Effects of a Heating Compress on Self-reported Sore Throat following Endotracheal Intubation for Anesthesia

Takiko Nemoto
Abstract

EFFECTS OF THE HEATING COMPRESS ON SELF-REPORTED SORE THROAT FOLLOWING ENDOTRACHEAL INTUBATION FOR ANESTHESIA

by

Takiko Nemoto

The purpose of this study was to determine the effects of the heating compress on self-reported sore throat following endotracheal intubation.

The null hypothesis stated that a heating compress to the throat would have no significant (alpha = 0.05) effect on the reduction of self-reported postoperative sore throat following endotracheal intubation for anesthesia. A pretest-posttest quasi-experimental research design was implemented in the study. Subjects who met the criteria for the study were divided randomly into an experimental and control group by coin toss.

The data were analyzed for differences between the groups at the 0.05 level of significance. Frequency distributions, means, and standard deviation were determined for classificatory variables. The chi-square formula was applied to determine whether the presence or absence of sore throat was dependent upon age, sex, smoking habits, use of nasogastric tube, and site of operation, and to compare the degree of soreness and change in level of soreness.
Ninety-nine subjects were admitted to the study; 25 subjects were discontinued from the study at the time of the first post-extubation interview. Seventy-four subjects completed the first post-extubation interview. Forty (54.1 percent) of the 74 subjects reported sore throat. The relationships between sore throat and the classificatory variables were studied with 74 subjects. Statistical analysis revealed that sore throat was significantly related to the subject's sex \((p = 0.0118)\), the use of a nasogastric tube \((p = 0.0045)\), and the site of operation \((p = 0.0013)\).

Thirty-four of 74 subjects did not experience sore throat and were discontinued in the study. Further, 12 of the 40 were discontinued prior to the second post-extubation interview. Twenty-eight subjects completed the study which included 13 in the experimental group and 15 in the control group. The null hypothesis was tested with the 28 subjects. Statistical analysis showed that there was no significant difference between the two groups \((p > 0.25)\) and the null hypothesis was accepted.

The sample was a convenience sample randomized into experimental and control groups. There was a high rate of discontinuance from the study; only 28 subjects completed. The findings therefore cannot be generalized beyond the subjects studied.

There was a trend toward a decrease of the severity of sore throat in the experimental group compared to the control group. Subjects verbalized satisfaction with use of the heating compress and its effect toward decreasing the severity of sore throat.
A heating compress is a simple treatment, inexpensive, and easily applied. It is recommended that nurses use this simple treatment for the comfort and relief of postoperative sore throat.
EFFECTS OF A HEATING COMPRESS ON SELF-REPORTED SORE THROAT FOLLOWING ENDOTRACHEAL INTUBATION FOR ANESTHESIA

by

Takiko Nemoto

A Thesis in Partial Fulfillment of the Requirements for the Degree Master of Science in the Field of Nursing

May 1982
The persons whose signatures appear below certify that this thesis in their opinion is adequate, in scope and quality, as a thesis for the degree Master of Science.

Frances L. Fickess, Chairman
Frances L. Fickess, Professor of Nursing

Grenith J. Zimmerman, Professor of Biostatistics

Helen K. Seibert, Assistant Professor of Physical Therapy
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Chapter 1

DELINEATION OF THE PROBLEM

Sore throat is a common sequelae of endotracheal intubation for anesthesia. It upsets patients and increases postoperative anxiety. The purpose of this study was to determine the effects of the heating compress on self-reported sore throat following endotracheal intubation.

Background of the Problem

Research has shown that the incidence of a sore throat is significantly greater in patients intubated for anesthesia. Some degree of denudation of respiratory tract epithelium is inevitable (Dripps and others, 1972, p. 198). Mechanisms contributing to postoperative sore throat have included: trauma to the tonsillar pillars, pharynx, tongue, larynx, and trachea; edema in the structures of the nasal cavity when this route of intubation is used; bruised or abraded mucosa of pharynx, larynx or trachea by the tube; or the ischemia resulting from the localized pressure on the tracheal wall by using a cuffed endotracheal tube. Cronin and others found that a sore throat of some degree was the complaint of more than 50 percent of the patients who had general surgery. Six percent of the patients reported this was the worst part of their procedure (1973, p. 884).
Need for the Study

Despite the high incidence of sore throat following endotracheal intubation, very little literature has shown concern for the treatment and care of this problem. It is believed that this complication will last only 48 to 72 hours postoperatively. However, the nurse's primary concern is for the patients' comfort and an uneventful recovery from their sickness. Therefore the control of sore throat becomes an integral part of nursing care.

A heating compress to the throat has been used for pharyngitis, laryngitis, or tonsillitis. No systematic studies have been conducted regarding the effectiveness of a heating compress, although those who use this treatment themselves or for their family members say that it works well for a sore throat. If the heating compress is effective for a sore throat following endotracheal anesthesia, then nurses may be encouraged to try this simple treatment for postoperative patients for their comfort.

Statement of the Problem

This study was conducted to investigate the effect of a heating compress to relieve self-reported sore throat of postoperative patients following endotracheal intubation for anesthesia. The experimental group subjects who received a heating compress were compared to the control group subjects who did not receive any treatment for their sore throat.
Assumptions

For the purpose of this study, it was assumed that: (1) localized pressure from the endotracheal tube will lead to necrosis and denudation of laryngeal and tracheal mucosa which causes a sore throat; (2) mucosa of the pharynx may be bruised or abraded by the endotracheal tube; (3) friction between the surface of the tube and the respiratory mucosa will lead the mucosa to be edematous, bruised, abraded or lacerated and become the causes for a sore throat.

Assumptions for using a heating compress were: (1) mild heat has a distinct pain diminishing effect because heat has a soothing and relaxing effect on skeletal muscles (Licht, 1972; Lehmann and others, 1974); (2) heat dilates the blood vessels, carrying more blood to the injured part and improving circulation, thus tending to reduce edema (Abbott, 1912; Waterson, 1978; Sorensen, 1979).

Rationale and Theoretical Framework

Physiological Phenomenon of Sore Throat

The pharynx, larynx and trachea are the anatomical structures affected when the endotracheal tube is inserted. The pharynx is subdivided into the nasopharynx, oropharynx, and hypopharynx (laryngopharynx). The nasopharyngeal mucosa is ciliated respiratory epithelium and contains numerous mucous-secreting glands. The mucosa of the oropharynx is a stratified squamous epithelium overlying the pharyngeal aponeurosis (Adams and others, 1978, pp. 439-445). The wall of the larynx, lined by columnar ciliated mucous cells are known as respiratory
epithelium. Numerous mucous secreting glands are present in the respiratory epithelium.

The larynx is composed of one hyoid bone and three single cartilages which include the arytenoid, corniculate, and cuneiform (Guyton, 1979; Adams and others, 1978; Greisheimer and others, 1972). Cricoid cartilage is a complete circle and is unable to expand. One experimental study on the monkey showed that histologic changes produced by endotracheal intubation appeared only over the cricoid cartilage (Way and others, 1965, p. 810).

The trachea, a muscular tube, is about 11 cm. long and 2 to 2.5 cm. in diameter. There are 16 to 20 C-shaped hyaline cartilages forming the tracheal rings. The trachea extends from the cricoid cartilage to about the level of the fourth or fifth thoracic vertebra. The epithelium of the mucosa of the trachea is ciliated pseudostratified columnar.

A histologic study of 99 autopsy specimens which included the larynx and trachea demonstrated that focal or complete loss of mucosal epithelium occurred in cases which had been in contact with the orotracheal tube for even one hour, as well as showing ischemic nature of the necrosis (Donnelly, 1969, p. 517). Macroscopic studies also showed that laryngeal irritation with mucous congestion will result within two to four hours of endotracheal intubation (Blanc, 1974, p. 208). The adverse effects of endotracheal tube for the larynx and trachea include: epiglottic or arytenoidal edema; supraglottic edema accompanied by congestion or submucosal hemorrhages; ulceration of tracheal mucosa; abrasion of the vocal process of the arytenoidal cartilage; ischemia
resulting from the localized pressure on the tracheal wall; and sloughing of the laryngotracheal mucosa which was believed to have followed pressure from the inflated cuff of the endotracheal tube (Dripps, 1972; Walter, 1965; Blanc, 1974; McGovern, 1971; Lewis, 1964; Hilding, 1971). If these research and experimental findings are true, then mucous damage occurs readily when an endotracheal tube is placed in the trachea and causes a sore throat, a scratchy throat, and/or difficult swallowing.

A heating compress to the throat has been used for sore throat resulting from tonsillitis, pharyngitis, and laryngitis. The underlying theory is that the external heat applied to local areas causes vasodilatation of the vessels, increased blood flow, decreased pain and decreased muscle tonus (Sorensen, 1979; Licht, 1960; Abbott, 1912). A widely accepted theory about why heat reduces pain is the belief that heat receptors compete with the pain receptors for recognition by the cerebral cortex (Sorensen, 1979, p. 1149). If this is true, then the heating compress to the throat will relieve sore throat following endotracheal intubation for anesthesia. Ischemia, ulceration of mucosa, and edema result from the localized pressure on the tracheal wall by the endotracheal intubation. Vasodilatation from a heat application will relieve the pain which is caused by ischemia (Finnerty, 1960; Sorensen, 1979). Why the ischemia causes the pain is not clearly known. However, Jones stated:

It is suggested that the pain may be triggered by the presence of lactic acid which can accumulate during anaerobic metabolism in ischemia. Bradykinin and histamine released by damaged muscle cells may also stimulate nerve endings and cause a pain experience (1978, p. 983).
Heat relaxes the involved muscle and relieves the pain originating from muscle spasm (Abbott, 1912; Sorensen, 1979). Also the application of heat increases local circulation and relieves pain caused by local congestion (Sorensen, 1979, p. 1148).

**Relationship Among Variables**

The variables which might have influenced the outcome of this study were grouped into four separate categories: controlled variables, recorded variables, variables to be measured, and uncontrolled variables.

**Controlled Variables**

The interviews and observations were carried out by the same investigator for all subjects. A designed interview was used. Treatment was provided by the investigator for all subjects and the same treatment was used for all the cases. The length of time for the treatment was controlled. To measure for sore throat, the same tool was used throughout this study.

**Recorded Variables**

The variables which were recorded in this study included: age, sex, type of surgery, posture during surgery, and primary agent of anesthesia. The method of intubation, difficulty of intubation, and the presence of nasogastric tube was also recorded.

**Variables to be Measured**

The following variables were measured in this study: number of
cigarettes smoked per day, the degree of sore throat, and the duration of time the endotracheal tube was in place. The effect of the treatment was measured in the experimental group.

Uncontrolled Variables

Since this study was conducted postoperatively and after the subject returned to ICU or surgical ward, the type and size of the endotracheal tube were uncontrolled. The status of nutrition of subjects, status of immune system, pain threshold of subjects, and characteristics of subjects were also uncontrolled. Routine postoperative care on the unit was uncontrolled in this study.

Hypothesis

Statement of the Hypothesis

A heating compress to the throat will relieve a self-reported postoperative sore throat following endotracheal intubation for anesthesia.

Statement of the Null Hypothesis

A heating compress to the throat will have no significant (alpha = 0.05) effect on the reduction of self-reported postoperative sore throat following endotracheal intubation for anesthesia.

Definition of Terms

Sore Throat

In this study sore throat will include the subject's report of
painful throat, pain upon swallowing, and a scratchy feeling following endotracheal intubation.

**Heating Compress**

**Theoretical definition.** A mild prolonged application of moist heat of several hours duration.

**Operational definition.** A cotton cloth long enough to encircle the neck twice is soaked in tap water and wrung so that it does not drip when it is applied to the neck. The compress is applied smoothly and quickly to avoid chilling and is covered with a part-wool flannel cloth to prevent the circulation of air. It is left in place for eight to ten hours in order to cause an accumulation of body heat. A safety pin is used to secure the compress. Upon completion of the treatment, the compress is removed. The treatment may be repeated once (Abbott, 1912; Finnerty, 1960; Moore, 1964).

