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Incidence of aspiration pneumonia in patients receiving enteral nutrition

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**Incidence of Aspiration Pneumonia
in Patients Receiving Enteral Nutrition**

A Thesis

Presented to

**The Faculty of the School of Nursing
San Jose State University**

**In Partial Fulfillment
of the Requirements for the Degree
Master of Science**

by

Karen J. Jones

June 1995

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ABSTRACT
INCIDENCE OF ASPIRATION PNEUMONIA
IN PATIENTS RECEIVING ENTERAL NUTRITION

by Karen J. Jones

This pilot study compares the incidence of aspiration pneumonia between two patients receiving enteral nutrition, one via a small-bore nasogastric (NG) tube and one via a gastrostomy tube. Utilizing an exploratory and comparative design, data were collected by chart review from the Transitional Care Unit at a major hospital in the Santa Clara Valley. The subjects ($n=2$) were selected and followed over a 2 month period.

The results of the data indicated no incidence in aspiration pneumonia in either of the subjects; however, both subjects did experience fevers, increases in pulse and respirations, low oxygen saturations, and labored breathing, without evidence of pulmonary infiltrates on chest x-ray. Review of the data suggests the need to include additional variables in future studies. Questions for future research are also generated from this data.

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Chapter 1

INTRODUCTION

Purpose and Need

The purpose of this pilot study was to examine and compare the incidence of aspiration pneumonia in 2 patients who were admitted to a Transitional Care Unit (TCU) and who were receiving enteral nutrition, one via a small-bore nasogastric (NG) tube and the other through a gastrostomy tube. There is limited information on the incidence of aspiration pneumonia in Transitional Care Units (TCU). Many of the patients on the TCU receive enteral nutrition through mainly NG or gastrostomy tubes and may be at risk for aspiration pneumonia. Therefore, the aim of this study was to compare the incidence of aspiration pneumonia on the TCU. This study using two different enteral nutrition feeding methods also tested the feasibility of replicating this study on a much larger scale.

The Problem and Research Question

Enteral nutrition can be accomplished through a variety of common feeding routes, including nasogastric, nasoduodenal, nasojejunal, gastrostomy, and jejunostomy. Previous research on enteral nutrition has investigated which of these feeding routes is the most effective, safe, and appropriate for the patients. However, in the hospital, the decision making process for which enteral feeding route is appropriate for each patient is usually made by which route is

skilled nursing facility as soon as possible. Consequently, sufficient thought may not be given concerning what will be the best enteral route for patients requiring long-term feedings. Physicians usually change the enteral feeding route after there has been a problem with the previous route.

Physicians at the study site generally do not use nasoduodenal, nasojejunal, or jejunostomy as commonplace feeding routes; they use either nasogastric or gastrostomy tubes as their main enteral feeding routes. Even so, it is still difficult to persuade physicians to use gastrostomy tubes more often for long-term feedings, because it requires a surgical procedure. A research study in this area might provide the information necessary to be used as the basis for decision-making when choosing one route or the other, depending on each patient's individual needs.

This study may prove to be useful to the current body of knowledge generated by previous research on enteral feeding routes and aspiration pneumonia. Because information on the incidence of aspiration pneumonia has not been collected previously on the TCU at the study site, the information could be used to help in the development and implementation of protocols related to tube feedings. The possibilities of collecting this kind of information could lead the hospital in changing nursing policies and procedures, and developing specific guidelines for choosing appropriate enteral feeding routes. In addition, this research study could provide more information regarding aspiration

pneumonia with enteral nutrition by comparing two enteral feeding routes which have not been exclusively studied together before on a step-down intensive care unit. This research study sought to answer the following question: What is the incidence of aspiration pneumonia in a patient receiving enteral nutrition through a small-bore NG tube when compared to a patient receiving feedings through a gastrostomy tube?

