6-1966

Principles Understood by Nurses Relative to the Care of Tracheostomy Patients

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PRINCIPLES UNDERSTOOD BY NURSES RELATIVE TO THE CARE OF TRACHEOSTOMY PATIENTS

by

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A Thesis in Partial Fulfillment

of the Requirements for the Degree

Master of Science in the Field of Nursing

June 1966

Each person whose signature appears below certifies that he has read this thesis and that in his opinion it is adequate, in scope and quality, as a thesis for the degree Master of Science.

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ACKNOWLEDGEMENTS

With gratitude I wish to acknowledge the enthusiastic encouragement and suggestions given by the Chairman of my committee, Matilda Anabelle Mills, and the other members of my committee, L. Lucile Lewis and Dr. Lloyd A. Dayes. Their contributions were invaluable to the completion of this study.

I would also like to thank the nurses and Directors of Nursing Service at the Pomona Valley and San Antonio Community Hospitals. Without their interest and participation, this study could not have been conducted.

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INTRODUCTION TO THE STUDY

Registered nurses are traditionally given responsibility for the care of patients with tracheostomies, an opening made in the trachea through which the patient may breathe. Those nurses who do not work in areas where tracheostomy patients are usually cared for may be required to assist with their care during an emergency. Even when private duty nurses are caring for tracheostomy patients, the staff nurses are still indirectly responsible for the care given those patients. In order for the care of tracheostomy patients to be of therapeutic benefit, nurses must have a knowledge of the principles upon which that care is based.

The actual tracheostomy care procedures may vary between institutions and/or individual nurses; but if the basic principles underlying that care are well understood, the actual techniques of care can be adapted.[1]

I. THE PROBLEM

This study was conducted to determine what scientific principles nurses understood relative to the care of patients with tracheostomies. It was felt that the nurses would identify the

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[1] Irene L. Beland, Clinical Nursing: Pathophysiological and Psychosocial Approaches (New York: The Macmillan Company, 1965), p. 411.

principles which they knew and understood during the data collection procedure.

Supplementary questions that were considered in the study are as follows:

1. Do nurses who work in intensive care units (I.C.U.) have a better understanding of principles underlying tracheostomy care than staff nurses?

2. Do nurses who care for more tracheostomy patients per year have a greater understanding of the scientific principles related to their care?

3. Do nurses who have worked a greater length of time have a better understanding of tracheostomy care principles?

Need for the Study

Meade indicated that although tracheostomy is one of the oldest and simplest operative techniques, it is also a procedure commonly mismanaged post-operatively.[2] The patients who require tracheostomy are usually critically ill, and often have other post-operative problems, but inept nursing care notably adds to the complications and problems of the tracheostomy patient.[3]

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[2]James W. Meade, "Tracheostomy--Its Complications and Their Management," New England Journal of Medicine, CCLXV (September 14, 1961), 519.

[3]James C. Erickson III, "The Patient with Tracheostomy," International Anesthesiology Clinics, II (May, 1964), 675.

Identification of nurses' understandings of the principles upon which tracheostomy care is based is essential for an analysis and ultimate improvement of the nursing care of these patients.

Purpose of the Study

The purpose of this study was to determine if the following principles of tracheostomy care, as substantiated by the literature overview, were identified and understood by registered nurses:

1. A patent airway must be maintained at all times.

2. Ciliary cleansing, mucosal humidification, and warming of inspired air is decreased in the opened respiratory tract.

3. The anatomical dead space of the nasal passages and oral pharynx is by-passed with tracheostomy, eliminating this means of warming and altering the composition of inspired air.

4. A compensatory increase in mucous secretion occurs after the insertion of a cannula.

5. Susceptibility of the tracheobronchial tree to infection, crust formation, and trauma is increased after tracheostomy.

6. Speech is eliminated and the effectiveness of the coughing mechanism is impaired when the larynx is by-passed.

II. METHOD OF THE STUDY

A descriptive study which determines the nature and occurring frequency of characteristics of a given situation or group,

was conducted.[4] No hypotheses were proposed prior to the study as the descriptive method may or may not be conducted with a specific hypothesis about the characteristics in mind.[5] Research was conducted to determine which principles of tracheostomy care were understood, not to prove a particular hypothesis concerning these principles.