**Postoperative**

The period of time between admission to the post-anesthetic room and discharge from the hospital.

**Hoarseness**

A combination of the acoustical features of breathiness and harshness of the voice.

**Endotracheal Intubation**

The endotracheal tube inserted into the trachea either by exposing the larynx with a laryngoscope or by passing it "blindly."
The methods include those in which the tube is inserted either through the nose or mouth.

Scope and Limitations of the Study

The study included subjects who received endotracheal intubation for anesthesia, who were extubated within four hours after the operation was finished and who did not receive analgesia from a half to three hours prior to the post-extubation interview. The effect of oropharyngeal airway on the incidence of sore throat was not studied. The influence of the size of the endotracheal tube was not investigated since it is difficult to measure the size of the larynx. The subject's throat was not examined by the researcher.

Because of the unavailability of appropriate tools to measure the sore throat and the effectiveness of the heating compress, the measurement depended on structured observation, structured interview, and the Simple Descriptive Scale. When the researcher is concerned with observations of the subjects, the halo effect may affect the outcome of the study.

Outline of the Thesis

The delineation of the research problem is explained in Chapter 1. Chapter 2 contains a historical background and a review of the current literature related to the sore throat following endotracheal intubation and the use of a heating compress. In Chapter 3 a description of the research methodology is presented. Chapter 4 analyzes the
data collected with a discussion of the findings., The conclusions and recommendations for additional research are presented in Chapter 5.
Chapter 2

SELECTIVE REVIEW OF THE LITERATURE

Introduction

Much literature is concerned about the complications of endotracheal intubation. The complications are divided into major and minor complications. A sore throat is considered to be a minor complication. The literature review reveals that the endotracheal tube cuff is the major factor contributing to the sore throat. Lubricants and nitrous oxide diffusion are also related to sore throat following intubation. These contributing factors are discussed in this chapter. Treatment and prevention are discussed following the review of the clinical studies about sore throat. Finally, the theory and the physiological benefits of the heating compress are discussed.

History of Endotracheal Intubation

According to Davison, the first efforts to introduce a tube into the trachea through the glottis were made by Charles Kite in 1787 (1965, p. 150). The first clinical use of endotracheal intubation was reported by William Macewen in 1880. He used a brass tube for intubation for the administration of an anesthetic during an operation on the tongue (Davison, 1965; Lee, 1973). Rowbotham and Magill developed the universally practicable technique of endotracheal anesthesia, and their methods were adopted by anesthetists throughout the world (Davison,
The use of endotracheal intubation has increased recently and has expanded the possibility of anesthesia in various fields of surgery (Way and Snooy, 1965; Hilding, 1971; Kumar, Pandit, Cohen, 1977).

Some clinicians are concerned about trauma to the larynx and trachea caused by the effects of intubation. These injuries cause postoperative sore throat (Wylie and Churchill-Davidson, 1972; Dripps, Eckenhoff, Vandam, 1972; Cronin, Redfern, Utting, 1973). According to Blanc and Tremblay, the history of accidents from tracheal intubation is as old as that of intubation itself (1974, p. 204).

Complications of Endotracheal Intubation

Major Complications

The commonly reported major complications included: contact ulcer granuloma (Jackson, 1953; Wylie and Churchill-Davidson, 1972; Kirchner and Roberts, 1978), laryngeal or tracheal laceration (Donnelly, Grossman, Grem, 1948; Donnelly, W. H., 1969; Kumar and others, 1977), membranous laryngo-tracheitis (Muir and Starton, 1954), and laceration of the vocal muscle (Kambic and Radsel, 1978). In these major complications many cases are related to prolonged duration of intubation (Wolfson, 1958; Riding, 1975). In severe cases, special medical treatment, such as tracheostomy, dilatation of stenosis, and surgical repair of the injury are required (Kumar and others, 1977; Kirchner and Roberts, 1978; Bahn and Vitikainen, 1981).
Minor Complications

The commonly reported minor complications following endotracheal intubation included: sore throat (Wolfson, 1958; Gard and Cruickshank, 1961; Riding, 1975), hoarseness (Jones and others, 1968; Dripps and others, 1972), difficulty in swallowing (Gard and Cruickshank, 1961), and laceration or bruising of the gums, tonsillar pillar, pharynx, and tongue (Riding, 1975). However, several researchers agreed that the sore throat is the most common complication (Conway, Miller, Sugden, 1960; Jones and others, 1968; Loeser, Orr, Bennett, Stanley, 1976). Conway, Miller, and Sugden found that 38 percent of the intubated patients had a sore throat (1960). Gard and Cruickshank found that 44 percent of the patients complained about a sore throat on direct questioning (1961).

Contributing Factors of Sore Throat Following Endotracheal Intubation

Tube Cuffs and Sore Throat

Lee wrote about the purpose of using the cuffs and gave the caution of using cuffs as follows:

Tubes with internal diameters in the larger sizes can be supplied with inflatable cuffs. Used to ensure airtight endotracheal anesthesia, instead of pharyngeal gauze packing. The Hewer pilot balloon shows the state of the cuff when it is hidden in the trachea... The pressure in a cuff when comfortably inflated may be 120-180 mm. Hg, but this does not correspond to the pressure applied to the tracheal mucosa. Cuffs should not be inflated to a pressure greater than that needed to prevent audible leakage of gas when the reservoir bag is compressed (1973, pp. 226-227).

The value of the inflatable cuff is widely recognized. Adriani and Phillips said that the cuff is 100 percent effective in preventing
aspiration (1957, p. 13). However, the tracheal cuff causes sloughing of the tracheal mucosa (Lee, 1973, p. 226).

Several researchers agreed that the tracheal injury, due to tracheal intubation, occurs at the cuff site (Cooper and Grillo, 1969; Loeser and others, 1980; Kamen and Wilkinson, 1971; Stauffer, Olson, Petty, 1981). Necrosis, ischemia, and sloughing of the laryngotracheal mucosa follows pressure from the inflated cuff (Lewis and Swandlow, 1964; McGovern, Fitz-Hugh, Edgemon, 1971; Lichtiger and Moya, 1978). Brice and others stated that there was undoubtedly a reduction in blood supply to the tracheotomy area when the cuff was inflated (1968, p. 549).

Hilding did extensive animal investigations and examination of human necropsy material. He found that all of the necropsy specimens of the larynx and trachea were injured by the cuffed tube. The maximal damage occurs on the arytenoid vocal process, on the cricoid plates, and on the anterior wall of the trachea (1971, p. 572).

Loeser and others did several studies for the relationship of endotracheal tube cuff design and the postoperative sore throat. Their two studies (1976, 1978) demonstrated that the large volume, low-pressure endotracheal tube cuffs were associated with a higher incidence and greater severity of postoperative sore throat than were the low volume, high-pressure cuffs. Loeser and others stated that these studies supported the concept that the cuff tracheal contact area is an important factor in the development of the postoperative sore throat (1978, p. 432). Their studies indicated that there was a correlation of
tracheal cuff contact area and the incidence of postoperative sore throat.

Further, Loeser and others did a histological study on twenty anesthetized dogs to elucidate a possible explanation for the above findings. They found that it was significant that the large volume, low-pressure cuff resulted in greater lengths of tracheal mucosa-cuff erosion, while the low volume, high-pressure cuff produced deeper than average mucosal erosion (1978, p. 579). Loeser and others pointed out that the large volume, low-pressure endotracheal tube cuffs wrinkle in spite of proper inflation, and the wrinkle results in deep mucosal grooves which tend to cause postoperative sore throat (1978, p. 579). After several studies, they concluded that the postoperative sore throat can be minimized by using narrow cuffs which reduce the total surface area of cuff-tracheal wall contact (1980, p. 259).

Lewis and others investigated the relationship of the tracheal complication and cuff pressure on the tracheal tube. They stated that "Any inflatable cuff, no matter how soft, is potentially hazardous when confined within the tracheal lumen with no safety mechanism" (Lewis, Schlobohm, Thomas, 1978, p. 456).

To minimize tracheal damage, periodical cuff deflation has been considered (McGovern and others, 1971; Bernhard and others, 1978). However, Carroll and others stated that in their study the periodical cuff deflation did not protect the tracheal mucosa from damage (Carroll, McGinnis, Grenvik, 1974, p. 127). Powaser and others studied the effectiveness of hourly cuff deflation. The study was done on fifteen
anesthetized female dogs over a 72-hour period. Their study showed that the hourly five-minute cuff deflation did not lessen tracheal damage. They noticed that the area at the cuff site was markedly reddened with the engorgement of superficial blood vessels or petechiae (Powaser, Brown, Chezem and others, 1976, p. 739).

**Lubricant and Sore Throat**

Lee stated "To intubate atraumatically, the tube and laryngoscope should be smeared with either a greasy or a water soluble lubricant . . ." (1973, p. 227). However, there are various opinions among the researchers in evaluating the effect of lubricants on the incidence of postoperative sore throat. Conway and others used lidocaine (Ligno-Caine), surgical lubricant (K. Y. Jelly), tetracaine hydrochloride (Amethocaine), and dibucaine hydrochloride (Cinocaine) in their studies. They found that the use of Cinocaine ointment was associated with a high incidence of sore throat (1960, p. 222). Winkel and Knudsen examined the incidence of sore throat in a series of 1,025 patients. They found there was a statistically significant reduction of the sore throat when they used the one percent Cinocaine Jelly on the endotracheal tube (1971, p. 94).

Gard and Cruickshank studied the various types of lubricants on the incidence of sore throats following intubation. They noticed that the lowest incidence of complications occurred with a single application of tronothane (Pramoxine) cream on the endotracheal tubes. They also found that repeated applications of lubricants during the operation did not reduce the incidence of sore throat (1961, p. 665). Lund and Daos
found a significantly reduced incidence of the symptom when they applied five percent lidocaine ointment (1965, p. 682). However, Menias stated that the residual effect of local anesthetic on tracheal mucosa might be a cause for the sore throat (1977, p. 438).

Loeser and others studied the influence of tracheal tube lubrication and cuff design on postoperative sore throats. They evaluated six groups of 20 patients who experienced orthopedic surgeries on the extremities. Group 1 had four percent lidocaine jelly; Group 2 had four percent lidocaine solution; Group 3 had saline solution; Groups 4 and 5 had the tracheal tube with a cuff, but it was unlubricated; and Group 6 had mask anesthesia. The study showed that Group 1 had the highest incidence (90 percent) and the most severe of the postoperative sore throat. In both Groups 2 and 3, there was a 40 percent incidence of sore throat. In Group 4 those who had the large volume cuff and no lubricant resulted in a 46 percent incidence of sore throat. Those in Group 5 who had had the low volume cuff resulted in a 25 percent incidence of a sore throat, and those in Group 6 who did not have the tube had a 15 percent incidence of sore throat. Loeser and others pointed out that the jelly or preservatives in the jelly is irritating or damaging to mucosa of the trachea or the upper airway (1980, pp. 156-158). In another paper, Loeser and Stanley explained the reason why there is a marked difference between the solution and the jelly, despite some similarities in the preservatives. They said, "The amount of the two substances remaining on the tube are certainly different. Also the solution is the only preparation whose pH is adjusted to 7.0. The
lubricant preparations are acidic, whereas normal tracheal secretions are slightly alkaline" (1981, p. 171). As Winkle and Knudsen pointed out, the investigations regarding lubricants on the incidence of sore throat are confusing and clouded (1971, p. 92).

**Nitrous Oxide Diffusion into Tracheal Tube Cuffs and Sore Throat**

According to Lee, nitrous oxide gas was first prepared by Priestly in 1772. In 1878, Paul Bert administered the gas under pressure and proved it to be a true anesthetic (Lee, 1973, p. 158). Churchill-Davidson said, "Nitrous oxide is non-irritating, sweet smelling and colourless; and is the only inorganic gas used to produce anaesthesia in man" (1978, p. 242). Nitrous oxide is widely used in anesthesia (Dripps and others, 1972; Lee, 1973; Lichtiger and Moya, 1978). However, researchers found that prolonged anesthesia with nitrous oxide may result in diffusion of the gas into cavities such as the bowel, the pneumothorax cavity, and the middle ear air space (Eger and Saidman, 1965; Lichtiger and Moya, 1978; Dripps and others, 1972).