Definition of Terms

For the purpose of this study, the following definitions applied:

1. Aspiration pneumonia is an inflammation of the lungs with exudation and consolidation due to aspiration of foreign material into the lungs (Dorland's Pocket Medical Dictionary, 1982, p. 549).
2. Enteral nutrition is artificial nutrition delivered into the gastrointestinal (GI) tract through enteral feeding tubes (Moghissi & Boore, 1983, p. 161).
3. Small-bore nasogastric tube is an enteral feeding tube size 8 french to 12 french. It has pliable tubing with a mercury-weighted tip, and it is introduced through the nose and passed through the pharynx down into the stomach, for the purpose of instilling enteral nutrition or medication into the GI tract. This was one of the enteral feeding routes examined in this study.
4. Gastrostomy tube is an enteral feeding tube placed surgically into the stomach for the purpose of instilling enteral nutrition or medication directly into the stomach. This was the other enteral feeding route examined in this study.

Research Design

This pilot study utilized an exploratory and comparative design to compare the incidence of aspiration pneumonia using two different enteral feeding tubes. In addition, this study explored how the incidence of aspiration pneumonia may be related to other factors, as well as to the enteral feeding tube.

Assumptions

The first assumption of this study is that patients are at risk for aspiration pneumonia even without receiving enteral nutrition. In Elpern, Jacobs, and Bone's study (cited in Eisenberg, 1991), even healthy people aspirated about 45% of the time when they slept, and as people aged, there was a decrease in the response of the protective laryngeal reflexes (Eisenberg, 1991, pp. 643-644). With the introduction of a NG tube, the risk for aspiration pneumonia is even greater.

The patients receiving enteral nutrition may have a decreased level of consciousness or may even be unresponsive. This alteration in level of consciousness may increase a patient's risk for developing aspiration pneumonia.

The second assumption of this study is that the nursing staff were following the hospital's standard protocol for administering enteral tube feedings.

All nurses in the hospital go through a mandatory skills review yearly. Enteral tube feeding is one of the skills that the nurses must demonstrate proficiently.

The third assumption of this study is that every NG feeding tube was checked for proper placement by chest radiograph and interpreted by a medical physician and radiologist. Every newly placed gastrostomy tube was evaluated by a physician before enteral feedings could be initiated.

Scope and Limitations

The scope of this pilot study had the potential to be far reaching. Because only certain variables were chosen to be collected on each subject and the inclusion/exclusion criteria were designed to be very specific in choosing a sample, this study was very limited in its scope. Given this same research study done on a larger magnitude, the opportunity for learning and/or the presence of significant findings could be endless.

There were some limitations to this research. The biggest limitation was the decline in patient census. Typically, the census at the study site increases in the winter months up to almost full capacity. However, there was an unexpected drop in patient census to almost half of its normal capacity. This factor made recruiting subjects very difficult.

Another limitation to this study was the change in nursing documentation that was initiated around the same time as the start of data collection. It became apparent during the data collection phase that the new documentation flowsheet did not include some aspects of the study site's tube feeding protocol, making it

difficult for the nurses to chart according to the enteral tube feeding protocol.

Because of that, some aspects of the data collection were not complete, such as documentation of tube placement checked, aspiration precautions in place, irrigation frequency, and position of head of bed. If one or both of the subjects did develop aspiration pneumonia, then complete documentation on those variables would have been crucial. Because the documentation was incomplete, the researcher combined 5 days of complete data, from the 10 days of collected data, to determine if there was anything significant in the results. Tables 1-3 (pp. 23-26) are based on 5 days of complete data collection.

Chapter 2

CONCEPTUAL FRAMEWORK AND REVIEW OF RELATED LITERATURE

Conceptual Framework

Roy's Adaptation Model was the conceptual framework for this study. "Roy's model focuses on the concept of adaptation of man" (Marriner-Tomey, 1989, p. 330). The patient is viewed as an open, living system, which continually scans his or her environment for stimuli so that he or she can ultimately respond and adapt. The goal of the patient is to seek and maintain his or her optimum level of wellness (p. 330).

The patient continually receives input or stimuli from his or her environment. This stimuli can be focal, contextual, or residual. According to Roy, the focal stimulus is the major factor confronting the patient, which then the patient must respond and adapt to. It is essentially the stimulus than comes before the behavior (Marriner-Tomey, 1986, p. 327). The focal stimulus in this study is the enteral feeding tube, because it is the stimulus immediately confronting the patient, causing the patient to adapt. The presence of aspiration pneumonia is also a focal stimulus when it occurs.