Appointments were made with the Director of Nursing Service at Pomona Valley Community Hospital, Pomona, and San Antonio Community Hospital, Upland, California. Permission to conduct interviews with registered nurse employees of those hospitals was sought in writing and obtained. (See Appendix A) At the meetings with the directors the purpose of the study was explained. The supervisory staffs of both hospitals were notified that a study relative to the care of tracheostomy patients would be conducted among the registered nurses at their respective hospitals. The cooperation of those supervisors in not alerting the nurses to the content of the study was obtained, and suitable times for interviews with the nurses was arranged. An effort was made to comply with unit preferences in order not to interfere with the care of patients.

Selection of Respondents. An unsystematic, random sample of thirty-five nurses was selected from lists of registered nurses

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[4] Claire Selitz, et al, Research Methods in Social Relations (New York: Holt, Rinehart, and Winston, 1965), p. 50.

[5] Ibid.

obtained from the nursing service offices at the Upland and Pomona hospitals. These lists included names of nurses who were scheduled to work at some time during a twenty-four hour period for at least four days a week on either the medical, surgical, pediatric, or intensive care units of the hospital. One respondent had worked with maternity patients for six years and had begun work on the pediatric division one week prior to the interview. She was, therefore, eliminated from the sample.

Each name on the lists was assigned a number, and a table of random numbers was used in the selection of fifteen nurses from one hospital and twenty nurses from the second. It was necessary to make some substitutions due to the availability of the nurses at the times arranged for the interviews.

No distinction was made between the types of programs from which the selected nurses had graduated. All three programs which prepare nurses to become licensed to perform skilled bedside care of critically ill patients should include care of tracheostomy patients in their curricula.

The Data Collecting Tool. The interview method of data collection was employed because of its greater flexibility and the opportunity which it presented to appraise the validity of reports.[6] It was felt that a questionnaire or objective test, etc. would not provide for all possible correct and incorrect

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[6] Ibid., p. 242.

responses which the nurses might give and the possibility of guessing could not be easily evaluated.

A review of pertinent literature in the fields of nursing, medicine and anesthesiology was made to gain insight into the problems of tracheostomy patients and to identify the principles involved in their care. No previous studies concerning the nurses' understanding of tracheostomy care principles was found.

An interview guide was prepared to aid in the collection of data pertinent to the study. Questions included in the guide were grouped into the four following areas: (See Appendix B)

1. Preliminary questions
2. Physiological changes that occur after tracheostomy
3. Possible complications and areas of observation
4. Nursing care procedures

A pilot study was conducted to acquaint the researcher with the use of the interview guide in an actual data collecting situation, to determine the length of time necessary for the interview, and to refine the questions used in the guide. The data collected in the pilot study were not used in the final study.

During the pilot study it was noted that the nurses seemed to show greater interest and willingness to cooperate when the interviewer was not wearing a uniform; so street clothes were worn when the interviews were conducted.

At the times designated, the nurses were approached and asked to participate in a study regarding the care of patients

with tracheostomies. Treatment and conference rooms were used for the interviews to eliminate as much distraction as possible. Each nurse contacted by the interviewer was willing to participate in the study. Several nurses made a special effort to acquaint the interviewer with the purpose and methods of tracheostomy care which they were describing. There were two nurses who were willing to participate but apparently were threatened by the topic of the study. They had to be reassured that all participants would remain anonymous and that their work was not being evaluated.

Assumptions. It was assumed that the knowledge of principles and skills mentioned by the nurses indicated the level of their understanding of those principles. It was assumed that the nurses' understanding of the principles involved in tracheostomy care was expressed fully during the interviews. It was also assumed that the nurses from two community hospitals were typical of those in the area.

prolonged artificial ventilation, and (5) to decrease the resistance to respiratory effort.[11]

I. PHYSIOLOGICAL CHANGES

Several physiological changes occur after tracheostomy and by-passing the nose and throat. The 150 cc. of air contained in the anatomical dead air space, which extends from the nose to the level in the respiratory tree where oxygen and carbon dioxide exchanges occur, are eliminated. Although this air does not participate directly in the exchange of gases, it dilutes the air entering and leaving the lungs and thereby protects the alveoli from sudden change. When the dead air space is by-passed, the work of breathing is reduced.[12] The oxygen exchange at the alveolar level is greatly facilitated and improvement of acid-base balance occurs. Occasionally the sudden increase in oxygen levels in the alveoli reduce the carbon dioxide level to the degree that stimulation of the respiratory center in the medulla is inhibited and apnea may occur.[14]

Another physiological change brought about by tracheostomy is the loss of the mechanisms for conditioning inspired air. The nasal airway normally overcomes much of the humidity deficit of

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[11] Erickson, loc. cit. [12] Neville, op. cit., p. 149.

