THE KNOWLEDGE AND PRACTICE OF ICU PRACTITIONERS WITH REGARD TO THE INSTILLATION OF NORMAL SALINE SOLUTION DURING ENDOTRACHEAL SUCTIONING

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DISCPLINES

Declaration

I certify that all material in this Dissertation which is not my own work has been identified and that no material is included which has been submitted for any other award or qualification.

Signed: Mohid Toufic El Hussein.....

Date: 28-4-2002.....

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ABSTRACT

Background Instillation of normal saline before suctioning is a common nursing intervention although little research supports the practice.

Objectives To determine when and how often saline is used during suctioning and to assess the knowledge of nurses and respiratory therapists of the advantages and dangers of using saline during endotracheal suctioning.

Methods A survey of nurses and respiratory therapists working in adult and neonatal intensive care units was conducted in three large teaching hospitals in the UAE.

Results Of the 81 respondents, 38 (47%) rarely instil saline before suctioning, whereas 20 (25%) frequently use saline. Seventy-four percent use saline to enhance retrieval of secretions, and 72% use it to stimulate cough. Nurses and respiratory therapists differ in their use and understanding of saline instillation. Most nurses (56%) rarely use saline before suctioning, whereas most respiratory therapists (37%) frequently use saline. Respiratory therapists (93%) were more aware than were nurses (61%) of the benefit of using normal saline to stimulate a cough. Respiratory therapists considered oxygen desaturation as a major adverse effect of saline instillation in comparison to nurses who stressed on pulmonary infection as a major side effect.

Conclusion The results of the survey indicates that the practice of these professionals are not in line with most recent research results in the area and indicate a need for in-service education.

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TITLE: The knowledge and practice of ICU practitioners with regard to the instillation of normal saline solution during endotracheal suctioning.

CHAPTER ONE: INTRODUCTION AND PROBLEM STATEMENT

Problem statement:

Patients who need the support of mechanical ventilation also require assistance in maintaining a patent airway. The presence of an endotracheal tube alters the abilty to effectively mobilize and expectorate secretions, and therefore secretion removal depends on mechanical aspiration or suctioning. For this reason, suctioning is a fundamental component of pulmonary care of every patient maintained on a ventilator. Even though suctioning is a routine part of nursing care, it can also initiate potential complications. The various complications and consequences of suctioning include: patient fear and anxiety, damage to the cilia and epethelium of the tracheobronchial tree, introduction of infection, hypoxemia, atelectasis, vagal stimulation, cardiac arrhythmais, and even death (Bostick & Wendeglass, 1987). Despite the seriousness of these complications, there remains a "lack of uniformity in suctioning procedures and confusion over what constitutes a proper technique" (Nielson, 1980:2208). One such technique used by nurses that has become a routine part of the suctioning procedure is the instillation of normal saline solution into an endotracheal tube before suctioning. The instillation of normal saline solution into an endotracheal tube before suctioning is widely documented in the general literature as beneficial in suctioning secretions (Sorensen & Luckmann, 1980; Blodgett, 1980; Wade, 1982). However, there are no studies that document the effectiveness of this practice, and little scientific attention has been given to its potential hazards.

In the United Arab Emirates (UAE), nurses are multinational, coming from different countries with different theoretical and clinical backgrounds, and therefore, different approaches to the patients. The diversity of training and experimental backgrounds of the nurses leads to a situation in which some fully support the practice of instilling saline during suctioning, while others disapprove.

Purpose and objectives:

The purpose of the study is to describe the knowledge and practice of nurses with regard to the instillation of saline before or during suctioning, with a view to developing policies and staff development programmes .

Objectives of the study are:

1. To assess the knowledge of nurses in the UAE with respect to suctioning in general and specifically the instillation of saline before/during suctioning.
2. Determine the current practices of nurses in the UAE with respect to suctioning and specifically instillation of saline before / during suctioing

Research questions:

1. What is the level of knowledge of nurses and respiratory therapists in intensive care units (ICU) and neonatal intensive care units (NICU) with respect to:

- the advantages and dangers of using saline during endotracheal suctioning;
- the correct technique of using saline in this precedure.

2. What is the current practice of nurses and respiratory therapists in ICU and NICU in terms of suctioning?

Significance of the study:

Patients in the intensive care unit who are intubated are usually seriously ill and at risk of developing major complications that might result in loss of life. Suctioning is an invasive procedure which is repeated many times every day for each patient. This increases the risk to the patient if the proecedure is not done in a safe way. Endotracheal suctioning can reduce tissue oxygenation by interrupting oxygen supply while increasing oxygen consumption. Hyperinflation techniques used before and after suctioning can reduce oxygen delivery by impairing venous return, thus lowering cardiac output. Consequently, suctioning is not a benign procedure and may be associated with a variety of complications including: suction-induced hypoxemia, cardiac arrhythmias, microateletasis, hypotension, tissue damage, laryngospasm, bronchoconstriction, vasovagal reactions, hemoptysis, increased intracranial pressure, hypoxia, increased respiratory work, unexplained cardiovascular collapse and sudden death (Clark, Tyler & White, 1990). Thus, it can be concluded that suctioning is a nursing procedure that has its advantages but also has a lot of serious side effects. Based on this fact, and because of the lack of uniformity and consistency in performing the procedure using the correct procedure, research on this aspect was undertaken.

Definition of terms:

The instillation of saline: adminstration of saline down the endotracheal tube into the respiratory tract before suctioning.

Nurse: a nurse who has graduated from an accredited nursing program, has passed the State exam for licensure (United Arab Emirates offical exam), and has been registered and licensed to practice by a State authority.

Respiratory therapist: an allied health professional who works under the direction of a physician, educating patients, treating, assessing patients' response to therapy and the need for continued therapy, managing and monitoring patients with deficiencies and abnormalities of cardiopulmonary function.

Intensive Care Nurse practitioner: a registered nurse with at least a master's degree in nursing and advanced education in the intensive care of critically ill clients. Capable of independent practice in a variety of settings.

CHAPTER TWO: REVIEW OF LITERATURE

2.1 INTRODUCTION

Endotracheal suctioning is a standard and necessary nursing procedure that is performed on all patients with an artificial airway. The presence of an artificial airway impairs the patient's natural ability to mobilize and expectorate secretions and maintains a patent airway for optimal ventilation and oxygenation. Suctioning is an essential part of nursing associated with numerous unintended, non-therapeutic, and possible life-threatening effects and complications (Bronson & Campell, 1993; Bostick & Wendeglass, 1978; Noll & Scott, 1990) including:

i) Hypoxemia

ii) Cardiac dysrhythmia

iii) Cardiac arrest

iv) Respiratory arrest

v) Bronchospasm

vi) Increased intracranial pressure

vii) Pulmonary atelectasis

viii) Damage to tracheobronchial tree mucosa

ix) Pulmonary hemorrhage

x) Patient anxiety and fear

xi) Nosocomial infection

xii) Death

Although there are no contraindications to suctioning when it is indicated (failure to do so may be lethal), Bronson & Campbell (1993) stipulate that this procedure is not benign and cannot be used to directly remove secretions from distant sections of the peripheral airway.

Several methods for endotracheal suctioning which intend to minimize potential complications have arisen over the past few years. One such method is the routine instillation of 3 to 10ml of normal saline into the endotracheal tube before suctioning. The theoretical advantages of normal saline instillation are: loosening of thick secretions (Ackerman, 1993), lubrication of suction catheter (Ackerman, 1993), enhanced cough stimulation and secretion mobilization (Bostick, 1987; Demers, 1973; Gray, 1990), increased secretion clearance (Ackerman, 1993), and dilution of secretions (Bostick, 1987; Gray, 1990). Although this method has become a common clinical practice, assessment of the research literature reveals that empirical evidence supporting its benefits is lacking. Research has implied that normal saline instillation may in fact be harmful to patients by interfering with the alveolar–capillary oxygen exchange with a resultant decrease in oxygen saturation (Bostick, 1987; Ackerman, 1993; Ackerman, 1990), increasing the rate of respiratory infection (Ackerman, 1993), and increasing intracranial pressure (Ackerman, 1993). Additionally, the financial implications of normal saline with suctioning should not be disregarded. At a large tertiary teaching hospital in the northeastern United States, nearly 40,000 5ml plastic vials of 0.9% sodium chloride are used per year. At a cost of $0.07 per vial, the total annual expense amounts to roughly $28,000. These 5ml vials are used for nebulizer treatments, eye irrigations, and small wet to dry dressings, but their principal use is for instillation before suctioning (Raymond, 1995). Based on this, one

should question the distribution of resources for practice such as normal saline instillation that lacks a scientific basis to substantiate routine use. In the discussion that follows, an attempt will be made to review and evaluate the literature using critical analysis and a scientific approach.

