of the research process consists of four interactive phases which are the conceptual phase, empirical phase, interpretive phase and communicative phase. Each phase is divided into steps that are similar to the EBP process.

'Research stimulates further research and cannot be seen as once off, linear, static act' (Brink, 2006: 50). This study was developed from gaps in a review of literature on oral care for the critically ill intubated patients. The concepts that were of interest were VAP, oral care, evidence based guidelines, nurses' oral care practice, nurses' knowledge of oral care guidelines and nurses attitude towards oral care practice.

2.3. VENTILATOR ASSOCIATED PNEUMONIA

Ventilator Associated Pneumonia (VAP) is a serious infection resulting from aspiration of secretion containing micro-organisms. These secretions are a medium for the growth of bacteria which causes infection. The micro-organisms migrate from the oropharynx in combination with leakage of contaminated secretions around the endotracheal tubes and colonise in the upper and lower respiratory tract leading to VAP (Munro and Grap, 2004:25; Jones, et al. 2004: 70).

2.3.1 Incidence of ventilator associated pneumonia

As already stated, bacterial colonisation in Critical Care affects 8% to 28% of patients on ventilation (Cutler and Davis, 2005:390; Perrie, Scribante and Windsor, 2011: 42; Berry, et al. 2007: 553; Berry and Davidson 2006; 319). Colonisation of the oro-pharyngeal tract has a greater influence on the outcomes of respiratory infections. Mortality rate for these patients is normally between 24 to 50% and sometimes, up to 76% in infections which result in virulent organisms such as pseudomonas, which consequently increase hospital cost (Cutler and Davis, 2005; 390).

This is concurred by Vollman (2006), that VAP leads to the following consequences which include; increase in mortality rate, increased days in ICU, increased total hospital stay and cost. VAP is one of the leading causes of death in ICU (Perrie et al. 2011: 42)

2.3.2 Pathogenesis/pathophysiology of ventilator associated pneumonia

Most patients in Critical Care are on mechanical ventilation. These patients are intubated. VAP is caused by microorganisms which pass into the lower respiratory tract (Brown, Evans, Christmas and Rodriquez, 2011; 26). During the first 48 hours of admission to the Critical Care Unit, the normal flora of a critically ill patient changes to gram negative organisms capable of respiratory infection (Halm and Armola, 2009: 275; Munro et al. 2006:454). Saliva reduction due to intubation leads to colonisation of oral mucosa, hence the build-up of secretions which, when aspirated, causes VAP (Munro, et al. 2006:454: Vollman, et al. 2005:13).

Pathogens can be transmitted from person to person (community or population specific), consequently the media is usually through water, equipment and air (Brown, et. al. 2011; 26). Pathogens, according to these authors, can be endogenous (transmitted from patient) e.g. due to micro-aspiration of pathogens, or exogenous (transmitted from Environment) such as lack of hand washing (Browne, et al. 2011; 26; Garcia, Jendresky, Colbert, Bailey, Zaman and Majunder, 2009: 524; Sole, Polalillo, Byers, and Ludy 2002: 142).

There are two types of VAP according to Augustyn, (2007: 32), which are early and late onset VAP. Early VAP develops after 48 to 96 hours and can be cured, while late VAP onset is after 96 hours and usually is difficult to treat (Augustyn, 2007: 32).

According to Vollman (2006), there are three key VAP risk factors which include:

- Dental Plaque.
- Bacterial Colonisation.
- Aspiration of subglottal secretions.

2.3.2.1 Dental Plaque

This is a biofilm containing micro-organisms which cause infection, forming a coat around tooth surfaces. (Munro and Grap, 2004:26; Sage products as quoted by Vollman, 2010). Dental plaques colonise the Oro-pharyngeal area.

The endotracheal tube, according to Grap, *et al.* (2003: 114); Brown, *et al.* (2011:26), causes a direct entry of bacteria through normal defence systems, 'the cilia and protective mucus of nares.' This bypass, according to Grap, *et al.* (2003:114); Browne, *et al.* (2011:26), encourages formation of dental plaque which acts as a reservoir for the growth of bacteria; this causes secretions to pool at the back of the mouth and above the endotracheal tube, as well as the bacteria. At this point, pathogens make their way into the lungs leading to VAP. According to Munro, *et al.* (2006: 454), dental plaque comprises of respiratory pathogens (e.g. Methicillin-Resistant Staphyloccocus aureas, Pseudomonas aeruginosa).

2.3.2.2 Bacterial colonisation

The insertion of an endotracheal tube during mechanical ventilation causes a decrease in the production of saliva. Saliva helps to micro-organisms down the respiratory tract; lack of saliva production causes colonisation of tissues which promotes growth of bacteria such as gram- negative bacilli, which is responsible for development of pneumonia (Munro and Grap, 2004: 26).

2.3.2.3. Aspirations of sub glottal secretions

Colonisation of the upper and lower respiratory tract causes accumulation of secretions which, when aspirated, is a media for infection hence VAP (Vollman, et al. 2005: 13). Oral secretions can be colonised with micro-organisms from within the patient or acquired from the environments which are called exogenous or endogenous organisms respectively (Browne, et al. 2011: 26). Exogenous organisms include gram-negative micro-organisms which are also antibiotic resistant and gain access into the respiratory tract due to lack of infection control measures, especially hand hygiene and infection control on equipment such as suction tubes (Browne, et al. 2011: 26; Sole, et al. 2002: 142).

Many pathogens are developed from normal flora, such as *Staphylococcus aureas* and other species of *streptococcus,* which may descend into the respiratory tract especially during intubation (Sole, et al. 2002: 142). Secretions which surround the endotracheal cuff, leak through the cuff into the lower respiratory tract leading to VAP. Some secretions are produced around the sub-glottal region which can access the airway during micro-aspiration. Other factors that may contribute to micro-aspiration include sedation, decreased level of consciousness and risk of endotracheal tubes.

2.3.4 Diagnosis of ventilator associated pneumonia

Actual diagnosis of VAP in ICU is difficult because almost all patients are on ventilation and have the possibility of developing VAP (Augustyn, 2007: 33). The diagnosis is based on the following: radiography, laboratory test and clinical assessment. Radiographic diagnosis consists of observing the chest or lung infiltrations on chest radiographs (Augustyn, 2007: 33). In clinical assessment, a patient usually presents with fever, increased white blood cell count or leukocytosis and Pus sputum. Microbiology tests are also useful to determine the type of micro-rganism and prescription of proper antibiotics (Augustyn, 2007: 33, Parsons, Lee, Stricket, and Trump, 2013: 139).

2.4 PROTOCOLS, GUIDELINES AND EVIDENCE-BASED PRACTICE

A bundle is a structured outline of procedures or activities of care for improving patient outcome (Cuccio, Cerullo, Paradis, Padula, Rivet, Steeves and Lynch, 2012: 303). It’s a

direct set of activities based on best practice guidelines comprising of 3 to 5 steps which when implemented correctly results in the desired outcome (Cuccio, et al. 2012: 303; Ganz, Fink, Raman, Asher, Bruttin, Nun and Benbinishty, 2009:133, Parsons, et al. 2013:139; Tolentino-Delos Reyes, Ruppert, and Shiao, 2007: 20).

In ICU, the following evidence-based bundles are used for infection prevention which incorporates prevention of VAP:

- VAP bundle.
- Ventilator Bundle.
- Oral care Bundle.
- Sepsis Bundle.

2.4.1 Ventilator associated bundle/Ventilator bundle

Efforts to reduce and eliminate VAP have been championed by numerous agencies. Some of these agencies include AACN and CDC (Center for Disease and Prevention Committee) (Browne, et al. 2011:26, Fields, 2008:293; Ganz, et al. 2009, 133). These organisations recommend the following VAP prevention strategies, which are also called ventilator bundle (Ganz, et al. 2009:133):

- Head of bed elevation to 30-45.
- No routine changing of ventilator circuit.
- Continuous removal of subglottal secretions.
- Hand washing.

2.4.2 Oral care bundle

Infection prevention is very important in ICU. Infections such as pneumonia, sepsis, pulmonary oedema and candidiasis are common in ICU. Oral care is one of the preventive measures for development of these infections. Some of oral care guidelines in ICU include Oral Assessment Guide (OAG) and the AACN Practice Alert 2006, 2007 and 2010 oral care guideline. According to Ross and Crumpler (2007: 132); Prendergast, Jakobsson, Renvert, and Hallberg (2012:135), OAG consists of the following categories of assessment voice, swallow, tongue, saliva, mucous membrane, gingival and teeth.

The AACN Practice Alert guidelines 2006, 2007 and 2010 recommended the following strategies for prevention of VAP:

- The mouth should be brushed at least twice a day using paediatric and soft tooth brush.
- Moisturiser should be added to oral mucosa and lips every 2 to 4 hours.
- Chlorhexidine rinse should be used twice a day during peri-operative period for adult patients undergoing cardiac surgery.

2.5 ORAL CARE

Oral care is an essential part of nursing care that promotes health and comfort to patients, especially those on mechanical ventilation (Cutler and Davis, 2005: 389; Dale, et al. 2011:267; Jones, et al. 2004: 69). Oral care that is based on best research evidence ensures a healthy oral mucosa, prevents halitosis, maintains a clean and moist oral cavity, prevents development of pressure sores from mouth devices, e.g. endotracheal tubes, prevents trauma caused by grinding teeth, dentures or biting of the tongue and decreases bacteria activity which causes local or systemic infection, such as VAP (Elliott, et al. 2007).

Although oral care in ICU is not regarded as an important aspect of care due to barriers to effective hygiene practices and it is mostly described as a difficult task compared to other importance nursing duties, it is an important strategy in reducing hospital acquired pneumonia (Berry, Davidson, Nicholson, Pasqualotto and Rolls, 2011: 182). According to current literature, there are problems associated with oral care methods however, literature only focuses on neglected areas.

Providing oral hygiene in Intensive Care Units, according to a literature review by Yeung and Chui (2010:3063) and Dale, et al. (2011:266), is very challenging due to medical conditions, treatment equipment and consciousness level of patients. The presence of mouth probes for example, endotracheal tubes, feeding tubes and oral thermometers make it even more difficult to perform oral care (Dale, et al. 2012: 267). However oral care is achieved through mechanical and chemical methods.

The mechanical method involves removing biofilm directly on the tooth surface using a tooth-brush, or swabbing the mouth with or without oral solutions (Munro and Grap,

2004:28; Sona, et al. 2009; 55). Evidence shows that brushing teeth with a toothbrush is more effective than oral swabs (Munro and Grap, 2004: 29).

The chemical method involves the use of antibacterial agents applied on the tooth surface to reduce plaque formation and reduce bacterial colonisation (Munro and Grap, 2004; 30; Sona, et. al. 2009:55). A commonly used chemical is Chlorhexidine 0.12%, which is a broad spectrum agent (Munro and Grap, 2004; 30; Sona, et. al. 2009: 55).

The methods of oral care (mechanical, chemical or pharmacological) when applied on the tooth surface, prevents respiratory infections. This method prevents development of dental plaque, bacterial colonisation and aspiration of secretions which are causative mechanisms of infections such as VAP.

2.5.1 Oral care versus dental plaque

Removal of dental plaque can be achieved by either mechanical or chemical methods (Sona, et. al. 2009: 55). According to Berry, et al. (2007: 559) and Sona, et al. (2009:55), brushing using a toothbrush and toothpaste is more recommended than using toothette swabs in removing oral plaque, however toothbrushes are not commonly used in ICU.

Munro, et al. (2006: 455) conducted a study aimed at describing the relationship between oral health condition, colonisation of the respiratory tract and development of respiratory pneumonia within seven days of intubation. The study enrolled 66 patients, with a mean age of 55 years, of which 58% were men. These patients already had oral problems as demonstrated by the presence of decayed and missing teeth (Munro, et al. 2006: 456).

The number of times oral care was given, according to the authors (Munro, et al. 2006), did not affects the results by Day 4, and did not significantly differ between patients in whom VAP developed and those it did not (Munro, et al. 2006: 456). An inverse relationship was observed between salivary volume and development of VAP (Munro, et al. 2006: 456). This showed that dental plaque increases the risk of VAP in severely ill patients. The presence of saliva and enzymes found in the mouth (Lactoferrin) may contribute to the development of VAP (Munro, et al. 2006: 457).

2.5.2 Oral care versus bacterial colonization

Colonisation of the oro-pharyngeal tract has greater influence on the outcomes of respiratory infections. Once the critically ill is intubated, the mouth will change from normal oral flora to pathogens commonly linked to pneumonia (Munro, et al. 2006:454; Halm and Armola, 2009:275).

A study was conducted to describe 'pathogens associated with VAP in Oral and endotracheal aspirates and to evaluate bacterial growth on oral and suctioning equipment' on 20 subjects within 24 hours of endotracheal intubation (Sole, et al. 2002: 144). Their oral and sputum specimens were collected for culture, suction tubes were changed as required and specimens were also collected from the equipment. The collection of specimens was done after 24 and 48 hours (Sole, et al. 2002: 144).

According to the study by Sole, et al. (2002: 141), pathogens which were present in the mouth and suction devices were gram negative. After 24 hours, the results indicated the presence of microorganisms in the patients' mouth and 67% had positive sputum cultures (Sole, et al. 2002: 144). Devices such as suction tubes were colonised with bacteria similar to those found in the mouth. Within 24 hours almost 94% of the devices were colonised with pathogens.

2.5.3 Oral care versus aspirations of sub glottal secretions

As already stated, treatment prescribed in ICU can lead to oral problems. Intubation causes dryness of the mouth, a condition known as xerostomia, inflammation of oral mucosa and a change of normal flora to gram-negative bacteria. Fluids migrate to the area and these secretions, together with the bacteria, when aspirated cause Ventilator Pneumonia (Jones, et al. 2004:70). Evidence shows that subglottic suctioning is effective in decreasing the prevalence of VAP (Halm and Armola, 2009: 275).

In a prospective study by Garcia, et al. (2009: 523), which was aimed at determining the effect of a comprehensive oral care protocol in a health care delivery system on the prevalence of VAP, 779 nurses were included in the control group and 759 in the study group. Oropharyngeal suctioning was done every 6 hours, tissues and gums were cleaned

four hourly and tooth brushing was done two hourly. The nurses were tested on the above knowledge twice a year, which promoted the increase in the use of evidenced-based knowledge and as a result, nurses' compliance to standard protocols increased by 80% in the intervention period which led to improved bed set up of oral care (Garcia, et al. 2009: 528) and the rate of infection, especially VAP, decreased.

VAP is a major problem in ICU. Oral care reduces transmission of this infection. Hence VAP can be prevented only if nurses in ICU are able to practice oral care according to standard guidelines.

2.6 NURSES' ORAL CARE PRACTICES IN ICU

2.6.1 Oral care practice and oral care/ventilator associated bundles

As stated, according to AACN Practice Alert (2007), colonisation of the oropharynx is a critical factor in the development of hospital acquired infections. A review article by Brown et al. (2011:25), illustrated that oral hygiene regimens combined with standardised ventilator associated care bundles reduce the incidence of pneumonia, length of hospital stay and related cost of Critical Care.

Based on a retrospective study by Schledler, Stott and Lloyd (2002: 27), which evaluated VAP oral care protocol in ICU, a new policy and procedure were introduced. The policy included:

- Daily assessment of oral cavity by registered nurse.
- Oral care should be provided every 2 to 4 hours for intubated and unconscious patients.
- Assessment of intubated patients for oropharyngeal secretions three times a day, or when changing suction tubing, or when deflating the endotracheal tube cuff.

According to the authors, "before intervention VAP rate was 5.6 VAPs per 1000 ventilator days" (Schledler, et al. 2002: 29). After intervention, the rate of VAP decreased to 2.2 per 1000 ventilator days (Schledler, et al. 2002: 29).