The contextual stimuli, then, consist of "all other stimuli present that contribute to the behavior caused or precipitated by the focal stimuli" (Marriner-Tomey, 1986, p. 327). The contextual stimuli that contribute to the effects of the focal stimuli in this study are patient positioning, age, level of consciousness,

rate of feeding, amount of residual, presence of bowel sounds, and tube feeding type.

In addition, the residual stimuli are those factors which may also affect behavior, but the effects cannot be measured (Marriner-Tomey, 1986, p. 328). Some examples of residual stimuli may be the patient's social support systems, culture and ethnicity, emotional stability, and religious beliefs.

According to Roy, the patient is made up of six subsystems: the regulator, cognator, and four adaptive modes (physiologic, self-concept, role function, and interdependence). All of these subsystems are interrelated to assist the patient in his or her adaptive process. The regulator is one of the patient's two coping mechanisms which responds through the neural-chemical-endocrine processes (Marriner-Tomey, 1986, p. 328). The cognator is the patient's other coping mechanism which responds through the processes of perception and information processing, learning, judgment, and emotion (p. 328). This study did not allow for collection of data based on the perception of the patient, which is a process of the cognator. Therefore, for the purpose of this study, the data were only collected from the physiological responses of the regulator.

The four adaptive modes provide the means for responding to the cognator and regulator activity, for the purpose of achieving physiological, psychological, and social integrity (Marriner-Tomey, 1986, pp. 330-331). The four adaptive modes are the physiological mode, the self-concept mode, the role

performance mode, and the interdependence mode. The responses to the focal, contextual, and residual stimuli are carried out through the adaptive modes, and the responses can be either adaptive or ineffective. The physiological mode involves the patient's physiological ways of "dealing with adaptation in regard to fluid and electrolytes; exercise and rest; elimination; nutrition; circulation and oxygen; and regulation, which includes the senses, temperature, and endocrine regulation" (p. 328).

The self-concept mode "is the composite of beliefs and feelings that one holds about oneself at a given time" (p. 328). This mode is shaped by perceptions taken from the reactions of others. The perceptions direct the patient's behavior regarding sensation, body image, expectations, and morals (p. 328). The role performance mode is defined as "the performance of duties based on given positions in society" (p. 328). Therefore, "the way one performs a role is dependent on one's interaction with the other in the given situation" (p. 328). The interdependence mode "involves one's relations with significant others and support systems" (p. 328). The goal in this mode is to sustain psychic integrity by meeting the needs for nurturance and affection (p. 328).

This study monitored nursing's goal to assist patients in adapting to the changes in their physiologic needs, as a result of two different enteral feeding tubes. The patient is viewed as adaptive when he or she responds in a positive way to a change in the environment, which is the mode of enteral nutrition. A

positive adaptive response leads to the health of the patient, and a negative response to stimuli leads to disruption of the integrity of the patient (Marriner-Tomey, 1986, p. 330).

Related Literature

Because aspiration pneumonia can be one of the most serious complications of enteral nutrition, many of the studies have included it in their research, and compared the incidence of aspiration with different enteral feeding routes. However, the findings from these studies are conflicting, which could be due to the variations in patient populations and variations in sample sizes. In addition, each of the studies compared different feeding routes with different populations, making it difficult to compare them to each other, but strengthening the need for further research on this topic.

Saltzberg et al. (1987) compared the incidence of pulmonary aspiration in a study of 9 male patients receiving large-bore NG tube feedings with 25 patients receiving gastrostomy tube feedings. The authors found that 89% of the patients with NG tubes aspirated their feeding, while only 32% of the gastrostomy patients aspirated (p. 20). Another nonexperimental, prospective study compared the incidence of aspiration pneumonia in 105 patients (over a 6 month period) with large-bore and small-bore NG tubes and nasointestinal tubes. Only 5.7% of the patients had pulmonary aspiration from the tube feedings (Metheny, Eisenberg, & Spies, 1986, p. 257). However, the incidence of

aspiration in patients fed via nasogastric tubes was five times greater than that of patients fed by nasointestinal tubes, even though the study used more nasointestinal tubes than NG tubes. Of the number of NG tubes used in the study, 84% were small-bore and 16% were large-bore (p. 258). Pulmonary aspiration was confirmed by chest radiograph.

