THE EFFECT OF THE PATIENT'S LEVEL OF CONSCIOUSNESS AND
THE DEGREE OF NASOGASTRIC TUBE FLEXIBILITY ON THE EASE
OF INSERTION OF THE TUBE IN PATIENTS WITH AN ENDOTRACHEAL
TUBE IN PLACE

by

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ABSTRACT

The Effect of the Patient's Level of Consciousness and the Degree of Nasogastric Tube Flexibility on the Ease of Insertion Of the Tube in Patients With an Endotracheal Tube in Place

Jane E. Heaslip

The purpose of this study was to examine the effect that the patient's level of consciousness and the degree of nasogastric tube flexibility would have on the ease of insertion of the tube in patients with an endotracheal tube in place. The statistical hypotheses tested were:

1. The Degree of nasogastric tube flexibility will not influence the ease with which the tube is inserted.

2. The level of consciousness of the patient will not influence the ease with which the nasogastric tube is inserted.

3. There will be no interaction between the degree of flexibility of the nasogastric tube to be inserted and the level of consciousness of the patient in whom the tube is placed.

The sample from whom data was collected for the study consisted of 121 patients admitted to the respiratory intensive care unit of a large teaching hospital who required endotracheal
intubation and subsequent placement of a nasogastric tube. The number of attempts per patient for successful placement of each tube were recorded over a four month period and the data analysed using a 2 X 3 factorial design. The two independent variables were degree of nasogastric tube flexibility with two levels: flexible and rigid, and level of consciousness with three levels: conscious, obtunded and unconscious.

The data collected from the study indicate that the degree of nasogastric tube flexibility significantly affects the ease with which a tube can be inserted in an intubated patient (α=.05), the rigid tube requiring a statistically fewer number of attempts than the flexible tube. The difference among levels of patient consciousness were not found to be statistically significant in this investigation but the interaction between the degree of tube flexibility and level of patient consciousness revealed statistical significance.

Thesis Chairman
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CHAPTER ONE

THE PROBLEM

Introduction

The ease with which a nasogastric tube is inserted may well be related to such factors as the degree of anxiety on the part of the nurse, the level of the nurse's knowledge concerning the anatomy of the nasopharynx, esophagus, and stomach, the degree of patient cooperation during the procedure, and the manageability of the tube itself.\(^1\) A recent article suggests that a nurse's level of anxiety concerning nasogastric intubation will decrease as she becomes more aware of the anatomic and physiologic principles that govern placement of the tube.\(^2\)

Procedures that are based upon these findings have recently been delineated.\(^3\) Manageability of the tube to

\(^1\) Cecilia Volden, Jacquelyn Grinde, and David Carl, "Nasogastric Intubation," Nursing 80.10 (September 1980):14-17.


be inserted has been discussed in relation to anaesthetised patients with endotracheal tubes in place. Volden et al recommend that the nasogastric tube be placed on ice before insertion in order to prevent coiling of the tube in the back of the throat, but this suggestion was made without benefit of a controlled clinical trial.

The approaches most frequently used by nurses to solve problems are trial and error, reliance on past experience, "common sense", "faith", and custom. All these methods have been used in deciding how best to insert a nasogastric tube. The rationale for inserting a tube that has been cooled before


insertion to promote rigidity or stored at room temperature to ensure flexibility is the same—"this is the way it has always been done" or "I believe this method works best". When one method fails a second is adopted, and when success is finally achieved it is more often than not attributed to "luck". In the case of a patient with an endotracheal tube in place the nurse is most likely to use one of the alternatives just described in placing a nasogastric tube despite some evidence that in this patient at least there is an advantage in inserting a more rigid tube. It seems a logical consideration that a stiffened tube might contribute to the ease of insertion if one's attention is given for a moment to the nature of the tube itself. Most nasogastric tubes now in use both for feeding and drainage are made of plastic. The assembly of polymeric chains is held together by a number of different forces and, when heated, these chains move apart sufficiently to permit them to slide over one another but retain their cohesiveness because of the forces still operating.\(^7\) This means that the type of plastic from which most nasogastric tubes are made, polyvinyl chloride, is softer and less easily directed when at room temperature than when cold. This softness is an advantage in terms of patient comfort and safety because it will cause less oropharyngeal discomfort than a harder material, but it is a disadvantage regarding insertion because it prevents the tube from being easily directed.

Statement of the Problem

Literature review has shown that quantitative, objective measures have not as yet been used to examine the factors that influence the ease with which a nasogastric tube can be introduced. Since the recent literature claims that the level of consciousness of the patient, the presence or absence of an endotracheal tube, and the degree of nasogastric tube flexibility all influence the ease with which that tube can be inserted, a controlled study to examine these factors would be helpful. Such a study would be especially significant if its implementation could encourage problem solving techniques that would replace what Thelma Wells calls the methods of reliance on past experience alone, common sense, faith, and/or custom.

Purpose of the Study

The purpose of this study was to examine the effects that two degrees of flexibility of the nasogastric tube and level of patient consciousness have on the ease of insertion of a nasogastric tube in patients with an endotracheal tube in place. The statistical hypotheses to be tested were:

1. The degree of tube flexibility will not influence the ease with which the nasogastric tube is inserted.
2. The level of consciousness of the patient will not influence the ease with which the nasogastric tube is inserted.
3. There will be no interaction between the degree of flexibility of the nasogastric tube to be inserted and the level of consciousness of the patient in whom
the tube is placed.

The objective of the study was to formally test what nurses have come to believe through trial and error or past experience, but what has not as yet been validated (i.e., that there is a difference in the ease of insertion of a nasogastric tube in the patient who has an endotracheal tube in place that is dependent upon the degree of flexibility of the tube inserted and the level of consciousness of the patient). The aim of the investigation was to provide a more scientific base upon which the clinical decision could be made concerning the placement of nasogastric tubes in intubated patients with varying levels of consciousness.

Definitions of the Terms

Nasogastric Tube

Argyle\textsuperscript{R} Salem Sump\textsuperscript{R} Tube. This is a double lumen tube made of thermosensitive polyvinyl chloride which increases in flexibility at normal body temperature. One lumen serves for suction drainage or feeding while the other provides an air vent to break the vacuum when the stomach has been evacuated of accumulated liquid, air and small particulate matter. A number 14 tube is 4.7 mm in diameter and 122 cm in length. A number 18 tube is 6.0 mm in diameter and 122 cm in length. The tube has an X-ray opaque Sentinel Line\textsuperscript{R} and Sentinel Eye\textsuperscript{R} which permit exact location of the tube and drainage eyes.