2.6.2 Oral care versus head of bed elevation

Again, raising the head of the bed is one of the strategies for prevention of infections. Raising the bed head to 30 to 45 degrees reduces the risk of aspirating secretions by the patient, thereby preventing VAP (Hannemann and Gusick, 2005: 378).

A study on implementation of oral care guideline was conducted in America, as quoted by Vollman, et al. (2005: 13). This oral care guideline incorporated the use of a semi-recumbent position for ICU patients. In addition, health care professionals (nurses, physicians, respiratory therapist) were also assessed on the use of the proper aseptic technique in handling suction machines, humidifiers, HME filters and ventilators (Vollman, et al. 2005:13). The rate of VAP decreased during this study.

2.6.3 Oral care guidelines and documentation

The article by Pear (2007) looked at current practices of oral care in ICU. A literature search by Pear (2007) illustrated in an interventional study in 2005, as quoted by the author (Pear, 2007), which included patients on mechanical ventilation in five hospitals with a sum of eight ICUs for two months period. Patients had no oral care assessment, no brushing or swabbing of gums, no moistening of lips, no suctioning and no change of suction tubing. There was no proper ICU protocol followed.

In this study, as cited by Pear (2007), the oral care that nurses applied was using suction or non-suction swabs to clean the mouth. The author states that two of the ICUs had suction toothbrushes but these were not used. Nurses falsely reported the frequency of oral care, which did not correspond with what was documented in their records (Pear, 2007). The intervention consisted of a structured education programme, including a standard, comprehensive oral care protocol and adequate oral care tools, which resulted in increased frequency of provision of oral care (Pear, 2007).

A literature search by Jones, *et al.* (2004: 70), in a UK ICU illustrated that evidence-based oral care protocol, in conjunction with good governance, improved oral care practice. The literature, according to Jones, *et al.* (2004: 71), indicates that programmed comprehensive

oral care coupled with oral care protocol guidelines assisted nurses provision of oral care, followed standardised procedure and identified gaps in current oral care practices.

2.6.4 Consistency and frequency of oral care

Several organisations have come up with different oral care guidelines. These guidelines recommend different oral care procedures and timing. According to Pear (2007), this is complemented by CDC, which described oral care as the brushing of teeth, oral swabbing and suctioning using, or not using, antibacterial agents (antiseptics).

In addition, (Pear, 2007) also quoted the AACN (2006) Practice Alert in which their oral care guideline recommended the brushing of teeth and gums for at least twice a day with a soft paediatric toothbrush. According to this author, this improves circulation (Pear, 2007). The lips and oral mucosa should be kept moist every two to four hours, which eventually prevents dry lips (Pear, 2007).

Again AACN Practice Alert (2006), as quoted by Vollman (2010), recommend that the mouth and respiratory tract should be assessed for development of plaque and potential oral abscesses. Oral care should be done twice a day using paediatric or adult soft toothbrushes. The teeth should be gently brushed to clean and remove plaque.

In addition to brushing the teeth, according to AACN Practice Alert (2006) as quoted by Vollman (2010), oral care using oral swabs with 1.5% hydrogen peroxide solution should be used to clean mouth every 2 to 4 hours. Again suctioning of the oral cavity/pharynx should be done as required to reduce risk of aspiration (Vollman, 2010).

2.6.5 Tools and equipment used in oral care practice

A review of literature by different authors recommends a variety of supplies to be used for oral care. The following tools were discussed:

- A paediatric soft toothbrush to remove food particles which lead to colonisation of oral mucosa (AACN Practice Alert, 2006: Berry, et al. 2011: 183). A small soft toothbrush helps to access all areas of the mouth and prevent injury to mouth

tissues, but according to Berry, et al. 2011: 183, bigger studies are recommended to further explore this suggestion.

- Swabbing should be performed in conditions where tooth brushing is contraindicated (e.g. sore mouth) (Berry, et al. 2011:183). A toothbrush is preferred over oral swabs (Dale, et al. 2013: 270: Munro and Grap, 2004; 29), however according to Berry, et al. (2011; 183), bleeding can be precipitated by use of a toothbrush.

- There is no evidence to support the utilisation of oral solutions. According to AACN Practice Alert (2007), 0.12 % Chlorhexidine gluconate is recommended in patients awaiting cardiac surgery. This product has been evaluated by several studies, according to literature, to determine the strength of the chemical in question, but according to Berry, et al. (2011: 183), the product still needs further exploration. However, Jones, et al. (2004: 73) recommends Chlorhexidine to be used if there is proof of inadequate oral care and dental plaque.

- Water is not supposed to be used directly for oral care in ICU (Berry, et al. 2011: 183). Hospital taps are not sterile, hence not being recommended for oral care in the ICU.

- Suctioning the oropharynx is recommended to remove secretions that might migrate down the endotracheal tube causing respiratory infection such as VAP. (Berry, et al. 2011: 183). Although Browne, et al. (2011: 28) do not recommend suctioning because it causes injury to the respiratory tract.

- Brushing teeth should be done 12 hourly (AACN practice alert 2007). Brushing is the mechanical method that removes plaque (Berry, et al. 2011: 183) .

- Brushing is supposed to be for 3 to 4 minutes using a paediatric toothbrush which will easily access the mouth; however no evidence has been found on the duration of brushing (Berry, et al. 2011: 183). This ensures the teeth are thoroughly cleaned.

- Well secured containers have been suggested to store oral care equipment, but there is no proof of their effectiveness; however there is a need for investigation of proper methods of storing the oral care tools to prevent contamination (Berry, et al. 2011: 183).

The studies illustrate that oral care practice is now based on guidelines and protocols. The literature provides information on how to carry out oral care as a procedure. Oral care that is research evidenced has proven to reduce respiratory infections, provide comfort and also reduce mouth ulcers due to insertion of endotracheal tubes. This shows that nurses' knowledge of oral care guidelines improves practice and prevents infection.

2.7 FACTORS INFLUENCING NURSING PRACTICE

2.7.1 Nurses knowledge of oral care guidelines.

Oral care removes biofilms that cause respiratory infection by cleaning, debriding, suctioning, and moisturising oral cavity, hence preventing VAP. This is supported by a study, cited by Vollman, et al. (2005:13), conducted on 859 intubated patients admitted into a Medical Intensive Care Unit, at Brookdale University Medical Center in America, in which the rate of VAP decreased after implementation of oral care protocol. The study included principles of epidemiology, for example staff interviews and close observation of the respiratory therapist, nurses and physicians following aseptic techniques, e.g. hand hygiene, change of suction tubing and ventilator circuit once in seven days, proper use of of the following humidifiers, HME Filters and stress drugs (Vollman, et al. 2005:13).

According to the study (Vollman, et al. 2005:13), gaps were observed in the following practices: inadequate mouth care especially for those mechanically ventilated patients, such as no daily oral care assessment, open suctioning (disconnection of suction tube during suctioning), no proper storage of oral care equipment and inadequate suctioning.

A literature search by Berry, et al. (2007:552), aimed to appraise the literature which provided enough evidence on oral care for patients on mechanical ventilation and its documentation as an important activity that optimises patient outcome. According to the authors, articles from 1985 to 2006 were searched; the literature search included three reviewers with a minimum of a Master's degree. The articles showed there were variations which were recognised in Meta- analysis on the use of chlorhexidine and incidence of nosocomial infection (Berry, et al. 2007: 555). This means the results lack the basis to inform the nurses on the use of the stated methods.

A quantitative study by Ross and Crumpler (2007: 132), aimed at determining the effect of an EBP programme on oral care in intubated patients in ICU which would decrease VAP rate. All adults in adult ICU, mechanically ventilated for 24 hours were included in the study. There were 75 patients who were ventilated. The method used was an already existing oral assessment guide tool which had the following categories: voice, swallow, tongue, saliva, mucous membranes, gingival and teeth. Again posters were displayed in each Unit highlighting the existing best practice oral care protocol on story boards, which were designed to describe the role of oral care in the prevention of VAP (Ross and Crumpler, 2007:134). The education programme on evidence-based oral care resulted in a decrease in oral assessment guide tool scores; recommended quality care was rendered which improved patient outcome.

AACN Practice Alert (2006/2007) states that chlorhexidine oral rinse helps prevent colonisation of respiratory pathogens responsible for causing VAP, while Munro, Grap, Jones, Mclish and Sessler. (2009: 429) compared the effect of toothbrush and chlorhexidine on development of VAP, in three Intensive Care Units in America amongst 547 patients on intubation (Munro, et al. 2009: 430). Clinical Pulmonary Infection Score (CPIS) was used as a scale for assessing development of pneumonia.

Pneumonia (CPIS=6) developed in 24% of the patients using chlorhexidine as a method of oral care, but tooth brushing or combined methods (toothbrush and Chlorhexidine) were not significant (Munro, et al. 2009: 434). According to these investigators, Chlorhexidine reduced the incidence of VAP in patients without pneumonia at baseline (Munro, et al. 2009: 433).

This concurred with the recommendation by the Centre for Disease Control and Prevention (CDC), which states that comprehensive oral hygiene programmes, including the use of chlorhexidine as an antiseptic, is preferred for reducing VAP (Munro, et al. 2009:435).

However, a clinical evidence review by Halm and Armola (2009: 275), indicated tooth brushing was recommended for removal of plaque colonisation as 0.12 % chlorhexidine did not reduce VAP. Seven studies captured from different ICUs and one meta-analysis were analysed in which oral care was mainly mechanical (tooth brushing) and

pharmacological (0.12% to 2% Chlorhexidine, 2% colistin or combining the two through an oral rinse, orals swab, or toothpaste) (Halm and Armola 2009: 275).

Halm and Armola (2009) found there was a variation in the use of chlorhexidine. The frequency of chlorhexidine use was 6 hourly, 8 hourly and 12 hourly. Pneumonia was detected using CPIS, culture and CDC criteria for testing respiratory infections and which has the following categories: fever, chest infiltrates and white blood cell count (leukoctosis) (Halm and Armola, 2009:275). Only a significant effect was observed on the use of 0.2% chlorhexidine which enhanced plaque development on the fifth, seventh and tenth day (Halm and Armola, 2009: 275). However the AACN Practice Alert recommends the guideline use of 0.12 % chlorhexidine in patients undergoing cardiac surgery.

A descriptive study by Gomez (2010:8), looked at EBP knowledge of VAP guidelines in two private and government hospitals of South Africa. Eighty three nurses (n=83) participated in the study. The results showed that nurses lacked knowledge on evidence-based practice in relation to prevention of VAP.

However, another article by Browne, *et al.* (2011: 25) aimed at developing a best research evidence oral care protocol while providing rationale for standard oral care methods and further plans of surveillance and possibly updating it. In their review of literature, the authors explain that when a critically ill patient is intubated, the bacteria present in the mouth rapidly changes to pathogens commonly linked to pneumonia (Browne, et al. 2011:26). The endotracheal tube itself becomes a media for growth of bacteria. The new environment encourages plaque formation and subsequent growth of bacteria. Its secretions pool in the back of the mouth and above the ETT cuff, so does the bacteria. The pathogens are then micro-aspirated. According to the authors (Brown, et al. 2011), literature search recommended subglottal suctioning every 4 to 6 hours to reduce micro-aspiration (Browne, et al. 2011:28)

These authors (Brown, et al 2011) quoted other organisations which also state that efforts to reduce and eliminate VAP have been championed by numerous agencies, including AACN and CDC (Browne, et al 2011:26). These organisations recommend following prevention strategies: head of bed elevation, no routine changing of the ventilator circuit,

continuous removal of subglottal secretions and hand washing. In this article authors were able to provide information to nurses on prevention of VAP.

However not many studies have been done to assess the effect of education level or ICU experience in determining the use of oral guidelines. Most studies emphasise the importance of knowledge obtained from different sources of information which assist in provision of oral care. A review of the studies above indicate that nurses have knowledge about oral care methods and the risk of inadequate oral care, but still oral care is not viewed as an important activity compared to other activities.

2.7.2 Nurses attitude and beliefs of oral care.

Oral care measures, according to Culter and Davis (2005: 389), are a neglected aspect of care for mechanically ventilated patients. According to Berry and Davidson (2006; 325), mouth care is viewed as unpleasant task. The provision of oral hygiene is viewed as a basic nursing activity. A review of studies by Berry and Davidson (2006: 325), indicated that oral care assists to prevent VAP and also provide basic comfort to the patient. The authors also explain that "This shortfall in the prioritisation of oral hygiene in the high pressure and highly technological Critical Care environment is possibly due to a deficiency in oral health knowledge, or lack of appreciation of its importance by registered nurses" (Berry and Davidson, 2006 :320).

However in a questionnaire survey by Jones, et. al. (2004:72), conducted in an adult in ICU in the United Kingdom on all nurses in the units (160), priority rating of oral care was given the same priority as other aspects of nursing care, whilst in a study by Hannemann and Gusick (2005: 385), in nine Intensive Care Units in America, the frequency for the patients was different.

The study by Hannemann and Gusick (2005:379), in which 384 members of nursing staff were included, was aimed at determining the frequency of oral care and patients' position. Frequency of oral care was four and three times for intubated and non-intubated patients respectively, according to AACN (2006/2007) guidelines (Hannemann and Gusick, 2005: 383). Nurses self-report indicated a difference amongst the Intensive Care Units on the use of mouth wash, sodium chloride peroxide mixture and chlorhexidine for intubated patients

(Hannemann and Gusick, 2005: 385). Hence in this study, oral care was regarded as a priority for intubated patients rather than for non-intubated patients.

A study by Cutler and Davis (2005: 389), observed oral care in 253 patients in eight Intensive Care Units of five acute hospitals in America. During the baseline period, oral care was done using suction swabs. Observation was done on brushing teeth and moisturising of oral mucosa; only 32% patients had suctioning of oral secretions. Cutler and Davis (2005: 389) also indicated that, before the year 2005, there were no proper guidelines for oral care and there was variation from nurse to nurse on how to conduct this activity. After introduction of oral care protocol, according to the authors, 33% had their teeth brushed, 65% oral care using swab, 63% oral moistness, 61% had suction of secretions and 38% had special oro-pharyngeal suctioning (Cutler and Davis, 2005: 393). This result indicated the availability of standardised comprehensive protocol, coupled with availability of resources, improved nurses' attitude related to oral care.

A cross-sectional study by Lin, *et al.* (2011: 3204), which included 205 nurses, described nurses' knowledge attitudes and practices of oral care in intubated patients. Higher scores on oral care knowledge were associated with oral care being performed more frequently. According to the study, nurses learnt about oral care from reading their own resources which increased knowledge of oral care and frequency of oral care procedure (Lin, et al. 2009: 3209). However they put less priority on oral care when compared to other nursing treatment activities for critically ill patients.

Lack of oral care prioritisation, according to the authors (Lin, et el. 2011), could be due to importance of nursing treatment activities over oral care that are lifesaving, especially activities such as maintaining airways, emergency administration of drugs; in both cases oral care is of least importance (Berry, et al. 2011: 180; Lin, et. al. 2011: 3204). Nurses' age and type of ICU also influenced the frequency with which nurses performed oral care.

However, in the article by Berry and Davidson (2006: 325), nurses had fears of removing the endotracheal tube, clearing toothpaste in patients mouth, sometimes oral care procedure itself lead to aspirating secretions, which lead to suffocation. This is complimented by two surveys and an observational study by Sona, *et al.* (2009: 55), conducted in America, where nurses mentioned problems faced when providing oral care. Problems related to

oral care which included record keeping and frequency for oral care. They also indicated oral care was a difficult procedure, as it was easy to remove devices in patients' mouth.