On the other hand, a more recent descriptive study by Sands (1991) comparing the incidence of pulmonary aspiration in 25 intubated patients, receiving either small-bore NG feedings or large-bore NG feedings, showed only one subject with pulmonary aspiration. Interestingly enough, that patient never exhibited any symptoms of pulmonary aspiration or aspiration pneumonia, such as tachypnea, dyspnea, hypoxia, or fever (p. 78). However, the subjects were only followed for 3 days.

Montecalvo et al. (1992) also studied intubated patients to compare aspiration pneumonia in 38 patients; 19 patients were randomized to gastrostomy tube feedings, and 19 were randomized to jejunostomy tube feedings. Patients were studied from 10 to 20 days. The rate of aspiration pneumonia was 31.6% with the gastrostomy feedings and 21.1% with the jejunostomy feedings (p. 1383). Pneumonia was diagnosed by chest radiograph.

Cataldi-Betcher, Seltzer, Slocum, and Jones (1983) studied a total of 253 patients over a 1 year period to evaluate the incidence of complications with patients receiving enteral nutrition. The patients were followed for up to 20 days.

Ninety-one percent of the patients received NG feedings, 4% received gastrostomy feedings, 2% received jejunostomy feedings, 2% received cervical esophagostomy feedings, and 0.05% received nasoduodenal feedings. The occurrence of aspiration pneumonia was only 0.8% (p. 548). The authors did not discuss how aspiration pneumonia was diagnosed in the study.

Strong et al. (1992) compared the aspiration rates of small-bore NG tubes placed either in the stomach or in the duodenum in a randomized study of 33 patients. The patients were followed for approximately 11 days. Chest radiographs were taken every 3 days. The data showed that aspiration occurred with tubes placed into the stomach as often as with the tubes placed into the duodenum. Aspiration pneumonia occurred in 31.3% of the gastric-fed patients and in 40% of the patients fed via the duodenum (p. 59).

However, Medley, Stechmiller, and Field (1993) studied the complications of enteral nutrition in 51 intubated patients. Seventy-three percent of the patients received enteral feeding via tube, and 27% of those tubes were large-bore NG tubes (p. 217). Only three patients (5.9%) showed signs of aspiration, and only one of those three patients had chest x-ray changes associated with aspiration (p. 220).

In addition, Treolar and Stechmiller (1984) studied 30 ICU patients fed enterally via dobbhoff tubes. The authors concluded that none of the patients

developed aspiration pneumonia or showed evidence of pulmonary aspiration (p. 669). The authors further stated that the inflated cuffs of the tracheostomy and endotracheal tubes may have contributed to the patients' clear lung fields, and enteral nutrition through the Dobbhoff feeding tube may be a safer route than previously thought (p. 669).

A study done by Ciocon, Silverstone, Graver and Foley (1987) followed 70 patients with diagnoses indicating esophageal obstruction, dysphagia without obstruction, and refusal to swallow, over an 11-month period. Fifty-four patients had small-bore and large-bore NG tubes, and 16 had gastrostomy tubes. During the first 2 weeks of the study, 43% of the patients with NG tubes and 56% of the patients with gastrostomy tubes developed aspiration pneumonia. The authors defined aspiration pneumonia as a "new infiltrate on chest roentgenogram combined with any two of the following signs: cough, dyspnea, fever, wheezing, or rales" (p. 429).

Marian et al. (1993) studied the safety of nasogastric feeding in ventilated patients over 6 months. Forty-two patients were fed via gastrostomy tubes. According to the authors, "there were 11 complications noted in ten patients, including one episode of aspiration pneumonia" (p. 475). The authors concluded that the complications were not related to "age, gender, admitting diagnosis, infusion method or type of formula used" (p. 475).

Summary

It is clear that the results from these studies are conflicting. The studies varied in patient populations, length of data collection, and comparison of feeding routes, clearly necessitating further research in this area.

Chapter 3

THE METHOD

Research Design

This pilot study tested the feasibility of replicating this study on a much larger scale. An exploratory and comparative design was used to describe the incidence of aspiration pneumonia, by comparing the usage of two different enteral feeding tubes, and to explore how the incidence of aspiration pneumonia may be related to other factors, in addition to the enteral feeding tube.