2.2 THE TECHNIQUE OF ENDOTRACHEAL SUCTIONING

Over the past 30 years, many authors have written about the technique of endotracheal suctioning (Demers & Saklad, 1973; Morrison, 1979; Blogett, 1980; Sorenson & Luckman, 1980; Wade, 1982; Burton et al., 1984) resulting in conflicting practical guidelines for safe endotracheal suctioning, which include:

i) Preoxygenation before the procedure.

ii) Use of aseptic technique.

iii) Use of the lowest amount of suction pressure to remove secretions.

iv) Short suction time (<15 seconds).

In these texts, the technique of normal saline instillation is also recommended as part of the endotrahceal suctioning procedure to dilute and mobilize secretions. Nevertheless, there are no consistent guidelines for normal saline instillation in terms of when and how often to use it, the volume of saline to instill, and whether it is best to instill the saline at the proximal or distal end of the endotracheal tube.

Previously, many intensive care units (ICUs) had strict endotracheal suction policies advocating 2-hourly routine suctioning as part of the standard care for mechanically ventilated patients (Fox et al., 1978; Simbruner et al., 1981). Currently, some units

still retain this 2-hourly routine procedure (Beeram & Dhanireddy, 1992). However, due to the potential risks relating to endotracheal suctioning and, in particular, mucosal trauma caused by frequent suctioning, many authors advocate suctioning only when necessary (Young, 1984; Hodge, 1991; Tarnow-Mordi, 1991; Copnell & Fergusson, 1995).

Recently, small surveys of the frequency of suctioning in ICUs are revealing a decline in the percentage of nurses performing 2-hourly endotracheal suctioning. In one United Kingdom study, Blackwood (1995) surveyed one regional ICU and reported that 27% of the staff suctioned 1-4 times per shift, 42% suctioned 5-9 times per shift and 31% suctioned 10 or more times per shift. In Copnell & Fergusson's (1995) Australian study of one ICU, 63% of nurses suctioned every 1-2 hours and 37% every 2-3 hours. In a larger survey of 92 hospitals in the USA (Swartz et al., 1996), 2–hourly routine suctioning was conducted in 55% of hospitals.

It is fairly well acknowledged in the literature with regard to neonates and adults that normal saline instillation is a common part of the endotrahceal suctioning procedure. Many authors have referred to this as being routine or standard practice (Bostick & Wendelglass, 1987; Gray et al., 1990; Ackerman, 1993; Raymond, 1995). In addition, many researchers studying endotracheal suctioning include normal saline instillation as routine in their protocols (Brandstater & Muallem, 1969; Fox et al., 1978; Walsh et al., 1989; Shorten et al., 1991). Two large USA surveys of neonatal endotracheal suctioning practices (Tolles & Stone, 1990; Swartz, 1996) reported that ICU nurses consistently irrigated with saline before suctioning. However, no one has investigated the decision–making process of nurses into whether or not to instill saline, nor

explored and identified the factors that prompt the nurses to use normal saline instillation.

In addition to the variation in the frequency with which normal saline instillation is carried out, the volume of saline instilled also varies significantly. In neonates it can vary from 0.25 to 0.5ml (Tolles & Stone, 1990; Shorten et al., 1991) to 1ml (Beeram & Dhanireddy, 1992). In pediatrics the volume can vary from 1 to 2ml (Swartz et al., 1996), and in adults from 2 to 5ml (Morison, 1979; Sorenson & Luckman, 1980), 5ml (Ackerman & Gugerty, 1990; Gary et al., 1990; Reynolds et al., 1990; Ackerman, 1993), 5 to 10ml (Burton et al., 1984), 10ml (Schmidt et al., 1995) to 40ml (Isea et al., 1993). In all cases, the volume of saline is not based on controlled research studies. In one study, Bostick & Wendeglass (1987) compared volumes of 5 and 10ml of saline to observe whether larger volumes of saline affected the weight of secretions retrieved. The weight of secretions regained was greatest when 5ml of saline was used, but the rationale for this was not discussed. In addition, while the weight of secretions retrieved when normal saline instillation was used was considerably different from the weight of secretions retrieved when saline was not used, the actual difference only amounted to = 0.4gm. Clinically, this is insignificant. A limitation of the study was that the researchers were unable to measure the percentage of saline recovered in the secretions.

2.3 THE EFFECT OF NORMAL SALINE INSTILLATION ON OXYGENATION

The relationship between normal saline instillation and oxygenation has been investigated in a number of studies. For example, Bostick and Wendeglass (1978) studied the effect of normal saline instillation on arterial partial pressure of oxygen (PA_{o2}) in 45-postoperative adult open–heart surgery patients. Subjects were randomly assigned to one of three groups; group 1 received no saline bolus before suctioning, group 2 received a 5ml saline bolus before suctioning, and group 3 received a 10ml saline bolus before suctioning. PA_{o2} values were measured 5 minutes before suctioning and 20 minutes after completion of suctioning. The results showed no statistically noteworthy difference in the mean post–PA_{o2} values among the groups. However, a trend toward lower post–PA_{o2} values with the instillation of increasingly larger amounts of saline (i.e. 5 and 10ml) was identified. The authors proposed that this decrease might have been a result of the instilled saline impeding alveolar capillary oxygen exchange. It should be noted that this study is generalizable only to a specific group of patients. Furthermore, although the suctioning procedure was thorough and in accordance with the recommended American Association of Respiratory Care (AARC) Clinical Practice Guidelines for endotracheal suctioning during mechanical ventilation, the between-groups experimental design introduced the possible inaccuracy of inter-subject differences and therefore weakened the results.

Bostick and Wendeglass (1978) also investigated the weight of the sputum aspirated by suctioning for each of the three groups. Although a significant difference ($p<0.05$) was found in the mean sputum weights between the two normal saline instillation

groups and the non-normal saline instillation group, the clinical significance of this finding is unclear because the weight increase may have resulted from the retrieval of instilled saline and not mucus. This finding contradicts that of Hanely et al., (1978) wherein their study normal saline instillation resulted in retrieval of only a fraction of the material instilled by suctioning. Additional research in this area is required to compare the percentage of mucus that is retrieved by suctioning after normal saline instillation.

Gray, MacIntyre, & Kronsnberger (1990) examined physiologic responses in 15 critically ill, intubated patients with pulmonary disease. The responses measured included blood pressure, heart rate, respiratory rate, arterial blood gas values, arterial blood saturation with oxygen (SaO2), the amount of material suctioned, and the degree of discomfort associated with endotracheal suctioning both with and without normal saline instillation. A repeated measure design was used and every subject was suctioned once with normal saline instillation and once without, with a 90-minute interval between the two methods. Measurements were taken before, immediately after, and 15 minutes after suctioning. The authors found no statistically notable difference in heart rate, blood pressure, respiratory rate, or arterial blood gas values between the two treatment methods immediately after and 15 minutes after suctioning. However, suctioning with normal saline instillation caused a significantly ($p<0.5$) greater amount of material to be aspirated than did suctioning without normal saline instillation. Since the secretion content of the suctioned material was not evaluated, the significance of this finding is not clear. Replication of the Gray et al. (1990) study comparing varying amounts (i.e., 0.5 and 10ml) of normal saline

instillation, using a larger, more diverse patient population, and analyzing aspirated secretion content might help to explain these inconclusive results.

Gray et al. (1990) concluded that the effects of suctioning with versus without saline instillation were not significantly different on hemodynamics, respiratory mechanics, and gas exchange. Also, they concluded that suctioning with normal saline instillation does not increase patient discomfort (per patient) and may in fact improve secretion clearance through cough stimulation. All patients coughed immediately after saline instillation. This implies that the major effect of normal saline instillation on secretion clearance is to stimulate coughing. Although this subjective observation may direct further research studies, the superiority of normal saline instillation over the insertion of a suction catheter alone for cough stimulation remains unsubstantiated.