Eger and Saidman's study of dogs showed that administration of nitrous oxide increased intestinal gas volumes 100 to 200 percent within four hours. Similarly, in the pleural space, gas volume increased 200 to 300 percent within two hours (1965, p. 61).

Bernhard and others studied various kinds of endotracheal tube cuffs and compared their physical characteristics. They found that nitrous oxide diffusion occurred continuously during the three hours of testing (1978, p. 416).
Stanley stated, "An air-inflated endotracheal tube cuff within the trachea represents a gas-filled cavity in the body" (1974, p. 480). He found in his study that 70 to 75 percent of nitrous oxide or ethylene causes an increase in the cuff volume by 200 percent within 4 hours. Stanley also studied the pressure of endotracheal tube cuffs in 160 anesthetized women. The result showed that all of the endotracheal tubes had a significant increase in cuff volume and pressure after exposure to nitrous oxide. He found that even low-pressure cuffs do not prevent pressure rises during nitrous oxide administration. He pointed out that the over expansion of the cuff during anesthesia may cause tracheal or laryngeal trauma and postoperative sore throat in intubated patients (1975, p. 639).

Revenas and Lindholm studied pressure and volume changes in tracheal tube cuffs during anesthesia in 54 patients. They used air, nitrous oxide-oxygen, and 0.9 percent saline to inflate the tube cuffs. The researcher noticed that if the cuff was inflated with nitrous oxide-oxygen, there was no pressure change in the cuff, while constant pressure rose in an air-inflated cuff (1976, pp. 322-323). Revenas and Lindholm recommended that the large-resting diameter, large-residual volume cuff filled with the anesthetic gas mixture be used; this would provide low sealing pressure in the trachea during nitrous oxide-oxygen anesthesia (ibid., p. 326).

Other Factors and Sore Throat

Other factors which are related to the sore throat included: sex differences, having a nasogastric tube in place, the position of the
patient during anesthesia, cough and bucking, and the duration of the intubation.

**Sex differences:** Wolfson reported that the incidence of sore throat in females was almost twice that in males and that there was a high incidence of contact ulcer and granuloma formation in the female (1957). Howland and Lewis noticed that the incidence of intubation granuloma is seven times greater in the female than in the male (1956). Hartsell and Stephen stated in their study that the complaint of sore throat was noted three times more frequently in females than in males (1965, p. 309). McKenzie and others studied human tracheal circumference by computerized tomography scanning in order to know the correct cuff size. They noticed that the male tracheal circumference was slightly greater than that of the female when each was breathing spontaneously. The researchers reported the average adult tracheal breath holding diameter to be 24.3 mm in males and 20.5 mm in females (1980, p. S414). Blanc and Tremblay mentioned that this difference was related to the greater resistance of the male laryngeal epithelium to trauma and to the tendency of using oversized tracheal tubes in females (1974, p. 210).

**Use of nasogastric tube:** Sore throats occurred twice as often in patients who had the nasogastric tube (Conway and others, 1960; Hartsell and Stephen, 1964). Blanc and Tremblay said that sore throat was significantly more frequent when the use of nasogastric tube accompanies tracheal intubation (1974, p. 211). However, other researchers
said that the presence or absence of a nasogastric tube made little difference to the incidence of the complication (Jones and others, 1968; Gard and Cruickshank, 1961).

**Position of the patient:** Several researches agreed that the amount of head movement, the position of head during surgery, and the patient's prone position are associated with a greater incidence of throat complications (Gard and Cruickshank, 1961; Hilding, 1971). Jones and others also found in their study that patients who had undergone head and neck operations complained of sore throats. However, they stated, "The severity of sore throat could not be directly related to the incidence of sore throat in any particular position on the operating table" (Jones and others, 1968, p. 28).

**Coughing and bucking:** Coughing and bucking episodes are considered to be related to the incidence of sore throats. During bucking, coughing, and swallowing, the tracheal tube moves and causes rubbing against the airway surface (Blanc and Tremblay, 1974, p. 212). Hartsell and Stephen found that a sore throat developed almost twice as frequently in patients who had a bucking episode when the endotracheal tube was in place (1964, p. 310). Conway and others agreed that if the coughing and bucking were reduced, the incidence of postoperative sore throat would be reduced. They recommended using a gallamine (non-depolarizing muscle relaxant) to facilitate intubation rather than using suxamethonium (depolarizing muscle relaxant). They recommended this because gallamine reduces the coughing and bucking immediately after
intubation because of its long-acting muscle relaxation action (1960, p. 222).

Duration of intubation: Donnelly studied the relationship between tracheal damage and the duration of intubation. He categorized his groups into those of less than 12 hours, those of 13 to 48 hours, and those of more than 48 hours, as determined on 99 autopsy specimens. Donnelly found that laryngeal ulceration was functionally related to the duration of intubation (1969, p. 513). Other researchers also stated that a direct relationship exists between the length of time an endotracheal tube was in position and the degree of laryngeal tracheal injury (McGovern and others, 1971; Blanc and Tremblay, 1974). However, some researchers disagreed. Jones and others noticed that the duration of intubation did not relate to the incidence of sore throat or to its severity (1968, p. 26). Nording, Engstrom, and Lindholm studied tracheal damage caused by different time durations of intubation, while keeping the cuff-to-tracheal wall pressure constant. They found that cuff pressure is more important than the duration of intubation for the development of tracheal damage (1977, p. 17).

Clinical Studies of Sore Throat Following Endotracheal Intubation

Wolfson studied 521 cases concerning the incidence of post-intubation sore throat. The study included 279 females and 242 males. The researcher used direct questions in the interview, such as "Did you have a sore throat after your operation?" The subjects were interviewed
on the second and eighth postoperative days. The researcher visited all the patients with esophageal tubes in situ during or after operation, or those who had intra-oral operations, or thyroid operations. Wolfson used only percentages for data analysis. The researcher reported the following results: "15.9 percent had a slight sore throat; 2.5 percent had a severe sore throat; 3.3 percent were hoarse; 0.4 percent lost their voices, and 0.8 percent had sore throats and were also hoarse. . . ." (1958, p. 332). In Wolfson's study, a higher incidence of sore throat was found when the patient was in the prone position than when he was in other positions. Also he noticed that female subjects complained about a sore throat more than male subjects did (Wolfson, 1958, pp. 326-332).

Conway and others investigated sore throats following anesthesia in 1,259 patients, including 475 males and 784 females. In this series, 617 of subjects were not intubated. The subjects were visited by the researchers three days after the anesthetic. A patient was considered to have a sore throat if he complained of it spontaneously or upon inquiry. Loss of voice, hoarseness, and stridor were assessed objectively. The patients who had pharyngeal or laryngeal operations or oral endoscopies were excluded. It was interesting that in their study, 10.21 percent of nonintubated patients complained of a sore throat. Conway and others pointed out that "it is possible that it was due to a multiplicity of causes such as the use of airways, premedication with drugs that diminish secretions, the use of mildly irritating anaesthetic agents, and the unduly prolonged withholding of post-anaesthetic drinks"
In the intubated group, 38.2 percent developed a sore throat. Conway and others also noticed that there was a high incidence of sore throats when non-cuffed tubes were used (1960, pp. 219-223).

Hartsell and Stephen studied the incidence of postoperative sore throat on 500 patients. Four hundred cases had endotracheal intubation, and 100 were anesthetized by mask. The researchers excluded from their study the patients under 15 years of age and those who were undergoing operations about the head and neck. The subjects were interviewed 24 to 48 hours after surgery by a resident anesthesiologist. In analysis, the researcher used percentages, and the result was that 5.7 percent who were intubated complained about a sore throat. Hartsell and Stephen found that the sore throat developed almost twice as frequently in patients who had bucking episodes while the endotracheal tube was in place. Also they found that the incidence of sore throat was doubled when a nasogastric tube was employed (Hartsell and Stephen, 1964, pp. 307-312).

A survey of acute complications associated with endotracheal intubation was done by Jones and others. Four hundred and nine patients including 92 of whom were not intubated, were studied. A questionnaire was completed on each patient in the study. Primarily, the information which was given voluntarily by the patient was used, but if no information was volunteered, then a standard questionnaire was used. The researcher stated the result as follows: "Of the total number of patients studied, 190 (11.49 percent) volunteered the information, and 143 (34.96 percent) complained of a sore throat on direct questioning."
Various extraneous variables were considered in this study. However, statistical analysis was not clear because some of the variables overlapped (1968, pp. 23-31).

**Prevention and Treatment**

Despite the high incidence of sore throat, few researchers are concerned about the treatment. It is believed that the lesions heal quickly (Kambic and Radsel, 1978), and that the discomfort disappears within 48 to 72 hours without any specific therapy (Lewis and Swardlow, 1964; Blanc and Tremblay, 1974; Winkel and Knudsen, 1971). Lewis and Swardlow listed several ways to prevent sore throat. These included: using smooth surface tubes, avoiding coughing and bucking, fixing the tubes with adhesive plaster, avoiding unnecessary movement of the head during surgery, and using well-lubricated tubes (1964, pp. 505, 512). Blanc and Tremblay stated that humidity seems to benefit for the post-intubation sore throat (1974, p. 202). Jones and others said that the symptoms complained of seldom require anything other than palliative treatments (1968, p. 23). However, Hilding pointed out that even though the sore throat does not trouble the patient a great deal, any trauma is undesirable and very serious complications may result. The researcher stated, "Methods and equipment to mitigate it should be developed as soon as possible" (1971, p. 575).

No published documentation for specific treatment or nursing care for the postoperative sore throat was found. The heating compress has been used with success for sore throats caused by tonsillitis,
pharyngitis, and quinsy (Abbott, 1912; Wolf, 1922; Krusen, 1941; Moor and others, 1964). Therefore, for the purpose of this study, it was assumed that the heating compress would relieve postoperative sore throat following endotracheal intubation for anesthesia.

**Heating Compress**

A heating compress is a local application of hydrotherapy (Wolf, 1922; Krusen, 1941). Hydrotherapy is defined as "the use of water in any of its three forms, solid, liquid, or vapor, internally or externally, in the treatment of disease or trauma" (Moor and others, 1964, p. 2). Baruch stated that the skin and water are the chief elements of hydrotherapy (1920, p. 20). A review of the physiology of the skin and the physical properties of water will precede the review of heating compress.

**Sensory End Organs of the Skin**

Finnerty and Corbit stated, "The skin is the organ which is of main concern in water applications since it lies between the body and the environment" (1960, p. 5). Sensory end organs such as cold receptors, warm receptors, and pain receptors, are located in the skin. Sorensen and others stated that cold receptors are more superficial and eight to ten times more numerous than are the warm receptors (1979, p. 1146).

When the skin receptors are stimulated by heat, cold, or pain, they send impulses via the somatic afferent fibers in the spinothalamic tract. Then the impulses travel up the spinal cord through the tract to
the anterior hypothalamus. From there the impulses are transmitted to the cerebral cortex where the interpretation of the impulse occurs (Sorensen and others, 1979, p. 1146).

Circulation of the Skin

Cutaneous blood vessels are controlled by the sympathetic nerve impulses (Finnerty and Corbitt, 1960; Guyton, 1978). According to Guyton, the hypothalamus controls the blood flow through the skin in response to changes in body temperature. These changes in body temperature occur by the sympathetic vasoconstrictor mechanism and by the sympathetic vasodilator mechanism (1978, p. 300). When local heat is applied, the peripheral cutaneous arterioles dilate, and the application of cold results in constriction (Finnerty and Corbitt, 1960; Sorensen and others, 1979).

Also cutaneous vessels have a reservoir action (Guyton, 1978; Sorensen, 1979). Wakin and others stated that the blood vessels of the skin are able to hold one-fourth of the total blood volume; this increases or decreases in accordance with local and general needs (1959, p. 127).