Research Question

What is the incidence of aspiration pneumonia in a patient receiving enteral nutrition through a small-bore NG tube when compared to a patient receiving feedings through a gastrostomy tube?

Sample

A convenience sample of 2 subjects was selected from the Transitional Care Unit (TCU) at a major hospital in the Santa Clara Valley. One patient was receiving enteral nutrition through an NG tube and the other through a gastrostomy tube. The TCU is a 24-bed, step-down intensive care unit, which serves patients with cardiac, respiratory, and gastrointestinal disorders, as well as patients with autoimmune disorders requiring plasmapheresis. The criteria for inclusion of subjects in this study was (a) admission to TCU, (b) age of 55 years and older, (c) presence of a small-bore NG tube or a gastrostomy tube, or the initiation of one of those tubes, (d) administration of a continuous enteral

initiation of one of those tubes, (d) administration of a continuous enteral feeding, (e) length of stay of at least 10 days, to complete data collection, (f) all diagnoses admitted to TCU, which may include cardiac problems, autoimmune disorders, stroke, and surgery, (g) hemodynamic stability, and (h) administration of one of the following enteral formulas: Nutren, Ultracal, Glucerna, Reabilan HN, Vivonex, Impact with Fiber, Hepatic, Suplena, Nephro, and Nutrivent.

The rationale for the criteria for inclusion of subjects in this study is as follows: (a) patients must be admitted to TCU in order to be evaluated by the nursing staff and the researcher, (b) the criteria of 55 years and older was chosen because, according to Burnside (1988), the older population has grown larger in the last two decades, and "by 1984, 1 in 5 was at least 55 years old" (p. 10), (c) patients must have either a small-bore NG tube or a gastrostomy tube, because there has been an insufficient amount of data regarding the use of only these two enteral feeding tubes, (d) continuous enteral feedings will be used, because according to Ciocon, Galindo-Ciocon, Tiessen, & Galindo (1992), aspiration pneumonia tends to be more frequent in patients receiving intermittent tube feedings when compared to continuous feedings (p. 525), (e) data were collected for 10 days on each patient, because a study done by Jacobs, Chang, Lee and Bartlett (1989) found that all of the pneumonias among the patients developed within 10 days of starting continuous NG feeding (p. 354), (f) all patients admitted to TCU, except those with diagnoses included in the exclusion

criteria, (g) patients who are not hemodynamically stable are at more risk to aspirate, because gastric secretions are decreased by alterations in blood flow (Luckmann & Sorensen, 1987, p. 1252), (h) the study site has only the enteral formulas that are listed above in the inclusion criteria, and the dietitians are responsible for suggesting the type of formula to be used on each patient to the physician.

All of the enteral formulas are lactose-free, have the same consistency, and contain approximately 80% free water; however, they vary in ingredients and range in cost from low to high. Nutren is one of the most common formulas, is not diagnosis-specific, and is low in cost. Ultracal is low in cost and very similar to Nutren, but it also contains fiber. Glucerna is indicated for diabetic patients and contains fiber as well, but is moderate in cost. Reabilan HN contains almost double the calories, protein and carbohydrates as the formulas previously mentioned, and is high in cost. Vivonex Plus is low in fat, very high in carbohydrates, and high in cost. Impact with Fiber is very similar to Ultracal, but is high in cost. Hepatic is indicated for patients with hepatic encephalopathy. It is very low in sodium and fat, and high in carbohydrates. It is also high in cost. Suplena, indicated for patients with kidney problems who are not on dialysis, is low in protein, high in fat and carbohydrates, and contains only 0.71% of free water. Suplena is moderate in cost. Nephro is the formula which can be used for patients on dialysis. It is high in protein, fat and carbohydrates, low in potassium,

and it is moderate in cost. Nutrivent is indicated for pulmonary patients who retain carbon dioxide. It is very high in potassium, protein and fat, and is moderate in cost. The content and/or consistency of the enteral feeding formulas will not be considered as contributing to the incidence of aspiration pneumonia in this study.