In 1990, Ackerman and Gugerty examined the oxygen saturation values (via pulse oximetry) and sputum weights of 26 critically ill, intubated patients with a variety of diagnoses. A single–case experimental design was used, and subjects were suctioned both after no saline bolus and after a 5ml saline bolus. Measures of SaO2 were taken at baseline, immediately after suctioning, at 15, 30, and 45 seconds, and at 1, 2, 3, and 5-minute intervals after suctioning. The researchers also noted that the SaO2 values of patients who received a 5ml normal saline instillation only returned to near–baseline values after 5 minutes, whereas the SaO2 noted was no greater than 1.04% and hence clinically insignificant.

Ackerman and Gugerty (1990) also found a statistically notable increase in the sputum weights of patients who had received a 5ml normal saline instillation before

suctioning. However, they concluded that this was an insignificant finding because the actual weight increase of 1.25g was minor by clinical standards. Again, sputum content analysis was not performed and therefore the percentage of saline in the sputum retrieved with suctioning was underdetermined. This study is limited by its small sample size and its lack of conformity to standard suctioning guidelines. Patients were not hyper oxygenated after suctioning and the literature suggests that they were receiving 100% oxygen when baseline SaO2 values were measured. Nevertheless, it is worth mentioning that these investigators were first to suggest a potentially harmful effect of normal saline instillation on patient oxygenation.

In the same year a study was done by Clark, Winslow & Tyler (1990) to ascertain the effects of endotracheal suctioning on mixed venous oxygen saturation (SVO2) and heart rate in 189 critically ill adults. One-pass, intermittent suction was applied for 10 or fewer seconds, with three prehyperoxygenation and three posthyperoxygenation breaths of 100% oxygen. Subjects in three hospitals (n=127) underwent suctioning using hyperoxygenation with anesthesia bags and traditional suction catheters (open suction method). Subjects at one hospital (n=62) endured suctioning with hyperoxygenation by ventilator and in-line suction catheters (closed suction method). When the results of all the hospital sites were combined, the overall SVO2 amongst the subjects decreased from 67% to 64% ($p= 0.001$), a 4% change from baseline, and returned to baseline within 2 minutes. However, in subjects receiving the open method of suction, the SVO2 level fell from 66% to 62% instantly after suctioning and returned to baseline within 4 minutes. Alternatively, when the closed suction method was used, SVO2 rose from 67.7% to 67.86% immediately after suctioning, drifting upwards to 71% for the next 2 minutes before dropping towards the baseline after 4 minutes. Mean heart rate increased from a

A limitation of this study worth mentioning involved Ackerman's (1993) failure to follow standard procedure guidelines for the endotracheal suctioning of patients, as was the case in his prior work with Gugerty (1990). In the latter study Ackerman (1993) stated that the patients were given 100% oxygen for 1 minute before suctioning and five manual tidal volume breaths with the ventilator before suctioning. However, the subjects were not hyperoxygenated or hyperventilated after the suctioning procedure. Although the authors of the American Association of Respiratory Care (AARC) Clinical Practice Guideline for endotracheal suctioning during mechanical ventilation state that the patient may be hyperoxygenated after suctioning, they are less flexible on the issue of hyperoxygenation, clearly stating that "the patient should be hyperoxygenated by delivery of 100% oxygen for 1 minute following suctioning event" (Bronson, Campbell, Chatburn & Covington, 1993:500-504). Also, baseline SaO2 values were measured after subjects had received 100% oxygen for approximately 1 minute. Oxygen saturation values measured before the initiation of preoxygenation would have provided a more accurate reflection of the subjects' baseline oxygenation status in Ackerman's study (1993). Although pulse oximetry is limited as a measure of oxygenation, the data analyzed had uncontradictory scores. Therefore, because the measurements were consistent, the reliability of the data is not compromised in this regard. Even though it is impossible to determine what impact, if any, these limitations had on the validity of Ackerman's (1993) findings, they are important to consider when evaluating the study's conclusions and recommendations for possible integration into clinical practice. Additional research using a similar study design but clear and specific operational/conceptual definitions and strict compliance to the procedure as detailed

in the accepted guidelines for endotracheal suctioning may help to shed light on remaining questions.

In 1995, Raymond reviewed the body of published literature on the practice of normal saline instillation before endotracheal suctioning of mechanically ventilated adult patients in her research utilization paper. The paper reported that although normal saline instillation before suctioning is a standard clinical practice, the research literature does not exemplify any physiologic benefit of this procedure. Furthermore, normal saline instillation may decrease oxygen saturation values (via pulse oximetry) after suctioning. Pertinent research studies have been inconsistent and inconclusive because of limitations in sample size and research methodology. Further research studies using larger, more diverse samples, adhering strictly to recommended guidelines for endotracheal suctioning, and examining additional physiologic parameters of oxygenation are required. Moreover, long-term outcomes of normal saline instillation such as respiratory infection and complications, as well as atelectasis, should be evaluated. Until scientific data can be presented to support the physiologic benefit of this practice, normal saline instillation should be withdrawn as routine or standard practice.

In 1995, Blackwood came to a conclusion that normal saline instillation, in conjunction with endotracheal suctioning, is helpful in removing thick and tenacious secretions for patients receiving mechanical ventilation. However, guidelines for this routine procedure are inconsistent and its efficacy is unsupported by research-based evidence. In his paper, Blackwood (1995) highlighted that the procedure produces no physiological benefits for the patient and, indeed, may have detrimental effects on the patient's psychological well being. It was proposed that after 25 years of inconsistent practice in attempting to eliminate thick and

tenacious secretions, it is time to focus on techniques to prevent thick and tenacious secretions.

In 1998, Ackerman & Mick studied the effect of instillation of normal saline before suctioning on oxygen saturation, heart rate, and blood pressure in patients with pulmonary infections. A prospective randomized controlled trial was conducted in the surgical, medical, and burn/trauma ICUs of an academic medical center. Eighteen men and eleven women (mean age = 60 years) receiving mechanical ventilation who met the criteria for pulmonary infection were randomly assigned to 2 groups. One group had instillation of a 5ml bolus of normal saline before suctioning; the other did not. Suctioning was done as necessary during an 8 to 12 hour period. Oxygen saturation, heart rate, and blood pressure were measured noninvasively immediately before and after suctioning, at 1 minute intervals for 5 minutes after suctioning, and at 10 minutes after suctioning. Instillation of normal saline had an adverse effect on oxygen saturation, which deteriorated over time. Differences in saturation between the 2 groups were significant at 4, 5, and 10 minutes after suctioning. Differences in heart rate and blood pressure were not significant. The authors concluded that instillation of normal saline before suctioning has an adverse effect on oxygen saturation and should not be used routinely in patients receiving mechanical ventilation who have pulmonary infection.

2.4 THE EFFECT OF NORMAL SALINE INSTILLATION ON THE QUALITY OF SECRETIONS

As early as 1973, Demers and Saklad discussed the effects of normal saline instillation on the quality of secretions. They concluded that instillation of normal saline is not effective in thinning or liquefying secretions and maintained that whereas " water in the form of an aerosol is of proven value in thinning secretions, mucus and water in bulk forms are immiscible and occupy separate phases in vitro, even after vigorous shaking. Endotracheal instillation and rapid removal by suctioning is therefore of dubious value" (Demers & Saklad, 1973:542-554). This finding is cited extensively in the literature on normal saline instillation, although Demers and Saklad (1973) did not support or scientifically document how they arrived at this conclusion. In 1978, Hanely, Rudd & Butler investigated the distribution of normal saline after instillation by tagging it with Technetium 99m and recording serial images of normal saline distribution for 30 minutes thereafter in the airways of five dogs and two human subjects. Results showed that saline remained in the trachea and main stem bronchi; none of it reached the periphery of the lungs after a 30-minute period. Additionally, only 10.7% of normal saline instilled in the dogs and 18.7% of that instilled in the human subjects could be retrieved by suctioning. These findings indicate that normal saline instillation does not affect secretions beyond the main stem bronchi. Furthermore, whether normal saline is beneficial in distal airways is not clear. The results of the Hanely et al. (1978) study are based on a limited, small sample size. Replication of this study using a larger, more diverse human patient population is needed to substantiate the validity and generalizability of these findings.