However, the results of a review of literature by Dale, *et al.* (2012: 268), in which 469 articles were searched, illustrated the change in oral care over time for patients on intubation. Oral care prevents mouth dryness and is still viewed as an important procedure for patients' comfort. This illustrates that nurses with a positive attitude towards oral care will provide oral care often according to guidelines, consequently this will improve oral practice in the Unit. However oral care is not only based on priority setting as there are several factors which influence attitude.

2.7.3 Other factors influencing nurses' attitude towards oral care

A review of literature, cited by Lin, et al. (2011: 3206), indicated there are several factors which influence oral care, amongst which are personal characteristics and work environment characteristics:

- Age.
- Sex.
- Experience in ICU.
- In-service education in oral care.
- Type of ICU.
- Availability of oral care protocol.
- Availability of infection control programme.
- Time.

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However, an article by Dale, et al. (2012: 267) and Cutler and Davis (2005; 389) indicates that oral care is of low priority in ICU considering the condition of patients and the environment. There are several hindrances to the provision of oral care, in which time is a major factor and again, education level of ICU nurse, 'however discussion of hygienic problems is often combined with conceptual and pragmatic tension,' (Dale, et al. 2012: 267).

The mechanical obstructions affect efficiency and effectiveness of oral care (Berry and Davidson, 2006: 321; Jones, et al. 2004: 70).The devices found on ICU patients, mainly those mechanically ventilated, includes endotracheal tubes, oro-gastric tubes and temperature probes (Berry and Davidson, 2006: 321); the tape or other devices used to secure the endotracheal tube, etc. further obstruct the respiratory tract during oral care.

In addition, nurses also have insufficient equipment and supplies for oral care (Berry and Davidson, 2006: 321). Nurses use the following tools, according to Berry and Davidson (2006: 321), soft toothbrush, cotton/foam sticks, toothpaste, mouth rinses such as Chlorhexidine, sodium bicarbonate, hydrogen peroxide, sodium chloride, water, Povidone Iodine, thymol and lemon and glycerine.

Again, the article by Browne, et al. (2011: 27) indicates that chlorhexidine swabbing is preferred by most nurses because it is an easy and inexpensive way to perform oral care procedure with a few side effects. The article also looked at a study conducted in 2007, where the effects of antibiotics were compared with antiseptics such as chlorhexidine; antiseptic reduced the development of VAP (Browne, et al. 2011: 27).

The literature (Browne, et al. 2011) shows evidence of the importance of sub-glottal suctioning of the secretions lying above the endotracheal cuff, which is effective in reducing incidence of VAP. AACN Practice Alert guidelines recommend sub-glottal suctioning frequently, however the literature review by Browne, et al. (2011:30), provides evidence which indicates that tracheal mucosa can be damaged by suctioning. Contrarily, according to SAGE products Inc. as quoted by Vollman (2010), suctioning tools have been proven safe and effective against VAP and HAP, including the use of toothette, suction toothbrush, toothette suction swabs, covered yankaeur, and oro-pharyngeal suction catheter.

According to literature (Elliott, et al. 2007), oral care also prevents pressure sores from devices such as endotracheal tubes and prevents trauma from grinding of teeth and biting of tongue (Elliott, et. al. 2007). However, the endotracheal tube prevents a view of the respiratory tract and also prevents oral care (Jones, et al. 2004: 70).

A review of literature indicates many of studies have been done on the effects of oral care on critically ill intubated patients. These studies illustrate that the performance of oral care is affected by knowledge, perception, nurse's priority of activities and oral devices such as endotracheal tube. However not many studies have been done on how education, training or experience of nurses in ICU affect implementation of evidence-based guidelines of oral care in ICU. This study is aimed at determining practices, knowledge and attitudes related to oral care for intubated patients, with associated factors of the same, with an intention of making recommendations for clinical practice and education of Intensive Care nurses.

2.8 SUMMARY

Oral hygiene in ICU is very challenging due to medical conditions, treatment, equipment and conscious level of patients. Lack of oral care lead to bacterial colonisation which, when aspirated, leads to VAP. A review of literature indicates that VAP a major cause of death in ICU.

Previously, oral care was performed to promote comfort but now it is incorporated into evidence-based practice and is conducted with the aim of reducing bacterial colonisation and subsequently preventing VAP. EBP is an explicit set of guidelines created to address a clinical problem.

EBP is a process consisting of five steps which are: formulating a question or identifying problem, literature search on the topic, implementation plan, conducting the study and evaluating the study. These steps are similar to the research process.

According to a review of studies, oral care helps prevent bacteria growth in the respiratory tract. Tooth brushing, for example, has beneficial effects in reducing dental plaque and colonisation, while chlorhexidine effectively reduces oro-pharyngeal colonisation and VAP. Conversely, sub-glottal suctioning is also effective in reducing secretions above the endotracheal cuff subsequently reducing VAP.

This indicates that oral care that is done under evidence-based practices will provide comfort and safety to the patient. The patient is free from micro-organisms that cause

respiratory infections. Providing evidence-based guidelines will improve nurse's attitude on performing oral care practice.

A review of studies have also illustrated that nurses possess knowledge about oral care guidelines and procedures, although oral care is viewed as an unimportant activity compared to other lifesaving activities. However, other studies have indicated that performance of oral care is affected by nurse's knowledge, attitudes and practices in ICU. Hence this study is focused on exploring practices, knowledge, attitudes of nurses towards oral care using an evidence-based guideline questionnaire and other associated factors of the same.

CHAPTER THREE

RESEARCH DESIGN AND METHODS

3.1 INTRODUCTION

This chapter describes the research methodology used in this study which focuses on the research design and method. The method consists of the study setting, population, sampling method and data collection process. This includes the research instrument used in the data collection, methods of data analysis, pilot study, ethical considerations and validity and reliability of the study.

3.2 OBJECTIVES OF THE STUDY

For consistency, the objectives of the study are repeated.

- To determine and describe ICU nurses knowledge, attitudes and practices related to oral care for intubated patients in ICUs.
- To establish whether there is a relationship between selected demographic data of the participants and their knowledge, attitudes and practices related to oral care for intubated patients in ICUs.

3.3 RESEARCH DESIGN

Research design refers to the overall plan for conducting a study that maintains control over factors that could interfere with the validity of the study (Burns and Grove, 2009:696). The research design for this study was **non-experimental**, **quantitative, descriptive** and **cross-sectional** and was used to investigate ICU nurses knowledge, attitudes and practices relating to oral care of critically ill patients with an endotracheal tube in situ.

3.3.1 Non-experimental

A non-experimental study is when the researcher collects data without introducing an intervention, known in literature as an observational study (Polit and Beck, 2010:234). The study is usually carried out in the natural setting and no manipulation of variables is involved. A non-experimental design was selected for this study as it took place in the natural setting, i.e. in the five ICUs in the selected hospital and there was no manipulation in terms of involvement of treatment or any intervention given to participants.

3.3.2 Quantitative

Quantitative research implies data collected from participants, by use of a data collection instrument, which can be analysed in terms of numbers and quantified or summarised. Lo-Biondo and Haber (2010:584) write that quantitative research is a process of testing relationships, differences and cause and effect interactions among and between variables. These processes can be tested through hypotheses or research questions. Quantitative research methods are particularly concerned with objectivity and the ability to generalise findings to others when describing and examining relationships amongst variables (Burns and Grove, 2009:23). This study is quantitative as it was explaining ICU nurses' knowledge, attitudes and practices of oral care, with data collection done numerically.

3.3.3 Descriptive

Descriptive research aims to describe certain phenomenon or occurrence in a specific context. According to Burns and Grove (2009:45), this approach is used to generate knowledge about a topic in which little or no research has been conducted. In addition, descriptive research helps to discover meaning, describe what exists and determine the frequency with which something occurs. This study is descriptive as it aimed to describe information by means of a structured questionnaire, which reflected ICU nurses' knowledge, attitudes and practices of oral care for intubated patients.

3.3.4 Cross-sectional Study

As the study was conducted over a short period of time it was considered as cross-sectional. The aim of the cross-sectional study design is usually to describe a population and to find a prevalence of the outcomes of interest (Polit and Beck, 2010:551). Cross-sectional studies provide information concerning a certain situation at a given time, which in this study, reflected ICU nurses' knowledge, attitudes and practices about oral care for intubated patients.

3.4 RESEARCH SETTING

The research setting for the study was five adult ICUs, at a 1,200 bed capacity university-affiliated, public sector hospital and tertiary level institution in Johannesburg. The ICU units (ICUs) include: trauma ICU, cardiothoracic ICU, coronary care (CCU), neurosurgery ICU and general ICU.

These five ICUs were considered by the researcher as homogenous. They represent highly specialised public sector ICUs, which admit critically ill patients from medical and surgical disciplines. The levels of ICUs are described according to the South African Society of Anaesthesia (SASA) guidelines for ICU (SASA, 2013). As such, the general ICU, cardiothoracic and trauma ICUs are considered level I ICUs as they provide highly specialised care to patients with multiple-organ dysfunction/failure, whilst the coronary care unit and the neurosurgical unit are considered level II ICUs as they provide care to patients for single organ dysfunction/failure.

The number of official beds range from seven to 12 ICU beds per unit. Assigned nurses to patients generally follow a one nurse to one patient ratio in the acute period of illness. Nurses practicing in these units have access to specialist health care professionals and technical support on a 24-hour basis and have contact with a variety of critically ill patients.

3.5 RESEARCH METHOD

According to Polit and Beck (2010) and Burns and Grove (2009) research method refers to the steps, procedures and strategies for gathering and analysing data. This includes the data collection methods, population, sampling methods and data analysis. The research method describes the overall plan used to conduct the study, and is presented in **Figure 3.1**.

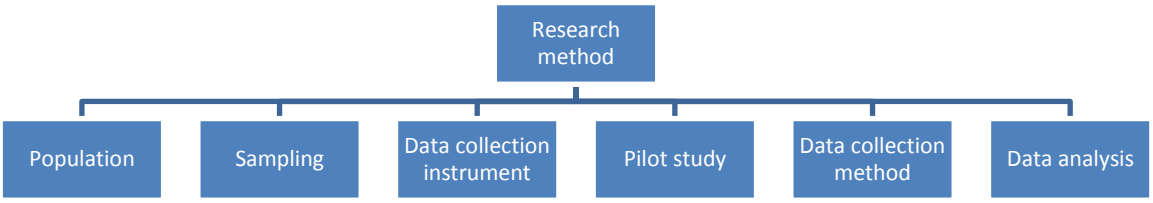


Figure 3.1 Overview of the quantitative research method used in this study

3.5.1 Population

The research population refers to individuals who meet certain criteria for inclusion in a given setting. The target population is the entire set of individuals who meet sampling criteria for a specific setting (Burns and Grove, 2009:344). In this study the research population refers to nurses working in ICUs in Gauteng, while the target population refers to nurses working in the five adult ICUs (see **Figure 3.2**), thus excluding neonatal and paediatric ICUs in the selected institution.

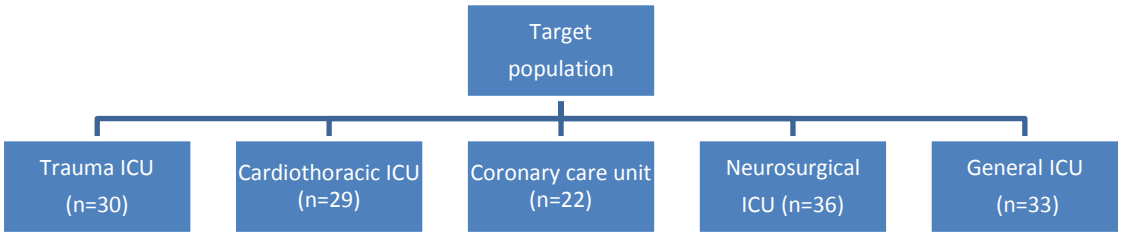


Figure 3.2 Number of nurses working in the ICUs of the selected institution

A preliminary record review undertaken in June 2013 indicated there were approximately 105 (N=105) ICU registered nurses working in these ICUs. This is the population that is accessible to the researcher in the selected institution and who meet the inclusion criteria as study participants (Polit and Beck, 2010:307).

3.5.2 Sampling

Sampling is a process of selecting a group of individuals who can be used in a research study (Lo-Biondo-Wood and Haber, 2010:221). A sampling method describes the strategies that will be used to obtain an adequate sample size (Polit and Beck, 2010:307). A sample is a group of individuals taken from a larger population that is selected for inclusion in the research study (Burns and Grove, 2009:349).

Following discussion with a statistician, a sample size of 81 (n=81) was decided upon to ensure good representation of the population from which the sample was drawn. This discussion was based on the preliminary record review undertaken by the researcher in June 2013.

For the purpose of this study, a non-probability, purposive sampling method was chosen in collecting data. In non-probability sampling, elements are chosen by non-random methods, whereas in purposive sampling the researcher conscientiously selects certain participants, elements, events or incidents to include in the study (Burns and Grove, 2009:349). In this way the researcher selects the participants based on who they think is appropriate for the study and who are well informed about a certain topic (Polit and Beck, 2010:312).

The inclusion criteria for prospective nurse participants included:

- Registered by the South African Nursing Council (SANC) with an additional qualification in ICU nursing.
- Registered by the South African Nursing Council (SANC) as a professional nurse including permanent and agency nurses working in the selected public sector institution.
- More than six months clinical experience in the selected ICU unit.

The exclusion criterion included enrolled nurses and auxiliary nurses, as their sub-professional category of nursing staff are not expected to have the skills and in-depth knowledge about oral care for intubated patients.

3.5.3 Data Collection Instrument

Data collection is the precise, systematic gathering of information relevant to the research purpose or specific objectives or questions of a study (Burns and Grove, 2009:42). Data collection can be done by means of instruments or questionnaires developed or modified for recording information such as: demographic data, information from patient records, observations or values from physiological measures (Burns and Grove, 2009:695).

In this study, a survey questionnaire developed by Lin *et al.* (2011) and identified in literature was used to achieve the study objectives (refer **Appendix A**). Permission was obtained from the developer to use the instrument (refer **Appendix B**). The questionnaire was reviewed by a small group of local domain medical and nursing experts (n=3) in clinical practice before commencement of the study. It was found to be appropriate and suitable for the South Africa context.

The self-administered questionnaire contained **five sections**. The *first section* comprised the demographic variables (5 items) for the participants, whilst the *second section* asked about the nurse participants' "sources of learning about oral care for intubated patients" (6 items). The *third section* consisted of "six multiple-choice questions with a total of 29 items regarding knowledge of oral care for intubated patients" (Lin et al. 2011:3206). Participants were asked to select the correct responses for "knowledge of the characteristics of oral care". The total "score ranged from 0 to 29, with one mark awarded for each correct response" (Lin et al. 2011:3206).

The *fourth section* of the questionnaire was divided into two parts. "The first part contained two questions describing nurses' priority rating of physical activities and treatment activities of nursing care", respectively. Participants were asked to "rank physical activities" (7 items) and "treatment activities" (8 items) in order of priority. "The second part of section four consisted of two questions concerning the importance of basic nursing care activities" according to nurses' perceptions". The total score "ranged from 2 to 20, the higher the score the more positive the nurses attitude was perceived" (Lin et al. 2011:3206).

The *fifth section* consisted of four questions which described the "frequency of oral care practices". Participants were asked to select the correct answers from a variety of "frequency options of practices for oral care" (Lin et al. 2011:3207). The total "score ranged from 1 to 4".

3.5.4 Pilot Study

A pilot study was conducted before the commencement of the main study using the information sheet and the adapted version of the oral care for intubated questionnaire to test the understanding of the wording used. Participants (n=10) who met the inclusion criteria were included in the study. Ethical considerations were followed. The results of the pilot study were not included in the main study.