Degree of Tube Stiffness

1. Flexible: tube in its natural pliable state at room
temperature.

2. Rigid: tube in the stiffened state as produced by a ten minute immersion in an ice bath.

Level of Consciousness

1. Conscious: the patient is alert and oriented to person and place, has a gag reflex present and is able to swallow and to cooperate with the nurse during the insertion of the nasogastric tube.

2. Obtunded: the patient is neurologically impaired either because of his physical condition or the administration of sedatives and/or analgesics so that he is unable to actively cooperate with the insertion of his nasogastric tube; there are gag and swallow reflexes present.

3. Unconscious: the patient is inappropriately responsive or nonresponsive to painful stimuli and has no gag or swallow reflex due either to physical condition or administration of anaesthesia.

Endotracheal Tube

Portex\textsuperscript{R} soft cuffed endotracheal tube.

Ease of Insertion Measure

The number of attempts necessary for successful placement of the nasogastric tube in the stomach as evidenced by aspiration of gastric fluid with a syringe. Any "pull back" of the tube determines the point at which second and subsequent attempts are to be counted.
CHAPTER TWO

REVIEW OF THE LITERATURE

Introduction

The nurse new to the typical medical-surgical respiratory intensive care unit is often overwhelmed by the number of tubes and catheters emanating from any given patient. There are tubes coming from below the dura that attach to transducers to record intracranial pressure. Swan-Ganz catheters inserted in jugular veins record pulmonary artery pressures. Silastic tubing in the subclavian vein provides an avenue for hyperalimentation of the seriously ill. Fine wires introduced through the femoral vein act as a temporary pacemaker for the failing heart and the humble jelco in the peripheral vein provides a route for the administration of medications and fluid. Blood drains slowly through a chest tube to a bottle on the floor while saline irrigates an abdominal wound through a sump tube. Suprapubic, ureteral and urethral catheters drain urine into bags. Rectal tubes drain liquid stool from nonfunctioning bowel. Endotracheal, nasotracheal, and tracheostomy tubes provide patient connections to ventilators while large bore catheters placed in femoral arteries and veins attach patients to hemodialysis machines. The number of tubes and catheters used to treat, diagnose and monitor any given patient depends upon his particular needs.

It is the purpose of this chapter to discuss highlights of the historical development of the use of tubes and catheters
in the provision of patient care. Emphasis will be placed on the historical development of the use of the nasogastric tube and discussion will include specific reference to methods devised to overcome difficulties encountered in nasogastric intubation.

Highlights of the Historical Development of the Nasogastric Tube

The early tubes and catheters reflected the primitive level of technology available to the ancient practitioner. Thus, the first urethral catheters, venous drainage systems, and tracheostomy tubes of 3,000 years B.C. were made of hollow reeds. As knowledge of metals became available these tubes began to be fashioned of gold, iron, lead and bronze. By 1036 the rigid metal urethral catheter had been replaced by a more flexible one made of silver, by the 16th century the venous reeds replaced by silver arterial tubes, and by 1869 tracheostomy tubes made of cane were replaced with those made of silver. In the early 19th century following the discovery of rubber and with advancement in manufacturing methods the first rubber urethral catheter was introduced in France. Twenty years later, in 1880, the first rubber endotracheal tube was described. In the 20th

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10Garrison, p.380.

century with the advent of the plastics industry, the tubes of reed and cane that had been replaced by tubes of metal and then of rubber were replaced once again by a new material. Double lumen catheters stiff enough to transmit intracardiac pressures and yet not injure the heart were invented. Silastic urethral catheters thought to harbour fewer bacteria than the rubber catheters were now available. Soft cuffed endotracheal and tracheostomy tubes were introduced in the hope that tubes of these new materials would lessen the possibility of tracheal erosion.

Although the discovery and use of new materials accompanied by advances in technology has resulted in improved tubes and catheters for patient care, these factors alone are not enough to explain the appearance of these devices throughout medical history. It is hoped that a more detailed account of the history of the nasogastric tube will demonstrate the part individual imagination has played in the evolution of any given tube or catheter.


Even prior to the use of the primitive stomach tube, various practices were indulged in by the Romans to induce vomiting at the completion of a banquet in order to prevent the after effects of an overloaded stomach as well as to give place again for another meal. At times emetics were employed but these seemed too uncertain in their results and it was soon realized that it was only necessary to apply the finger to the throat to accomplish the same result. It was only a matter of time before the pinna or "vomiting feather" was employed as a substitute for the finger in order to give a sense of refinement to the procedure. The pinna, before using, was often dipped into some nauseating mixture to increase its effectiveness. It was Oribasius, writing in the fourth century, however, who gave us what is probably the first description of a stomach tube. This was an instrument made of soft leather filled with wool in the lower portion and hollow in the upper part so that the finger could be introduced into it. It was the length of sixteen fingers so that it would reach at least into the esophagus and perhaps even into the stomach. The stomach contents obviously did not escape through

18 Oribasius, Collection Medicale, ed. Daremberg (Erlangen, 1612), Book 8, Chapter 6.
the lumen of the sound and the instrument was probably withdrawn when the patient began to vomit. Instruments of this type, known as lora vomitoria, were often used in the treatment of poisoning and proved quite effective.\(^19\)

The further developments of this instrument are described in many of the works of the ancient physicians.\(^20\) The uses for the instrument increased so that they were no longer confined to emptying the stomach but also included forcing food down into the stomach and extracting foreign bodies from the esophagus. These tubes were hollow and were made of lead, copper, or silver. They often had small sponges tied to the distal end to make it possible to remove foreign bodies such as fish bones.

An advance in the use of the stomach tube was made in 1598 by Hieronymus Capivacceus when he devised an instrument for artificial feeding.\(^21\) He attached an animal bladder to the


\(^{21}\) Hieronymus Capivacceus, *Medical Practice*, (Venice, 1598), Lib.1, Cap.53.
proximal end of a hollow metal tube and expressed fluid through it into the stomach of a patient suffering from tetanus. In 1670 Fabricius ab Aquapendente described a curved tube made of silver and covered with sheep intestine which he introduced through the nose and into the stomach for the purpose of feeding.\textsuperscript{22} He felt his tube was able to pass more easily into the stomach when covered with the sheep intestine which acted as a lubricant.

In 1744 the use of the stomach tube was extended to include the administration of antidotes to poisons in patients unconscious or obtunded and unable to swallow. Forty-six years later the first long term use of a stomach tube was described by John Hunter in the management of a patient with bulbar palsy.\textsuperscript{23} The instrument used was made of a fresh eel skin drawn over a probang and tied at the distal end over a sponge and at the proximal end just below a small longitudinal slit through which a bladder and a wooden pipe were introduced to administer wine, eggs, milk, sugar, and medications twice daily. The patient improved over the next seventeen days with this treatment and required no further care once he was able to swallow.