Reaction of the Skin

When the body contacts a cold substance, vasoconstriction occurs, while moderate heat causes vasodilatation (Abbott, 1912; Sorensen, 1979). Abbott called this reaction the intrinsic effect (Abbott, 1912, p. 19). However, the body recognizes the cold as a depressing agent so that it starts to counteract or overbalance this anticipated
depressant action. The heart beat increases, circulation increases, and muscles are energized as a result. This series of alteration of body functions is called a reaction. This reaction is always the opposite of the intrinsic effect (Abbott, 1912, pp. 19-20). According to Abbott, each internal organ has reflex areas, which when stimulated cause the greatest change in the blood vessels of that organ. He said that the skin of the neck is reflexly related with the pharynx and larynx (1912, pp. 36, 38).

Abbott stated that the most interesting and beneficial results of hydrotherapy are due to reaction (1912, p. 21). Krusen stated that the beneficial effects of all general and some local cold applications are the result of reaction. He also quoted Nylin's words that "a good reaction is the alpha and omega in all cold-water applications" (1941, p. 472).

There are three phases of reaction. These are a thermic reaction, a circulatory reaction, and a nervous reaction (Abbott, 1912; Krusen, 1941). The clinical signs of reaction include the dilatation of the peripheral blood vessels, redness of the skin, warmth, relaxation, a slowing of the pulse rate, a decreased respiratory rate, and a fall of the internal temperature (Abbott, 1912; Krusen, 1941). However, in the case of an incomplete reaction, there will be dusky skin, goose-flush, chills or shivering, and cold feet or hands may result (Abbott, 1912, p. 22). The following factors influence the reaction: the method of application, the temperature of the water, the duration of the treatment, and the physical condition of the patient (Wolf, 1933; Krusen, 1941).
Physical Properties of Water

Krusen stated, "Water is a flexible therapeutic agent because it can be variously modified from the solid form (ice), to the liquid form, to the gaseous form (steam)" (1941, p. 460). Moor and others discussed the specific heat and the latent heat of water. Since water has high specific heat conductivity compared to other substances, water is considered to be a good conductor of heat. When water vaporizes, about 540 calories of heat are required for each gram of water. Because of this latent heat vaporization, the evaporation of water has a good cooling effect. When water changes its state from liquid to solid, it takes 80 calories of heat per gram. Because of this latent heat of fusion, ice has an effective cooling effect (Moor and others, 1964, pp. 2-3).

Several authors agreed that water has a higher heat conductivity than other liquids do (Abbott, 1912; Baruch, 1920; Wakim, 1959; Licht, 1964). According to Baruch, water conducts temperature twenty-seven times more rapidly than air does to objects with which they come into contact (1920, p. 24). This high specific and latent heat makes water very valuable as a curative agent (Abbott, 1912, p. 16).

Heating Compress

Evans and others defined a heating compress as "a cold compress so covered that warming up soon occurs. The effect is therefore that of a mild application of moist heat" (1923, p. 131). A heating compress is also called a warming compress, a wet compress, or a priessnitz compress (Wolf, 1933; Krusen, 1941; Finnerty and Corbitt, 1960). The effects and benefits of the heating compress are (1) to relax muscles, (2) to
relieve pain of sore throat or rheumatic joints, and (3) to relieve abdominal distress (Moor and others, 1964, p. 46). Compresses are named after the part of the body to which they are applied, for example, the throat, head, chest, joints, calf, etc. (Finnerty and Corbitt, 1960; Moor and others, 1964). In spite of many experiments, the physiological action has not been definitely established (Wolf, 1933, p. 100).

The literature review did not reveal a study documenting the effects of the heating compress. However, many authors recommended that it be used for a variety of clinical conditions. Hunter stated that slight ailments such as sore and ulcerated throats are easily removed by the application of the throat compress (1882, p. 152). Abbott stated that the heating compress causes a relaxation of the muscles and a vasodilatation of the vessels in the immediate area or in the reflex relation with the surface which is being treated. Furthermore, he said, "'the cold cloth around the neck' is a very common household remedy for sore throat, hoarseness, tonsillitis, etc. It is indeed a very sufficient measure, its usefulness can hardly be overestimated" (1912, pp. 184, 188).

Baruch stated that the chief objective of the heating compress is to cause a stimulation of the cutaneous nerve and vessels, and by subsequent warming of the damp linen to create a soothing vapor (1920, p. 25). Wolf said that the application of the wet compress brings an optimum in the temperature of the skin, the underlying tissues, and in the circulation, thus helping recovery (1933, p. 101). Krusen stated that the effect of the warming compress is that of "increasing
peripheral circulation and at the same time causing a depletion of blood in deeper tissues, thus overcoming venous congestion" (1941, p. 509).

Clinical Studies of Wet Dressing

No documentation of a study of the heating compress was found. However, there was an interesting study about using wet dressings in the dermatology field. The method of wet dressing is almost the same as that of the heating compress. Quinones and Winkelman investigated changes in skin temperature and blood flow when using open wet dressings and when using closed wet dressings. The open wet dressing consisted of using a gauze bandage saturated with solution and placed over or wrapped around the affected area. The closed wet dressing included using a dry cotton flannel covering over a saturated gauze bandage. Four subjects were studied each with a variation of techniques. The researcher applied the dressing on the subject's forearm. Temperatures were measured by placing thermistors on the anterior aspect of both arms, the lateral volar aspect of the forearms, and the dorsa of the hands. Blood flow in the forearm was measured over the greatest diameter of the forearms by using the Whitney mercury-in-rubber strain gauze technique.

The researcher used dry dressings on the forearm as a comparison. Both open and closed dry dressing caused an increase in temperature. According to them, the maximal increase using the closed dry dressing occurred at the end of two-and-a-half hours. At the time, the temperature was 2.15 degrees C higher than at the onset. Quinones and Winkelman found that the open wet dressing produced a cooling of the area, while closed wet dressings produced minor temperature variations.
Blood flow increased in the dry dressing subjects, but there was no significant difference among the open and wet dressing subjects. The researcher pointed out that some patients could not tolerate closed wet dressings, while they had no difficulty with the open wet dressing. The researcher assumed that it might be because of the increase in the skin temperature while using the closed wet dressing (1967, pp. 708-711).

The heating compress is almost similar to the closed wet dressing in Quinones' study. Therefore the results of their study support the idea that the wet compress will be warmed by body heat and tend to be like a heating compress.

**Summary**

The review of literature has discussed the history of endotracheal intubation, the complications of endotracheal intubation, and the various factors contributing to the sore throat following endotracheal intubation. Four clinical studies related to the postoperative sore throat were presented prior to the discussion of prevention and treatment. Finally, the theory and the physical benefits of the heating compress were discussed. The literature review revealed that many authors support the effectiveness of the heating compress for sore throats even though physiological action has not been definitely established.
RESEARCH METHODS

Overview

The purpose of this study was to investigate the effects of a heating compress to relieve self-reported sore throat of postoperative patients following endotracheal intubation for anesthesia. A pretest-posttest quasi-experimental research design was implemented in the study. Subjects were divided randomly into the experimental group and the control group by a coin toss. The degree of sore throat of both groups was assessed by using the Simple Descriptive Scale (Appendix M). The experimental group received the heating compress, and the effectiveness of the treatment was evaluated by using the Simple Descriptive Scale and comparing the findings with that of the control group.

Variables

Independent Variable

The independent variable was the heating compress.

Dependent Variable

The dependent variable was a sore throat, which included the subject's report of a painful throat, pain upon swallowing, and a scratchy feeling in the throat.
Classificatory Variables

Classificatory variables included: age, sex, smoking habits, the degree of difficulty of intubation, the presence of the nasogastric tube, the type of surgery, the position of the patient during surgery, and the duration the endotracheal tube was in place.

Selection of Subjects

The sample was a convenience sample and randomization was partially used. The subjects were drawn from patients admitted to a university hospital in San Bernardino County, California, and these subjects were scheduled for general surgery under anesthesia with endotracheal intubation.

Admission to the Study

Subjects were contacted two to twenty-four hours preoperatively between 7 a.m. and 10 a.m. The researcher checked each day's surgery schedule to identify possible subjects who would meet the criteria. Those who met the criteria were assigned to the experimental or the control group by the flip of a coin: if "heads" came up, the first subject was assigned to the experimental group; if "tails" came up, the first subject was assigned to the control group. The coin flip came up "heads" so the first subject was assigned to the experimental group. The following subjects were assigned alternatively to the experimental and control groups. To indicate each subject's assignment, the letter E (for experimental) or C (for control) was marked on the surgery schedule. After this randomization, the researcher checked the
patients' charts to assess the other criteria. An initial screening interview for admission to the study was conducted. The screening interview form is in Appendix K.

A verbal explanation of the study was given to each subject (Appendix H). The participant was asked to read and sign a consent form, and a copy was given to him. A different consent form was used for the experimental group and the control group. Copies of the consent forms appear in Appendix I. Each patient's physician was located before research was started. A verbal explanation of the study was given and a physician consent form was signed. A copy of the physician consent form is in Appendix J.

Sample Criteria and Rationale

The criteria for the selection of the participants in the study and the rationale is discussed below. These included: age, sites of surgery, upper respiratory infection, sore throat, allergies, duration of intubation, analgesia, and the patient's mental condition.

Age

The age group studied included those who were twenty to fifty-nine years of age. Jones and others stated that a significant perceptual change that occurs with aging is a reduction in pain sensation (1978, p. 79). Another factor affected by age is the number of the glomus bodies in the dermis. The glomi function to regulate heat loss and to conserve body heat. However, glomus units decrease and become atrophied with age. This causes the elderly to experience a feeling of
chilliness (Finnerty and Corbitt, 1960, p. 10). Since the heating compress is an application of a cold wet cloth around the neck, the elderly person most likely would not react to the cold effectively. Therefore, subjects over 60 years of age were not included.

Site of Surgery

The participants who had eye, ear, nose, oral, and neck surgery were not included in this study. In these cases, it would be difficult to apply a heating compress because of the dressing on the operative wound. It would be difficult also to distinguish between a sore throat and the incisional pain in these cases.

Upper Respiratory Infection

The participants who had upper respiratory infection preoperatively were eliminated from this study. Upper respiratory infection causes sore throat and other signs and symptoms which require systemic treatment.

Sore Throat

Subjects who reported any degree of sore throat preoperatively were excluded from the study because it was hard to distinguish a sore throat due to intubation from a sore throat due to other reasons.

Allergy

Subjects who were allergic to wool were not included in this study because a part-wool flannel cloth was applied to the neck as a cover for the dampened cotton cloth.
Duration of Intubation

Subjects who had had the endotracheal tube for more than four hours after the operation was over were excluded from the study. Donnelly stated that total damage and laryngeal ulceration in the intubated larynx and trachea were statistically related to the duration of intubation (1969, p. 511). Therefore, prolonged intubation tends to cause more serious problems other than the simple sore throat, and it requires close observation.

Analgesia

Subjects who received analgesia during the time period of a half hour to three hours prior to the post-extubation interview were not included in the study. It was assumed that the analgesia affected not only the surgical pain but the pain of the sore throat as well.

Mental Condition

Subjects had to demonstrate alertness and orientation at the time of interview. Therefore, they were able to answer whether they had sore throat or not.

Description of the Setting

The subjects were selected from those scheduled for surgery on a regular basis. The researcher checked the surgery schedule and the subject's chart to determine eligibility for the study. A screening interview for admission to the study was conducted.
The selected agency was a 500-bed acute care medical facility located in San Bernardino County, California. It has a large teaching program which provides clinical experiences for students of nursing, medicine, dentistry, anesthesia, nutrition, respiratory therapy, physical therapy, and other health related fields.

The department of anesthesia of the selected agency uses large volume-low pressure endotracheal tubes made by National Catheter Co. They do not routinely use a lubricant. Some anesthetists use 5 percent xylocaine ointment, and some are not using any lubricant for intubation. Also some use 4 percent xylocaine spray prior to intubation, but some are not using anything.