Exclusion criteria included patients admitted to TCU with (a) gastrointestinal disorders, (b) chronic respiratory disorders, such as COPD, restrictive lung disease, or sarcoidosis, and acute respiratory problems, and (c) admission diagnosis of aspiration pneumonia. The rationale for the exclusion criteria is as follows: (a) patients with gastrointestinal disorders have malabsorption problems, which increases their risk for aspiration pneumonia; (b) patients with respiratory disorders have alterations in air exchange and risk factors, such as smoking, predisposing them to pneumonia; and (c) patients admitted with aspiration pneumonia would change the results of the study, because it would be difficult to discover and distinguish a new aspiration pneumonia from a previous one.

The independent variable was continuous feeding with a small-bore NG tube and gastrostomy tube, and the dependent variable was the incidence of aspiration pneumonia as demonstrated by selected signs and symptoms. Demographic variables, such as age, gender, and diagnosis, as well as where

the subjects resided before admission, and where they were cared for after discharge, were collected for descriptive analysis.

Data Collection

The staff nurses were trained on the policies and procedures for administering continuous tube feedings via the gastrostomy and dobhoff tubes, insertion of dobhoff feeding tubes, and utilization of the kangaroo feeding pump, following the study site's protocol. The staff nurses on the TCU were also instructed to perform a neurological assessment on each patient, developed for the study, in order to describe more in depth each patient's level of consciousness. The researcher conducted all of the inservices for consistency and continuity purposes. Every staff nurse on the TCU received this training at a staff meeting, in the Fall of 1994. All staff nurses were informed as to what parts of the 24 Hour Patient Care Record were to be recorded for the study. A copy of the policies and procedures mentioned above was left in the Staff Meeting Minutes Binder for those nurses to review who did not attend the inservice. Each procedure was discussed at the inservice. The nurses were then notified of the start date for the study, which was approximately 1-2 weeks later. Data collection was finished 2 months after the initiation date.

The data were collected by chart review on TCU on the 2 subjects which met the inclusion criteria. Chart information was reviewed daily for 10 days, and recorded by the researcher for consistency and completeness. The nursing

flowsheet was reviewed for documentation on the presence of bowel sounds, tube feeding type, tube placement check, residual check every 4 hours, type of formula, feeding rate, position of head of bed, and whether each patient was placed on aspiration precautions. In addition, vital signs were recorded, and the nurses' notes were reviewed, to follow changes and/or trends in each patient's condition, for factors leading to the diagnosis of aspiration pneumonia, such as a decline in the patient's oxygen saturation rate, signs of respiratory distress, abnormal breath sounds, or fever. The physicians' notes were reviewed for results of chest x-rays for evidence of new pulmonary infiltrates.

Patients were recruited by the researcher, with the help of the TCU nursing staff, using the inclusion and exclusion criteria. When a patient was admitted to the TCU, the researcher compared the information on the patient with the inclusion/exclusion criteria for this study. If the patient met the inclusion criteria, then the researcher placed a gold star on the patient's chart and medication rand. This alerted all nursing staff providing care for the patient that this patient was part of a research study, and the policies and procedures on administering continuous enteral tube feedings for gastrostomy and dobhoff tubes, placement of dobhoff feeding tubes, and utilizing kangaroo feeding pumps must be instituted. Data were collected immediately after the patient was admitted to the TCU and met the inclusion criteria. The researcher met daily with the nursing staff providing care for the patients included in the study, to ensure

that the hospital's protocols mentioned above were being instituted consistently each day.

Instrument

A data collection tool (See Appendix A) was developed by the researcher to include the information that was recorded from 24 Hour Patient Care Record and Progress Notes. A recoding sheet was also developed by the researcher to ensure confidentiality. Each patient's medical record number was recoded to an identification number (See Appendix B). This form was kept separately from the rest of the data and locked in a file cabinet, and only the researcher had access to this information.

Human Subjects Approval

Approval for conducting this research study at the study site was obtained by the Research Committee prior to obtaining approval from the Human Subjects-Institutional Review Board at San Jose State University (See Appendix C). Informed consent did not need to be obtained by the patients, because the patients were not interviewed or identified by name or medical record number. This study was a chart audit, and all of the information collected was retrieved from the medical charts.

Analysis Procedures

Descriptive statistics were used to analyze the data on the 2 subjects on age, gender, diagnosis, place of residence before hospitalization, and place of residence after discharge.