A pilot study is defined as a smaller version of a proposed study, which is conducted to refine the research methodology or strength of a study design (Burns and Grove, 2009:44). It serves to test feasibility, it determines whether the chosen methodology is appropriate, assesses the length of time it takes to complete the questionnaire and checks clarity of understanding of the language used (Burns and Grove, 2009:44).

The results of the pilot study demonstrated the instrument was understandable and took approximately 15 to 20 minutes for the participants to complete. No major changes were made to the existing questionnaire. However, the wording of *"total ICU work experience"* in the demographic section was modified by the researcher after the pilot study was completed to read as **"total registered nurses (RN) work experience."** This was done to assist participants in understanding the response required as the wording of the next item was reflected as *"Current ICU work experience."*

3.5.5 Data Collection Process

Permission was sought from the Chief Executive Officer (CEO) of the hospital being requested to participate in the study. Once obtained, permission from the Nursing Services Director was sought and thereafter the ICU unit managers were approached, informed about the study, purpose and its significance to practice and their permission sought. The researcher visited the ICUs (n=5) and observed the respective allocation list for selection

of nurse participants. The ICU nurses who agreed to participate received an information letter outlining the study and its procedures and a consent form to complete (**Appendix C and D**). Each participant placed the completed questionnaire into an envelope and placed it into a sealed box in the respective ICU unit. At the end of the data collection period, which was approximately two months, the researcher opened the boxes.

3.5.6 Data Analysis

The purpose of analysing data collected in a study is to describe the data in systematic meaningful terms. The role of the researcher is to reduce, organise and give meaning to collected data (Polit and Beck, 2010: 393). In this study, data were analysed using the Statistical Package for the Social Science (SPSS) version 17. Descriptive and inferential statistics were used to analyse the data. According to Polit and Beck (2010:405), descriptive statistics are used to describe and integrate data, whereas inferential statistics provide a means of drawing conclusions about the population data. The following statistical tests were used in this study:

- Percentage, mean and standard deviation were used to analyse and compare the demographic data, along with knowledge, attitudes and practices of oral care.
- Spearman's rank correlation coefficient (rho) was used to determine the correlation between the nurses' knowledge, attitudes and practices of oral care for intubated patients.
- Mann-Whitney U test was used to compare differences between the nurses' knowledge, attitudes and practices of oral care for intubated patients.
- Kruskal-Wallis (H2) one-way analysis of variance was used to test the relationships and differences between the demographic data for the nurses and their knowledge, attitudes and practices of oral care for intubated patients.

Statistical assistance was obtained from a statistician from the university postgraduate office. Testing was done on the 0.05 ($p<0.05$) level of significance.

3.7 RELIABILITY AND VALIDITY OF THE STUDY

Reliability refers to the consistency of measure obtained by means of an instrument (Burns and Grove, 2009:377), whereas validity refers to the issues of whether data collected is a true reflection of what is being studied.

Face and content validity was assessed by the developers in the sample of the original study. A pilot test was carried out before the actual main study to ensure feasibility of the study and detect possible flaws in the instrument used.

The instrument was reviewed by local domain medical and nursing experts in this field of study to see if the content of the instrument was applicable to the South African context. Prospective studies allow the investigation of usual or unexpected results during the data collection and investigate causes that yield such results.

Reliability was maintained by ensuing consistency and accurate recording of data. Data collection was only done by the researcher. An appropriate sample size was discussed with a statistician so as to be representative of the population of the study taking into consideration possible refusal rates. Sample inclusion and exclusions were followed.

3.8 ETHICAL CONSIDERATIONS

Ethical consideration is important when conducting a research study because the rights of research participants and others must be protected. (Burns, Grove and Gray, 2013:160). Furthermore, ethical research generates sound knowledge for evidence-based practice. In this regard, ethical review and clearance adherence is essential to ensure a balance between benefits and risks of the study and prevent research misconduct (Polit and Beck, 2010:117). The ethical considerations as applied in this study will be discussed in the next section under the headings of voluntary participation, informed consent, permission to conduct research, confidentiality and anonymity.

3.8.1 Voluntary Participation

Participants must be willing to participate in a research study (Burns et al. 2013:164). The consideration of voluntary participation was stated in the information letter and discussed with participants before conducting the study (**Appendix C**).

3.8.2 Informed Consent

Informed consent is the process of providing individuals with detailed and understandable information regarding his/her participation in a research study (Burns et al. 2013:177). In this study, an informed written consent sheet was signed by the participants before conducting the study (refer **Appendix C and D**).

3.8.3 Permission to conduct research

The research proposal and instruments were submitted to the Committee for Research on Human Subjects of the University of the Witwatersrand to ensure compliance with the ethical standards. The committee issued a clearance certificate (refer **Appendix F**). In addition, written permission to conduct the study at the selected institution was obtained from the hospital management (**Appendix E**) before commencing the study. Written permission for use of the data collection instrument was obtained from the authors (Lin et al. 2011) (refer **Appendix B**).

3.8.4 Confidentiality

Confidentiality refers to the researcher's responsibility to protect all data gathered within the study from being revealed to others. According to Burns *et al.* (2013:172), the strategies to protect the data in a study include use of a security protected file, providing access only to those people who are involved in the study. In this study, code numbers were placed on the questionnaires, which were placed in sealed boxes on completion of data collection. Questionnaires will be stored in the research safe in the department of nursing for five years, thereafter they will be shredded.

3.8.5 Anonymity

Anonymity refers to keeping participants anonymous in relation to their participation in a research study. The strategies to ensure anonymity include keeping a list of participant's names and research codes in separate locations under lock and key after assigning each participant with a code name (Burns et al., 2013:172). In this study anonymity was maintained by allocating study generated code numbers to each questionnaire.

3.9 SUMMARY

In this chapter, the research methodology of the study has been presented. The design, the study setting, the population, eligibility criteria and sample described, data analysis discussed, methods to ensure reliability and validity described and related to this study, ethical considerations and pilot study discussed, along with the validation of the instrument used in the data collection.

The next chapter will discuss data analysis and the results of the study.

CHAPTER FOUR

DATA ANALYSIS AND RESULTS

4.1 INTRODUCTION

Data files were set within the computer statistical package Statistical Software for the Social Sciences (SPSS) version 17.0, data entered once and then verified during the second direct entry. Descriptive and inferential statistics were used to achieve the study objectives. The descriptive tests (frequency, mean and standard deviation) were used to synthesise nurse participant's demographic data and interview schedule. Inferential testing was then employed to describe and synthesise total questionnaire scores to compare the socio-demographic data of nurse participant's with obtained level of measurements to test for statistical significance. Statistical tests included the Spearman rank order correlation coefficient and Kruskal-Wallis one-way analysis test. Testing was done at the 0.05 level of significance ($p<0.05$).

This chapter describes the analysis of data using descriptive and inferential statistical tests, and the interpretation of findings.

4.2 APPROACH TO DATA ANALYSIS

Descriptive statistics were used to present interpretation of demographic data of ICU nurse respondents, which included age, level of nursing education, type of ICU unit, years of experience as a registered nurse and years of current ICU work experience. Since percentages in these findings were rounded off to one decimal place, the cumulative percentages may not add up 100% in all cases.

Descriptive statistics were then employed to describe and synthesise the distribution of ICU nurses responses that are inclusive of three major constructs (knowledge, attitude and practices) and total questionnaire scores for knowledge, attitude and practices to compare scores within the total sample. The total questionnaire scores for knowledge, attitude and practices can respectively range from 0 to 29, 2 to 20 and 0 to 4 (Lin et al., 2011). All sections of the questionnaire were added together to form the total questionnaire scores for

knowledge, attitude and practices. Mean scores were calculated by following the analytical method as advocated by Lin *et al.* (2011:3208).

When comparing the relationships and differences between the demographic data for the ICU nurses and their knowledge, attitudes and practices of oral care for intubated patients the Spearman's rank correctional coefficient and Kruskal-Wallis one-way analysis of variance was employed. The Spearman's rank correlation coefficient test is a statistical measure of the strength of a relationship between paired data. According to Polit and Beck (2010:569) correlation is an effect size and the strength of the correlation (rho) can be described as either *very weak* (00 to 19), *weak* (20 to 39), *moderate* (40 to 59); *strong* (60 to 79) or *very strong* (80 to 1.0). The closer the rho is to +1 the stronger the relationship (Burns et al. 2013:561). The application of the Kruskal-Wallis one way analysis of variance to the study was to compare *mean ranked* differences between the responses of two or more independent variable on a continuous or ordinal dependent variable (Hole, 2011:7) and used to determine where the differences in groups are occurring. Testing was done on the 0.05 level of significance.

As a purposive sample was used, it should be noted that findings cannot be extrapolated to all ICU nurses in other ICU units. It was however hoped that because of the homogeneity of the sample the findings may be of interest to other public sector ICU units, clinical practice and education of ICU nurses.

4.3 RESULTS AND FINDINGS

4.3.1 Section One: Socio-Demographic Data for the Nurse Participants

This section related to the ICU nurse participants demographic data, which comprised of five items (items 1.1 to 1.5). Items included age, level of nursing education, type of ICU unit, years of experience as a registered nurse and years of current ICU work experience. These findings are displayed in **Figures 4.1 to 4.5**. Items were combined to form coherent groups to facilitate the discussion of the data.

4.3.2.1 Age

In this study, age of the participants was categorised into four sub-categories, namely 27 to 29 years, 30 to 30 years, 40 to 49 years and 50 to 59 years. **Figure 4.1** presents these results.

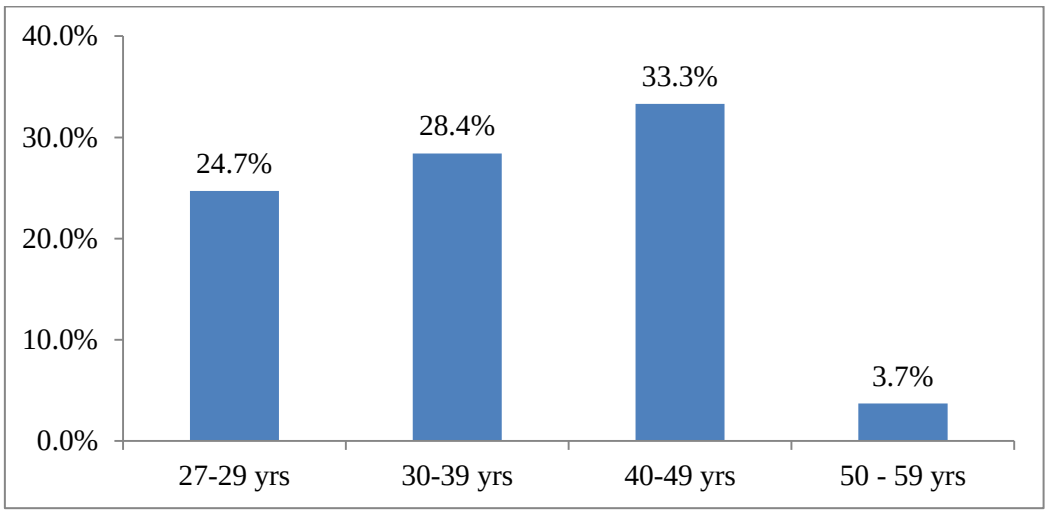


Figure 4.1 Age distribution of the nurse participants

In this study, it was noted that eight participants omitted this item. Of the remaining sample (n=73), most (33.3%; n=27) of the nurse participants were aged between 40 to 49 years, followed by 28.4% (n=23) and 24.7% (n=20) in the 30 to 39 and 27 to 29 age categories, respectively; only 3.7% (n=3) of the participants were between 50 to 59 years of age. It can be extrapolated from these findings that slightly more than half (53.1%;

n=50) of the nurse participants in this study were aged between 27 to 39 years, when contrasted with, only 30 (37.0%) of the nurse participants between 40 to 59 years of age.

4.3.2.2 Level of nursing education

In this study, the level of nursing education was categorised into four sub-categories, namely diploma, advanced diploma, Bachelor's degree and Master's degree. **Figure 4.2** presents these results.

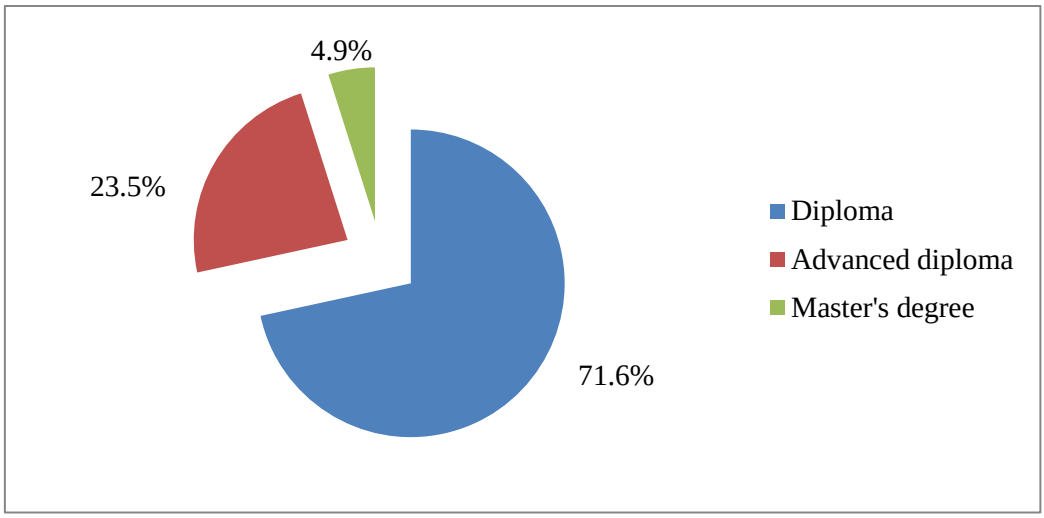


Figure 4.2 Level of nursing education of the nurse participants

Of the total sample (n=81), the majority (71.6%; n=58) of the participants in this study were in the sub-category of a diploma level of nursing education, whilst 23.5% (n=19) and 4.9% (n=4) of the participants were in the sub-categories of advanced diploma and Master's degree, respectively; no responses were indicated for a Bachelor's degree level of education in this study. It can be extrapolated from these findings that three-quarters (71.6%; n=58) of the nurse participants had a diploma level of nursing education, while only 4 (n=4.9%) participants had a Master's degree level of education.

4.3.2.3 Type of ICU unit

In this study, type of ICU unit consisted of six sub-categories, namely general ICU, cardiothoracic ICU, coronary care unit, neurosurgery ICU, trauma ICU and other. **Figure 4.3** presents these results.