Permission to collect data was obtained from the Nursing Ethics in Student Research Committee (Appendix A). A letter was sent to the Vice President for Nursing Service of the selected hospital, to the Director of Surgical Nursing Department, and to the Director of the Critical Care Nursing Department. Copies of these letters can be seen in Appendices B, C, and D. The researcher explained the study to all the head nurses in the Surgical Nursing Department and to the Medical-Surgical Intensive Care Unit head nurse. Data collection was begun in August, 1981, and extended through November of the same year.

**Pilot Study**

A pilot study was conducted to minimize the possibility of difficulties in the major study. The objectives for the pilot study included: identifying problems with the design and data collection
sheet, familiarizing the investigator with the process and application of the treatment, and assessing the feasibility of the project. Twelve participants, which included six in the experimental group and six in the control group, were observed during the two weeks of the pilot study.

As a result of the pilot study, one change was made in the data collection procedure. Originally the plan was made to visit the participants between three hours to twelve hours after extubation. However, it was found that this was not feasible for the following reasons: (1) There was a trend for the subjects to complain about the sore throat more than six hours after extubation. (2) Postoperative patients receive pain medication more frequently in the post-anesthesia room than when being back on the unit. This fact made it unfeasible to interview the patients within several hours of the postoperative period. (3) Several operations were scheduled in the afternoon. It was impossible to interview these patients before 10 p.m., and the twelve hours time period elapsed before 7 a.m. Therefore, the time for the first post-extubation interview was changed so that it was conducted six to eighteen hours after extubation. All other data-gathering processes were carried out smoothly during the pilot study.

Data Collection

Preoperatively, subjects who met the criteria were visited by the researcher. The initial screening interview for admission to the study was conducted. Postoperatively, the subject's anesthesia record
was checked to collect the information according to the Data Collection Sheet (Appendix K). These data included: type of surgery, primary anesthesia agent, posture during surgery, pathway of intubation, difficulty of intubation, experience of nasogastric tube, and duration of time the endotracheal tube was in place. Subjects who experienced endotracheal intubation were interviewed by the researcher six to eighteen hours after extubation. If the experimental group subject reported a sore throat, the heating compress was applied.

If the subjects in the control group reported a sore throat, the treatment was not given. Both the experimental and control groups were interviewed once again 48 to 60 hours after extubation. All interviews were carried out by using the Data Collection Tool. Subjects who received analgesia from thirty minutes to three hours prior to the first and second post-extubation interview were excluded from this study because the analgesic medication masked the sore throat.

Data Analysis

Frequency distributions, means, and standard deviations were determined for the classificatory variables. Relationships between the classificatory variables and the presence or absence of sore throat were checked using chi-square tests. For the experimental group versus the control group a comparison of the degree of soreness and change in soreness level was done by using chi-square. Details of the analysis are discussed in Chapter 4.
Methodological Assumptions and Limitations

Methodological Assumptions

The methodological assumptions for this study were as follows: (1) Direct questions would give a higher incidence of complaints than if the obtained complaints were volunteered spontaneously. (2) When the subject had recovered from anesthesia, he would be able to answer whether he had a sore throat or not, according to the Simple Descriptive Scale. (3) Respondents would be honest, and most people undoubtedly would try to cooperate fully.

Methodological Limitations

The limitations that may have affected the results of the research include: (1) the small sample size for each of the two groups, (2) the uncontrolled extraneous variables, and (3) the unavailability of appropriate tools to measure sore throat and to measure the effectiveness of the heating compress. The measurement depended on structured observation, interview, and the Simple Descriptive Scale.

Summary

In this chapter the methodology of the research was presented. The independent, dependent, and classificatory variables were stated. The criteria for the selection of the subjects, the research tool, the pilot study, the data collection procedure, the analysis and methodological assumptions, and the limitations of the study were discussed.
Chapter 4

PRESENTATION OF RESEARCH DATA

The purpose of this chapter is to present the data obtained from the study. The relationship between sore throat and classificatory variables which include sex, age, smoking habits, nasogastric tube, and operation site will be discussed concerning the 74 subjects who completed the first post-extubation interview. Demographic data will be presented for 28 subjects who completed the study. Finally, data analysis related to the hypothesis and the interpretation will be discussed.

Research Study Findings

Ninety-nine subjects were admitted to the study; 25 subjects were discontinued from the study at the time of the first post-extubation interview. Of these 25, 8 received pain medication and the limitation of the time elapsed, 6 received anesthesia by mask, 4 had endotracheal intubation tube in place more than four hours after their surgery was completed, and 7 presented other reasons. Seventy-four subjects completed the first post-extubation interview. Thirty-four of 74 who did not experience sore throat were discontinued from the study. Further, 12 of 40 discontinued the study prior to the second post-extubation interview. Five subjects were discharged, 3 received pain medication, 2 refused the heating compress, and 2 presented other reasons (Appendix N). Originally, there were to be 20 subjects in each
group. However, it was difficult to find subjects who met the criteria for the study. Twenty-eight subjects, which included 13 in the experimental group and 15 in the control group completed the study. A paradigm demonstrating admission of subjects to the study with subsequent participation can be seen in Appendix N.

Sore Throat and Classificatory Variables

The first post-extubation interview was completed on 74 subjects. Of these, 40 (54.1 percent) subjects complained of a sore throat and 34 (45.9 percent) subjects did not report a sore throat. Thirteen (18 percent) of 74 subjects complained of hoarseness. The degree of severity of the sore throat is shown in Table 1.

Table 1

<p>| Degree of Severity of Sore Throat as Reported by the Combined Experimental and Control Groups |
|-------------------------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|</p>
<table>
<thead>
<tr>
<th>No.</th>
<th>%</th>
<th>No.</th>
<th>%</th>
<th>No.</th>
<th>%</th>
<th>No.</th>
<th>%</th>
<th>No.</th>
<th>%</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>34</td>
<td>45.9</td>
<td>20</td>
<td>27.0</td>
<td>15</td>
<td>20.3</td>
<td>4</td>
<td>5.4</td>
<td>1</td>
<td>1.4</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Sore throat and sex difference. Women reported a greater incidence of sore throat than men. As Table 2 shows, there was a significant difference between the sexes. The results were similar to other studies. Gard and Cruickshank reported that in a series of 450 cases, they found a higher incidence of sore throat in women (56 percent) as compared to men (33 percent) (1961, p. 664). McKenzie and
others stated that the male tracheal circumference was significantly greater than that of the female when each was spontaneously breathing (1980, p. S414). This anatomical fact may contribute to the decreased incidence of sore throat reported by males.

Table 2
Incidence of Postoperative Sore Throat According to Sex

<table>
<thead>
<tr>
<th></th>
<th>Sore Throat</th>
<th>Nonsore Throat</th>
<th>Total No.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Male</td>
<td>13</td>
<td>38.2</td>
<td>21</td>
</tr>
<tr>
<td>Female</td>
<td>27</td>
<td>67.5</td>
<td>13</td>
</tr>
<tr>
<td>Totals</td>
<td>40</td>
<td>67.5</td>
<td>34</td>
</tr>
</tbody>
</table>

\[ x^2 = 6.34 \quad p = 0.0118 \]

Sore throat and age difference. The age was similarly distributed in both groups of subjects who reported a sore throat and those who did not experience a sore throat. The age factor was not significantly related to the postoperative sore throat following endotracheal intubation for anesthesia in this study.

Sore throat and smoking habits. Few smokers were among the subjects of this study. As Table 3 shows, 51 of 74 subjects were nonsmokers. No significant relationships were detected between the postoperative sore throat and smoking habits of the subjects in the study.
Table 3
The Relationship Between the Smoking Habits and the Incidence of Postoperative Sore Throat

<table>
<thead>
<tr>
<th>Amount</th>
<th>Sore Throat No.</th>
<th>Sore Throat %</th>
<th>Nonsore Throat No.</th>
<th>Nonsore Throat %</th>
<th>Total No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>28</td>
<td>54.9</td>
<td>23</td>
<td>45.1</td>
<td>51</td>
</tr>
<tr>
<td>Less than ¼ pkg.</td>
<td>3</td>
<td>37.5</td>
<td>5</td>
<td>62.5</td>
<td>8</td>
</tr>
<tr>
<td>¼ - 1 pkg.</td>
<td>7</td>
<td>58.3</td>
<td>5</td>
<td>41.7</td>
<td>12</td>
</tr>
<tr>
<td>More than 1½ pkg.</td>
<td>2</td>
<td>66.7</td>
<td>1</td>
<td>33.3</td>
<td>3</td>
</tr>
<tr>
<td>Totals</td>
<td>40</td>
<td></td>
<td>34</td>
<td></td>
<td>74</td>
</tr>
</tbody>
</table>

\[ x^2 = 1.18 \quad p = 0.76 \]

Sore throat and the nasogastric tube. Thirteen of 15 subjects had a nasogastric tube during surgery reported a sore throat. Table 4 shows that there was a significant relationship between the incidence of sore throat and the use of a nasogastric tube. This finding was

Table 4
The Relationship Between the Use of Nasogastric Tube and the Incidence of Postoperative Sore Throat

<table>
<thead>
<tr>
<th>NG Tube</th>
<th>Sore Throat No.</th>
<th>Sore Throat %</th>
<th>Nonsore Throat No.</th>
<th>Nonsore Throat %</th>
<th>Total No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>13</td>
<td>86.7</td>
<td>2</td>
<td>13.5</td>
<td>15</td>
</tr>
<tr>
<td>No</td>
<td>27</td>
<td>45.8</td>
<td>32</td>
<td>54.2</td>
<td>59</td>
</tr>
<tr>
<td>Totals</td>
<td>40</td>
<td></td>
<td>34</td>
<td></td>
<td>74</td>
</tr>
</tbody>
</table>

\[ x^2 = 8.06 \quad p = 0.0045 \]
supported by several other studies. Hartsell and Stephen reported in their study of 500 cases that the incidence of sore throat was doubled when a nasogastric tube was employed (1964, p. 310). Cronin and others reported that 32 percent of 55 subjects who had a nasogastric tube stated that it was very unpleasant and they would be "very upset" if they had to go through this again (1973, p. 880).

Sore throat and operation site. Thirty-two (43 percent) of 74 subjects had surgery of one or more extremities; 21 (28.4 percent) had abdominal surgery; and 21 (28.4 percent) had surgery of varying sites such as the breast, spine, or genito-urinary areas. The site and type of surgery was significantly related to the postoperative sore throat as presented in Table 5.

Table 5

<table>
<thead>
<tr>
<th>Operation Site</th>
<th>Sore Throat No.</th>
<th>Sore Throat %</th>
<th>Nonsore Throat No.</th>
<th>Nonsore Throat %</th>
<th>Total No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal</td>
<td>17</td>
<td>81.0</td>
<td>4</td>
<td>19.0</td>
<td>21</td>
</tr>
<tr>
<td>Extremity</td>
<td>8</td>
<td>25.0</td>
<td>24</td>
<td>75.0</td>
<td>32</td>
</tr>
<tr>
<td>Others</td>
<td>15</td>
<td>71.4</td>
<td>6</td>
<td>28.6</td>
<td>21</td>
</tr>
<tr>
<td>Totals</td>
<td>40</td>
<td>34</td>
<td>74</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$x^2 = 19.5 \quad p = 0.0013$

Wylie and Churchill-Davidson discussed the sore throat and stated, "It can be quite severe, and symptomatically sufficient to
upset the patient particularly when the operation procedure is elsewhere on the body and of a relatively minor type" (1972, p. 369). In the present study, subjects who had abdominal surgery experienced a greater incidence of sore throat than subjects who had extremity surgery. This high incidence of sore throat with abdominal surgery might be related to other factors, such as the length of time of surgery with nasogastric tube insertion as well as endotracheal intubation.

**Demographic Data**

An overview of the demographic data of 28 subjects who completed the study is seen in Tables 6 and 7 in Appendix 0. Summarized data of the experimental group and the control group are presented in Table 8.