In 1797 Alexander Monro pointed out that the stomach tube when attached to a syringe could be used for the aspiration of stomach contents in cases of poisoning and for the administration

\textsuperscript{22}Fabricius ab Aquapendente, Oeuvres Chirurgicales, (Lyon: Higuetain and Barbier, 1670), p.594.

of food in patients with dysphagia. The stomach tube was introduced into France by Renault and was used by him and by Dupuytren in the treatment of poisoning. It was introduced in America by Philip Physick who had studied in Edinburgh under John Hunter and who was familiar with the use of the stomach tube in France. A heated discussion arose in the literature in connection with the use of the stomach tube in the poisoned patient. This discussion also concerned the invention of the first stomach pump, but it is difficult to establish who actually invented it.

It remained for Lefevre in 1842, Canstatt in 1843, and Kussmaul in 1869 to urge the use of the stomach tube in


different clinical settings. Lefevre recommended its use in the treatment of patients with life threatening vomiting, Canstatt in the treatment of gastric dilatation, and Kussmaul as a method both for diagnosis and treatment of diseases of the stomach. In 1871 Leube established the concept of the "test meal" while using the stomach tube in studies concerned with gastric motility after the ingestion of certain foods. By this time then, the stomach tube was an instrument whose value had been recognized both for diagnosis and therapeutics and physicians began to look more closely at the properties of the tube itself. Jurgensen wrote the first article recommending the use of a soft rubber tube, explaining its method of introduction, describing the position the patient should take during tube insertion, and advising the reader of the type of suction to be applied. Jurgensen's tube ended in a perforated


ivory ball and was guided by means of a wire stylet. In 1874 and 1875 Ewald and Oser independently introduced a soft rubber tube which could be inserted without the aid of a stylet. In an emergency situation in which a stiff tube was not available Ewald improvised a tube made from rubber gas tubing in which he cut off the sharp end and cut out two eyelets. He oiled the tube and succeeded in passing it into the stomach with little difficulty. Oser felt he was able to pass his rubber tube because he first sought the patient's cooperation during the procedure.

The need for assuring patient cooperation during nasogastric intubation through both teaching and the provision of support has been stressed by several clinicians since Oser made his important observation. McConnell recommends that all patients, even those who may appear to be unconscious, receive an explanation of the procedure before it is begun. She suggests that an explanation should include information about the purpose of the nasogastric tube for the particular patient, what he can expect both during and after the insertion, and what he can do to make the passage of the tube as atraumatic as possible. McConnell emphasizes the point that although all this information is necessary for every patient the manner in which it is presented will depend upon the needs of the individual patient and can be determined by asking the patient both what he wishes to know and what he already knows. Griggs and Hoppe in

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31 David Charles Schechter and Henry Swan, "Levin and his Tube," _Surgical History_ 51 (1962):417
their review of nasogastric tube feeding, point out that all 
patients undergoing gastric intubation require support, 
encouragement, and reassurance during the procedure but are not 
specific as to how this should be given. Thomas, however, 
recommends a "firm but sympathetic approach" coupled with 
"a skill acquired with the confidence of experience" in order to 
calm the fear surrounding the procedure which she feels all 
patients have. The need for adequate explanation of the 
procedure as well as the provision of emotional support during 
nasogastric tube insertion is also stressed by Volden, et al. 
These authors suggest that it is often advisable to have an 
assistant during the procedure who will provide emotional 
support by holding the patient's hand during intubation. 
Although no recommendations specific to the particular needs 
for information and support of the patient requiring nasogastric 
intubation in a critical care unit have been made it is clear that 
in principle the suggestions made by the authors previously 
mentioned should be applied. In the critical care environment 
there are times when restorative treatments designed to be 
supportive are carried out in a hurried manner. The hurried 
activity of the health team pushes it into a goal directed 
framework and this is likely to convey to the patient a feeling 
of anxiety or sense of urgency. In her discussion of the

33 Barbara A. Griggs and Mary C. Hoppe, "Nasogastric 

34 Sally Thomas, "Passing Tubes and Catheters," 
Nursing Mirror, 148 (March 29, 1979): 32.

35 Cecilia Volden, Jacquelyn Grine, and David Carl, "Taking 
the Trauma out of Nasogastric Intubation," Nursing 80 10 
(September, 1980): 16.
psychological equilibrium of the patient in the critical care environment Roberts says that the primary stabilizing force is the nurse. She stresses the need for adequate explanation of all equipment and procedures used for the provision of patient care and emphasizes the teaching, supportive, reassuring role of nurses in the intensive care unit. The level of consciousness of any given patient will certainly dictate the type of explanation and support necessary at the time of nasogastric intubation but as Oser, McConnell, Griggs and Hoppe, Thomas, and Volden et al have pointed out, some explanation and support are necessary if intubation is to be carried out with the cooperation of the patient.

The advantages of the rubber tube were its flexibility and the fact that it could easily be made radiopaque. However, pure natural latex absorbs considerable water and picks up an unpleasant odor and stain, both of which are difficult to remove. For these reasons many materials and alterations in design have been used in an effort to further improve upon the stomach tube. The tubes now in use are made of polyvinyl resins softened with plasticizers and made radiopaque by the addition of platinum chloride. The tubes are non-toxic, non-reactive to body tissues, odor and taste free, and thermosensitive at normal body temperature. They still, however, pose certain problems regarding insertion and much of the recent literature concerning the stomach tube addresses this issue.

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Methods of Inserting Nasogastric Tubes

Methods of inserting nasogastric tubes are described in both the medical and nursing literature. It is difficult to establish precisely when nurses began to insert nasogastric tubes but it is unlikely that this occurred much before the late thirties as it is at this time when the procedure is first described in the nursing procedure manuals in this city. It is certainly true, however, that procedures found in policy manuals have generally been established in practice for some period of time so this date must be taken only as a rough guideline for the acceptance of nasogastric insertion as a nursing procedure. At the moment both doctors and nurses insert stomach tubes in situations that vary from hospital to hospital and from ward to ward in the same hospital. That all who insert these tubes do at times experience difficulty with the procedure is evidenced by the number of articles that has appeared with suggestions for overcoming insertion problems.


The major problem areas that have been identified are those that relate to the experience of the person attempting to insert the nasogastric tube with the procedure, those that relate to the anatomical and physiological knowledge base of the person inserting the tube, those that relate to anxiety on the part of the patient regarding the procedure, those that relate to alterations in the anatomy of the mouth, nose, esophagus or stomach as a result of immaturity, aging, injury, or the presence of other foreign bodies in the nasopharyngeal cavity, those that result from physiological changes due to alterations in the patient's level of consciousness, those that relate to the nature of the insertion as a blind procedure, and finally, those that relate to the nature of the tube to be inserted.  