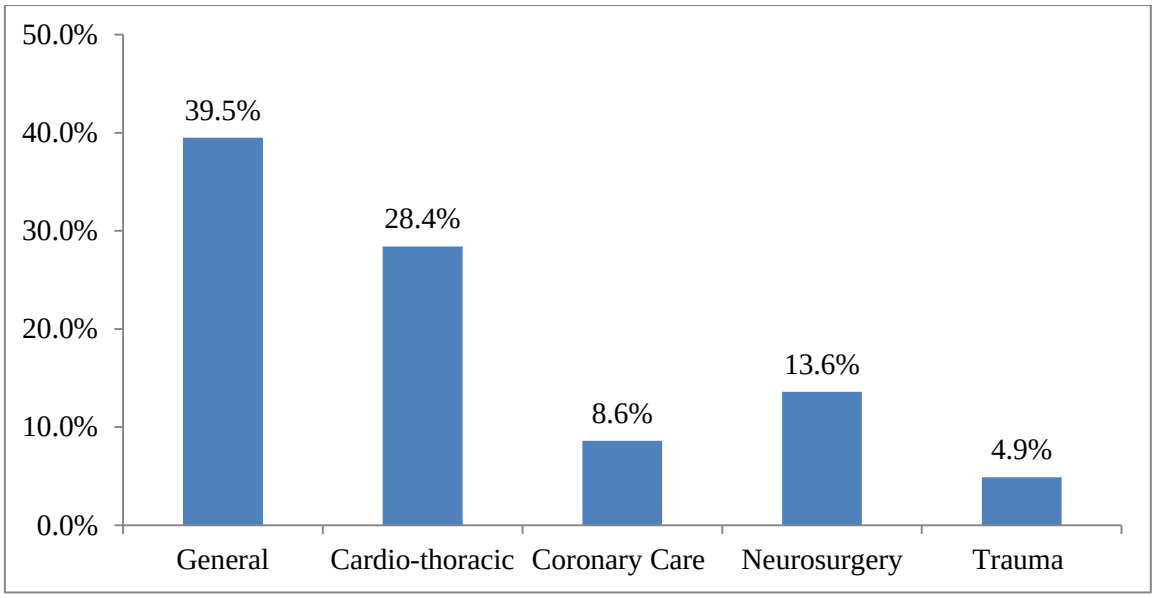


Figure 4.3 Type of ICU where the nurse participants worked

In this study, it was noted that four participants did not respond to this item. Of the remaining sample (n=77), most (39.5%; n=32) of the participants indicated they worked in the general ICU, followed by 28.4% (n=23) and 13.6% (n=11) in the cardiothoracic, neurosurgical and coronary care units, respectively, whilst a minority (4.9%; n=4) of the participants worked in the trauma unit. It can be extrapolated from these findings that more than half (67.9%; n=55) of the participants in this study worked in the general and cardiothoracic units.

4.3.2.4 Years of experience as registered nurse

In this study, the years of experience as a registered nurse comprised five sub-categories, namely, less than five years, greater than five to 10 years, greater than 10 to 20 years, greater than 21 to 30 and greater than 31 years.

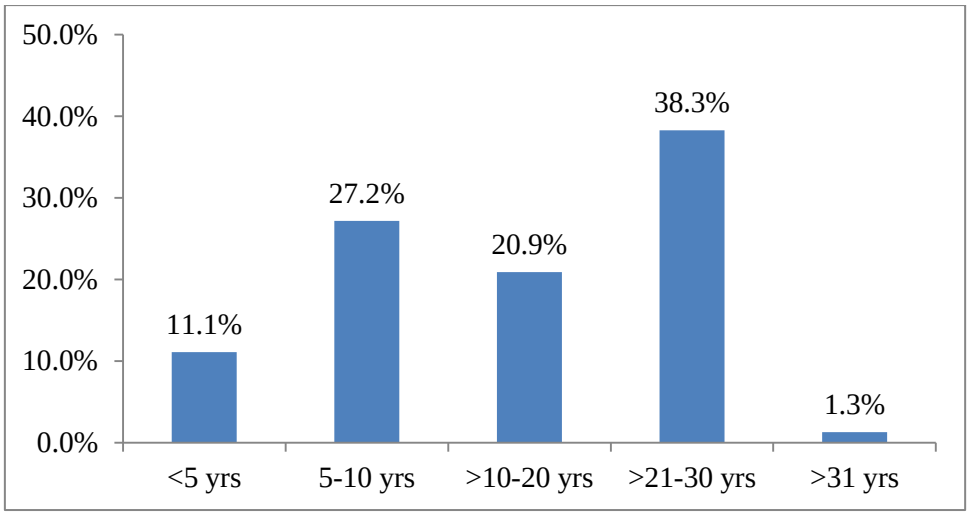


Figure 4.4 Years of experience as a registered nurse

In this study, it is noted that one participant did not respond to this item. Of the remaining sample (n=80), most (38.3%; n=31) of the participants were in the category of greater than 21 to 30 years of experience as a registered nurses, whilst 27.2% (n=22) and 20.9% (n=17) were in the five to 10 and greater than 10 to 20 years categories, which contrasted with only 1.3% (n=1) in the category of greater than 31 years of experience as a registered nurse. It can be extrapolated from these findings that most (68.2%; n=48) of the nurse participants have between 10 to 30 years of nursing experience.

4.3.2.5 Current years of ICU work experience

In this study, the current years of ICU work experience comprised four sub-categories, namely, less than five years, greater than five to 10 years, greater than 10 to 20 years and greater than 20 years. **Figure 4.5** presents these findings.

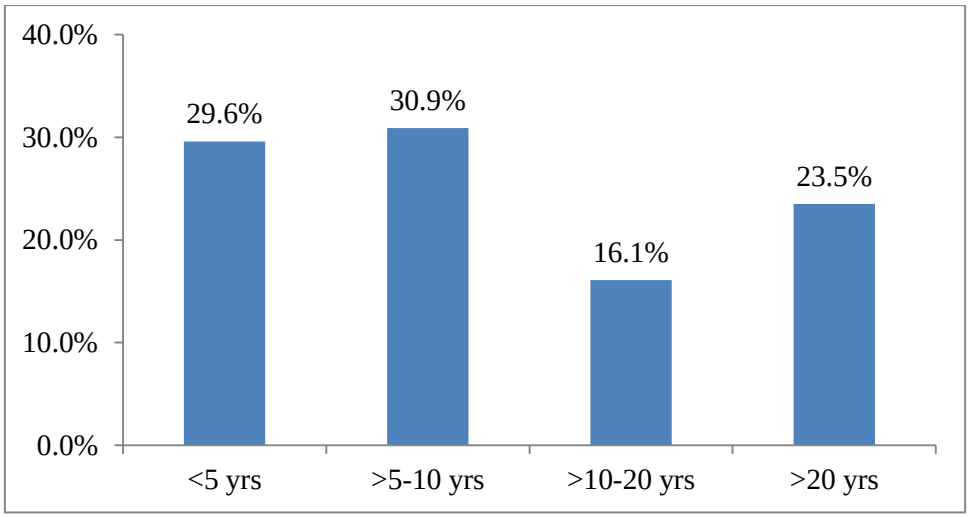


Figure 4.5 Current years of ICU work experience

Of the total sample (n=81), most (30.9%; n=25) of the nurse participants were in the more than 5 to 10 years of current ICU work experience, 29.6% (n=24) were in the category of 5 years, followed by 23.5% (n=19) and 16.1% (n=13) in the categories of greater than 20 years and greater than 10 to 20 years, respectively. It can be extrapolated from these findings that most (60.5%; n=32) participants had less than 10 years of ICU nursing experience.

4.3.2 Section Two: Sources of Learning

The ICU nurses "sources of learning" about oral care for intubated patients comprised of six (6) items (Lin et al., 2011). This included "instructions from senior ICU nurses, nursing school, in-service education at ICU, participating in in-service education outside of the hospital, reading related studies and material on own accord and participating in in-service course outside the hospital". Further, the participants "could tick more than on response". **Table 4.1** presents a summary of the results of the process for the total sample (n=81).

Table 4.1 Nurses sources of learning about oral care for intubated patients

Item	Statement	Participant's responses			
		n	f	Mean	SD
2.1	"Instruction from senior ICU nurses"	48	**59.5%**	0.59	0.49
2.2	"Nursing School"	56	**70.4%**	0.70	0.45
2.3	"In-service education in ICU"	41	**50.6%**	0.51	0.50
2.4	"Participating in in-service education outside hospital"	10	12.4%	0.12	0.33
2.5	"Reading related studies and materials of own accord"	27	**34.6%**	0.35	0.47
2.6	"Participating in in-service course within hospital"	6	7.4%	0.07	0.26

In terms of "sources of learning" about oral care for intubated patients, a higher (70.4%; n=56) response was indicated from the participants in the "nursing school" group (**item 2.2**), followed by 59.5% (n=48) in the "instructions from other senior ICU nurses" (**item 2.1**), 50.6% (n=41) in the "in-service education" at ICU (**item 2.3**) and 34.6% (n=27) indicated "reading related studies and materials of their own accord" (**item 2.5**).

However in contrast, the lowest (7.4%; n=6) number of responses were indicated in the participating in an in-service course in the hospital group (**item 2.6**), followed by 12.4% (n=10) in the participating in an "in-service course outside of the hospital" categories (**item 2.4**). It can be extrapolated from these findings that the highest (70.4%; n=56) "source of learning about oral care" for ICU nurses is nursing school.
Findings are displayed in **Table 4.1**.

4.3.3 Section Three: Knowledge of Oral Care

This section related to ICU nurses knowledge of oral care, which consisted of "six multiple-choice questions (items 3.1 to 3.6) with a total of 29 sub-items" (Lin et al., 2011). The content of these items included "characteristics of oral care cleaning agents" and "oral care cleaning tools for effective removal of dental plaque". **Participants were asked to**

choose all the answers (sub-items) which fit the item in question. Results of this process are summarised in **Table 4.2.**

Table 4.2 Summary of ICU nurses' percentages of responses for knowledge of oral care for intubated patients

Item	Statement	n	%
3.1	"Characteristics of an ideal oral cleaning solution"		
	A. "Contains alcohol*"	36	44.4
	B. "Antibacterial or inhibits bacteria"	11	13.6
	C. "Maintains oral moistness"	3	3.7
	D. "Increases viscosity of oral mucus*"	30	37.0
	E. "Promotes wound healing"	1	1.2
3.2	"Characteristics of chlorhexidine as an oral cleaning agent"		
	A. "Antibacterial"	22	27.2
	B. "Appropriate concentration is 0.1 to 0.12%"	14	17.3
	C. "Decreases viscosity of oral mucus*"	39	48.2
	D. "Treats oral infections "	6	7.41
	E. "Causes oral pain"	-	-
3.3	"Characteristics of sodium chloride as oral cleaning agent"		
	A. "Eliminates debris attached to oral mucus*"	13	16.1
	B. "Maintains oral moistness*"	24	29.6
	C. "Tends to cause mouth dryness"	3	3.7
	D. "Removes dental plaque*"	31	38.3
	E. "Promotes wound healing"	6	7.4
3.4	"Characteristics of hydrogen peroxide as an oral cleaning solution"		
	A. "Antibacterial"	31	38.3
	B. "Removes bad odours"	4	4.9
	C. "Decreases viscosity of oral mucus*"	31	38.3
	D. "Irritating to oral mucus"	12	14.8
	E. "Promotes wound healing"	1	1.2
3.5	"Characteristics of sodium bicarbonate as an oral cleaning solution"		
	A. "Antibacterial"	29	35.8
	B. "Tends to encourage bacterial growth"	-	-
	C. "Increases viscosity of oral mucus*"	31	38.3
	D. "Removes cell debris from inside mouth"	8	9.8
	E. "Neutralises excessive oral acidity"	11	13.6
3.6	"Oral supplies and equipment effective for removing dental plaque"		
	A. "Cotton swab*"	30	37.0
	B. "Foam swab*"	-	-
	C. "Toothbrush"	49	60.5
	D. "Gauze pad*"	2	2.5

Key: *=incorrect response

Of the total sample (n-81), only some (13.6%; n=11) of the participants believed, correctly, that the characteristic of an ideal cleaning agent solution (**item 3.1**) was that it was "antibacterial or inhibited bacteria growth" (*sub-item B*). Similarly, most of the participants also believed, correctly, that "antibacterial properties were characteristics of chlorhexidine" (**item 3.2**), "hydrogen peroxide" (**item 3.3**) and "sodium bicarbonate" (**item 3.4**) and indicated respectively as 27.2% (n=22) (*sub-item A*), 38.3% (n=31) (*sub-item A*) and 35.8% (*sub-item A*). However, despite a reasonable (27.2%; n=22) recognition that "chlorhexidine (**item 3.2**) has antibacterial properties", only a few (7.41%; n=6) of the participants believed, correctly, that "chlorhexidine was used to treat oral infections" (*sub-item D*).

Related to the "characteristics of oral cleaning solutions", the most (17.3%; n=14) correct percentages of the nurse participants responses in **item 3.2** was related to *sub-item B*, which indicated that the "appropriate concentration of chlorhexidine is 0.1 to 0.12%", followed by 14.8% (n=13) of responses in **item 3.4** related to *sub-item D*, which indicated that "hydrogen peroxide was irritating to oral mucus". Furthermore, the most (13.6%; n=11) correct percentages of responses in **item 3.5** related to *sub-item E*, which indicated that "sodium bicarbonate neutralises excessive oral acidity".

Related to "oral supplies and equipment for removing dental plaque" (**item 3.6**), the majority (60.5%; n=49) of the participants believed, correctly, that this was related to the "use of a toothbrush" (*sub-item F*).

Of the total sample (n=81), most (44.4%; n=36) participants believed, incorrectly, that the "characteristics of an ideal cleaning agent" (**item 3.1**) was that "it contained alcohol" (*sub-item A*), whilst 37.0% of all participants also believed, incorrectly, that it "increased viscosity of oral mucus" (*sub-item B*).

Related to "characteristics of chlorhexidine as an oral cleaning agent" (**item 3.2**), a close majority (48.2%; n=39) of the participants believed, incorrectly, that "chlorhexidine decreases viscosity of oral mucus" (*sub-item C)*, whilst 31 (38.3%) and 24 (29.6%) of the participants believed, incorrectly, that the "sodium chloride (**item 3.3**) removed dental plaque" (*sub-item D*) and "maintains oral moistness" (*sub-item B*), respectively.

In this study, most (38.3%; n=31) of the participants believed, incorrectly, that "hydrogen peroxide (**item 3.4**) decreases viscosity of oral mucus" (*sub-item C*), similarly, 31 (38.3%) of the participants also believed, incorrectly, that "sodium bicarbonate (**item 3.5**) increases viscosity of oral mucus" (*sub-item C*).

Related to "oral supplies and equipment effective for removing dental plaque" (**item 3.6**), most (37.0%; n=30) of the participants in this study believed, incorrectly, that the "use of cotton swabs was effective for removing dental plaque" (*sub-item A*).

4.3.4 Section Four: Attitudes about Oral Care

The next section of the questionnaire related to attitudes about oral care for intubated patients, which comprised two parts. The first part contained two questions (**items 4.1 and 4.2**), namely *"*Your opinion of the priority of various physical care activities for ICU patients" (**item 4.1**) and "Your opinion on the priority of various nursing treatment activities for ICU patients" (**item 4.2**). Nurse participants were asked to "rank seven physical activities in terms of their priority and eight nursing treatment activities in terms of their priority" (Lin et al., 2011). The second sub-part consisted of two questions (**items 4.3 and 4.4**) regarding "the importance as perceived by the nurse participant of oral care as a physical activity in relation to nursing treatment activities", respectively. Results of this process are summarised in **Tables 4.3 to 4.5.**

Table 4.3 ICU Nurses' mean ranking of priority of physical care activity

Item	Statement	Participant's responses			
		n	f	Mean	SD
4.1.1	"Physical assessment"	77	96.3%	**1.15**	0.85
4.1.5	"Chest physiotherapy"	71	88.8%	2.44	1.33
4.1.3	"Oral care"	66	82.5%	**3.00**	0.84
4.1.4	"Bed bath"	36	45.0%	4.35	1.07
4.1.6	"Changing position"	30	37.5%	4.46	0.96
4.1.2	"Bowel activity"	63	80.3%	5.63	1.08
4.1.7	"Gastrointestinal care"	65	77.50	6.68	1.03

Table 4.3 presented the mean ranking of physical care activities by the participants. Of the total sample (n=81), the nurse participants ranked physical assessment (M=1.15; SD 0.85) first in order of priority of physical care activities (**item 4.1.1**), contrasting with, oral care (M=3.00; SD 0.84) which was third in order of priority of physical care activities (**item 4.1.3**).