Chapter 4

ANALYSIS AND INTERPRETATION OF DATA

Description of the Sample

The sample consisted of only 2 subjects; 1 male and 1 female, ages 73 and 84, respectively. The mean age was 78.5 years. The male subject was admitted for surgery, and the female subject was admitted for stroke. Both subjects resided at home before their hospital admission. While the male subject expired in the hospital long after the data collection was completed, the female subject was transferred to a skilled nursing facility (See Table 1).

During the data collection period, no subjects were admitted to TCU with a gastrostomy tube. Therefore, data were collected on 2 subjects who were enterally fed via small-bore NG tubes. Both subjects utilized different enteral formulas at different rates. The male subject was fed with Nutren at 90 milliliters per hour, while the female subject was fed with Ultracal at 60 milliliters per hour during the period of data collection.

Vital signs and neurological data are included in Table 2. The mean or averages of both subjects' temperature, pulse, and blood pressure were within normal limits. However, the mean for respirations was 28 and was above the normal limit of 12-24 respirations/minute. In addition, both subjects had 1-2 days of confusion, but were alert and/or oriented otherwise. Both subjects had active

bowel sounds throughout the study, and the average residuals of both subjects were 4cc.

Table 1

Demographic Data

Variable	Frequency (days)	Mean
Age		78.5 years
Gender	Male = 1 Female=1	
Diagnosis:		
Stroke	1	
Surgery	1	
Enteral tube:		
Nasogastric (NG)	2	
Gastrostomy	0	
Residence before admit:		
Home	2	
Skilled Nursing Facility	0	
Residence after Discharge:		
Skilled Nursing Facility	1	
Expired during Hospitalization	1	

Table 2

Summary of Vital Signs and Neurological Data

Variable	Frequency (days)	Frequency (days)	Mean
	M	F	
Vital Signs			
Temperature	5	5	98.8F
Pulse	5	5	96
Respirations	5	5	28
Blood pressure	5	5	128/60
Level of			
Consciousness:			
Alert/oriented	4	3	
Confused	1	2	
Presence of active	5	5	
bowel sounds			
Tube feeding	5	5	5ml
residual			

Note. M = male subject; F = female subject.

Because neither of the subjects utilized gastrostomy tubes, no statistical tests were used to evaluate differences between independent variables. In addition, neither of the subjects developed aspiration pneumonia, as evidenced

by chest x-ray. Therefore, no tests for significance were performed. However, both subjects did experience periods during data collection of increases in temperature, decreases in oxygen saturation rates, labored breathing, and changes in sputum without evidence of new pulmonary infiltrates based on chest x-rays. Table 3 indicates the number of days that both subjects had changes in sputum, abnormal breath sounds, and labored breathing. Since each subject's data collection started at different times during the 2 months of data collection, each subject has a different number of chest x-rays. The chest x-rays were performed every 3 days, and then as needed for each subject based on their physician's orders.

Table 3

Pulmonary Data

Variable	Frequency (days)	Frequency (days)	Mean
	M	F	
Change in Sputum	3	2	
Pulse Oximeter	5	5	93%
Saturations (subj. readings)			
Lung Sounds:			
clear			
wheezing			
rales	1	2.5	
rhonchi	4	2.5	
Labored Breathing	1.5	2	
CXR	3	2	

Note. M = male subject; F = female subject.

Analysis Regarding Complications

In addition to the limitations, there was also a change in enteral tube feeding practice beginning around the same time as the initiation of data collection. Because the majority of the skilled nursing facilities prefer to do bolus enteral feedings instead of continuous, many of the physicians have switched their patients to bolus feedings. This research study did not anticipate the change in enteral feeding practice, so many patients could not be considered to be included in the study because they were receiving bolus feeds.

The shorter length of patient stay was also not anticipated. Physicians have been encouraged to discharge patients as soon as possible in order to lower hospital costs. Again, many patients were excluded from this study, because they were only in the hospital for a couple of days.

This change in enteral feeding practice and shorter length in patient hospital stay drastically altered the potential sample size and subsequently the results of the pilot study. With only a 2 month data collection period, it was impossible to recruit more than 2 subjects.