Various authors have addressed one or another of these issues. Thomas, for example, stresses the importance of experience with the procedure as a positive factor in attaining successful nasogastric intubation. Volden et al., on the other hand, state that experience is not likely to lessen the anxiety experienced by the nurse for any particular insertion. These authors, as well as others, stress the importance of a calm, cooperative patient and a sound knowledge base of the involved anatomy and physiology in ensuring successful tube placement. Advice based upon the provision of an anatomical basis as a rationale in guiding insertion of a nasogastric tube is, however, conflicting at times. McConnel advises hyper-extension of the neck during the procedure as the best anatomical position while Thomas and Persons recommend flexion.


41 Cecilia Volden, Jacquelyn Grinde, and David Carl, "Taking the Trauma out of Nasogastric Intubation," *Nursing* 80 10 (September, 1980):14.


43 See McConnell, p.32; Thomas, p.32; and Persons, p.37.
Tucker and Lewis offer helpful "troubleshooting" tips for nasogastric insertion based on problems that arise as a result of anatomical variations that are found from patient to patient.44

Two informative studies based upon anatomical relationships that influence the proper placement of the nasogastric tube have been reported. Ziemer and Carroll arranged to be present at infant autopsies in order to verify tube placement accomplished by a conventional measurement taken from the tip of the infant's nose to the lobe of the ear to the xiphoid process, a measurement in common clinical use.45 Based on their findings at autopsy they recommend that a better and more accurate measurement is one taken from the tip of the nose to the lobe of the ear to a point midway between the xiphoid process and the umbilicus.

Robert Hanson in his study sought to find the best measurement for placement of the nasogastric tube in the fundus of the adult stomach.46 His study was conducted using 99 cadavers and 5 normal adult volunteers. With the subjects in the supine position various external measurements used in clinical practice were made and compared to measurements that would be required to secure proper placement in the cadaver and in the normal living adult. He found that the best measurement in use in clinical practice was that made from the tip of the nose to the tip of the


ear lobe to the tip of the xiphoid, but that this measurement would ensure proper placement in only 72% of the subjects in his sample. He went on to develop a formula using this clinical measurement that would secure proper placement of the nasogastric tube in 91% of his sample. This formula makes use of the NEX (Nose, ear and xiphoid), and is expressed as: \[
\frac{\text{NEXcm} - 50\text{cm}}{2} + 50 = \text{the length of tube necessary for accurate placement.}
\]

Those who most frequently and most practically approach the problems that arise in regard to introduction of a nasogastric tube and altered level of consciousness are the anaesthetists. Their problem is compounded by the fact that the alteration in consciousness is drug induced and requires the presence of an endotracheal tube which alters the normal anatomy of the region concerned in order to accomplish ventilation of the patient. Several of the authors suggest inserting a second endotracheal tube, either cut or uncut, into the esophagus and directing the nasogastric tube through this tube. Once placement of the nasogastric tube in the stomach is assured the second endotracheal tube is removed. Baraka, however, recommends that a rectal

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tube rather than an endotracheal tube be used for this procedure. He thinks that the firm but flexible wall of the rectal tube, its greater length, and its smooth terminal outlet are more suitable for blind nasoesophageal intubation.

The methods thus far described require the insertion of tubes with diameters significantly larger than the diameter of the nasogastric tube itself. The use of these large tubes can result in trauma to the nose and the use of large tubes either nasally or orally in a conscious or semiconscious patient is difficult and painful even with topical anaesthesia. Robinson and Cox describe a method for the insertion of pediatric feeding tubes which does not require the use of a tube of larger diameter. They suggest threading the feeding tube with a straight stainless steel guide wire. When the tube is in the stomach the guide wire is removed and the tube left in place. This method is similar to that described by Matsuke and Zsigmond. During anaesthesia they use a well lubricated guitar string to thread the nasogastric tube before insertion and they report good


results with this method in both adults and children. 50

Other methods reported in the anaesthetic literature to aid in the insertion of nasogastric placement in the unconscious patient do not rely on the degree of tube rigidity as the most influential factor in tube placement. Liew Pak Chin, for example, suggests that packing the mouth with gauze around an uncuffed endotracheal tube in the infant will provide a "tunnel" through which a nasogastric tube will easily pass. 51 Smith recommends an even more novel approach. 52 He recommends holding the distal end of the nasogastric tube in the mouth and blowing repeatedly on it until it reaches the stomach. This action, he says, distends the esophagus ahead of the tube and provides for immediate recognition of obstruction or kinking of the tube. Another interesting manoeuvre is described by Mundy. 53 He passes a tap-water cooled, well lubricated nasogastric tube into the posterior pharynx and then grips the alae of the thyroid cartilage between the thumb and index fingers and lifts it anteriorly. This opens the esophagus which is usually collapsed due to gravity and the nasogastric tube then passes through


the esophagus into the stomach. One must monitor the patient carefully during this procedure as vigorous manipulation of the thyroid cartilage may activate the carotid sinus reflex causing changes in heart rate and blood pressure.

The extraordinary methods used to facilitate nasogastric tube insertion are most often used in highly specialized areas of the hospital where the necessary equipment and personnel familiar with its use are readily available. The most common method used by nurses and doctors in the hospital wards to facilitate nasogastric intubation is the cooling of the nasogastric tube before insertion. This action is widely recommended in the literature, particularly when patients are unconscious or obtunded and unable to cooperate during the procedure.54

While it is usually true that nasogastric intubation is an uneventful procedure, certain complications can occur. These include erosion of nasal cartilage, sinusitis, esophageal stricture, inadvertant canulation of the tracheobronchial tree with or without laryngeal obstruction, otitis media, rupture of esophageal varices, rupture of the esophagus or stomach, inability to remove the tube, and reflux esophagitis.55 In addition,

54 See Thomas, p.33; Beck, p.5; Nethercott, p.26; Volden et al, p.15; Persons, p.37; McConnell, p.34; and Tucker and Lewis, p.1130.

there have been reports of intracranial penetration by a nasogastric tube both in the presence and absence of existing cranial trauma. For this reason certain authors advise passage of the nasogastric tube under direct vision no matter what manipulations are used. Others recommend X-ray of the abdomen for tube position at least in the case of the critically ill or unconscious patient.