Table 4.4 ICU nurse's mean ranking of priority of nursing treatment activities

Item	Statement	Participant's responses			
		n	f	Mean	SD
4.2.4	"Observing and recording status of patient"	69	86.5	**1.57**	1.54
4.2.2	"Oxygen therapy"	64	80.5	1.93	0.54
4.2.3	"Suctioning sputum"	67	83.7	3.19	1.03
4.2.6	"Administering medication"	65	81.3	4.24	1.14
4.2.7	"Catheter care"	62	77.5	5.25	1.36
4.2.5	"Assisting physician with procedures"	65	81.3	5.75	1.21
4.2.1	"Processing patient entrance into ICU"	62	77.5	6.06	2.24
4.2.8	"Oral care"	61	76.3	**7.06**	1.96

Table 4.4 presented the mean ranking of priority of nursing treatment activities. Of the total sample (n=81), the nurse participants mean ranked observing and recording status of the patient (M=1.57; SD 1.54) as the first priority of nursing treatment activities (*sub-item 4.2.4*), contrasting with oral care (M=7.06; SD 1.96) which was placed eighth in order of priority (*sub-item 4.2.8*).

Table 4.5 Importance of oral care in physical care and nursing treatment activities

Item	Statement	Participant's responses		
		n	Mean	SD
4.3	"Importance of oral care in physical care activities"	81	5.93	1.52
4.4	"Importance of oral care in nursing treatment activities"	81	6.25	1.79

Table 4.5 presented the importance of oral care in physical care and nursing treatment activities, respectively. Of the total sample (n=81), the mean score for the nurse participants' importance of oral care in physical activities (**item 4.3**) on the attitude scale was 5.93 (SD 1.52); the mean score for the nurse participants' importance of oral care in nursing treatment activities (**item 4.4**) on the attitude scale was 6.25 (SD 1.79).

4.3.5 Section Five: Practices about Oral Care

This part of the questionnaire consisted of four items (5.1 to 5.4) in relation to practices about oral care for intubated patients. The ICU participants were asked to "choose their own answers from the five different frequency or duration options to each question. Included were A=once every 2 to 4 hours, B=once every 4 to 6 hours, C=once every 6-8 hours, D=once every 8 to 12 hours and E=once a day" (Lin et al., 2011). These four items and the "minimum standards recommended in literature", supported by Lin *et al.* (2011), were used as a "cut-off point" for the frequency of performance of oral care. Results of the process are provided in **Table 4.6**.

Table 4.6 Summary of ICU nurses' frequency of oral care practices for intubated patients

Item	Statement	n	%
5.1	"Frequency of removal of secretions":		
	A. "Once every 2-4 hours*"	7	**8.6**
	B. "Once every 4 -6 hours"	17	20.9
	C. "Once every 6 – 8 hours"	2	2.5
	D. "Once every 8 – 12 hours"	55	67.9
	E. "Once a day"	-	-
5.2	"Frequency of assisting patients to maintain oral moistness":		
	A. "Once every 2 – 4 hours*"	8	**9.9**
	B. "Once every 4 – 6 hours"	11	13.6
	C. "Once every 6 – 8 hours"	2	2.5
	D. "Once every 8 – 12 hours"	60	74.1
	E. "Once a day"	-	-
5.3	"Frequency of performing oral care for patients using a toothbrush":		
	A. "Once every 2 – 4 hours"	1	1.2
	B. "Once every 4 – 6 hours"	12	14.8
	C. "Once every 6 – 8 hours"	3	3.7
	D. "Once every 8 – 12 hours *"	3	**3.7**
	E. "Once a day"	62	76.5
5.4	"Frequency of performing oral care for patients using cotton or foam swab":		
	A. "Once every 2 – 4 hours"	1	1.2
	B. "Once every 4 – 6 hours"	12	14.8
	C. "Once every 6 – 8 hours *"	3	**3.7**
	D. "Once every 8 – 12 hours"	62	76.5
	E. "Once a day"	3	3.7

Key: *="cut-off point" for best performance

In this study, the highest (9.9%; n=8) frequency of participants correct responses was for "assisting patients to maintain oral moistness" (**item 5.2**) as indicated in *sub-item A*, which

indicated this as once every 2 to 4 hours. Similarly, the next highest (8.6%; n=7) frequency of responses was for "removal of oral secretions" (**item 5.1**) as indicated in *sub-item A*, which indicated the removal of secretions as once every 2 to 4 hours.

Related to the "frequency of performing oral care for patients using a toothbrush" (**item 5.3**) and the "frequency of performing oral care for patients using cotton or foam swab" (**item 5.4**), some (3.7%; n=3) of the participants indicated this as once every 8 to 12 hours and once every 6 to 8 hours, as indicated in *sub-item D and sub-item C*, respectively.

Of the total sample (n=81), most (67.9%; n=55) participants believed, incorrectly, that the "frequency of removal of oral secretions" (**item 5.1**) was indicated as once every 8 to 12 hours (*sub-item C*). Furthermore, most (74.1%; n=60) participants believed, incorrectly, that the "frequency of assisting patients to maintain oral moistness" (**item 5.2**) was indicated as once every 8 to 12 hours (*sub-item C*).

Related to the "frequency of performing oral care for patients using a toothbrush" (**item 5.3**), most (76.5%; n=62) participants believed, incorrectly, that this was indicated as once per day (*sub-item E*). Similarly, most (76.5%; n=62) participants believed, incorrectly, that "frequency of performing oral care using cotton or foam swab" (**item 5.4**) was indicated as once every 8 to 12 hours (*sub-item D*).

4.3.7 Correlation between Nurses' Knowledge, Attitudes and Practices

Table 4.7 Summary of the total mean scores for knowledge, attitudes and practice

Construct	n	Range	Minimum	Maximum	Mean	SD
Knowledge	81	10.0	3.0	13.0	9.235	2.82
Attitude	81	12.0	8.0	20.0	12.185	2.95
Practice	81	3.0	1.0	4.0	2.049	0.63

The mean knowledge score was 9.235 (SD 2.82), where the range was 3 to 13 points. For comparison, the analytical methods as advocated by Lin *et al.* (2011) were followed, whereby the mean score was converted into percentage of correct responses using the

mean score divided by total score and then multiplied by 100%. In this study, the average percentage of ICU nurses' knowledge of oral care for intubated patients was **31.84% (9.235/29 x 100%).**

In this study, the mean attitude score on the attitude scale was **12.185 (SD 2.95),** where the range was 8 to 20 points, the average percentage representing ICU nurses' attitude about oral care was **60.92% (12.185/20 x 100%).**

The mean score on the ideal practice scale was 2.049 (SD 0.63), where the range was 1 to 4 points. The average percentage representing the ICU nurses' practice on oral care for intubated patients was **52.25% (2.09/4 x 100%).**

Table 4.8 Nurses mean ranking of sources of learning about oral care for intubated patients

Item	Statement	Participant's responses			
		n	f	Mean	SD
2.2	"Nursing School"	56	**70.4%**	**0.70**	0.45
2.1	"Instruction from senior ICU nurses"	48	59.5%	**0.59**	0.49
2.3	"In-service education in ICU"	41	50.6%	0.51	0.50
2.5	"Reading related studies and materials of own accord"	27	34.6%	**0.35**	0.47
2.4	"Participating in in-service education outside hospital"	10	12.4%	0.12	0.33
2.6	"Participating in in-service course within hospital"	6	7.4%	**0.07**	0.26

Table 4.8 presented these results. In this study, the ICU nurses' mean ranking of sources of learning about oral care for intubated patients ranked highest for "nursing school" (0.70; SD 0.45), followed by the second and third mean rankings of 0.59 (SD 0.49) and 0.51 (SD 0.50)*"*instruction from senior ICU nurses" and "in-service education,*"* respectively. In addition, it was noted that the mean ranking obtained for *"*reading related studies and materials on own accord*"* was 0.35 (SD 0.47), and *"*participating in in-service course outside the hospital*"* ranked the lowest (0.07; SD 0.26) of sources of learning.

Table 4.9 Correlation between sources of learning and level of knowledge

Variables	Correlations	Sources of learning	Knowledge
Sources of learning	rho	1.000	.302*
	p-value	-	0.006
	Total	81	81
Knowledge	rho	.302*	1.000
	p-value	0.006	-
	Total	81	81

Key: *=correlation is significant at the 0.01 level (2-tailed)

Table 4.9 displayed these results. The relationship between the number of sources of learning and knowledge demonstrated was investigated using Spearman's rank order correlation coefficient (rho). There was a correlation between sources of learning and level of knowledge demonstrated (rho=.302; p=0.006; n=81). Based on the results of this study, ICU nurses who had indicated **more than one (multiple) source of learning** tend to **rank higher in knowledge**, **than those** ICU nurses **with one (single) source of learning** (**rho=.302; p=0.006**), which means when nurses are **exposed to more than one source of learning** about oral care there **will be an increase in knowledge**.

4.3.8 Relationships between Demographic Data for Nurses and Oral Care Knowledge, Attitudes and Practices

Table 4.10 Correlation between ICU qualification and the level of knowledge, attitude and practice

Construct	n	rho	p-value
Knowledge	81	.036	0.748
Attitude	81	.275	0.013
Practice	81	-.046	0.681

Table 4.10 presented these results. The relationship between ICU qualification levels was investigated using Spearman's correlation coefficient (rho). There was a positive

correlation between qualification and level of knowledge (rho=.036; p=0.748; n=81), and attitude (rho=.275; p=0.013; n=81), while there was a negative correlation between ICU nurse qualification and practice (rho=-.046; p=0.681; n=81). Based on these results, it can be observed that ICU qualification levels increases knowledge and attitude (rho=.036; p=0.748; rho=.275; p=0.013) respectively, but has a negative effect on practice (rho=-.046; p=0.681).

Table 4.11 Relationship between ICU qualification and knowledge, attitude and practice

Construct	Qualification	Participant's responses			
		n	Mean	Kruskal-Wallis test	p-value
Knowledge	Diploma	58	40.80	0.166	0.920
	Advanced diploma	19	40.63		
	Master's degree	4	**45.63**		
	Total	81	-		
Attitude	Diploma	58	40.85	5.238	0.073
	Advanced diploma	19	36.92		
	Master's degree	4	**62.50**		
	Total	81			
Practice	Diploma	58	40.89	0.766	0.682
	Advanced diploma	19	**42.39**		
	Master's degree	4	36.00		
	Total	81	-		

Table 4.11 presented these results. The relationship between ICU qualification and the level of knowledge, attitude and practices demonstrated was investigated using the Kruskal-Wallis test. Based on the results of this study, there was **no statistical significant difference** between **knowledge and** different **ICU qualification levels (H2=0.166; p=0.920),** with a mean rank of 45.63 for Master's degree, 40.80 for diploma and 40.63 for advanced diploma.

Based on the results of this study, there was **no statistical significant difference** between **attitude and** different **ICU qualification levels (H2=5.238; p=0.073),** with a mean rank of 62.50 for Master's degree, 40.85 for diploma and 36.92 for advanced diploma.

Based on the results of this study, there was **no statistical significant difference** between **practices and** different **ICU qualification levels (H2=0.766; p=0.682),** with a mean rank of 42.39 for advanced diploma, 40.89 for diploma and 36.00 for Master's degree.

On inspection of the means, it was noted that the **Master's level** of ICU qualification **demonstrates more knowledge (45.63)** and **attitude (62.50)**, while the **advanced diploma demonstrates more practice (42.39).**

Table 4.12 Relationship between ICU experience and knowledge, attitude and practice

Construct	ICU experience	Participant's responses			
		n	Mean	Kruskal-Wallis test	p-value
Knowledge	<5 years	24	**49.90**	6.451	0.092
	5 – 10 years	25	34.54		
	10 – 20 years	13	44.12		
	>20 years	19	36.13		
	Total	81	-		
Attitude	<5 years	24	**45.63**	3.606	0.307
	5 – 10 years	25	43.06		
	10 – 20 years	13	34.46		
	>20 years	19	36.92		
	Total	81	-		
Practice	<5 years	24	37.69	5.038	0.169
	5 – 10 years	25	44.10		
	10 – 20 years	13	**45.35**		
	>20 years	19	38.13		
	Total	81	-		

Table 4.12 presented these results. The relationship between ICU experience and the level of knowledge, attitude and practices demonstrated was investigated using the Kruskal-Wallis test. Based on the results of this study, there was **no statistical significant mean difference between knowledge** and **ICU experience levels (H2=6.451; p=0.092)**, with a mean rank of 49.90 for < 5 years, 44.12 for 10 to 20 years, 36.13 for >20 years and 34.54 for 5 to 10 years of ICU experience.

Based on the results of this study, there was **no statistical significant mean difference between attitude** and **ICU experience levels (H2=3.606; p=0.307),** with a mean rank of

45.63 for < 5 years, 43.06 for 5 to 10 years, 36.92 for >20 years and 34.46 for 10 to 20 years of ICU experience.

Based on the results of this study, there was **no statistical significant mean difference between practice** and **ICU experience levels (H2=5.038; p=0.169),** with a mean rank of 45.35 for 10 to 20 years, 44.10 for 5 to 10 years, 38.13 for >20 years and 37.69 for <5 years of ICU experience.

On inspection of the means, it was noted that nurses with <5 years of ICU experience demonstrate more knowledge (49.90) and attitude (45.63), while nurses with 10 to 20 years of ICU experience demonstrate more practice (45.35).

4.4 DISCUSSION OF MAIN FINDINGS

The purpose of the study was to investigate ICU nurses' knowledge, attitudes and practices related to oral care for intubated patients with the associated factors of the same.

The distribution of the sample in this study revealed most (53.1%; n=50) of the participants were aged between 27 to 39 years and only 30 (27%) participants were between 40 to 59 years of age. Three-quarters (71.8%; n=56) of the nurse participants had a diploma level of education, followed by 23.5% (n=19) and 4.9% (n=4) indicated as an advanced diploma and Master's degree, respectively. More than half (67.9%; n=55) of the participants worked in the general and cardiothoracic ICUs. Most (60.5%; n=32) of the nurse participants had less than 10 years of ICU experience, while 19 (23.5%) and 13 (16.1%) nurses had more than 10 and more than 20 years of ICU experience, respectively.

Findings yielded in this study demonstrated that the highest number (n=56; 70.4%) of nurse participants indicated "nursing school as a source of learning". This was followed by 59.5% (n=48) and 50.6% (n=41) indicated as *"*instructions from senior ICU nurses*"* and *"*in-service education in ICU*",* respectively. In this study, a close third (34.6%; n=27) of the participants indicated *"*reading related material on their own accord.*"* These results are consistent with studies conducted overseas (USA), whereby Binkley *et al.* (2004) reported in their study that nurses training was the primary source of education for 67% (n=376) of the respondents, whilst Sole *et al.* (2002) indicated instruction from senior ICU nurses was

also a secondary source of learning about oral care in their study. In this study, the average number of sources of learning indicated by the nurse participants was 2.32. These results are slightly higher than in one study by Lin *et al.* (2011), whereby it was reported that the average number of sources of learning in their sample was 1.92.

In this study, the average percentage of ICU nurses "knowledge of oral care for intubated patients" was 31.82% (9.235/29 x 100%). These results are lower than one study conducted overseas, whereby Lin et al. (2011) reported that the average knowledge score of their sample of 205 nurses was 58.8% (17.05/29 x 100%).

Regarding the "knowledge of characteristics of cleaning solutions", the answer most often chosen correctly about an ideal oral agent (item 3.1) was *"*antibacterial or inhibits bacteria*"* (13.6%; n=11). These results are lower than one study conducted overseas, whereby Lin *et al.* (2011) indicated that 92.7% (n=190) of the nurses correctly identified this characteristic of oral cleaning solutions in their study. However, findings in this study demonstrate that only a **small number of nurses** believed correctly that **cleaning solutions should have antibacterial or bacterial inhibiting effects**.