[13] Beland, op. cit., p. 408.

[14] Meade, op. cit., p. 521; W.W. Glas, et al, "Complications of Tracheostomy," Archives of Surgery, LXXXV (July, 1962), 61.

dry and/or cold air, but with tracheostomy the humidity deficit is restored by the tracheal and bronchial mucous membranes alone. This abnormal cooling and loss of fluid from the tracheal mucous membranes produces ciliary paralysis.[15] Cilia function only when bathed in mucous.[16]

The ciliary cleansing or filtering action of the nasopharynx is lost after tracheostomy and bacteria may find their way down the cannula of the tracheostomy tube from the inspired air or from adjacent sites of infection.[17]

Because air is diverted from the larynx, the loss of voice results, and the cough mechanism is impaired. Eiseman and Spencer indicated that the major physiological disadvantage of tracheostomy "is the loss of the ability to cough effectively, because the endobronchial pressure cannot be raised by forced expiration against a closed glottis."[18]

Normally the average adult produces 900 cc. of fluid daily in the respiratory tree. This amount may be increased when

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[15] J. McK. Watts, "Tracheostomy in Modern Practice," British Journal of Surgery, L (November, 1963), 967; Matthew Spence, "Emergency Treatment of Acute Respiratory Failure," Anesthesiology, XXIII (July-August, 1962), 528.

[16] Charles Sara, "Management of Patients with a Tracheostomy," Medical Journal of Australia, I (January 23, 1965), 99.

[17] Meade, op. cit., p. 520.

[18] Ben Eiseman and F.C. Spencer, "Tracheostomy: An Underrated Surgical Procedure," Journal of the American Medical Association, CLXXXIV (June 1, 1963), 686.

central centers in the medulla are stimulated by inflammation or anoxia.[19] Absence of cough, aspiration vomitus, pharyngeal pooling and pulmonary edema can also add to the normal amount of fluid found in the lungs.[20]

Secretion of fluids in the respiratory tree is increased in the first few hours after tracheostomy. The presence of a foreign body, such as a tracheostomy tube, in the trachea irritates the mucosa which responds by an increase in secretions.[21] This increase varies with the length of time the tube is present and also with the material of which the tube is made. Rubber apparently causes the greatest amount of irritation and synthetic tubes are almost non-irritating.[22] Metallic silver tracheostomy tubes are used most frequently because they are durable, cause minimal irritation chemically, maintain their shape, have thin walls, and have a removable inner cannula.[23] (See Figure 1)

When an increase in secretions is combined with a failure of mechanisms for ridding the tracheobronchial tree of them,

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[19] D.V. Maythem, "Secretional Anoxia and Tracheotomy," South African Medical Journal, XXXIV (March 12, 1960), 220.

[20] Watts, op. cit., p. 956. [21] Beland, op. cit., p. 413.

[22] J.M. Kodicek, "The Place and Management of Tracheostomy in Respiratory Insufficiency," Journal of Laryngology and Otology, LXXIV (December, 1960), 903.

[23] Watts, op. cit., p. 965.