Darlow, Sluis & Inder (1997) aimed to investigate whether the composition of material obtained by the clinically preferred technique of dry shallow suctioning varied significantly from that obtained with saline lavage and deep suctioning. Eleven pairs of dry and saline lavage aspiration samples were compared for the neutrophil enzyme myeloperoxidase, total and active antitrypsin, antitrypsin complexed with elastase, and secretory leukoprotease inhibitor. Even though individual values of each analyte, expressed per gram of albumin varied over at least a fivefold range, there was no difference between mean values of dry and lavage samples for any of the constituents. Darlow et al. (1997) reached the conclusion that the yield of material for research obtained by dry shallow suctioning is sufficient and the quality at least as satisfactory as that provided by saline lavage.

The effect of temperature of the instilled saline was thought to alter the quality of secretions. However, this issue has not been thoroughly studied and published in the literature .

2.5 EFFECTS ON PSYCHOLOGICAL WELL-BEING

Many of the research studies have focused on the science of normal saline instillation and measured objective, scientific data such as physiological parameters. However, this review would not be complete without a holistic appraisal of the effects of normal saline instillation on the patient. A patient's physiological functioning cannot be separated from her/his accompanying experiences. Some researchers attempted to measure patients' experiences of the normal saline instillation procedure, such as discomfort (Gray et al., 1990) and tolerance (Isea et al., 1993), but these attempts at quantifying experiences provide limited data . Gray et al. (1990) endeavored to

measure patient discomfort during normal saline instillation on a scale of 1 (least comfortable) to 6 (most uncomfortable). However, the concept of discomfort is not operationally defined and no explanation is given concerning the design of the scale (i.e. verbal report, ruler scale) nor its reliability and validity. While the findings propose that patients found normal saline instillation more uncomfortable than without normal saline instillation, this was not statistically significant. The methodological problems with these investigations are the definitions of the positivism; that all things can be reduced to quantifiable measures. There are some experiences however, that cannot be expressed quantitatively and are best expressed narratively. For example, Wade (1982) provides anecdotal evidence about patients feeling a sensation of drowning or suffocation with normal saline instillation. Providing patients with the opportunity to express their feelings is perhaps the best way to obtain insightful information on a phenomenon that is otherwise inaccessible to the scientist.

Jablonski (1994) used a qualitative method of inquiry to provide rich, descriptive data about patients' experiences of being mechanically ventilated and their feelings about endotracheal suctioning and saline instillation. Some patients expressed that saline instillation, as a technique of disposing of secretions was 'kinda nice'. Others were filled with fear because the saline lead them to cough and they were afraid of possible damage to their surgical wounds resulting from excessive coughing. Jablonski (1994) reports that many patients dreaded both the suctioning procedure and the instillation of saline because they experienced an immense amount of pain after coughing.

2.6 CONCEPTUAL FRAMEWORK - SUCTIONING

Introduction:

The conceptual framework contains the full evidence-based protocol for endotracheal suctioning, from the need for suctioning to the procedure for doing it. Although not all these issues are addresssed in this research, a comprehensive protocol was included, to put the issues covered in the questionaire in context.

The muco-ciliary system in the airways fully humidified and heated to 37° C, sweeps and traps inhaled particles that may harm the lungs (Guyton, 1971).
Endotracheal intubation forms an artificial airway that by-passes these normal processes, and inhibits the cough reflex. The respiratory tract is vulnerable to opportunist organisms. Mucus secretion is often increased, and pneumocytes and surfactant are reduced (Ackerman, 1985; Bostick & Wendelglass 1987).
A patient with an endotracheal/tracheostomy tube in situ will require periodic endotracheal suctioning to help clear secretions, and prevent atelectasis (Bostick & Wendelglass, 1987; Kuzenski 1978).

Suctioning is a potentially hazardous procedure (Young 1984). Severe mucosal damage can result from tracheo-bronchial suctioning. Associated haemodynamic complications include: arterial hypoxaemia, cardiac arrythmias, hypotension and death (Walsh, 1989; Boutros, 1970). No consistency of endotracheal suction technique is found in ICUs nationwide. There is a lack of uniformity in suctioning

procedures, and confusion over what constitutes proper technique (Bostick & Wendelglass, 1987).

Endotracheal suctioning should only be performed when necessary, and not as routine (Young, 1984; Rosan & Hillard, 1962). The patient should be assessed by the nurse prior to each suction, and one or more of the following found: rise in ventilator peak inspiratory pressure; diminished breath sounds on auscultation; crepitations on auscultation. The following information from literature provides some basis for deciding on procedures for airway clearance.

Frequency of suction:

Mucosal trauma can be caused simply by catheter contact during insertion. The number of catheters passed in a given time is a highly significant factor (Sackner et al, 1973; Link et al, 1976). Although Jung and Gottlieb (1976) concluded that trauma due to suctioning was negligible after one catheter insertion, in clinical practice patients seldom require suctioning only once. Patients on life support systems may require suction several times an hour for many days. It is particularly worrying, then, that even after just one catheter insertion minor trauma is observed, and this will obviously be enhanced with subsequent suctioning procedures. It is advised that suction should, therefore, be carried out only when necessary and not on a routine basis, that is at pre-determined intervals.

Type of catheter:

There are many types of commercially available suction catheters of different designs. Some studies appear to indicate that those with a single side-hole produce more

damage than catheters with multiple side-holes (Sackner et al, 1973; Link et al,1976). This probably due to the increased chance of simultaneous occlusion of both holes, producing maximum vacuum pressure build-up which is transmitted directly to the tracheobronchial mucosa.

With reference to the Aero-Flo catheter, a smaller size than would normally be selected must often be used order to facilitate the passage of the bead tip into airway. This may mean that the smaller catheter may not be large enough to remove thicker secretion adequately. In addition the bead tip appears to produce degree of trauma on insertion (Link et al, 1976; Jung and Gottlieb, 1976), when there is no cushion of air around the tip to protect the mucosa. Clinical experience suggests that introducing the Aero-Flo catheter into nasopharynx of children frequently causes bleeding increase discomfort. It may, therefore, be better suit to adults who are intubated, where insertion via a large endotracheal tube is easier.

Catheters without a built-in control valve and which attach directly to the vacuum source must be firmed pinched to prevent the negative pressure being transmitted to the catheter tip during insertion. This results maximum pressure build-up which is suddenly relayed to the airway on release. In catheters with a control valve or where a Y-connection is used, this does not occur, as negative pressure builds up only when the valve or opening is occluded. Induction of maximum pressure is, therefore, easily avoided by using interrupted suctioning.

In babies and young children, who have small lung volumes, catheters with control valves or Y-connections should always be used to minimize the risk of atelectasis and

tracheobronchial trauma. It is also suggested that such catheters or Y-connections should generally be preferred so as to avoid the sequelae associated with high negative pressures.

Catheter size:

Lager catheters increase the risk of mechanical trauma due to greater mucosal contact. Wedging large diameter catheter into segmental bronchi of similar proportions causes airway collapse and atelectasis (Brandstater & Muallem, 1969) because of the direct transmission of negative pressure to the lung tissue. A greater amount of air may be evacuated with larger catheters and thus the risk of hypoxia may also be increase (Boutros, 1970).

Catheter size should, ideally, be less than half the diameter of the trachea. It is occasionally necessary to use a proportionately larger diameter of catheter, especially if secretions are viscous, but this must be done with care.

Vigour of catheter insertion:

The vigour with which a catheter is inserted will also affect the degree of mucosal trauma (Jung and Gottlieb, 1976). It is therefore recommended that they should be inserted and withdrawn gently. If difficulty is experienced in a non-intubated patient, accessibility to the airway can be improved by extending his neck. On no account should catheters be forced into the airway with repeated jabbing movements.
Two studies identified the risk of perforating the lung with a suction catheter in neonates with severe lung disease (Anderson & Chandra, 1976; Vaughan et al, 1978). Introducing the catheter to only 1cm beyond the carina will lessen this danger.

Applied negative pressure:

The higher the level of vacuum pressure applied to a function catheter, the greater the degree of mucosal avagination and tissue damage which is likely to result (Sackner et al , 1973). In addition, if uninterrupted vacuum is used, the suction machine attains its maximum degree of negative pressure in a relatively short time. High negative pressures also cause airway collapse and atelectasis (Brandstater & Muallem, 1969), especially if large diameter catheters are used. Rux & Powaser (1979) implicated high negative pressure with an increased risk of hypoxia, possibly due to greater evacuation of air from the lungs.