The five questions (items 3.1 to 3.5) related to the nurse participants **least often answered correctly** in this study were: (1) *"*promotes wound healing as a characteristic of oral cleaning agents" (1.2%; n=1) (item 3.1), (2)*"*tends to cause mouth dryness as a characteristic of sodium chloride" (3.7%; n=3) (item 3.3), (3) *"*removes bad odours as a characteristics of hydrogen peroxide" (4.9%; n=4) (item 3.4), (4) *"*treats oral infections as a characteristic of chlorhexidine" (7.41%; n=6) (item 3.2) and (5) *"*removes cell debris from inside the mouth (9.8%; n=8) as a characteristic of sodium bicarbonate" (item 3.5). These results suggest that some of the nurse participants in this study **may not have a clear understanding** of the **characteristics of sodium chloride, chlorhexidine, and sodium bicarbonate** as oral cleaning agents.

In addition, the **highest percentage of incorrect answers** in this study were related to *"*contains alcohol" (44.4%; n=36) "as a characteristic of an ideal cleaning solution" (item 3.1), *"*decreases viscosity of oral mucus*"* (48.2%; n=39) as a "characteristic of chlorhexidine as an oral cleaning solution" (item 3.2), "removes dental plaque*"* (38.3%; n=31) as a "characteristic of sodium chloride" (item 3.3), *"*decreases viscosity of oral

mucus*"* (38.3%; n=31) as a "characteristic of hydrogen peroxide" (item 3.4) and *"*increases viscosity of oral mucus*"* (38.3%; n=31) as a "characteristic of sodium bicarbonate" (item 3.5). These results mean that **many of the nurse participants** in this study **did not have a clear understanding** of the properties of oral cleaning agents.

In item 3.6, most (60.5%; n=49) nurses in this study answered correctly that *"*toothbrushes could be effectively used to remove dental plaque,*"* however one third (37.0%; n=30) of the nurses believed, incorrectly, that *"*cotton swabs could be effectively used to remove dental plaque.*"* These results differ from studies conducted overseas, whereby Binkley *et al.* (2004) indicated in their study that toothbrushes and toothpaste were used infrequently by almost 80% of participants and Lin *et al.* (2011) reported the use of cotton swabs by 23.1% (n=49) of participants in their sample of 205 nurses. The literature demonstrates that dental plaque can only be removed by means of tooth brushing (ACCN Practice Alert, 2010; Munro et al. 2009) and that cotton swabs may be ineffective for removing oral secretions and dental plaque (Grap et al. 2003).

In terms of attitudes of participants toward oral care of intubated patients, in this study, nurses' ranked (Mean 3.00; SD 0.84) oral care **third in order of priority** of physical care activities, this was after "physical care assessment" (mean 1.15; SD 0.85) and "chest physiotherapy" (mean 2.44; SD 1.33). They ranked (mean 7.06; SD 1.96) oral care **eighth** in order of **priority** of nursing activities, this was after nursing "**activities of assisting physician with procedures**" (mean 5.75; SD 2.24) and *"***processing patient entrance into ICU***"* (mean 6.06; SD 2.24). These results are similar to a study conducted by Lin et al. (2011), whereby it was reported that the sample of ICU nurses ranked oral care third in order of priority of physical care activity and oral care eighth in order of priority of nursing treatment activities.

In addition, the mean score for the nurse participants' importance of oral care in physical activities was 5.93 (SD 1.52), and the mean score for the nurse participants' importance of oral care in nursing treatment activities on the attitude scale was 6.25 (SD 1.79). These results differ from studies conducted overseas, whereby Lin *et al.* (2011) indicated that the mean score of 8.19 (SD 1.60) and 7.68 (SD 1.92) reflected in their study as importance of oral care in physical care activities and importance of oral care in nursing treatment activities, respectively. Similarly, Ganz *et al.* (2009) and Jones *et al.* (2004) reported the

mean score for attitude was 7.89. In this current study, these findings suggest that when it came to nursing treatment activities the nurse participants in this study had a positive attitude.

The mean score on the attitude scale was 12.185 (SD 2.95), where the range was 8 to 20 points, the average percentage representing **ICU nurses attitude about oral care was 60.9%** (12.185/20 x 100). These results are lower than the study of Lin *et al.* (2011), where it was reported that the mean attitude score obtained in their sample of nurse participants (n=205) was **79.4%** (15.87/20 x 100%), and Soh *et al.* (2011) indicated that more than 89% of nurses in their study demonstrated a positive attitude towards oral care of mechanically ventilated patients.

In this study, the frequency of performance of oral care amongst most of the participants was *"*removing oral secretions*"* (item 5.1) and *"*assisting patients to maintain oral moistness (item 5.2) was once every 8 to 12 hours", indicated at 67.9% (n=55) and 74.1% (n=60), respectively. The percentage of nurses "using a cotton or foam swabs once every 8 to 12 hours*"* (item 5.4) was 76.5% (n=62). The frequency of performing oral care "using a toothbrush once a day*"* (item 5.3) was 76.54% (n=62). Findings in this study suggest that the **nurses performed these oral care practices less frequently**, compared to the results of studies conducted overseas (Cason et al. 2007; Ganz et al. 2009; Grap et al. 2003; Sole et al. 2002).

The best performance about oral care amongst participants in this current study, was *"*removing oral secretions (item 5.1) and "assisting patients to maintain oral moistness (item 5.2) once every 2 to 4 hours," indicated as 8.6% (n=7) and 9.9% (n=8), respectively. The percentage of nurses *"*using cotton or foam swabs (item 5.4) once every 6 to 8 hours" was 3.7% (n=3). The frequency of performing oral care for patients "using a toothbrush (item 5.3) once every 8 to 12 hours" was 3.7% (n=3). The literature and recommendations demonstrates the frequency of oral care best performance as removal of oral secretions and assisting patients to maintain oral moistness once every 2 to 4 hours (AACN Practice Alert, 2010; Lin et al. 2011) and the frequency of using cotton foam swabs once every 6 to 8 hours and using a toothbrush once every 8 to 12 hours (Booker, Murff, Kitko & Jablonski, 2013; Grap et al. 2003; Lin et al. 2011).

In this study, the mean score on the ideal practices scale was 2.049 (SD 0.63), where the range was 1 to 4 points. The average percentage representing ICU nurses **frequencies of oral care practices was 51.22% (2.049/4 x 100%).** These results are marginally higher than the mean score in the study of Lin *et al.* (2011), where they reported that the mean score was 49.8% (1.99/4 x 100%) and lower than the study of Ganz et al. (2009) where the average percentage best practice score of 218 nurses in their study was 68%. Findings in this study suggest nurses in this study were often **not adhering to the latest evidence-based practice** and therefore need to be educated and encouraged to do so in order to improve patient care.

The study found correlations between sources of learning and level of knowledge (rho=.302; p=0.006; n=81); ICU nurses qualification and level of knowledge and attitudes (rho=.302; p=0.006 and rho=.275; p=0.013), respectively, but it had a negative effect on practice (rho=.046; p=0.68). Although there were statistically significant correlations the **correlation coefficients were small**, the implications of these **findings should be viewed with caution.**

This study found no relationship (p>0.05) between ICU nurses' qualification categories and knowledge, attitudes and practices related to oral care (H2=0.166; p=0.920; H2=5.238; p=0.073 and H2=0.766; p=0.682), respectively. It was noted on inspection of the mean ranks of the Kruskal-Wallis test that Master's level of ICU qualification demonstrated more knowledge (mean=45.63) and positive attitude (mean=62.50), whilst the advanced diploma demonstrated more ideal frequency of oral care practices (mean=45.39).

The study also found there was no relationship (p>0.05) between the levels of ICU nurse's qualification and knowledge, attitudes and practices of oral care (H2=6.451; p=0.092; H2=3.606; p=0.307; H2=5.038; p=0.166), respectively. It was noted on inspection of the mean ranks of the Kruskal-Wallis test, that ICU nurses with <5 years of ICU experience demonstrated more knowledge (49.90) and positive attitude (mean=45.63), while ICU nurses with 10 to 20 years of ICU experience demonstrated more ideal frequency of oral care practices (mean=45.35).

Although participants were offered an option to make additional comments at the end of the questionnaire no such comments were made by the participants.

4.5 SUMMARY

This chapter presented the quantitative results obtained from the study and discussed the descriptive and inferential statistics used to describe and analyse the data. The results have been presented in the form of descriptive tables and figures so as to enhance interpretation of the results. The following chapter will present as summary of the study, main findings, limitations and recommendations and conclusion.

CHAPTER FIVE

SUMMARY OF THE STUDY, FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This concluding chapter presents a summary of the study, including a brief summary of the study methods, the main findings which emerged as well as limitations. The main findings will be discussed in relation to the study objectives. Finally, recommendations for clinical nursing practice, nursing education and areas for further research are also presented, as well as the conclusions.

5.2 SUMMARY OF THE STUDY

5.2.1 Purpose of the Study

The purpose of the study was to investigate ICU nurses knowledge, attitudes and practices related to oral care for intubated patients with the associated factors of the same. The intention of the study was to make recommendations for clinical practice and education of ICU nurses.

5.2.2 Objectives

The objectives of the study were to:

- Determine and describe ICU nurses' knowledge, attitude and practices in relation to oral care for intubated patients in ICU.
- Establish whether there is a relationship between selected demographic data of the participants and their knowledge, attitudes and practices related to oral care for intubated patients in ICU.

5.2.3 Methodology

The Committee for Human Research Ethics (Medical) of the University of the Witwatersrand (see **Appendix F**) granted ethical clearance before commencement of the study. Permission was further obtained prior to commencement of the study from the Faculty of Health Sciences Postgraduate Committee (see **Appendix G**), the Gauteng Department of Health and the Chief Executive Officer of the hospital (see **Appendix E**).

Five adult ICU Units (ICUs) at a tertiary public sector hospital were used to conduct the study. A biomedical statistician was consulted prior to data collection and a sample size of 81 was decided as acceptable and ensured a power of at least 95% accuracy of findings, which was acquired to achieve 0.05 level of significance ($p<0.005$) testing.

To test the feasibility of the study, understanding of the information letter and informed consent form and questionnaire, a pilot test was conducted. The pilot test consisted of ten participants, who completed the data collection instrument prior to commencement of the main study. The results of the pilot study revealed the instrument was understandable and took approximately 15 to 20 minutes to complete. No major changes were made to the existing instrument.

The instrument used for the study was the "Oral care for Intubated Patients" questionnaire developed from literature by Lin *et al.* (2011). The self-administered questionnaire consisted of five parts. The *first section* of the questionnaire comprised demographic data for the participants; the *second section* comprised of "six items related to the participants learning about oral care for intubated patients"; the *third section* of the questionnaire consisted of "six-multiple choice questions with a total of 29 sub-items regarding knowledge of oral care for intubated patients". Included items were related to the "characteristics of oral cleaning solutions and oral cleaning tools that effectively remove dental plaque". "One point was awarded for each characteristic correctly identified, with the total scores ranging from 0 to 29 points" (Lin et al., 2011). The *fourth section* of the questionnaire consisted of two parts. The first part asked participants to "rank seven physical care activities in terms of priority and then rank eight nursing care treatment activities in terms of their priority" (Lin, et al. 2011). The second part consisted of "two questions regarding the importance of oral care, as perceived by the participant, as a

physical care activity and in relation to nursing treatment activities, respectively" (Lin et al., 2011). Responses were in the form of a 10-point scale, and the "total score ranged from 2 to 20, whereby a higher score reflected a more positive attitude to oral care" (Lin et al., 2011). The *fifth* and final section of the questionnaire consisted of "four questions regarding the frequency of performing oral care practices" (Lin et al., 2011). Participants selected their own answers from five different frequency options to each question. The scores were added to form a "total score, ranging from 0 to 4, where a higher score reflected a higher frequency of performing oral care practices" (Lin et al., 2011).

To meet the study's objectives, a quantitative, descriptive research design was used. Data were collected during the months of **March and April 2014**. Descriptive and inferential statistics were used for data analysis, which was done in consultation with a statistician.

5.3 SUMMARY OF MAIN FINDINGS

The purpose of this study was to investigate ICU nurses' knowledge, attitudes and practices relating to oral care for patients with an oral endotracheal tube. The study was conducted in the ICUs of one university-affiliated public sector hospital and tertiary level institution in Johannesburg. Data were collected from 81 ICU nurses, using an established questionnaire developed by Lin *et al.* (2011).

The first objective of the study was to determine and describe ICU nurses' knowledge, attitude and practices in relation to the oral care for intubated patients. Findings yielded in this study reported that the average percentages obtained for ICU nurses knowledge, attitude and practices was 31.84%, 60.92% and 52.20%, respectively.

These findings demonstrate that the ICU nurses in this study had a poor level of knowledge and implementation of ideal frequency of oral care practices for patients with an oral endotracheal tube, whilst ICU nurses demonstrated a more positive attitude of the priority of oral care for patients with an endotracheal tube.

The main reason for the ICU nurses' poor knowledge levels was related to poor understanding of the "characteristics of oral cleaning agents", in particular relating to the

"use of sodium chloride, chlorhexidine and sodium bicarbonate as ideal oral cleaning agents for intubated patients".

The reason for the ICU nurses' poor oral care frequency of practices was related to poor adherence of evidence-based guidelines and recommendations by Lin *et al.* (2011) for ideal frequency of oral care practices. This was because the ICU policies for standardisation of oral care procedures are not implemented according to ideal best practice recommendations.

In this study, there was a correlation between ICU nurses sources of learning and level of knowledge (rho=.302; p=0.006; n=81), the highest mean rank was obtained for "nursing school" (0.70), "instructions from senior nurses" (0.59), "ICU in-service education" (0.51) and "learning on own accord" (0.35). Although the correlations were of statistical significance, the correlation coefficients were small.

The study also found there was a correlation between ICU nurses qualification and level of knowledge and attitudes (rho=.306; p=0.748; rho=.275; p=0.013), respectively, but it had a negative effect on practice (rho=-.046; p=0.68). Although the correlations were of statistical significance the correlation coefficients were small.

This study found no relationship ($p>0.05$) between the levels of ICU nurses' qualification categories and knowledge, attitudes and practices related to oral care ($H2=0.166$; $p=0.920$; $H2=5.238$; $p=0.073$ and $H2=0.766$; $p=0.682$), respectively. It was noted, on inspection of the mean ranks of the Kruskal-Wallis test, that Master's level of ICU qualification demonstrated more knowledge (45.63) and positive attitude (62.50), whilst the advanced diploma demonstrated more ideal frequency of oral care practices (45.39).

The study also found there was no relationship ($p>0.05$) between the levels of ICU nurse's qualification and knowledge, attitudes and practices of oral care ($H2=6.451$; $p=0.092$; $H2=3.606$; $p=0.307$; $H2=5.038$; $p=0.166$), respectively. It was noted, on inspection of the mean ranks of the Kruskal-Wallis test, that ICU nurses with <5 years of ICU experience demonstrated more knowledge (49.90) and positive attitude (45.63), while ICU nurses with 10 to 20 years of ICU experience demonstrated more ideal frequency of oral care practices (45.35).

These findings have implications for patient safety and quality of care as well as on nursing education and training of ICU nurses.

5.4 LIMITATIONS OF THE STUDY

The researcher acknowledges the following limitations in this study.

The study sample comprised of 81 ICU nurses working in five adult ICUs of one university-affiliated, public sector hospital and tertiary level institution. However, the results cannot be generalised, as only those nurses currently practising in the ICUs of one public sector hospital were invited to participate.

The survey tool was designed to gather data pertaining to ICU nurses knowledge, attitudes and practices about oral care of intubated patients may not be representative of actual patient care. Content validity and reliability were not assessed specifically in relation to the South African context.