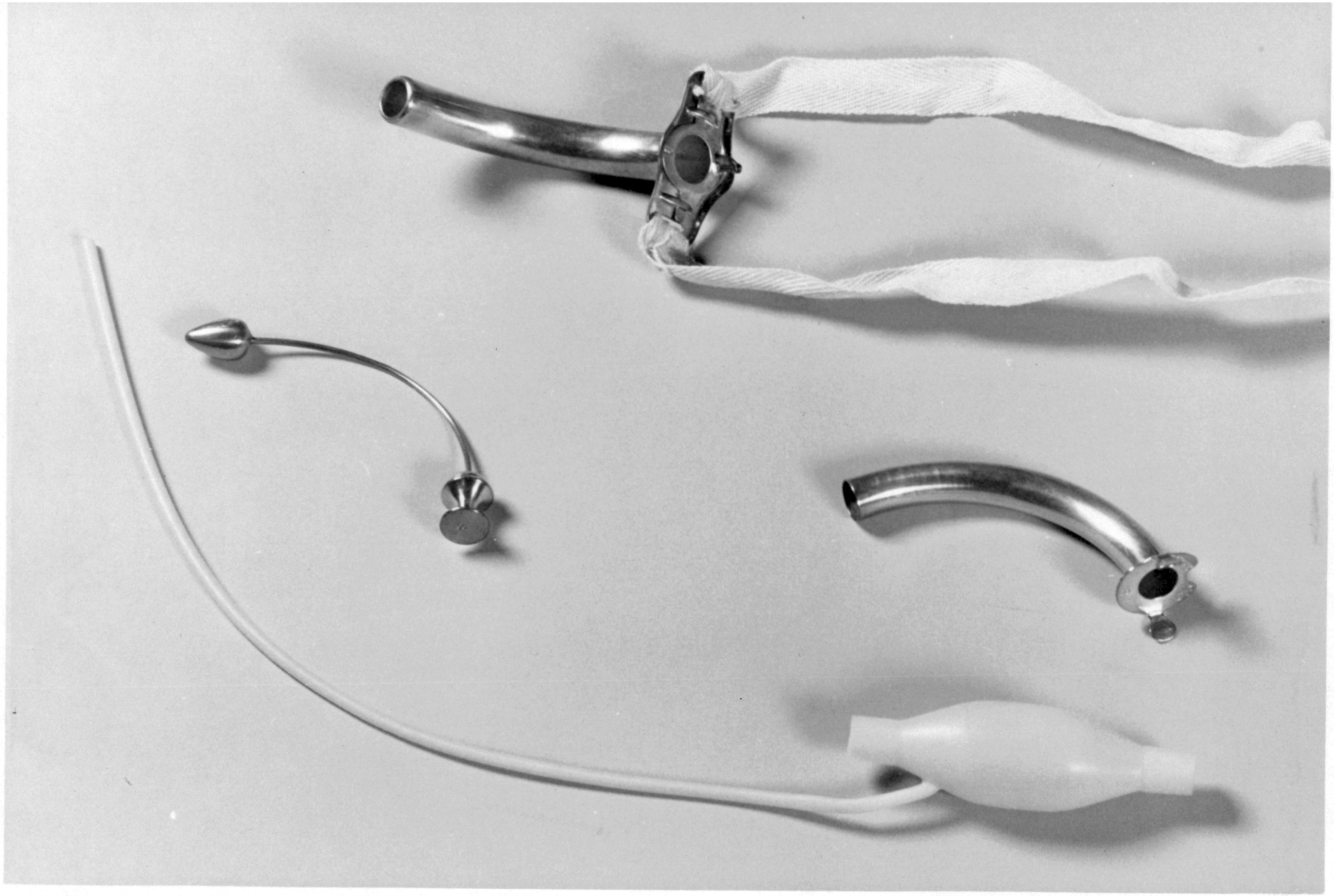

Figure 1. Tracheostomy Tube, Inner Cannula, Obturator, and Tracheostomy Cuff

tracheobronchitis and crusting can occur. Tracheobronchitis further increases secretion and intensifies the destruction of the ciliated mucous membrane.[24]

II. COMPLICATIONS

Glas found that the seven complications listed below occurred in thirty-three of the sixty-one elective and nineteen emergency tracheostomy patients included in a study of post-operative problems tracheostomy patients might encounter:

1. Hemorrhage at the operative site
2. Recurrent obstruction of the tracheostomy tube
3. Ulceration of the tracheal mucosa
4. Pneumothorax
5. Tracheobronchial fistula
6. Aerophagy
7. Apnea and shock.[25]

Molphy also includes displacement of the tracheostomy tube, laryngeal edema, fistulous tract formation, tracheal or laryngeal stenosis and infection as important complications which follow tracheostomy.[26]

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[24]Beland, loc. cit.