This historically oriented review of the literature has attempted to demonstrate that the use of new materials accompanied by advances in technology and individual imagination has resulted in improvements in tubes and catheters that have been used for centuries. It has been shown as well that problems encountered in tube insertion may exist despite the use of the best materials technology can offer. It is the purpose of this thesis to address the question of whether or not the
degree of nasogastric tube flexibility and the patient's level of consciousness have bearing on the ease of insertion of the nasogastric tube. The next chapters will describe the methodology employed to answer this question, the findings that resulted from implementation of the study, and the recommendations and implications that arose as a result of those findings.
CHAPTER THREE

METHODOLOGY

An experimental approach was selected for this study as review of the literature demonstrated that factors which affect the ease with which a nasogastric tube can be inserted have been fairly well defined. The data from the experiment were collected and recorded by the nurses involved in the study and analysed using a 2 X 3 factorial design.

Preliminary Experiment

Use of the nasogastric tube in the unit in which the study was carried out was performed with a tube at room temperature or one which had been immersed in a ten minute ice bath. Sophisticated measurements to determine the optimum degree of stiffness for insertion of a nasogastric tube were beyond the scope of this study. However, an experiment was performed to determine the effect of a ten minute ice bath immersion on the nasogastric tube and measurements were taken which demonstrated a threefold difference between the force required to bend a flexible and a rigid tube.\(^{59}\)

Research Design

This investigation used a 2 X 3 factorial design involving

\(^{59}\) The experiment is described in Appendix One.
a fixed-model analysis of variance. Such a design was considered appropriate for this study which had two independent variables, degree of nasogastric tube flexibility and level of patient consciousness, with two and three levels respectively. One of the variables, degree of nasogastric tube flexibility, was manipulated by the experimenter while the other, level of patient consciousness, was dependent upon the physical status of any given patient. Assignment of subjects to this latter variable was considered to be random as review of unit statistics regarding patients' level of consciousness on admission to the unit showed very little week to week variation.

**Schema of 2 X 3 Factorial Design**

![Diagram of 2 X 3 Factorial Design]

Factor A

\[
\begin{array}{c|c|c}
  a_1 & & \\
  a_2 & & \\
  b_1 & b_2 & b_3 \\
\end{array}
\]

Factor B
Population and Sample

The population from which the study sample was drawn were those patients admitted to an Intensive Respiratory Care Unit of a 940 bed tertiary care teaching hospital who require both endotracheal and nasogastric intubation.

The sample for the study consisted of 121 patients requiring oral endotracheal placement and subsequent nasogastric tube intubation admitted to the Intensive Respiratory Care Unit over a period of sixteen weeks. Criteria for exclusion from the study were contraindication for nasogastric intubation as determined by the admitting resident and presence of a tracheostomy or nasotracheal tube as opposed to an oral endotracheal tube.

Data Collection Method

In order to conduct the study in the Intensive Care Unit approval from both the Nursing Research Committee at the hospital and the Ethics Committee at the University of British Columbia was sought and obtained. Consent forms were signed by the unit nurses indicating their willingness to participate. The unit nurses attended an inservice training session conducted to explain the research proposal and to standardize the technique by which nasogastric tubes would be inserted during the study. The technique used was compatible with that already in use in the unit at the time of the study. Systematic

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60 Appendix Two.
61 Appendix Three.
randomization of the degree of nasogastric tube flexibility was assured by assigning rigid tubes to odd study weeks and flexible tubes to even weeks. The level of consciousness of each patient was assessed by the nurse inserting the nasogastric tube immediately prior to the procedure. Data was collected on a data collection sheet by the nurse inserting the nasogastric tube immediately following the procedure.62

Method of Scoring the Number of Insertions

Any continuous forward movement of the nasogastric tube resulting in stomach placement, as evidenced by aspiration of gastric contents was considered a successful insertion and was given a score of one. Any "pull back" on the tube, that is, interruption of the forward movement, determined the point at which second and subsequent attempts were counted. Each attempt (forward movement) was given a score of one. This meant, for example, that should a nurse be required to pull back three times on the nasogastric tube before a steady forward motion resulted in proper positioning of the tube, the number of attempts or score for this insertion would be four. The score obtained, therefore, was considered to have an underlying ratio scale, making parametric statistics appropriate for data analysis.

Ethics and Human Rights

Preceding implementation of this study approval was sought and obtained from both the hospital and university ethics

62 Appendix Four.
committees. Permission for implementation of the study was also obtained from the Medical Director and Head Nurse of the Intensive Care Unit who were responsible for the welfare of the patients under their care. Patient consent was considered to be unnecessary as insertion of a nasogastric tube in the patient who had an endotracheal tube in place was a routine procedure conducted to ensure protection of the airway in the face of possible gastric aspiration and both flexible and rigid tubes were being randomly used in the unit for insertion in the patient.

Permission of nurses to participate in the study was obtained as each nurse was required to use both rigid and flexible tubes and it was not known if all nurses would initially be willing to do this. Nurses were advised that if in their judgement one of the other type of tube was clinically indicated in a particular patient then they should proceed as they thought proper and the insertion would be excluded from the study.

**Data Analysis**

Descriptive Statistics

The number of attempts required for successful nasogastric tube placement in three groups of patients with varying levels of consciousness were recorded and displayed in graphic form. The means and standards deviations of the six groups of subjects were calculated and displayed in table form. A graph of the means from all groups was also constructed in order to demonstrate the nature of the interaction that existed between the three levels of patient consciousness and the degree of nasogastric tube flexibility.
Inferential Statistics

An analysis of variance (ANOVA) was used to analyse the difference in ease of insertion of the nasogastric tube among the different groups of patients. An F test was used to test for significant differences between the groups. It was decided that the null hypothesis would be rejected at the .05 level of significance. Hypothesis testing based on the F distribution as the theoretical model involved the assumptions of normality, randomness, homoscedasticity, independence, and additivity. A summary table was used to report the ANOVA results. Finally, a pooled variance estimate t-test was performed on the data from the two groups of unconscious patients and the results reported in table form.
CHAPTER FOUR

THE FINDINGS

The data were analysed using the Analysis of Variance (ANOVA) procedure found in the Statistical Package for the Social Sciences, Version 8.00 at the University of British Columbia Computing Centre. The purpose of the analysis was to test three hypotheses:

1. There will be no statistically significant difference in the mean number of attempts required to insert a nasogastric tube in an intubated patient when a flexible tube is compared with a rigid tube at the $\alpha = .05$ level of statistical significance.

2. There will be no statistically significant difference in the mean number of attempts required to insert a nasogastric tube in the intubated patient when three levels of consciousness are compared at the $\alpha = .05$ level of statistical significance.