Although there were statistically significant correlations between ICU qualification, knowledge and practice, the correlation coefficients were small, which could be because of the lower percentages of correct responses, the smaller number of items and other factors. These factors may limit the clinical implications of this study.

5.5 RECOMMENDATIONS OF THE STUDY

The results of the study place an emphasis for improvement in application and adherence of evidence-based oral care practices and quality of patient care. The following recommendations are made relating to nursing practice, education and further research.

5.5.1 Intensive Care Nursing Practice

The following recommendations are made for clinical practice:

- On-going and regular in-service training should be introduced into the ICUs to improve knowledge on evidence-based oral care.

- Unit protocols should be reviewed regularly as updates and new evidence for best practice are constantly emerging and ICU nurses should be educated on updated protocols.
- ICU nurses should be encouraged to engage in reading journal articles. Articles on oral care guidelines and developments should be discussed in unit meetings as part of on-going in-service development.

5.5.2 Intensive Care Nursing Education

The following recommendations are made for nursing education:

- ICU training programmes should include evidence-based oral care guidelines.
- Nursing educators and clinical facilitators must incorporate strategies of oral care evidence-based practice into the ICUs and use learning opportunities to raise the topic.
- Continuing professional development programmes should be instituted for ICU nurses so as to motivate then to attend conferences, lecturers and updates in order to increase their knowledge levels.
- Continuing professional development programmes should include skills updates and re-testing to ensure all ICU nurses maintain high standards in advanced clinical skills.

5.5.3 Further Research

The following recommendations are made for further research:

- The study should be extended to include other hospitals and possibly other provinces in South Africa with a larger population and sample. Findings of larger studies will help to enhance generalizability of the study findings.
- Future research should be conducted to examine ICU nurses knowledge, attitudes and practices before and after implementation of an educational programme on evidence-based oral care for intubated patients. Findings of this type of study can

then be used to address areas of knowledge deficits in applying knowledge to practice.

- A study on protocols used nationally and internationally and their inclusion of oral care guidelines should be conducted to evaluate South African nursing practice. Findings from this type of study could better inform development of standardisation policies for evidence-based oral care in South Africa.

5.6 CONCLUSION

The ICU Nurses lack knowledge on evidence-based guidelines in implementation of oral care for patients with an endotracheal tube. Without this knowledge, nursing practice and patient care are not of a high standard. The ICU Nurses need knowledge on the characteristics of oral care agents and frequency of ideal oral care practices so as to challenge measures that are no longer being used in the ICUs and their usefulness in oral care practices for patients with an endotracheal tube.

From this study it can be concluded that ICU nurses, working in the five ICUs of one university-affiliated, public sector hospital and tertiary level institution in Johannesburg, do not have an adequate knowledge level in the implementation of evidence-based guidelines for oral care. The correlations between sources of learning, ICU qualifications and knowledge, attitudes and practices are small and should therefore be viewed with extreme caution. The study found no difference between the level of knowledge, attitudes and practice in the categories of ICU qualifications and ICU years of experience. Nurses with an advanced level of education and training are expected to demonstrate skills competency in the provision of a higher level of quality care and in the achievement and maintenance of clinical expertise.

This final chapter provided a summary of the study, an overview of the main findings, limitations of the study as well as recommendations for ICU nursing practice, education and further research.

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APPENDIX A

INTENSIVE CARE NURSES KNOWLEDGE, ATTITUDES AND PRACTICES OF ORAL CARE FOR PATIENTS WITH ORAL ENDOTRACHEAL INTUBATION

DATA COLLECTION INSTRUMENT

Research Code _____

Instructions:

This questionnaire is anonymous. Please do not write you name on this document.

Section 1

Demographic Data

1.1 Age: _____

1.2 Level of nursing education

( ) Diploma

( ) Advanced Diploma

( ) Bachelor's degree

( ) Master's degree

1.3 Type of ICU

( ) General ICU

( ) Cardiothoracic ICU

( ) Coronary Care

( ) Neurosurgery

( ) Trauma ICU

( ) Other

1.4 Total ICU work experience:_____Year_____Month

1.5 Current ICU work experience:_____Year_____Month

Section 2:

2.0 Sources of learning about oral care for intubated patients.

Please tick **ALL** the answers that fit.

( ) Instructions from senior ICU nurses

( ) Nursing school

( ) In-service education in ICU

( ) Participating in an in-service course outside of the hospital

( ) Reading related studies and materials of my own accord

( ) Participating in an in-service course within the hospital

Section 3

3.0 Knowledge of oral care for intubated patients.

This section consists of six multiple-choice questions about characteristic of oral care cleaning solutions and tools. Please choose **ALL** the answers that fit.

(3.1) What are the characteristics of ideal oral cleaning solution?

A. Contains alcohol

B. Anti-bacterial or inhibits bacteria

C. Maintains oral moistness

D. Increases viscosity of oral mucus

E. Promotes wound healing

(3.2) What are the characteristics of chlorhexidine as oral cleaning solution?

A. Anti-bacterial

B. Appropriate concentration is 0.1 to 0.12%

C. Decreases viscosity of oral mucus

D. Treats oral infections

E. Causes oral pain

(3.3) What are the characteristics of sodium chloride as oral cleaning solution?

A. Eliminates debris attached to oral mucus

B. Maintains oral moistness

C. Tends to cause mouth dryness

D. Removes dental plaque

E. Promotes wound healing

(3.4) What are the characteristics of hydrogen peroxide as oral cleaning solution?

A. Anti-bacterial

B. Remove bad odours

C. Decreases viscosity of oral mucus

D. Irritating to oral mucus

E. Promotes wound healing

(3.5) What are the characteristics of sodium bicarbonate as oral cleaning solution?

A. Anti-bacterial

B. Tends to encourage bacterial growth

C. Increases viscosity of oral mucus

D. Remove cell debris from inside mouth

E. Neutralises excessive oral acidity

(3.6) Which oral care supplies and equipment are effective for removing dental plaque?

A. Cotton swab

B. Foam swab

C. Toothbrush

D. Gauze pad

Section 4

4.0 Attitudes about oral care for intubated patients

(4.1) Please **rank** the seven physical care activities in order of their priority.

( ) Physical assessments

( ) Bowel and bladder care

( ) Oral care

( ) Bed bath

( ) Chest physiotherapy

( ) Changing position

( ) Gastrointestinal care

(4.2) Please **rank** the eight nursing treatment activities in order of their priority.

( ) Processing patients' entrance into ICU
( ) Oxygen therapy
( ) Suctioning sputum
( ) Observing and recording status of patients
( ) Assisting physician with invasive procedures
( ) Administering medication
( ) Catheter care
( ) Oral care

(4.3) Please circle the number that corresponds with the importance of oral care in relation to physical care activities.

1 2 3 4 5 6 7 8 9 10

Not important at all Very important

(4.4) Please circle the number that corresponds with the importance of oral care in relation to nursing treatment activities.

1 2 3 4 5 6 7 8 9 10

Not important at all Very important

Section 5

5.0 Practices of oral care for intubated patients.

Please choose your own answers for providing oral care in your practice.

5.1 How often do you help patients remove oral secretions?

( ) A. once every 2-4 hours
( ) B. once every 4-6 hours
( ) C. once every 6-8 hours
( ) D. once every 8-12
( ) E. once a day

5.2 How often do you assist patients in maintaining oral moistness?

( ) A. once every 2-4 hours

( ) B. once every 4-6 hours

( ) C. once every 6-8 hours

( ) D. once every 8-12

( ) E. once a day

5.3 How often do you perform oral care for patients using a toothbrush?

( ) A. once every 2-4 hours

( ) B. once every 4-6 hours

( ) C. once every 6-8 hours

( ) D. once every 8-12

( ) E. once a day

5.4 How often do you perform oral care for patients using a cotton swab or foam swab?

( ) A. once every 2-4 hours

( ) B. once every 4-6 hours

( ) C. once every 6-8 hours

( ) D. once every 8-12

( ) E. once a day

If there is anything else you wish to add, please write it in the space provided below.

THANK YOU FOR YOUR PARTICIPATION IN THIS STUDY.

APPENDIX B

Dear Shelly:
Attached please find the oral care questionnaire in English. We translate the questions from Chinese to English.
You are welcome to use it and modify it to fit in your population.
Warm Regards,
Meeifang Lou

From: Shelley Schmollgruber [mailto:schmoll@iafrica.com]
Sent: Saturday, April 13, 2013 12:58 AM
To: mfalou@ntu.edu.tw
Cc: shelley.schmollgruber@wits.ac.za
Subject: request for permission
Importance: High
Dear Professor Lou,
My name is Shelley Schmollgruber. I am the postgraduate coordinator in the Department of Nursing Education of the University of the Witwatersrand in Johannesburg, South Africa. I am currently supervising a research study and my MSc student has expressed particular interest in your work entitled Lin, Chang, Chang & Lou "Critical care nurses' knowledge, attitudes and practices of oral care for patients with oral endotracheal intubation: a questionnaire survey. Journal of Clinical Nursing, vol 20, pp. 3204-3241
On behalf of my student I would like to request your permission to use the instrument as we are conducting a similar study in our South African context. Would it be possible to send us a copy of the instrument along with your permission to use the instrument. If you are in agreement we can forward a copy of the proposal to you once our ethics committee has approved the study. We anticipate that the study will be completed by early 2014.
I am looking forward to your response.

Kind regards
Shelley Schmollgruber
Senior Lecturer Intensive and Critical Care Nursing
Department of Nursing Education
Faculty of Health Sciences
University of the Witwatersrand

APPENDIX C

INTENSIVE CARE NURSES KNOWLEDGE, ATTITUDES AND PRACTICES OF ORAL CARE FOR PATIENTS WITH ORAL ENDOTRACHEAL INTUBATION

PARTICIPANT INFORMATION LETTER

Dear Colleagues

My name is Esther Tembo, I am currently registered as a student at the University of Witwatersrand, in the department of Nursing Education. I am hoping to conduct a research project to evaluate intensive care nurses' knowledge, attitudes and practices of oral care for patients and related factors of the same.

The purpose of this study is to evaluate ICU nurses knowledge, attitudes and practice related to oral care for intubated patients together with the associated factor of the same. Many studies suggest that oral care promotes comfort pleasant smell and prevents accumulation of microorganism which causes Ventilator Associated Pneumonia.

I am pleased to inform you that you are chosen to participate in the research project. You have the right not to participate or to with draw from the study at any time, if you feel so. Should you therefore agree to participate, I will request that you allow me to use the information I will obtain to complete the project. You are required to fill in a questionnaire which will include demographic data, knowledge attitude and practices of oral care.

Participation in the study is entirely voluntarily. Data will be conducted using a questionnaire which will exclude names of participant and only the researcher and supervisor will have access to these questionnaires. The questionnaire will be filled in your convenient time which will not affect your services rendered to the hospital in any way. I appreciate that you derive no direct benefit from participating in the study. However, I hope that the results of the study will help to provide evidence based information on oral care which when applied will prevent ventilator associated pneumonia, promote quick recovery and reduce hospital stay and eventually hospital cost. These research tools will not be destroyed immediately until after the study has been published. No names of participants will be published. The participants will be informed on how to have access to the publication.

The appropriate people and research committees of the University of the Witwatersrand, Gauteng Department of Health and Johannesburg Hospital have approved the study and its procedures.

Thank you for taking time to read this information letter. Should you require any further information regarding the study or your rights as a study participant you are free to contact me in the Department Of Nursing Education or on the following telephone number 0781040994 or email me using the following address; esthert2011@hotmail.com

Yours Faithfully,
Esther Tembo
Date

APPENDIX D

INTENSIVE CARE NURSES KNOWLEDGE, ATTITUDES AND PRACTICES OF ORAL CARE FOR PATIENTS WITH ORAL ENDOTRACHEAL INTUBATION

PARTICIPANT CONSENT FORM

I _____ (name) give permission to be included in the study.

I have read and understood the content of the information sheet and been given the opportunity to ask questions I might have regarding the procedure and my consent to being included in the study.

_____ _____

Signature Date

_____

(Witness)

APPENDIX E

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

CHARLOTTE MAXEKE JOHANNESBURG ACADEMIC HOSPITAL

Enquiries:
Ms. O. Noge
Office of the Chief Executive Officer
(011): 488-3792
(011) 488-3753
20th March 2014

Ms. Esther Tembo
MSc Nursing student
University of Witwatersrand

Dear. Ms. Tembo

RE: "Intensive Care nurses, knowledge, attitudes and practice of oral care for patients with oral endotracheal intubation"

Permission is granted for you to conduct the above research study as described in your request provided:

1. Charlotte Maxeke Johannesburg Academic hospital will not in anyway incur or inherit costs as a result of the said study.
2. Your study shall not disrupt services at the study sites.
3. Strict confidentiality shall be observed at all times.
4. Informed consent shall be solicited from patients participating in your study.

Please liaise with the Head of Department and Unit Manager or Sister in Charge to agree on the dates and time that would suit all parties.

Kindly forward this office with the results of your study on completion of the research.

Approved / not approved

Ms. G. Bogoshi
Chief Executive Officer

APPENDIX F

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M131109

NAME: (Principal Investigator)	Ms Esther Tembo
DEPARTMENT:	Nursing Education Charlotte Maxeke Johannesburg Academic Hospital
PROJECT TITLE:	Intensive Care Nurses' Knowledge, Attitudes and Practices of Oral Care for Patients with Oral Endotracheal Intubation
DATE CONSIDERED:	29/11/2013
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Shelley Schmollgruber

APPROVED BY: Professor PE Cleaton-Jones, Chairperson, HREC (Medical)

DATE OF APPROVAL: 12/03/2014

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Secretary in Room 10004, 10th floor, Senate House, University.

I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit the application to the Committee. **I agree to submit a**

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

UNIVERSITY OF THE
WITWATERSRAND,
JOHANNESBURG

Private Bag 3 Wits, 2050
Fax: 027117172119
Tel: 02711 7172076

Reference: Ms Thokozile Nhlapo
E-mail: thokozile.nhlapo@wits.ac.za

09 January 2015
Person No: 560195
PAG

Miss E Tembo
Ntchisi District Hospital
P O Box 44
Ntchisi
Malawi

Dear Miss Tembo

Master of Science in Nursing: Approval of Title

We have pleasure in advising that your proposal entitled *Intensive care nurses' knowledge, attitudes and practices of oral care for patients with oral endotracheal intubation* has been approved. Please note that any amendments to this title have to be endorsed by the Faculty's higher degrees committee and formally approved.

Yours sincerely

Mrs Sandra Benn
Faculty Registrar
Faculty of Health Sciences

APPENDIX H

Gill Smithies

Proofreading & Language Editing Services

59, Lewis Drive, Amanzimtoti, 4126, Kwazulu Natal

Cell: 071 352 5410 E-mail: moramist@vodamail.co.za

Work Certificate

To	Dr Shelley Schmollgruber
Address	Wits Dept of Nursing Education
Date	10/9/2014
Subject	Thesis: Forward and Chapters 1 – 5 INTENSIVE CARE NURSES' KNOWLEDGE, ATTITUDES AND PRACTICES OF ORAL CARE FOR PATIENTS WITH ORAL ENDOTRACHEAL INTUBATION, by Esther Tembo.
Ref	SS/GS/03

I, Gill Smithies, certify that I have proofed and language edited:

Thesis: Forward and Chapters 1 – 5 by Esther Tembo,
INTENSIVE CARE NURSES' KNOWLEDGE, ATTITUDES AND PRACTICES OF ORAL CARE FOR PATIENTS WITH ORAL ENDOTRACHEAL INTUBATION
to the standard as required by Wits Dept. of Nursing Education.

Gill Smithies
10/9/2014

RE-EDITED 2/2/2016