A vacuum pressure of 70-100mm Hg is suggested (Chambiran & Ripley, 1966; Kuzenski, 1978) although; this level is often insufficient to evacuate thick mucoid secretions. In this situation, negative pressures of up to 200 mm Hg may be needed to clear the airways adequately. Vacuum-interrupted suctioning techniques are recommended if pressures up to and above 200mm Hg are used, to prevent maximum pressure build-up should the catheter become occluded.

Duration of suction:

Prolonging the time taken to carry out suction has been implicated in the degree of hypoxia induced (Brandstater & Muallem, 1969; Boutros, 1970). Although reflex broncho constriction, caused by mechanical stimulation of the trachea, may contribute to hypoxia (Woodburne & Powaser, 1980) it is thought that this occurs early in the procedure and is not related to the duration of suction. Hypoxia due to atelectasis, however, may be related to prolonged periods of suction, especially if large diameter catheters are used.

Patients who are unable to breathe spontaneously will tend to become hypoxic when artificial ventilation is interrupted and they are, therefore, at greater risk if suctioning time is also prolonged. It is always advisable to keep suctioning time to a minimum and not to exceed 30 seconds (15 seconds in neonates), especially in the patient dependent upon mechanical ventilation.

Lung hyperinflation:

Studies comparing different suction techniques have shown that hyperinflating the lungs with oxygen on room air, before and after suction, decreases the risk of hypoxia (Boutros, 1970). Although raising the PaO2 levels before suction may mask rather than prevent, the mechanism by which this occurs, it will also help to minimize the hypoxia response. Lung hyperinflation after suction corrects hypoxia, possibly by reinflating collapsed lung segments. Breathing oxygen before suctioning has also been shown to decrease the incidence of cardiac arrhythmias in patients with respiratory disease (Shim et al, 1969).

Hyperinflation of the lung with 100% oxygen must be carried out with care, as rapid acid-base changes in the blood may affect the stability of the severely ill patient. It should be attempted only by experienced staff, especially in neonates where high positive intrathoracic pressures must be avoided. Patients at risk of suffering a marked hypoxia response following suction will benefit from careful lung hyperinflation for period of up to 30 seconds before, and following, the procedure.

Irrigant:

The need for an irrigant during suctioning is ventilated patients has not been thoroughly investigated . Although an irrigant can be effective as a vapor or aerosol, the direct instillation of water or saline as a means of thinning secretions is questionable (Ackerman, 1985). The use of saline as an irrigant may have become an accepted practice when earlier humidification systems attached to mechanical ventilators were inadequate to deliver heat and humidity, thus producing dry and tenacious secretions.

If it is used, normal saline should be instilled just before the catheter pass to enhance retrieval of the solution. The saline should be measured; most saline vials are designed for the adult patient . Each "squeeze" of the vial can deliver an uncontrolled volume of saline.

Anther hazard of saline instillation is the potential contamination of the contents during opening (Fisher, 1982). Each caregiver should take extra precautions when opening a saline vial so as not to contaminate the tip of the vial with thumb or fingers. It may therefore, be recommended that normal saline instillation before suctioning should be used in practice only after the need for this intervention has been well established in an individual patient (by quality of secretions, quality of breath sounds, quality and effectiveness of cough, oxygenation, and ventilatory status) and the patient's response to it has been carefully evaluated. Until it is clearly demonstrated that a physiologic benefit accrues from this procedure, it should not be used as a routine or standard clinical practice.

Patient preparation:

Airway suction is an unpleasant experience for the patient to whom adequate preparation and explanation (where appropriate) should be given. The conscious patient should be told what is about to occur and the help of another staff member enlisted to prevent any sudden movement by the patient. Children should be securely held or wrapped in a blanket with their arms tucked firmly inside. Resistance and movement serve only to increase the risk of trauma.

If possible, positioning the non-intubated patient in side lying (or turning the head to one side) is preferable so that if vomiting occurs, the risk of inhalation is reduced. In addition, in side lying the neck can easily be extended to facilitate catheter insertion into the airway.

Conclusion:

Airway suction was once described as a surprisingly simple technique (Thompson, 1936) and in terms of the technology involved and equipment used, it is. However, there are many variables associated with suctioning which affect the degree of trauma to the patient. It is vital that medical, nursing and paramedical staff using this procedure appreciate the possible dangers accompanying it and modify their approach accordingly.

CHAPTER THREE: METHODOLOGY

Research Design:

The design of the study was a cross-sectional survey of health professionals. This design was selected because it captures the phenomenon under investigation (instillation of saline) during one period of data collection, so it is practical, economical and easy to manage.

Sampling:

The United Arab Emirates is a country consisting of seven emirates. A multi-stage sampling was done.

First stage: One emirate in the country was selected randomly, which was Abu Dhabi.

Second stage: Three major hospitals were included in the study, which were Tawam hospital, Khalifa hospital and Al-Jimi hospital.

These hospitals were selected based on their accessability and convenience.

Third stage: In Tawam hospital all staff nurses in the Intensive Care Unit (ICU) and Neonatal Intensive Care Unit (NICU) were involved in the study, the staff nurses that met the inclusion criteria were those with at least two years of experience in the critical care units, and a diploma or degree in nursing. In addition to the staff nurses in Tawam hospital, all respiratory therapists (RTs) were also involved.

In Al-Jimi hospital all staff nurses in the ICU and NICU nurses were included. The inclusion criteria were the same as those of Tawam hospital.

In Khalifa hospital only respiratory therapists were included in this study to increase the RT population.

Table One - Total number of nurses and resp. therapists

Site	ICU Nurses	NICU Nurses	Resp.therap	Total
Tawam	16	13	11	40
Al-Jimi	13	12	---	25
Khalifa	---	---	16	16

Total number of participants: 81

Data Collection Instrument:

A questionnaire was developed to determine the knowledge of and procedures used for instillation of normal saline before suctioning based on the paper done by Diane Sckwneker in 1998. A review of the literature on the practice was done, such as the indications for the use of saline, the myths associated with instillation of saline and the advantages of instilling saline. Questions were devised to test knowledge of this literature and to determine the current practices of instilling saline before suctioning. The questionnaire consisted of two parts:

Section A: Demographic data: nine closed items covering areas such as sex, age, nationality, title, years of experience and qualifications.

Section B and C: Suctioning survey: Fifteen items addressing the four main components of the study as outlined in table two.

Items were a combination of open and closed ended questions (multiple choice questions, dichotomous questions, true or false). However, more emphasis was given to the closed-ended questions (13 items vs. 2 items).

The reason for using this approach is that both open and closed-ended questions have certain strengths and weaknesses. Good closed-ended items are often difficult to construct but easy to administer and, especially, to analyze. With closed-ended questions, the researcher needs only to tabulate the number of responses to each alternative to gain some understanding about what the sample as a whole thinks about an issue. It is thus a convenient and shorthand way of recording complex data. The analysis of open-ended items is time consuming. The procedure that is normally followed is the development of categories and the assignment of the open-ended responses to those categories. That is, the researcher essentially transforms the open-ended responses to fixed categories in a post hoc fashion so that tabulations can be made. This classification process takes considerable time and skill.

Closed-ended items are generally more efficient than open-ended questions in the sense that a respondent is normally able to complete more closed than open-ended questions in a given amount of time. In questionnaires, participants may be less willing to compose a written response than to check off or circle the appropriate alternative. With respondents who are unable to express themselves well verbally, closed-ended items have a distinct advantage. Furthermore, there are some types of questions that may seem less objectionable in closed form than in open form.
The major drawback of closed-ended questions lies in the possibility of the researcher neglecting or overlooking some potentially important responses. It is often difficult to see an issue from multiple points of view. The omission of possible alternatives can lead to misrepresentation of the issues and to outright bias if respondents choose an alternative that does not represent the true facts. When the area of research is relatively new, open-ended questions may be more suitable than closed-ended items for avoiding bias.

Another objection to closed-ended items is their superficiality. Open-ended questions allow the researcher to test the limits of the respondent's knowledge and to make a truer assessment of what the respondent really believes. Open-ended questions can also result in unexpected or unanticipated answers that may suggest unthought-of relationships or hypotheses.