The ratio of males and females in both the experimental group and control group were similar. There were no significant differences found between the two groups in the site of surgery or in the number of subjects who had the nasogastric tube. The mean and standard deviation of the duration of time in which the endotracheal tube was in place are presented in Table 8. There were no statistically significant differences in the length of time of intubation between the two groups.

**Hypothesis**

The null hypothesis stated that a heating compress to the throat would have no significant (alpha = 0.05) effect on the reduction
Table 8
Summarized Data of Experimental and Control Groups
According to Sex, Operation Site, Presence of NG Tube, and Duration of Time the Endotracheal Tube in Place

<table>
<thead>
<tr>
<th></th>
<th>Experimental (N = 13)</th>
<th>Control (N = 15)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Sex:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>4</td>
<td>30.7</td>
</tr>
<tr>
<td>Female</td>
<td>9</td>
<td>69.2</td>
</tr>
<tr>
<td>Operation Site:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abdominal</td>
<td>5</td>
<td>38.5</td>
</tr>
<tr>
<td>Extremity</td>
<td>2</td>
<td>15.4</td>
</tr>
<tr>
<td>Others</td>
<td>6</td>
<td>46.2</td>
</tr>
<tr>
<td>NG Tube:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>3</td>
<td>23.1</td>
</tr>
<tr>
<td>No</td>
<td>10</td>
<td>76.9</td>
</tr>
<tr>
<td>Duration of Endotracheal Tube in Place</td>
<td>Mean</td>
<td>3.42 hours</td>
</tr>
<tr>
<td></td>
<td>*S.D.</td>
<td>3.30</td>
</tr>
</tbody>
</table>

*S.D. = Standard Deviation
of self-reported postoperative sore throat following endotracheal intubation for anesthesia.

The degree of severity of sore throat at the first post-extubation interview and second interview is shown in Tables 9 and 10. At the first post-extubation interview, 6 (46.2 percent) of the 15 subjects complained of a mild sore throat, 5 (33.3 percent) had a moderate sore throat, and one experienced quite a lot of a sore throat. Statistical analysis showed that there was no significant difference in the severity of the sore throat between the two groups at the first post-extubation interview (p > 0.25).

At the time of the second post-extubation interview, the experimental group had been receiving the heating compress to the throat while the control group had no treatment. In the experimental group, 10 (76.9 percent) subjects reported no sore throat, and 3 (23.1 percent) said they still had a mild sore throat at that time. In the control group, 7 (46.7 percent) had no sore throat, 5 (33.3 percent) had a mild sore throat, one had a moderate sore throat, and 2 (13.3 percent) reported they had a very bad sore throat at that time. Statistical analysis showed that there was no significant difference in the severity of sore throat between the two groups (p > 0.25). The null hypothesis was accepted.

Table 11 reveals a trend for the experimental group who received the heating compress to have a less severe sore throat than the control group had. Severity of sore throat was measured by the Simple Descriptive Scale (Appendix M). The direction of movement of the
Table 9
Degree of Severity of Sore Throat at the First Post-Extubation Interview of the Experimental Group and the Control Group*

<table>
<thead>
<tr>
<th>Degree of Sore Throat</th>
<th>Experimental No.</th>
<th>%</th>
<th>Control No.</th>
<th>%</th>
<th>Total No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>0</td>
<td></td>
<td>0</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>Mild</td>
<td>6</td>
<td>46.2</td>
<td>9</td>
<td>60.0</td>
<td>15</td>
</tr>
<tr>
<td>Moderate</td>
<td>7</td>
<td>53.8</td>
<td>5</td>
<td>33.3</td>
<td>12</td>
</tr>
<tr>
<td>Quite a Lot</td>
<td>1</td>
<td>6.7</td>
<td>1</td>
<td>6.7</td>
<td>1</td>
</tr>
<tr>
<td>Very Bad</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unbearable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>13</strong></td>
<td></td>
<td><strong>15</strong></td>
<td></td>
<td><strong>28</strong></td>
</tr>
</tbody>
</table>

\[ x^2 = 3.5 \quad p > 0.25 \]

*Interview done 6-18 hours post-extubation.
Table 10
Degree of Severity of Sore Throat at the Second Post-Extubation Interview of the Experimental Group and the Control Group*

<table>
<thead>
<tr>
<th>Degree of Sore Throat</th>
<th>Experimental No.</th>
<th>%</th>
<th>Control No.</th>
<th>%</th>
<th>Total No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>10</td>
<td>76.9</td>
<td>7</td>
<td>46.7</td>
<td>17</td>
</tr>
<tr>
<td>Mild</td>
<td>3</td>
<td>23.1</td>
<td>5</td>
<td>33.3</td>
<td>8</td>
</tr>
<tr>
<td>Moderate</td>
<td>1</td>
<td>6.7</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Quite a Lot</td>
<td>0</td>
<td></td>
<td>0</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Very Bad</td>
<td>2</td>
<td>13.3</td>
<td>2</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Unbearable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>13</td>
<td></td>
<td>15</td>
<td></td>
<td>28</td>
</tr>
</tbody>
</table>

$x^2 = 3.5 \quad p > 0.25$

*Interview done 48-60 hours post-extubation.
severity of sore throat from the first to second post-extubation interview was compared. One unit better or worse meant that the degree of sore throat moved one number; that is, it either decreased or increased as measured by the ordinal scales in questions 21 and 31 (Appendix K). For example, mild to none or moderate to mild or vice versa would be one unit of change. Two units better or worse meant that the degree of sore throat moved two numbers; that is, it either decreased or increased by the scale. In the experimental group, 11 (85 percent) of the subjects reported a decreased sore throat, while 10 (67 percent) of the subjects in the control group reported a decreased sore throat. None of the experimental group reported increased severity of sore throat after the treatment, but 3 (20 percent) of the control group reported at the time of the second post-extubation interview that the degree of severity of sore throat had increased.

Table 11
Change in Degree of Severity of Sore Throat Between the First and Second Post-Extubation Interview

<table>
<thead>
<tr>
<th></th>
<th>Experimental (N = 13)</th>
<th>Control (N = 15)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Better + 2 units</td>
<td>6</td>
<td>46.2</td>
</tr>
<tr>
<td>Better + 1</td>
<td>5</td>
<td>38.5</td>
</tr>
<tr>
<td>Same</td>
<td>2</td>
<td>15.3</td>
</tr>
<tr>
<td>Worse</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>13</td>
<td></td>
</tr>
</tbody>
</table>
Interpretation of Findings

The study revealed that sore throat following endotracheal intubation for anesthesia was significantly related to the subject's sex, the presence of nasogastric tube, and the site of operation. Statistical analysis revealed that a heating compress to the throat was not statistically significant in the relief of sore throat following endotracheal intubation for anesthesia. However, several subjects who received the heating compress reported decreased sore throat after the treatment.

Discussion of Findings

The incidence of postoperative sore throat following endotracheal intubation for anesthesia was 54.1 percent in the study. This data was obtained by direct questioning of the subjects. According to Riding, directly questioning the subjects elicits a higher incidence of complaints than would occur spontaneously (1975, p. 93). Gard and Cruickshank found that 44 percent of the patients complained about a sore throat upon direct questioning (1961). The present findings are similar to previous findings as reported in the literature.

Five classificatory variables which included sex, age, smoking habits, presence of nasogastric tube, and site of operation were studied to see if there was a relationship to the incidence of sore throat. Age and smoking habits were not significantly related to the incidence of postoperative sore throat. As was previously discussed, sex difference, the presence of nasogastric tube, and the site of
operation were significantly related to the incidence of postoperative sore throat. Besides these variables, endotracheal tube cuffs, lubricants, and nitrous oxide gas diffusion to the tracheal tube cuffs may be related to the incidence of sore throat of the present study. These factors were discussed in Chapter 2.

The null hypothesis stated that the heating compress to the throat would have no significant \( (\alpha = 0.05) \) effect on the reduction of self-reported post-operative sore throat following endotracheal intubation for anesthesia. The result was \( p > 0.25 \). Thus the null hypothesis was accepted.

The sample was a convenience sample which was randomized into the experimental and the control groups. There was a high rate of discontinuance of the study as discussed in the beginning of this chapter. Only 28 subjects completed the study. The results, therefore, cannot be generalized beyond the subjects included in the study.

**Summary**

Chapter 4 presented the findings of the incidence of postoperative sore throat following endotracheal intubation for anesthesia, the relationship of the sore throat to classificatory variables, and the results of statistical analysis. Statistical analysis revealed that the heating compress had no significant effect upon the reduction of postoperative sore throat. However, there was a trend toward a decrease in the severity of the sore throat in the experimental group as compared to that of the control group.
Chapter 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Chapter 5 will present a summary of the study, the conclusions drawn, the implications for nursing, and the researcher's recommendations for further study.

Summary

Sore throat is a common sequelae of endotracheal intubation for anesthesia. It is sufficient to upset patients and increase postoperative anxiety. Despite the high incidence of sore throat following endotracheal intubation, there is little in the literature which shows concern for the treatment and care of this commonly occurring problem. The purpose of this research study was to determine the effects of a heating compress to relieve the self-reported postoperative sore throat, following endotracheal intubation for anesthesia.

A review of the literature focused on factors contributing to sore throat following endotracheal intubation and the underlying theory of the heating compress. No research studies were found in the literature which utilized the heating compress for the relief of sore throat, although several authors recommend it for treating sore throat.

A pretest-posttest quasi-experimental research design was used in the study. Sample was a convenience sample which randomized into experimental and control groups. Ninety-nine subjects were admitted to the study. Of these, 25 subjects discontinued at the first post-extuba-
tion interview. The classificatory variables were discussed with the 74 subjects who completed the first post-extubation interview. Data analysis showed that three of the classificatory variables including sex difference, use of the nasogastric tube, and site of operation were significantly related to the postoperative sore throat following endotracheal intubation. Of the 74 subjects who completed the first post-extubation interview, only 28 completed the study. The null hypothesis was tested with these 28 subjects which included 13 experimental group subjects and 15 control group subjects. The test results revealed that the heating compress did not have a significant effect on the reduction of the self-reported postoperative sore throat following endotracheal intubation for anesthesia (p > 0.25). Therefore the null hypothesis was accepted.

Conclusions

Statistical analysis resulted in the acceptance of the null hypothesis. However, the data for change in the degree of the severity of the sore throat between the first and second post-extubation interview showed a trend toward a decrease of the reported sore throat in the experimental group. Three of the 15 subjects in the control group reported an increased severity of sore throat at the second post-extubation interview. Since the sample size was small, further study seems necessary in order to find out the effectiveness of the heating compress.
Implications for Nursing

In the study, 40 of 74 subjects reported the experience of a postoperative sore throat. Of these, 20 said that they experienced moderate or quite a lot of sore throat. Nurses usually seem unaware and unimpressed with the postoperative sore throat, because it has been considered as a very common minor complication. Cronin and others stated that over half the total number (100) of patients had some degree of a sore throat. Of these, 6 subjects reported that the sore throat was the worst part of their procedure (1973, p. 884). These facts make it reasonable to expect that nurses would be concerned with the relief of this common complaint.

The present study showed that the heating compress tends to reduce postoperative sore throat. Several subjects in the experimental group stated that the heating compress was comfortable because it kept their neck warm. One subject said that he would like to have the treatment in the future, too, because he would be having several more surgeries to repair his injuries. A female subject stated that the heating compress relieved her sore throat. She added, "I like it because it is a natural treatment, and it does no harm to the body."

Pain, regardless of its sources, increases the patient's anxiety. Sore throat, a common sequelae of endotracheal intubation, upsets the patient and increases postoperative anxiety. A heating compress is a simple treatment, inexpensive, and easily applied. Nurses may use this simple treatment for postoperative patients for
their comfort and for the relief of the pain of this commonly occurring condition.

**Recommendations for Further Study**

It is recommended that a similar study be conducted but with some changes. These changes could include: an increase in group sample size, a change in the fabric of the compress, a shortening of the duration of treatment, an expanding of the age limits, an expanding of the limits of duration of endotracheal intubation, and including subjects who have a diagnostic procedure involving intubation.