3. There will be no statistically significant interaction between the degree of nasogastric tube flexibility and patient level of consciousness when these different treatments are compared at the $\alpha = .05$ level of statistical significance.
Descriptive Data

The total number of patients in the study was 121. Forty-two patients were conscious at the time of nasogastric tube insertion, forty-two were obtunded, and thirty-seven were unconscious. Sixty-one patients were intubated, using flexible tubes and sixty using rigid tubes. The number of attempts required using flexible and rigid tubes in the three different groups of patients is displayed in graphic form in Table 1. The mean number of attempts and the standard deviations for the six different groups of patients are reported in Table 2. A graphic representation of the means is represented in Figure 1.

During the sixteen week study period four patients admitted to the unit were excluded from the study. One patient had a platelet count of four hundred and nasogastric intubation was not performed because of the possibility of hemorrhaging as a result of the trauma. One patient was admitted for multi-system failure following esophagectomy and his nasogastric tube had been inserted prior to surgery. One patient required tracheostomy and the last had a nasotracheal tube in place.

Inferential Data

In analysing the data from this study the letter A was assigned to main effect one (the effect of tube flexibility on the ease of insertion of nasogastric tubes in intubated patients), and the letter B to main effect two (the effect of level of patient consciousness on the ease of insertion of nasogastric tubes in intubated patients). The interaction effect (that between level of patient consciousness and the degree of nasogastric tube flexibility) was designated AB. The level of
TABLE 1

Number of attempts Required for Successful Nasogastric Tube Insertion in Patients with Three Different Levels of Consciousness Using Flexible and Rigid Nasogastric Tubes.

<table>
<thead>
<tr>
<th>Number of attempts</th>
<th>Number of attempts</th>
<th>Number of attempts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rigid Tubes</td>
<td>Flexible Tubes</td>
<td>Rigid Tubes</td>
</tr>
</tbody>
</table>

![Graphs showing the number of attempts for conscious, obtunded, and unconscious patients for flexible and rigid tubes.](image-url)
Table 2

Mean Nasogastric Tube Insertion Attempts

<table>
<thead>
<tr>
<th>State of Patient</th>
<th>Tube Type</th>
<th>Flexible</th>
<th>Rigid</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conscious</td>
<td>X</td>
<td>3.600</td>
<td>2.591</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>1.353</td>
<td>1.593</td>
<td></td>
</tr>
<tr>
<td>Obtunded</td>
<td>X</td>
<td>3.238</td>
<td>2.571</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>1.480</td>
<td>1.805</td>
<td></td>
</tr>
<tr>
<td>Unconscious</td>
<td>X</td>
<td>4.800</td>
<td>1.588</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>2.745</td>
<td>1.064</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>61</td>
<td>60</td>
<td>121</td>
</tr>
</tbody>
</table>

Figure 1  Graphic representation of the mean number of insertions required for successful nasogastric intubation in patients with three different levels of consciousness.

---

flexible tube

---- rigid tube

Level of consciousness
statistical significance or alpha, for this experiment, was set at .05. The summary table for the analysis is found in Table 2.

Based on the experimental findings the null hypothesis for Factor B was accepted and the null hypotheses for Factor A and the interaction AB were rejected.

An additional statistic, a pooled variance estimate, was employed to examine further the unconscious group of patients as the mean number of insertions in the two subgroups obviously varied. The t value which resulted from this calculation was significant beyond the .01 level of significance and the null hypothesis in this case was rejected as well. (Table 3)

Analysis of the data, in light of all statistical tests performed, led to the conclusion that the variation present in the groups of conscious and obtunded patients was most likely due to chance while the variation in the unconscious patients represented the significant degree to which the degree of flexibility of the nasogastric tube influenced the ease with which this tube could be inserted in these patients. Use of a rigid tube in the unconscious patients significantly reduced the number of attempts required for successful insertion.

Post Hoc Analyses and Additional Observations

In recording the data for the study the nurses were asked to report their experiences with the procedure in terms of number of nasogastric tube insertions they performed per month, their level of anxiety regarding a particular insertion, their confidence in obtaining successful placement of the tube, the
Table 3

ANOVA of the Effect of the Patient's Level of Consciousness and Degree of Nasogastric Tube Flexibility on the Ease of Insertion.

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F Ratio</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>79.755</td>
<td>1</td>
<td>79.755</td>
<td>25.592</td>
<td>0.001</td>
</tr>
<tr>
<td>B</td>
<td>1.734</td>
<td>2</td>
<td>0.867</td>
<td>0.278</td>
<td>0.758</td>
</tr>
<tr>
<td>AB</td>
<td>38.217</td>
<td>2</td>
<td>19.108</td>
<td>6.132</td>
<td>0.003</td>
</tr>
<tr>
<td>Error</td>
<td>358.389</td>
<td>115</td>
<td>3.116</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>478.095</td>
<td>120</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4

t-TEST Comparing Mean Insertion Attempts on Two Groups of Unconscious Patients.

<table>
<thead>
<tr>
<th>Group</th>
<th>Number of cases</th>
<th>Mean</th>
<th>Value</th>
<th>df</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20</td>
<td>4.800</td>
<td>4.53</td>
<td>35</td>
<td>0.000</td>
</tr>
<tr>
<td>2</td>
<td>17</td>
<td>1.588</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Group 1 - flexible nasogastric tube.

Group 2 - rigid nasogastric tube.
method they were taught to insert nasogastric tubes, and whether or not they had a personal preference for the type of tube used. They were also asked to record the presence of side effects induced by the insertion of the nasogastric tube.

All nurses had at least two years of work experience prior to employment in the unit and length of time working in the unit ranged from three weeks to eleven years. No nurse reported inserting fewer than two nasogastric tubes per month and one nurse reported inserting an average of six. The mean number of monthly insertions was 4.23. It was concluded that all nurses were experienced with the procedure.

Although two nurses reported a high level of anxiety during some insertions the number of attempts necessary in these cases to secure successful nasogastric tube placement did not seem to vary significantly from the mean number of attempts required for successful insertions performed by nurses reporting low or moderate levels of anxiety.

The mean number of attempts required for successful nasogastric intubation by nurses who had been taught to insert their tubes using either rigid or flexible tubes was very similar. (a mean of 3.2 for the former and 3.4 for the latter).

It was not possible to determine whether preference for a flexible or rigid tube had any bearing on successful nasogastric intubation because of the large number of nurses who reported that it would depend upon the circumstances but then did not elaborate on those circumstances.

There were no significant side effects noted in this study that could be attributed to the degree of nasogastric tube
flexibility except for subjective complaints of discomfort from patients who were conscious. There were a greater number of complaints of discomfort from those who were intubated using rigid tubes. These complaints stressed the uncomfortable feeling of coldness of the tube, and were expressed in the form of expletives. Patients who had subdural screws in place at the time of nasogastric intubation experienced a rise in intracranial pressure (ICP) during the procedure regardless of the type of tube used.