Finally, by using closed-ended questions may allow for the possibility of irritating respondents who might find none of the alternatives suitable. Open-ended questions give a lot of flexibility to the respondent and, therefore, offer the possibility of spontaneity, which is unattainable when a set of responses is provided.

The decision to use open and closed-ended questions is based on a number of important considerations, such as the sensitivity of the topic, the verbal ability of the respondents, the amount of time available, and so forth. Combinations of both types are highly recommended for offsetting the strengths and weaknesses of each.

Validity:

A panel of experts in the content area was consulted to evaluate and document the content validity of the instrument. The panel consisted of at least three experts in suctioning. The experts were asked to evaluate individual items on the new measure as the entire instrument. Two key issues in such an evaluation are whether individual items are relevant and appropriate in terms of the construct and whether the items adequately measure all dimensions of the construct. The content validity index (CVI) was computed in order to assess the relevance of items, the experts were asked to rate items on a 4 point scale (from 1 = not relevant to 4 = very relevant). They all agreed

that the individual items are relevant and appropriate in terms of construct, as well as adequately measuring all dimensions of the construct as shown below in table two.

Table Two - Content analysis of survey instrument

Topic	**Number of items**	**Items**
Advantage of saline instillation	Five	11a,13, 13a,13b,14c
Disadvantage of saline instillation	Five	11b,14,14a 14b,16
Correct technique for endotracheal suctioning	Seven	9,11,12,15, 10,16,17
Frequency of use of saline instillation	Two	10,11

Reliability:

The questionnaire was developed based on a Gold standard identified in the literature. This standard was a survey done by Schewintler et al. in 1998. The instrument was modified to suit the culture and population (bearing in mind that the Gold standard was applied in the USA).

To reinforce or increase the reliability of the instrument, stability was assessed by evaluating test–retest reliability. The same instrument was used twice and a comparison of scores or results was conducted. The comparison procedure was

performed objectively by computing reliability co-efficient. However, because test-retest was time consuming, a repeated measure design was taken into consideration and used. The use of this design was to ease the access of my sample. Moreover, since I was not expecting reliability problems, this was going to give me less work. Another way of ensuring reliability was to perform the split half technique and compute the cronbach's alpha. However, due to time restraints and the use of the above mentioned two points, the split half techniques and cronbach's alpha were not adopted.

Pilot study:

The questionnaire was administered to 10 nurses as a pilot test to determine the ease of use and the need to improve clarity.

Data collection procedure:

The hospital and nursing directors of Al-Jimi, Khalifa and Tawam hospitals were contacted for approval, then through the director of nursing to the head nurses which consequently were going involve the concerned staff nurses. Questionnaires were distributed and collected via the same channels; that is through the head nurse to the nurses and then from the nurses back to the head nurse.

The self–administered questionnaire included a covering letter stating the objectives of the research and the ethical considerations (see Appendix B).

Questionnaires were selected as a tool to conduct the study because questionnaires, relative to interviews, are much less costly and require less time and energy to

administer. Besides offering the possibility of complete anonymity, questionnaires minimize the chances of interviewer bias.

The problem of low response rate was taken care of by sending two reminders. In the case of no response after the second reminder, it was considered as non-respondent. I consider my investigation as a success, since out of 105 questionnaires distributed, 81 were completed and returned, indicating a response rate of 77%.

Ethical aspects:

The application was submitted to the Ethics Committee of the University of Natal, as well as the local ethical committee. Names were not collected during the study; data was stored in a password-protected computer. The packets were numbered (each nurse had a number on the packet not on the questionnaire to maintain follow up) and packaged so as not to lose track and to know who answered the questionnaires and who didn't so as to send a reminder later on. The packet contained a letter to the head nurse and a second internal packet. The second internal packets were numbered and contained a letter to the staff nurse, the final questionnaire and a return envelope with a seal.

Data analysis:

In addition to the descriptive statistics, a correlation analysis was conducted using the Pearson Correlation (2-tailed). Data were analyzed using SPSS Version 9.

CHAPTER FOUR: THE RESULTS

INTRODUCTION

This chapter deals with the presentation of the results mainly based on the information gathered by the questionnaires. A copy of the questionnaire appears at Appendix A. Data from the survey is presented in tables and figures that have been checked for statistical reliability. The results of the questionnaire were entered into SPSS, which enabled responses to be both counted and compared, in addition to enabling connections to be made between responses.

The results of the questionnaire will be presented in graph form and will then be described. A discussion of the results will then follow.

1. SAMPLE DESCRIPTION

Respondents were asked a number of biographical data in order to establish some baseline data on the characteristics of the survey population.

Gender

A total of 81 nurses and respiratory therapists (RTs) participated in the study. The sample was composed of 19 males and 62 females (see table 4.1).

Table 4.1 - Gender of respondents

Sex	N	Percent
Male	19	23.5
Female	62	76.5

Age

In table 4.2 it can be seen that the participants' ages ranged between 24 to 50 years, with the mean age of 35 years and a standard deviation (SD) of 6.73.

Table 4.2 - Ages of respondents

Age range	Frequency	Percent	Valid Percent	Cumulative Percent
24-29	16	19.8	19.8	19.8
30-34	25	30.9	30.9	50.6
35-41	19	23.5	23.5	74.1
42-50	21	25.9	25.9	100.0
Total	81	100.0	100.0	

Nationality

The respondents were classified into three categories for nationality: the Western category included: British, Canadian, South African, New Zealand, German, American, Australian, and French participants. South Africans were considered as Westerns for two main reasons; the first one is that the government in the UAE classifies them as Westerns and are therefore entitled for the Westerns' extra-priviliges. The second reason is that the nursing background in South Africa including the ethos of the particpants match those of the west as approved by the criteria of evaluation in the UAE. The Middle Eastern category included Omani, Jordanian, Egyptian and Lebanese respondents. The Eastern category consisted of Malaysian, Indian and Filipino participants.

As table 4.3 reveals, more than half of the participants were classified under the Western category.

Table 4.3 – Nationality of respondents

Nationality	No.
Western	46
Middle Eastern	4
Eastern	31

Job status

As table 4.4 indicates, three quarters of the participants work as nurses. This could be attributed to the fact that only two hospitals in Abu Dhabi have a respiratory therapy (RT) department whereas other hospitals totally rely on nurses and physicians to perform the job of the respiratory therapists.

Table 4.4 – Job status of respondents

Job status	Frequency	Percent	Valid Percentage	Cumulative Percentage
Nurse	54	66.7	66.7	66.7
Respiratory Therapist	27	33.3	33.3	100.0
Total	81	100.0	100.0	

Qualifications

It is clear that the most commonly held qualification amongst respondents is the Diploma (68%). Only a fifth of the nurses (20%) held BSN's and 11% of the RTs held BSRT's (see table 4.5).

Table 4.5 – Qualifications of respondents

Qualification	Frequency	Percent	Valid Percent	Cumulative Percent
Diploma	55	68	68	68
Specialization	1	1	1	69
Bachelor of Science in Nursing (BSN)	16	20	20	89
Bachelor of Science in Respiratory Therapy(BSRT)	9	11	11	100.0
Total	81	100.0	100.0	

Year of graduation

The participants graduated between the years 1970 to 1999. As table 4.6 reveals, most of the participants graduated between the periods of 1990-1999.

Table 4.6 – Year of graduation

Year of graduation	Number
1970 – 1979	9
1980 – 1989	29
1990 - 1999	43

Highest professional qualifications

The highest qualification amongst the respondents is a Masters (1%) with the second highest being a BS (32%).

Table 4.7 – Highest professional qualifications amongst respondents

Level of education	Frequency	Percent	Valid Percent	Cumulative Percent
Diploma	51	63	63	63
Master	1	1	1	64
Specialization	3	4	4	68
BSN	16	20	20	88
BSRT	10	12	12	100.0
Total	81	100.0	100.0	

Years of experience

The years of experience range between 1 to 26 years, with a mean of 10.07 years, a median of 9 years and a SD of 5.52 years.

2. SUCTIONING SURVEY

2.1 Frequency of pre oxygenation

Figure 1 presents data looking at the respondents, aspects of knowledge that relates to the importance of pre oxygenation of patients before suctioning.

Overall, 43% (23) of the nurses and 67% (18) of the RTs in the sample indicated that they always pre oxygenate before suctioning.