The sample size was small in the present study. The results, therefore, cannot be generalized. Further study is necessary with a greater number of subjects.

It was hard to find part-wool flannel cloth. The material could be changed to 100 percent wool which is soft to the touch or to a wool-polyester combination. Wool socks or wool knit might also be suitable.

In the present study the compress was applied to the subject's neck for eight to ten hours. The compress appeared to dry within six hours. Two subjects who received the heating compress commented that they felt more comfortable and warm while the compress was moist. Therefore, the duration of treatment might be shortened from the eight to ten hours to six hours.

The aged person could be included in future study. Because of the increasing numbers of the older population, there are many older
patients who have surgery. Several nurses reported to the researcher that the older patients complained of a sore throat and that they wanted to have the treatment.

The subjects who had prolonged intubation might be included in future studies in order to compare the effectiveness of the heating compress to the sore throat with that of the length of duration of intubation. At least one study showed that there was a direct relationship between the length of time an endotracheal tube is in position and the degree of laryngeal and tracheal injury (McGovern and others, 1971, p. 562).

Subjects who have gastroscopy, laryngoscopy or bronchoscopy could be studied to find out if the heating compress will relieve sore throat following these procedures. It is common for such patients to complain of discomfort of the throat after these procedures. Since the incidence of these diagnostic procedures is increasing, nurses could recommend and teach the client to apply the simple heating compress to relieve throat discomfort and pain.

It is hoped that these recommendations may be of assistance to nurses in generating ideas for continued and improved research. Research or experimentation related to the clinical study of nursing might be helpful in establishing nursing diagnosis and in improving the quality of patient care.
BIBLIOGRAPHY


APPENDIX A

PERMISSION TO CONDUCT THE STUDY FROM THE ETHICS IN STUDENT RESEARCH COMMITTEE
Dear Takiko:

The Ethics in Student Research Committee has reviewed the proposal you submitted for a research study in partial fulfillment of the requirements for a Master of Science degree from Loma Linda University.

The committee has voted your study is:

- Approved as submitted in the specified setting for one year.
- Approved as submitted with the attached recommendations in the specified setting for one year. Please return memo to this effect for your file, signed by your research chairman.
- Not approved as submitted to the committee. See the attached comments for recommended changes.
- Must be resubmitted prior to any data collection.
- Deferred to: UCOHS Major Advisor Advisor
  Research Advisor Other
- Please see attached comments regarding this action.

Please contact the Chairman of the Ethics in Student Research Committee if you have questions related to the decision of the Committee. If any changes are made in the hypothesis, setting, sample, tool, consent form, or the procedure for data collection, or if data collection extends beyond one year, this proposal must be resubmitted to the Ethics Committee.

We pray that the Lord will continue to bless your endeavors.

Sincerely,

Penny Miller, Chairman
Ethics in Student Research Committee

PM: jd
xc: Research Advisor - F. Fickess
RECOMMENDATIONS AND/OR COMMENTS

1. The length of time the compress is to be left in place should be placed in the consent form.

2. Differentiate between Cepacol in the admission pack and that ordered by the physician postoperatively. It is suggested that subjects whose physicians order the Cepacol postoperative for sore throat be deleted from the study. Since all patients receive Cepacol as part of the admission pack, they would ordinarily use it only for oral hygiene; therefore, its use should not interfere with the study.

3. Develop a tool to admit subjects to the study, or include criteria for admission to the study in the developed tool.

4. Delete subjects with allergies to wool. (Ask subjects about this, place a statement in the consent that they are not allergic to wool.)

5. Put physician's signature at the bottom of consent with the others.

6. See Consent Form (Exp) No. 4 and Consent Form No. 3. Edit these statements so that they do not promise unknown benefits of the study. (The statement on the Control Consent seemed best.)

7. Look at the methodology for admission to the study. The committee suggests that a table or random numbers be used to determine the date to start collecting, and that subjects be admitted alternately to the experimental and control groups after that point. Patient numbers will not need to be used. P. McElmurry informed the committee that the medical center has added two numbers to patient numbers which signify the number of admissions the client has had—and which could influence admissions to the study the way it had been planned.

8. Page 4 of proposal: paragraph 4, line 8 - Edit the phrase "soreness of the breathing tube" to read, "soreness of the throat after the breathing tube is removed."

APPENDIX B

LETTER TO FACILITY REQUESTING PERMISSION TO CONDUCT STUDY
Gertrude Haussler, Vice President  
Loma Linda University Medical Center  
Loma Linda, CA 92354  

July 7, 1981

Dear Miss Haussler:

As a graduate student in nursing, I am investigating the effects of a heating compress upon self-reported sore throat of selected clients who have had endotracheal anesthesia. This study entitled "Effects of Heating Compress on Self-Reported Sore Throat Following Intubation for Endotracheal Anesthesia" is for partial fulfillment of the requirements for a master's degree in nursing at Loma Linda University. I am requesting permission to study patients and their records at the Loma Linda University Medical Center. My research advisor, Frances L. Fickess, has approved the research proposal. I also have approval from the graduate student research subcommittee of the University Committee on Human Studies.

The proposed research will be quasi-experimental. Within twelve hours following surgery, subjects will be interviewed by the investigator to determine the presence of sore throat. If an experimental subject reports sore throat, he will receive the heating compress twice. The heating compress is a cotton cloth soaked in tap water, wrung out, and applied to the subject's neck. It is covered with a part-wool flannel cloth to prevent circulation of air and is left in place eight to ten hours for accumulation of body heat. The subject who receives Viscus Xylocaine or Cetacaine Spray will be discontinued in the study. There will be no risk resulting to the subjects from the heating compress. The signatures of all subjects' primary physicians, the Director of the Surgical Nursing Department, and of the head nurses on all surgical units will be obtained. Confidentiality of the subjects' responses and the right to withdraw from the study without prejudice will be assured for each subject.

With your permission, I would like to begin data collection during the third week in July. Data collection will be completed within three or four months. I will be happy to make an appointment with you to discuss the study further if you so desire and to share the findings of the study after its completion.

Space has been provided on the attached letter from the graduate program...
Miss Gertrude Haussler  
-2-  
July 7, 1981

for your reply. A stamped self-addressed envelope is enclosed for your convenience.

Thank you for your assistance.

Sincerely,

Takiko Nemoto, R.N.  
Graduate Program in Nursing  
Loma Linda University

xc: Frances L. Fickess, Research Chairman (Advisor)  
    Clarice Woodward, Clinical Agency Coordinator
APPENDIX C

LETTER TO SURGICAL NURSING DEPARTMENT REQUESTING PERMISSION TO CONDUCT STUDY
Elsie McLellan  
Director of Surgical Nursing Department  
Loma Linda University Medical Center  
Loma Linda, CA 92354  

July 14, 1981

Dear Ms. McLellan:

As a graduate student in nursing, I am investigating the effects of a heating compress upon self-reported sore throat of selected clients who have had endotracheal anesthesia. This study entitled "Effects of Heating Compress on Self-Reported Sore Throat Following Intubation for Endotracheal Anesthesia" is for partial fulfillment of the requirements for a master's degree in nursing at Loma Linda University. I am requesting permission to study patients and their records at the Loma Linda University Medical Center. My research advisor, Frances L. Pickett, has approved the research proposal. I also have approval from the graduate student research subcommittee of the University Committee on Human Studies.

The proposed research will be quasi-experimental. Within twelve hours following surgery, subjects will be interviewed by the investigator to determine the presence of sore throat. If an experimental subject reports sore throat, he will receive the heating compress twice. The heating compress is a cotton cloth soaked in tap water, wrung out, and applied to the subject's neck. It is covered with a part-wool flannel cloth to prevent circulation of air and is left in place eight to ten hours for accumulation of body heat. There will be no risk resulting to the subjects from the heating compress. The signatures of all subjects' primary physicians and of the head nurse on the unit will be obtained. Confidentiality of the subjects' responses and the right to withdraw from the study without prejudice will be assured for each subject.

With your permission, I would like to begin data collection during the fourth week in July. Data collection will be completed within three or four months. I will be happy to make an appointment with you to discuss the study further if you so desire and to share the findings of the study after its completion. Thank you for your assistance.

Sincerely,

Takiko Nemoto, R.N.

TN/mn
APPENDIX D

LETTER TO CRITICAL CARE NURSING DEPARTMENT REQUESTING PERMISSION TO CONDUCT STUDY
Phyllis McElmurry  
Director of Critical Care  
Nursing Department  
Loma Linda University Medical Center  
Loma Linda, CA 92354  
July 14, 1981

Dear Ms. McElmurry:

As a graduate student in nursing, I am investigating the effects of a heating compress upon self-reported sore throat of selected clients who have had endotracheal anesthesia. This study entitled "Effects of Heating Compress on Self-Reported Sore Throat Following Intubation for Endotracheal Anesthesia" is for partial fulfillment of the requirements for a master's degree in nursing at Loma Linda University. I am requesting permission to study patients and their records at the Loma Linda University Medical Center. My research advisor, Frances L. Fickess, has approved the research proposal. I also have approval from the graduate student research subcommittee of the University Committee on Human Studies.

The proposed research will be quasi-experimental. Within twelve hours following surgery, subjects will be interviewed by the investigator to determine the presence of sore throat. If an experimental subject reports sore throat, he will receive the heating compress twice. The heating compress is a cotton cloth soaked in tap water, wrung out, and applied to the subject's neck. It is covered with a part-wool flannel cloth to prevent circulation of air and is left in place eight to ten hours for accumulation of body heat. There will be no risk resulting to the subjects from the heating compress. The signatures of all subjects' primary physicians and of the head nurse on the unit will be obtained. Confidentiality of the subjects' responses and the right to withdraw from the study without prejudice will be assured for each subject.

With your permission, I would like to begin data collection during the fourth week in July. Data collection will be completed within three or four months. I will be happy to make an appointment with you to discuss the study further if you so desire and to share the findings of the study after its completion. Thank you for your assistance.

Sincerely,

Takiko Nemoto, R.N.

TN: mn
APPENDIX E

PERMISSION FROM FACILITY TO CONDUCT STUDY
Dear: 

Your request for permission to collect data for your research project at Loma Linda University Medical Center has been received and reviewed. The following action has been taken:

☑ You have my permission to conduct your study in our facility.

☐ Your request has been temporarily denied pending provision of additional information.

☐ Your request cannot be granted at this time.

Also, it will be necessary for you to:

☑ Obtain permission from the attending physician since your study involves patients and/or their records.

☐ Obtain additional permission from [signature: Elizabeth Secaur (illegible)]

☐ Notify and/or advise the following persons of your study.

☐ Make an appointment with [signature: [illegible]] for additional discussion and information provision.

☐ Other

If I can be of further help, please let me know.

Sincerely,

Gertrude L. Haussler, M.S.
Assistant Administrator
Nursing
APPENDIX F

PERMISSION FROM SURGICAL NURSING DEPARTMENT
TO CONDUCT STUDY
Date: 7-16-81

Dear [Intended Recipient],

Your request for permission to collect data for your research project at [Institution Name] has been received and reviewed. The following action has been taken:

☑ You have my permission to conduct your study in our facility.

☐ Your request has been temporarily denied pending provision of additional information.

☐ Your request cannot be granted at this time.

Also, it will be necessary for you to:

☐ Obtain permission from the attending physician since your study involves patients and/or their records.

☐ Obtain additional permission from ____________________________.

☐ Notify and/or advise the following persons of your study.

☐ Make an appointment with ____________________________ for additional discussion and information provision.

☐ Other

If I can be of further help, please let me know.

Sincerely,

[Signature]
Director, Surgical Nursing Department
APPENDIX G

PERMISSION FROM CRITICAL CARE NURSING DEPARTMENT
TO CONDUCT STUDY
Date: 7/20/81

Dear: Mr. Terrioto, Ph.

Your request for permission to collect data for your research project at has been received and reviewed. The following action has been taken:

✓ You have my permission to conduct your study in our facility.