[25]Glas, op. cit., pp. 57-60.

[26]Ruth Molphy, "The Care of the Patient with a Tracheostomy," Medical Journal of Australia, I (May 29, 1965), 789.

In considering the possible complications that may or may not arise after tracheostomy, Crawford points out that the highest incidence of complications post-operatively is found in children, especially those under one year of age, and in patients on whom emergency tracheostomies have been performed.[27]

Glas noted that hemorrhage resulted most frequently in those patients on whom an emergency tracheostomy was performed. These individuals usually are hypotensive at the time of the procedure and the small, collapsed vessels are not easily noted. After restoration of adequate blood volume and with the return of peripheral blood flow, oozing occurs from the severed ends of these formerly unobserved vessels. If large volumes of blood are lost through this manner, shock results. The insidious implication of this complication is the internal oozing that is not observed and the resultant clotting of blood and formation of plugs which can lead to atelectasis or serve as an excellent media for bacterial growth.[28]

"Inspissation of secretions in and about a tracheal cannula with formation of occluding crusts and plugs is the single most important post-operative problem following tracheostomy."[29]

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[27]Oral B. Crawford, "Anesthesiologists' Responsibilities in Tracheostomy," Anesthesiology, XXII (January-February, 1961), 89.

[28]Glas, loc. cit.

[29]Rodman E. Taber, "A Tracheostomy Program," Journal of the Michigan State Medical Society, LXI (March, 1962), 329.

Totman and Lehman further explain the consequences of a preponderance of secretions: "As secretions accumulate, the respiratory and cardiac rates become faster, low grade fever develops and cyanosis appears. . ."[30]

Lewis and Gunn point out that "anything, be it mucus or an oxygen catheter, that decreases the functional area of the respiratory channel may serve to increase the workload of breathing."[31] Since the diameter of the tracheostomy tube is not equivalent to that of the trachea, any obstruction, even though temporary, may be harmful.[32] In order to decrease the work load of breathing, maintain adequate aeration and prevent hypoxia, and minimize other conditions conducive to infectious processes, secretions must not be allowed to accumulate in the lungs.

Secretions become dry and thick due to the inability of the tracheobronchial tree to adequately humidify inspired air, an inadequate fluid intake and dehydration of the patient, and fever.[33] The high air flow of automatic respirators further dries these secretions into a tenacious, glue-like mass.[34]

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[30]Totman and Lehman, op. cit., p. 98.

[31]Lewis and Gunn, op. cit., p. 304.

[32]Ivor J. C. Frew, "Tracheostomy and Controlled Respiration," Journal of Laryngology and Otology, LXXV (February, 1961), 139.

[33]Kodicek, op. cit., p. 913.

[34]Glas, op. cit., p. 58.

The initial observation that secretions have accumulated in the respiratory tree is based on the presence of a "gurgling, rumbling" sound. Thick secretions do not produce this sound and, therefore, cannot be heard easily.[35] Dyspnea and cyanosis are indications that thick secretions are blocking the passage of air into the lungs.[36]

Secretions are an important factor in the formation of crusts. These crusts composed of "fibrin, leukocytes, and desquamated epithelial cells, develop in areas of tracheal erosion, become detached and embolize to the bronchi as mucous plugs."[37] Plugs can become large enough to take on the oval or annular configuration of the respiratory tree.[38] Although crust formation is due mainly to the pooling of secretions and injury to the tracheal mucosa, ineffective aspiration, dehydration, fever and infection, and ineffective humidification of inspired air contribute to the problem.[39]

Obstruction of the tracheostomy tube by means other than inspissated secretions and crusts can occur. The aspiration of a

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[35] Molphy, loc. cit.

[36] Eiseman and Spencer, op. cit., p. 687.

[37] Meade, loc. cit. [38] Totman and Lehman, op. cit., p. 97.

[39] Kodicek, op. cit., p. 907; and Thomas G. Nelson, Tracheostomy: A Clinical and Experimental Study (Baltimore: Williams and Wilkins Co., 1958), p. 62.

foreign body and edema below the tube can serve to occlude the tube. Overinflation of the tracheostomy tube cuff, used to insure that air will not escape around the tube (for I.P.P.B.), may result in herniation of the cuff over the end of the tube.[40] Obstruction can occur if this detachable cuff is left in the trachea after removal and replacement of the tracheostomy tube.[41] Displacement of the tracheostomy tube in the initial operative procedure can also result in obstruction of the tube.