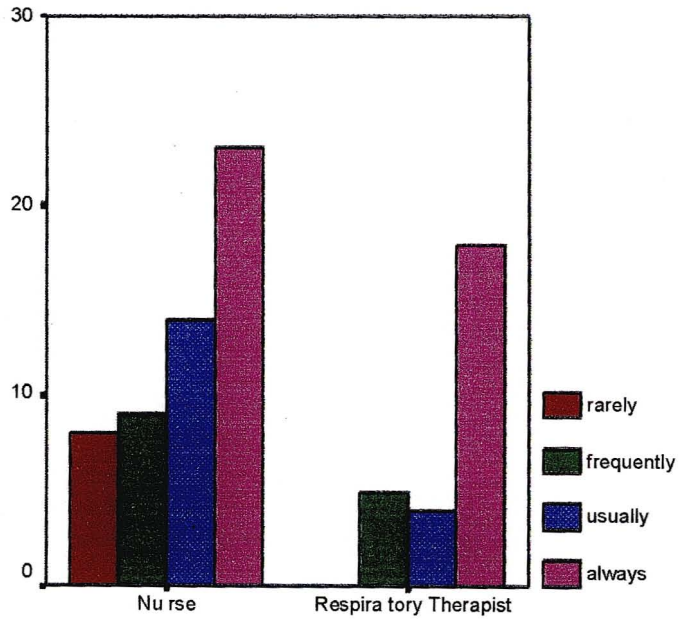

Figure 1 - Frequency of pre oxygenation

2.2 Frequency of saline instillation before suctioning

As Figure 2 reveals, a much higher proportion of nurses 56% (30) in the sample "rarely" use saline instillation before suctioning, as compared with RTs 30% (8). The data was split according to title and a correlation analysis was conducted using the Pearson Correlation (2-tailed), which showed to be 1, indicating a statistical significance.

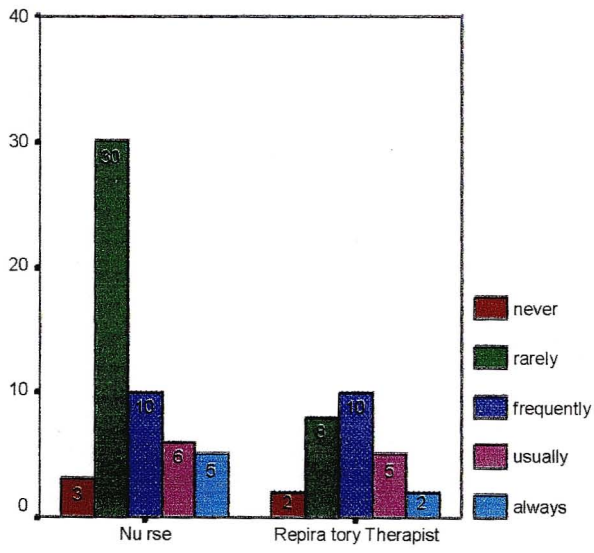

Figure 2 – Frequency of saline instillation before suctioning

2.3 Reasons for the use of saline instillation

Figure 3 shows that the majority of nurses (89%) stated that if they ever used saline, they used it to liquefy or loosen secretions, in comparison to 100% of the RTs.

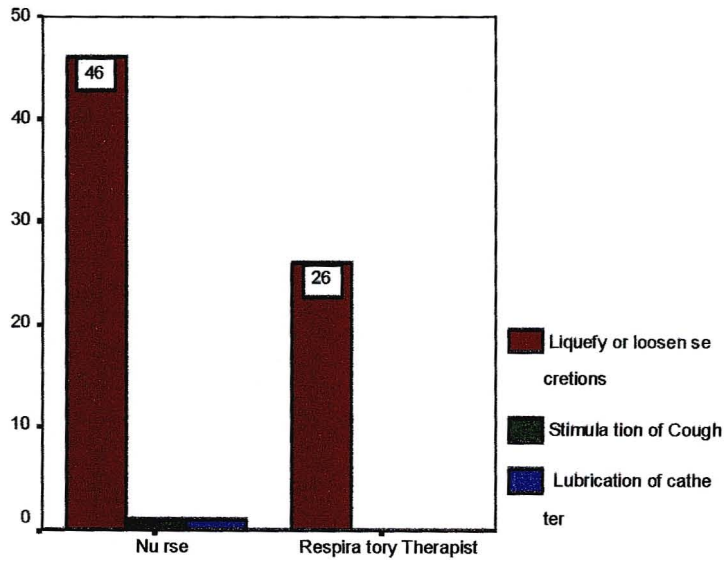

Figure 3 – Reasons for the use of saline

2.4 Reasons for not using saline instillation

Only 5% of the respondents did not use saline installiation and their rationale was that saline decreased oxygen saturation and increased the risk of infection.

2.5 Reasons for practice choices

Table 4.8 represents the reasons for using/not using saline as reported by the participants.

Table 4.8 – Reasons for practice choices

Section C	True %	False %
I only use saline once I have determined the secretions are thick.	91	9
Suctioning is a sterile procedure.	97	3
Saline instillation has the following benefits:		
Retrieval of more secretions.	74	26
Stimulation of cough.	72	28
Reduction of bacterial growth.	17	83
Saline instillation has the following adverse effects:		
Decreased oxygen saturation.	53	47
Increased incidence of pulmonary infection.	43	57
Decreased comfort of patient.	60	40

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

Introduction

Questions have been raised for more than 2 decades about the comfort, efficacy, and safety of instilling saline into artificial airways. Despite these questions, I have found that instillation of saline was being used in practice, was thought to have beneficial effects, and was incorporated in the written guidelines for nurses and respiratory therapists.

This study has attempted to explore a number of factors related to the knowledge and practice of nurses with respect to the instillation of saline during endotracheal suctioning. It has attempted to highlight the factors that affect the performance of the procedure using a cross-sectional study approach through a survey.

The response rate for the questionnaires was high and there appeared to be no problems with the content and format of the questions. However, obtaining access to some of the hospitals was a tedious and time-consuming process.

Due to the restricted time available, which was beyond the control of the writer, the questionnaires had to be administered and collected in a short period of time.

Discussion

Although 47% of respondents indicated that they rarely instill saline before suctioning, 25% indicated that they frequently use saline. Use of saline is more prevalent among respiratory therapists than among nurses; 37% of respiratory therapists but only 19% of the nurses reported that they frequently instill saline before suctioning.

Nurses (57%) and respiratory therapists (100%) agreed on the perceived beneficial effects of instillation of saline before suctioning, which showed to be liquefication or loosening of secretion.

Forty three percent of the nurses cited that they all preoxygenate before suctioning in comparison to 64% of RTs. This result matches previous research studies conducted by Ackerman (1993).

In contrast to the previous research (Gray, MacIntyre, & Kronenberger,1990) which revealed that the instillation of saline is tied to the stimulation of a cough reflex. Both respiratory therapists and nurses could benefit from teaching about the beneficial effects of instillation of normal saline and specific guidelines for the use of this procedure. For example, if the only benefit of instilling normal saline before suctioning is stimulation of a cough, then instilling saline would not benefit patients who are paralyzed or who have an impaired or absent cough reflex. Guidelines should state that these patients should never have normal saline instilled before suctioning. Healthcare providers should question, however, whether instillation of normal saline before suctioning should be occurring at all. The practice of administering boluses of

liquids to liquefy secretions is not substantiated in the literature. The procedure does not approximate any usual function of the respiratory tract and may be akin to drowning. Large amounts of water are incorporated during normal formation of mucus, but once formed mucus has a gelatin like surface that repels water. References published in the late 1970s and early 1980s support using heat and humidification of gases, such as oxygen, that bypass the nasopharynx to eliminate dried and tenacious secretions. Ackerman (1985, 1996) twice reviewed the literature on suctioning and concluded on both occasions that instilling normal saline before suctioning to thin, mobilize, or remove secretions has little or no value. He suggested that the first steps in liquefying secretions are adequate hydration of the patient and humidification of the artificial airway. Two primary functions of the upper respiratory tract are to heat and humidify gases. Therefore, replacing these functions in patients in whom the upper part of the airway has been bypassed most likely would be far more desirable than instilling normal saline into an endotracheal tube. This assumption should be reflected in the guidelines on suctioning.