The size of nasogastric tube used in 119 insertions was a number 18. Two patients, one a sixteen year-old boy and the other a 72 year old 40kg woman were intubated with #14 Salem Sumps. It would appear that the largest tube possible is used for nasogastric insertion in this unit and this probably reflects the fact that the tubes are initially used for drainage which can only be successfully accomplished through a wide bore tubing.

The mean size of oral endotrachial tube used for patients in the study was a number 7 for women and a number 8 for men.
CHAPTER FIVE

SUMMARY, RECOMMENDATIONS, IMPLICATIONS AND CONCLUSIONS

Summary

The purpose of this study was to examine the effects that the degree of flexibility of the nasogastric tube and the patient's level of consciousness would have on the ease of insertion of the tube in patients with an endotracheal tube in place. The ultimate aim of the investigation was the provision of a more scientific base upon which clinical decisions could be made about how best to insert a nasogastric tube in intubated patients.

In order to ensure that the study findings would be generalizable, procedures used in the study were those commonly in use in clinical practice. Thus, the number of attempts required for successful nasogastric tube placement in the stomach constituted the definition of ease of insertion and the number of tube "pull back manoeuvres", the point at which subsequent insertions must be counted. In the same manner the degree of tube flexibility was designated rigid or flexible depending upon whether or not the tube was at room temperature or submerged in an ice bath. In practice these tubes were referred to as "warm" and "cold".

The sample from whom the study data was collected consisted of 121 patients admitted to an eleven bed respiratory
medical-surgical intensive care unit in a large teaching hospital who required endotracheal intubation and subsequent placement of a nasogastric tube. The number of attempts required for successful nasogastric placement was recorded over a four month period and the data analysed by computer using a 2 X 3 factorial design. The two independent variables were degree of tube flexibility and level of consciousness. The two levels of flexibility were flexible and rigid. Three levels of consciousness were: conscious, obtunded and unconscious. The data showed that the degree of tube stiffness significantly affected the ease with which a nasogastric tube could be inserted in an intubated patient (p=.001); the rigid tube required a statistically significantly fewer number of attempts for successful placement than the flexible tube. The differences in levels of consciousness were not found to be statistically significant in their effect on ease of insertion in this study. The interaction between the degree of tube stiffness and level of consciousness, however, was statistically significant. The difference in the means in the unconscious group of patients seemed particularly dramatic and a pooled variance estimate t-test performed on these two groups yielded a t value of 4.53 and a probability less than .001. It was therefore concluded that the variation found in the conscious and obtunded groups of patients resulted more likely from chance than from the type of nasogastric tube used for intubation. The variation produced in the two groups of unconscious patients by the type of tube used was so great that it was highly unlikely that chance alone could be responsible for the variation noted.
The experimental finding that the use of a rigid tube in nasogastric intubation of the unconscious patient with an endotracheal tube in place does positively influence the ease with which the nasogastric tube is introduced supports in principle those manoeuvres recommended by Hunter, Sprague and Carter, Tahir, Cohen, Adriani, Baraka, Robinson and Cox, Matsuki, and Zsigmond. In the unconscious patient neither the voluntary, pharyngeal, nor esophageal stages of swallowing are present and the peristaltic movements initiated during these various stages that could be expected to aid in nasogastric tube insertion, are therefore, absent. The conscious patient, however, is able to actively participate in the act of deglutition while secondary peristaltic action, at least, is present in the patient who is obtunded. Both the results of this study and the large number of anecdotal reports recommending the use of rigid nasogastric tubes in unconscious patients would seem to indicate that the difficulties encountered in the nasogastric intubation of this group of patients due in part to the inability to swallow, can be somewhat overcome by using a rigid tube.

In this study the belief held in clinical practice and expressed by authors such as Thomas, Griggs and Hoppe, and Nethercott that level of consciousness in itself influences the ease with which a nasogastric tube can be inserted was not supported. This is probably an indication of the influence that individual patient characteristics have upon the ease of insertion of any given nasogastric tube. An unconscious intubated patient unable to swallow, for instance, may be easier to intubate with a nasogastric tube than a conscious patient who is able to swallow
but whose anxiety during the procedure adversely affects the extent of his cooperation, despite adequate explanation and support by the nurse.

**Recommendations and Implications**

Implications for clinical practice which arose from this study are limited by the fact that there have been no other controlled clinical trials concerned with this particular problem and that data has not yet been published that would indicate at exactly which degree of flexibility a nasogastric tube can be most easily directed and still fulfill criteria for safety and comfort. Notwithstanding these cautions, the following recommendations are made:

1. Where the clinician is knowledgeable about the technique of nasogastric intubation and is experienced in its application, the use of a rigid nasogastric tube reduces the number of attempts necessary for successful tube placement in the unconscious patient with an endotracheal tube and should be used in this patient.

2. Although there was no significant difference between using a flexible or rigid tube in the conscious or obtunded patient there were more subjective complaints of discomfort using the rigid tube in conscious patients and it is advised that in this group of patients the initial insertion attempt be made with a flexible tube.

Implications for further research which can be made as a result of this study are:

1. The study should be replicated to ensure confidence in
the findings.

2. Patients with tracheostomies and nasotracheal tubes were not included in this study. Further information about the effect altered tracheal and/or oesophageal anatomy has on the ease of nasogastric tube insertion might be gained by including these patients in the study.

3. There were no significant side effects noted in this study that could be attributed to the degree of nasogastric tube flexibility except for the subjective complaints of discomfort from those in the conscious group. Direct visual techniques were not employed to assess nasopharyngeal or esophageal damage and application of these techniques in subsequent investigations may very well increase our knowledge about side effects occurring as a result of nasogastric intubation with both flexible and rigid tubes.

4. All 22 patients who had subdural screws in place at the time of nasogastric intubation experienced a rise in intracranial pressure (ICP) during the procedure regardless of the degree of tube flexibility. It would be interesting to repeat the study in this group of patients to see if the degree and duration of ICP rise is affected by the degree of nasogastric tube flexibility in patients with varying levels of consciousness.

**Conclusions**

In order to seek more information concerning his own body and to treat or diagnose the maladies that sometimes afflict it, man has for centuries inserted tubes and catheters into the body's numerous orifices. The tubes used in this exploration have
increased in sophistication with advances in scientific knowledge and technology. Initial attempts made to ease the manner in which these tubes have been introduced were focussed upon manipulation of the materials used and experimentation with new and different materials as these became available.