Chapter 5

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Because there was no incidence of aspiration pneumonia in this study, and there were no subjects with gastrostomy tubes, it was not possible to compare the difference between small-bore NG tubes and gastrostomy tubes, and perform tests of significance. Even though both subjects exhibited the signs and symptoms of aspiration pneumonia, the chest x-rays on both subjects did not show evidence of new pulmonary infiltrates as read by the radiologists.

On day 7 during the study, the male subject had a temperature of 102.2 degrees Fahrenheit, pulse of 108, and labored respirations of 32. His oxygen saturations were 88%, and yet he still did not show any evidence of aspiration pneumonia on a chest x-ray taken that same day. His temperature lasted only during the night shift and was brought down with Tylenol; however, his respiratory rate remained at 32 for another day. Similarly, the female subject also presented with a temperature of 102.3 degrees Fahrenheit, pulse of 117, respirations of 32, and oxygen saturations of 87% with labored breathing on day 3 during the study. The female subject also did not show any evidence of aspiration pneumonia on chest x-ray taken 2 days later. In addition, her signs and symptoms only lasted during the night shift and all of her vital signs, oxygen saturations, and breathing came down to normal after she was given Tylenol.

This had led the researcher to believe that maybe there were some variables that were overlooked in this study. The results have also led to some questions: (a) why did both subjects present with symptoms and never develop aspiration pneumonia?, and (b) if the variables used in the study were not indicators of aspiration pneumonia, then what variables are?

Recommendations

There is still a need to do further research on this topic, utilizing a larger sample size and allowing more time to recruit the sample. In addition, it would be more meaningful to include some additional variables which were overlooked in this study. For instance, it would be necessary to include the amount of oxygen each subject is receiving, in order to obtain a more detailed clinical picture of each subject. However, it would also be interesting to incorporate both types of enteral tube feeding methods (continuous and bolus). Additional research questions which need to be explored in future studies are as follows:

1. What is the incidence of aspiration pneumonia in patients receiving continuous enteral tube feedings when compared to patients receiving bolus or intermittent tube feedings?
2. What is the incidence of aspiration pneumonia in patients receiving enteral tube feedings at a skilled nursing facility when compared to patients receiving enteral tube feedings in the hospital?

These questions are of great concern to hospitals, because they pertain to changes in practice and/or differences in protocol. The findings from studies exploring those questions would provide important information with regards to patient safety.

The feasibility of replicating this study on a much larger scale would be possible if the data collection period was extended to at least 1-2 years in order to obtain a substantial number of research subjects. It would also be necessary to extend the data collection on each subject to include data on where each subject was discharged, whether it be to a skilled nursing facility or the subject's home. With an increase in the number of subjects and more complete data on the subjects, including data after discharge, it would be very feasible to replicate this study.

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APPENDIX A
Data Collection Tool

APPENDIX B
Recoding Sheet

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APPENDIX C

Approval Letter

A campus of The California State University

Office of the Academic Vice President • Associate Academic Vice President • Graduate Studies and Research
One Washington Square • San Jose, California 95192-0025 • 408/924-2480

TO: Karen Jones
601 Pamilar Ave.
San Jose, CA 95128

FROM: Serena W. Stanford *Serena W. Stanford*
AAVP, Graduate Studies & Research

DATE: October 17, 1994

The Human Subjects-Institutional Review Board has approved your request to use humans subjects in the study entitled:

"Incidence of Aspiration Pneumonia in Patients Receiving
Enteral Nutrition Through a Small-Bore Nasogastric Tube
Versus a Gastrostomy Tube"

This approval is contingent upon the subjects participating in your research project being appropriately protected from risk. This includes the protection of the anonymity of the subjects' identity when they participate in your research project, and with regard to any and all data that may be collected from the subjects. The Board's approval includes continued monitoring of your research by the Board to assure that the subjects are being adequately and properly protected from such risks. If at any time a subject becomes injured or complains of injury, you must notify Dr. Serena Stanford immediately. Injury includes but is not limited to bodily harm, psychological trauma and release of potentially damaging personal information.

Please also be advised that each subject needs to be fully informed and aware that their participation in your research project is voluntary, and that he or she may withdraw from the project at any time. Further, a subject's participation, refusal to participate, or withdrawal, will not affect any services the subject is receiving or will receive at the institution in which the research is being conducted.

If you have any questions, please contact me at (408) 924-2480.