Information about the dangers of instilling normal saline should be more widely disseminated. The false belief that instillation of saline does not cause a decrease in oxygen saturation is widely held; 47% of the respondents indicated that oxygen saturation was not affected. Although this finding may be due to earlier research that did not show a significant difference in the Pao2 with instillation of saline before suctioning (Bostick &Wendelgass, 1987), more recent research (Akerman, 1993) has indicated that instillation of normal saline before suctioning causes a greater decrease in oxygen saturation than does suctioning without instillation of saline. The long-term

effects of a temporary decrease in oxygen saturation on patients outcomes should be investigated.

The relationship between instillation of normal saline and the risk of pulmonary infection also should be more widely disseminated. The professionals that were surveyed in this study did not think that instillation of saline increased the risk of pulmonary infection; only 43% of all responses indicated increased risk of pulmonary infection as an adverse effect. Respiratory therapists especially should be targeted for this teaching; only 26% of their responses indicated an awareness of this adverse effect. This finding suggests that few respiratory therapists are aware of the study by Hagler & Traver, 1994), perhaps because the article appeared in the nursing literature. Another possibility is that the in vitro nature of the study by Hagler and Traver may have influenced acceptance of the results. However, subjecting patients to a definitive in vivo study might be considered unethical. An in vivo study would needlessly expose patients to the risk of pulmonary infection.

The objective part of the questionnaire was corrected according to an evidence-based literature, and participants were given a pass or a fail score. Surprisingly when cross tabulating the title vs the scores, only 45% of the nurses passed the knowledge content of the questionnaire in comparison to 67% of the RTs. With regard to gender analysis of scores, 74% of the males passed in comparison to 45% of the females. So more studies showing the effect of gender are recommended in this regard.

Limitations and recommendations of the Research:

As with most first-time research studies, the methodology techniques that are chosen may contain certain limitations, which despite piloting and careful planning, do not necessarily come to light until after the research process has been completed.

Below are the limitations that I, the researcher, consider to apply to the present study:

a) Sample - ideally, I would have liked to have used a larger sample (say, 200 nurses and RTs) in order to allow for more comparable results.

b) Survey methods - due to time and access constraints, only questionnaires were used. I would have liked to have used interviews in order to have gained a more comprehensive view on the subject. According to Cohen and Manion (1989), interviews are "flexible", so they give the chance to the interviewer to get below the surface of the problem, to measure the knowledge of the respondents and to identify the values, preferences, attitudes, beliefs and the reasons for responding as they do. An additional important limitation which needs to be addressed is that in the covering letter to the participants, the researcher did not clearly state that the participants should not ask others or refer to books when answering the knowledge content of the questionnaire. This might have affected the outcome of the results to a certain extent.

c) A replication of the study including both governmental and private hospitals.

d) A replication of the study with a different ICU population to assess the effects of experience on concerns.

e) The effectiveness and necessity of saline instillation needs replication studies.

f) An interesting phenomenon that emerged was that nurses with higher education had lower knowledge of the content. Perhaps it would be relevant to investigate this further to identify how this can be explained.

g) The failure of a large group of nurses, lends further support to the need for adoption of problem – oriented records and for the development of process- oriented programs of quality assurance, both of which provide data for peer review and ultimately improvement of nursing practice.

h) Despite the historical reliance of nurses on procedure manuals and more recently on standardized nursing care-plans, the overall correct score was 45% in the knowledge content of the procedure suggests that nurses either do not learn or fail to retain concepts and principles underlying complex procedures . In my opinion, I would strongly urge educators to include reading and discussion of research studies in their educational programs to enable nurses to make data based rather than intuitive nursing decisions. It is recognized that some of the items require revision and updating in light of current practices, new suctioning tip designs and research published in the interim.

CONCLUSION

Nurses every day experiences provide a rich supply of problems for investigation. Experience is often the most compelling source for topics. Immediate problems that are in need of solution or that excite the curiosity are relevant and interesting and, thus, may generate more enthusiasm than abstract and distant problems inferred from a theory. In conclusion, it is very important to explore actual practice rather than the ideal, in order to establish continuing education and policy development needs.

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APPENDIX A

QUESTIONNAIRE WITH REGARD TO SUCTIONING

SECTION A: DEMOGRAPHIC DATA

Please fill in the following demographic data before completing the questionnaire.

1. Age: _____ (in completed years)

2. Gender: 1. Male ☐ 2. Female ☐

3. Nationality: _____

4. Title: 1. Nurse ☐ 2. Respiratory therapist ☐

5. Basic nursing qualifications: _____

_____

6. Year of graduation of basic nursing/Respiratory Therapy education: _____

7. Highest professional qualifications obtained: _____

_____

8. How long have you been working in the ICU (adults or ped):

_____

SECTION B: SUCTIONING SURVEY

PLEASE INDICATE WITH A TICK ✓ WHAT IS YOUR USUAL PRACTICE WITH REGARD TO ENDOTRACHEAL SUCTIONING IN THE FOLLOWING THREE ITEMS.

9. How often do you pre oxygenate the client before suctioning?

- ☐ Never
- ☐ Rarely
- ☐ Frequently
- ☐ Usually
- ☐ Always

10. How often do you use saline instillation before suctioning?

- ☐ Never
- ☐ Rarely
- ☐ Frequently
- ☐ Usually
- ☐ Always

11. If yes, why do you use saline instillation?

_____

_____

12. If no, why don't you use saline instillation?

_____

_____

SECTION C: YOUR REASONS FOR PRACTICE CHOICES

PLEASE INDICATE WITH A TICK ✓ WHETHER EACH STATEMENT IS TRUE OR FALSE:

13. I only use saline once I have determined the secretions are thick. TRUE ☐ FALSE ☐

14. Suctioning is a sterile procedure. TRUE ☐ FALSE ☐

Saline instillation has the following benefits:

15. Retrieval of more secretions. TRUE ☐ FALSE ☐

16. Stimulation of cough. TRUE ☐ FALSE ☐

17. Reduction of bacterial growth. TRUE ☐ FALSE ☐

Saline instillation has the following adverse effects:

18. Decreased oxygen saturation. TRUE ☐ FALSE ☐

19. Increased incidence of pulmonary infection. TRUE ☐ FALSE ☐

20. Decreased comfort of patient. TRUE ☐ FALSE ☐

IN THE FOLLOWING ITEMS, PLEASE INDICATE WITH A TICK ✓ WHICH ALTERNATIVE YOU CONSIDER TO BE THE CLOSEST TO THE TRUTH.

21. What would be the optimum negative pressure during suctioning?
    - ☐ >120mmhg
    - ☐ 80-120mmhg
    - ☐ <80mmhg
    - ☐ Max

22. What is the most common adverse effect of using inappropriate negative pressure during suctioning?
    - ☐ Hypoxemia
    - ☐ Less retrieval of secretions
    - ☐ Atelectasis
    - ☐ Bleeding and damage to the tracheal mucosa

23. What is the best amount of saline to be instilled during suctioning?
    - ☐ 2-5ml
    - ☐ 5-10ml
    - ☐ 10-20ml
    - ☐ 20-40ml

THANK YOU FOR YOUR PARTICIPATION!

APPENDIX B

THE COVERING LETTER

Dear Colleague,

Questionnaire on the use of saline instillation during tracheal suctioning.

My name is Mohammed Toufic. I am a master's student at the University of Natal, South Africa. This research is being undertaken as a part of the requirements for a master's degree in critical care nursing.

I would appreciate your participation in this research project, which is attempting to elicit views (perceptions) of the nurses and respiratory therapists in the ICU and the NICU with respect to the instillation of saline during endotracheal suctioning in the Tawam, Khalifa and Al-Jimi hospitals. I am very much interested in your views on this subject, as you are the front line professionals involved in health care delivery to the critically ill.

This is an anonymous survey and completing the questionnaire should not take you more than ten minutes. The results will be

pooled and presented in aggregate form and no individual will be identified at any point. If you are willing to take part in the study, please complete the questionnaire, put it in the envelope and hand it in to the nurse in charge of your ICU. I will collect the completed questionnaires from him/her. I have permission from the hospital authorities to do this study.

Please spare a few minutes of your valuable time to fill in this questionnaire, since it might enable us to improve care to critically ill patients. Thank you for reading this and I hope you will be able to provide me with your views.

If you have any further questions about the research, please feel free to contact me.

Sincerely,

Mohammed Toufic

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