It has been the purpose of this study to apply quantitative measurements to two methods of nasogastric tube insertion in common clinical use in an effort to determine the effect each has on the ease with which those tubes can be inserted in patients with varying levels of consciousness. The results have shown that while use of a rigid tube in the unconscious patient significantly affects the ease with which a nasogastric tube can be inserted in that fewer attempts are necessary to secure placement with this type of tube than with a flexible tube, there has been no evidence to show that different levels of consciousness have any overall effect that could be considered significant on the ease with which a tube can be introduced. Implications have been drawn and recommendations made on the basis of these results.

It is hoped that implementation of this study with its focus on a question of clinical interest and significance has been able to provide a more scientific base upon which to make clinical decisions regarding nasogastric placement of intubated patients with varying levels of consciousness.
**BOOKS**


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APPENDIX ONE
Experiment to Determine an Effect of Cooling on a Deflection of Nasogastric Tube

Objective: To measure and compare the forces required to deflect a lubricated polyvinylchloride nasogastric tube at room temperature and 0°C.

TABLE 5
Forces required to deflect lubricated PVC Nasogastric tubing at 0°C and 18°C.

<table>
<thead>
<tr>
<th>tubing temperature</th>
<th>force to deflect tubing from 0-20cm</th>
<th>force to deflect tubing from 20-50cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>18°C (room temperature)</td>
<td>1.0 Newtons</td>
<td>2.0 Newtons</td>
</tr>
<tr>
<td>0°C (ice water bath)</td>
<td>3.0 Newtons</td>
<td>5.0 Newtons</td>
</tr>
</tbody>
</table>

The above results are averages of 80 trials for each condition.

Conclusion: The force required to deflect lubricated polyvinylchloride nasogastric tubing at 0°C is greater than the force required at room temperature or 18°C. The results obtained in this experiment indicate that the forces required to deflect the tubing at 0°C are about three times as great as the forces required to deflect the tubing at 18°C.
APPENDIX TWO
Nurse's Information and Consent Form

Mr./Miss/Mrs./Ms. ________________

My name is Jane Heaslip. I am a student in the graduate programme in nursing at the University of British Columbia. I am interested in studying how nurses can more easily introduce nasogastric tubes in intubated patients.

Although the basic procedure for placing the tube is well understood, nurses have not yet been able to document whether or not changes in the degree of flexibility of the tube have any bearing on the ease with which the tube is inserted. In order to discover if there is an effect from the degree of tube flexibility on the ease of insertion of the nasogastric tube, I would like to ask you to participate in a study to be implemented in the ICU that would require you to use a nasogastric tube that has been submerged in an ice bath for ten minutes to ensure rigidity, and one that has been stored at room temperature to ensure flexibility on alternate weeks. I would also ask your permission as part of the study to collect some data concerning your professional experience with the procedure and your opinions about it.

Should you at any time feel that in the interests of the patient the research protocol should be abandoned, you are free to do so. You are at all times encouraged to follow your clinical judgement and no criticism will be brought against you for doing so.

Participation in the study will require attendance at an inservice session, during which the research protocol will be described and data collection methods explained.

Your name will not be included in the data taken for the study, and data sheets will be destroyed following analysis.

You are free to withdraw from the study at any time and will incur no penalty for doing so.

If you have any questions regarding this study feel free to ask them please.

Date: _____________________________

Nurse's Signature _____________________________
(indicating willingness to participate in the study)

Investigator's Signature _____________________________
Nasogastric Tube Study Protocol

1. Insertion Technique

The insertion technique of all tubes is to follow the basic principles described by Griggs and Hoppe in their article published in The American Journal of Nursing, Vol.79, No.3. March, 1979, pp.481-485. The principles are:

1. Explain the procedure to the patient as necessary and support him throughout the intubation.

2. Assess level of consciousness and determine presence or absence of gag and swallow reflexes.

3. Examine tube. Distal end should be free of rough or sharp edges and outlet holes should be open.

4. Determine approximate depth of insertion. Measure the distance from the xiphoid process of the sternum to the tip of the nose to the ear lobe.

5. If the tube to be inserted is a rigid one, submerge the tube in an ice bath for 10 minutes. If the initial insertion is not successful return the tube to the ice bath for 10 minutes preceding second and subsequent attempts. If the tube to be inserted is a flexible one remove from the package and attempt to insert into the patient.

6. Lubricate both the tip and first few inches of the tube.

7. Pass the tube gently along the floor of the nasal passageway. A common mistake is to push the tip both posterior and superior, losing it in the turbinates and causing pain and bleeding. To prevent this, aim down and back toward the ear.

8. In the conscious patient the patient will feel a lump in the back of the throat when the tube begins to curve downward into the pharynx. At this point instruct the patient to begin swallowing.

9. Continue passing the tube until the desired length is reached.

10. Verify tube placement by aspiration of gastric contents with a syringe.

11. Tape the tube securely, avoiding pressure on the nares.

2. Study Week and Type of Tube to be Used:

Rigid tubes are to be used on odd study weeks and flexible tubes on even weeks. Each week will begin at 0001 hours Sunday
and end at 2359 hours Saturday.

3. Criteria for Inclusion:

All patients in whom nasogastric tube placement has been approved by the admitting resident and who have endotracheal tubes in place.
Data to be Collected -(Please check one of each of the following)

1. Information Regarding the Patient and Procedure:

   a) Level of consciousness
      i) conscious ( ) ii) obtunded ( ) iii) unconscious ( )

   b) Degree of tube stiffness
      i) rigid ( ) ii) flexible ( )

   c) Number of attempts before successful insertion
      i) initial ( ) ii) subsequent with number ( )

   d) Size of Nasogastric Tube
      i) 14 ( ) ii) 18 ( ) iii) other ( )

   e) Size of endotracheal tube
      i) 7 ( ) ii) 8 ( ) iii) 9 ( ) iv) other ( )

   f) Side effects from nasogastric tube insertion
      i) complaints of discomfort with specifics
         ii) bleeding and source
         iii) change in ICP reading
         iv) other

   g) Was this procedure:
      i) elective ( ) ii) emergent ( )

2. Information Regarding the Nurse:

   a) Level of anxiety regarding this procedure
      i) none ( ) ii) low ( ) iii) moderate ( ) iv) high ( )

   b) Approximate number of nasogastric tube insertions per month ( )

   c) How were you taught to insert an NG tube?
      i) rigid ( ) ii) flexible ( )

   d) Do you have a personal preference for the type of tube used?
      i) rigid ( ) ii) flexible ( ) iii) no difference ( )
      iv) depends upon circumstances ( )
      if iv, describe: ____________________________

   e) How confident were you regarding success with this insertion?
      i) very ( ) ii) moderately ( ) iii) not at all ( )