☐ Your request has been temporarily denied pending provision of additional information.

☐ Your request cannot be granted at this time.

Also, it will be necessary for you to:

☐ Obtain permission from the attending physician since your study involves patients and/or their records.

☐ Obtain additional permission from the Head Nurse on each unit involved in data collection.

☐ Notify and/or advise the following persons of your study.

☐ Make an appointment with __________________________ for additional discussion and information provision.

☐ Other

If I can be of further help, please let me know.

Sincerely,

[Signature]

Director of Nursing - Critical Care Dept.
APPENDIX H

VERBAL EXPLANATION OF STUDY
VERBAL EXPLANATION FOR PATIENT

My name is _______________ and I am a graduate student in nursing. As part of the requirement for my Master's degree, I am studying about sore throat which may follow endotracheal intubation for anesthesia. When a person has surgery he will usually receive anesthesia. One of the methods to administer anesthesia is by endotracheal intubation. This method involves putting a breathing tube into the throat so that anesthetic gas and oxygen can be carried to the lung effectively. But some people complain about sore throat, scratchy throat or difficulty in swallowing following the intubation. It is believed that a heating compress will relieve the sore throat, and it is a very simple treatment which will help you have relief from the post-operative sore throat if you do have a sore throat.

If you have received endotracheal intubation, I will visit you after your surgery and I will ask if you have a sore throat or not. This Consent Form explains briefly what I would like to do. Would you read it and I will be happy to answer questions you may have. I hope you will consent to participate in my study. If you change your mind after you have consented to be in the study, you can withdraw at any time without risk. No harm will result from your participation in this study.
APPENDIX I

PATIENT CONSENT FORM
PATIENT CONSENT FORM

I have been told that the purpose of this study is to investigate nursing intervention for patients who may experience post-intubation sore throat. I am aware that as a participant of this study:

1. I will be visited by the investigator within 18 hours after the endotracheal tube is removed from my throat. The investigator will ask me if I have a sore throat, a scratchy throat, or any difficulty in swallowing.

2. If I have any of the above symptoms, I will receive a throat compress which is a cotton cloth soaked in tap water, wrung, and then applied to my neck. One thickness of part-wool flannel cloth will be applied to cover the wet cloth. The compress will be left in place for eight to ten hours. The treatment will be repeated once.

3. If I receive the throat compress, the investigator will visit me again at specified times. I will be asked again about my throat condition.

4. I have been told that the benefits of the study may help me cough up secretions more easily and to soothe my throat. Other benefits of the study include increased understanding of the use of the throat compress to establish nursing procedures.

5. The use of the part-wool flannel cloth to cover the damped cotton cloth has been explained to me. To my knowledge I have no allergy to part-wool flannel. I will not be harmed by participation in the study and there is no risk to my physical, social, or emotional health, or to my personal privacy. However, I might feel slight discomfort because the compress will be in place for several hours.

6. It has been explained to me and I am aware that participation in the study is voluntary and I have the right to withdraw from it at any time without incurring any disadvantages. I will still receive care as ordered by my physician; such care receives priority over the throat compress. Any and all information obtained through the study will be treated in a confidential manner. Reports or publications resulting from the study will not contain any information which could lead to my identification as a participant.

7. I have been told that in the event of physical injury resulting from the research procedure, while financial compensation is not available, immediate first aid treatment is provided free of charge. In the event of physical injury as a result of participation in the research program I may contact Glenn Sharman, patient representative, (714) 824-0800, ext. 3122, for information and any required forms.
I have considered all of the above statements and hereby give my free and voluntary consent to participate in the survey of postoperative sore throat following endotracheal anesthesia under the supervision of Takiko Nemoto, R.N., graduate student in nursing, Loma Linda University, and in witness thereof I have signed this consent. I have been given a copy of this Consent Form.

Subject's Signature __________________________ Date __________

Witness __________________________ Date __________

I certify that I have reviewed the contents of this form with the person signing above who, in my opinion, understood the explanation. I have explained the known side effects and benefits of the study. Any significant change in the nature of the study from that described above will be fully explained to the person signing above.

Investigator's Signature __________________________ 714-796-1474 Telephone Number Date __________

I am aware of the nursing study described above and support its intent and purpose.

Signature of Head Nurse __________________________ Signature of Director of Surgical Nursing Department
PHYSICIAN CONSENT FORM

This is to acknowledge that I am aware of the nursing study conducted by Takiko Nemoto, R.N., graduate student in nursing at Loma Linda University, for the purpose of investigating the effects of a heating compress to relieve self-reported sore throat of subjects, following intubation for endotracheal anesthesia. I understand that the study subjects may or may not receive the heating compress. I support the study for the contribution it may make to establish therapeutic nursing intervention.

________________________________________________________
Signature of Primary Physician

________________________________________________________
Date
PATIENT CONSENT FORM

I have been told that the purpose of this study is to investigate nursing intervention for patients who may experience post-intubation sore throat. I am aware that as a participant of this study:

1. I will be visited by the investigator within 18 hours after the endotracheal tube is removed from my throat. The investigator will ask me if I have a sore throat, a scratchy throat, or any difficulty in swallowing.

2. If I have a sore throat, the investigator will visit me again within 48-60 hours after the tube is removed from my throat. I will be asked about my throat condition.

3. I have been told that the potential benefit of the study is that the information gained might be helpful to investigate lasting time of the sore throat following endotracheal anesthesia.

4. I will not be harmed by participating in this study and there is no risk to my physical, social or emotional health, or to my privacy that would result from my participation in this study.

5. It has been explained to me and I am aware that participation in this research project is voluntary and I have the right to withdraw from it at any time without incurring any disadvantages. I will still receive the usual care as ordered by my physician. Any and all information obtained through this study will be treated in a confidential manner. Reports or publications resulting from this study will not contain any information which might lead to my identification as a participant in the study.

I have considered all of the above statements and hereby give my free and voluntary consent to participate in the survey of postoperative sore throat following endotracheal anesthesia under the supervision of Takiko Nemoto, R.N., graduate student in nursing, Loma Linda University, and in witness thereof I have signed this consent. I have been given a copy of this Consent Form.

Subject's Signature ___________________________ Date ______________________

Witness ___________________________
Page 2 of 2 pages

I certify that I have reviewed the contents of this form with the person signing above who, in my opinion, understood the explanation. I have explained the known side effects and benefits of the study. Any significant change in the nature of the study from that described above will be fully explained to the person signing above.

Investigator's Signature

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I am aware of the nursing study described above and support its intent and purpose.

Signature of Head Nurse

Signature of Director of Surgical Nursing Department

PHYSICIAN CONSENT FORM

This is to acknowledge that I am aware of the nursing study conducted by Takiko Nemoto, R.N., graduate student in nursing at Loma Linda University, for the purpose of investigating the effects of a heating compress to relieve self-reported sore throat of subjects, following intubation for endotracheal anesthesia. I understand that the study subjects may or may not receive the heating compress. I support the study for the contribution it may make to establish therapeutic nursing intervention.

Signature of Primary Physician

Date
APPENDIX J

PHYSICIAN CONSENT FORM
PHYSICIAN CONSENT FORM

This is to acknowledge that I am aware of the nursing study conducted by Takiko Nemoto, R.N., graduate student in nursing at Loma Linda University, for the purpose of investigating the effects of a heating compress to relieve self-reported sore throat of subjects, following intubation for endotracheal anesthesia. I understand that the study subjects may or may not receive the heating compress. I support the study for the contribution it may make to establish therapeutic nursing intervention.

Signature of Primary Physician

____________________________________
Date
APPENDIX K

DATA COLLECTION TOOL
**DATA COLLECTION TOOL**

**Initial Screening Interview for Admission to the Study**

**Patient Number:** ______  
**URI:** Yes  No  
**Sore throat:** Yes  No  
**Allergic to wool:** Yes  No  Not Known  
**Admitting to study:** Yes  No  
**Date:** ______________

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<td>( ) ( ) . ( ) hrs.</td>
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<tr>
<td></td>
<td>( )2 No</td>
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<td>16</td>
<td>Received Viscus Xylocaine or Cetacaine Spray prior to postextubation, 1st interview</td>
<td>( )1 Yes</td>
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<td>( )2 No</td>
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Data Collection Tool
Page 2

17 Analgesia 0.5-3.0 hrs prior to postextubation 1st interview
   ( )1 Yes
   ( )2 No

18 Postextubation 1st interview
   (6-18 hrs)
   Date ________ Time ________

19 Number of hours postextubation
   ( ) ( ) ( ) hrs

20 Hoarseness or loss of voice
   ( )1 Present
   ( )2 Absent

21 Sore throat 0 1 2 3 4 5

22 Treatment No. 1
   Result 0 1 2 3 4 5

23 Analgesia
   ( )1 Yes
   ( )2 No

24 Treatment No. 2
   Result 0 1 2 3 4 5

25 Analgesia
   ( )1 Yes
   ( )2 No

26 Received viscous Xylocaine or Cetacaine Spray prior to postextubation 2nd interview
   ( )1 Yes
   ( )2 No

27 Analgesia 0.5 - 3.0 hrs prior to postextubation 2nd interview
   ( )1 Yes
   ( )2 No

28 Postextubation 2nd interview
   Date ________ Time ________

29 Number of hours postextubation
   ( ) ( ) ( ) hrs

30 Hoarseness or loss of voice
   ( )1 Present
   ( )2 Absent

31 Sore Throat
   0 1 2 3 4 5
APPENDIX L

STRUCTURED INTERVIEW
How are you feeling now?

- Fine
- Pain at operative site
- Sore throat

Do you have sore throat, scratchy throat, or difficulty in swallowing?

- No
- Yes

Same as above

No

Yes

(Modified from Hartsell, 1964, p. 308.)
### SIMPLE DESCRIPTIVE SCALE

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<th>Moderate</th>
<th>Quite a Lot</th>
<th>Very Bad</th>
<th>Unbearable</th>
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<td>Quite a Lot</td>
<td>Very Bad</td>
<td>Unbearable</td>
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<td></td>
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<td>Amount of</td>
<td>Sore Throat</td>
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</table>

Modified from Jacox, 1977, p. 111.
APPENDIX N

PARADIGM DEMONSTRATING ADMISSION OF SUBJECTS
TO THE STUDY WITH SUBSEQUENT PARTICIPATION
PARADIGM DEMONSTRATING ADMISSION OF SUBJECTS TO THE
STUDY WITH SUBSEQUENT PARTICIPATION

Admitted Subjects 99

Experimental Group 51

Withdraw before 1st post-extubation interview 13

- Mask 2
- Pain med. 5
- Discharge 1
- Prolonged intubation 1
- Local anesthesia 1
- Op. cancel 1
- C.V.P. line in neck 2

1st post-extubation interview 38

- Sore 18
- Not Sore 20

- Withdraw before #1 treatment 3
  - Received Cepacol 1
  - Refused treat. 2

- #1 Treatment 15

- Withdraw from #2 treatment 2
  - Hyperbaric O₂ treat. 1
  - Discontinue treat. 1

- Finished #2 Treatment Completed Study 13

Control Group 48

Withdraw before 1st post-extubation interview 12

- Mask 4
- Pain med. 3
- Discharge 1
- Prolonged intubation 3
- Refused interview 1

1st post-extubation interview 36

- Not Sore 14
- Sore 22

- #1 Treatment 15

- Withdraw before 2nd interview 7

- Discharge 5
- Pain med. 2

Completed Study 15
APPENDIX 0

TABLES 6-7
## Table 6
Demographic Data of Experimental Group

<table>
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<tr>
<th>Patient Number</th>
<th>Sex</th>
<th>Age</th>
<th>Smoking</th>
<th>Operative Site</th>
<th>Intubation Was:</th>
<th>NG Tube Duration of Tube in Place</th>
<th>Degree of Sore Throat Post Extubation</th>
<th>1st Interview</th>
<th>2nd Interview</th>
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<td>Less than 1/2 pack</td>
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Table 7
Demographic Data of Control Group

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<th>Patient Number</th>
<th>Sex</th>
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