Injury to the trachea produces an increase in secretions, potentiates infection and may produce tracheal narrowing.[42] Irritation and ulceration of the mucosal lining of the tracheobronchial tree can result from mechanical traumatization by the suction catheter or by rubbing of the tracheostomy tube against the tracheal walls.

Tracheal ulceration and obstruction from the rubbing of the tube against the anterior or posterior tracheal walls are usually due to incorrect tube size or shape. Rigid tubes with excessive curvature or length can cause erosion of the innominate artery or erode the coryna. Tubes that are too small or mobile injure the trachea also.[43] Pulsation of the tracheostomy tube may indicate that it is pressing on an artery.

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[40] Molphy, op. cit., p. 790.

[41] D. B. Clarke, "Tracheostomy in a Thoracic Surgical Unit," Thorax, XX (January, 1965), 91.

[42] Watts, op. cit., p. 964. [43] Kodicek, loc. cit.

Suctioning methods caused acute and chronic inflammatory reactions in sixteen out of eighteen fatal polio cases followed by Bridge.[44] Repeated and/or forceful suctioning techniques can result in ulceration of the coryna, formation of a bronchial stump fistula or endotrachitis.

Necrosis of the tracheal rings can occur if the air in the inflatable tracheostomy tube cuff is not released periodically.[45] The least amount of air that will keep the cuff inflated properly should be used. The cuff should be deflated every one to two hours for as long a period as the patient can tolerate.[46]

As the mucosa becomes traumatized, the vulnerability to infection increases.[47] Also, trauma to the mucosa which induces bleeding, however slight, can lead to the passage of this blood down into the lower air passages where it further thickens secretions by clotting.[48]

Should the patient become dyspneic and no apparent cause can be found (thick secretions, foreign body, etc.,) "it is essential to look for signs of emphysema and pneumothorax."[49]

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[44] Carl J. Bridge, "Sequelae of Tracheobronchial Aspiration," Laryngoscope, LXX (March, 1960), 324.

[45] Clarke, loc. cit. [46] Molphy, op. cit., p. 791.

[47] Meade, loc. cit. [48] Kodicek, op. cit., p. 916.

[49] S. D. Parikh, "A Case of Bilateral Pneumothorax After Tracheostomy," Journal of Laryngology and Otology, LXXIX (May, 1965), 461.

These complications result from improper postioning of the tube and allow air to enter the tissues, mediastinal cavity, or chest cavity.[50] Pneumothorax can be detected by the absence of breath sounds on the side of the chest affected due to the collapse of all or part of that lung.[51] Both conditions are detected readily on X-Ray. The occurrence of these two complications is seen relatively often, but usually they are not present to a degree to cause concern, especially is this true with emphysema.[52]

Occasionally a tube which is too long may become placed in the right main bronchus. Not only does this cause obstruction of the tube, but the left lung can become collapsed.[53]

Partial displacement of the tracheostomy tube into the tissues anterior to the trachea is not always recognized readily. The improper fit or position of the cannula can sometimes be recognized by the unusual angle at which the tube rests. If the aspiration catheter consistently meets an obstruction, if the patient has a persistent, irritating cough or recurring episodes of respiratory distress not relieved by aspiration, tracheostomy tube displacement can be suspected.[54]

Should the tapes, which are tied around the patient's neck to hold the tube in place, becomes loosened the tube can be coughed

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[50]Molphy, op. cit., p. 789. [51]Glas, op. cit., p. 560.

[52]F. Jensen Putney, "Complications and Postoperative Care After Tracheostomy," Archives of Otolaryngology, LXII (1955), 273.

[53]Molphy, op. cit., p. 790. [54]Nelson, op. cit., p. 61.

out of the opening. Only the doctor should replace the tracheostomy tube for reasons of sepsis control as well as to insure proper replacement of the tube. The nurse should use a sterile, curved hemostat or Trousseau dilator to keep the incision open until a sterile tube can be inserted.[55]

Tracheostomy does not prevent aspiration of liquids given by mouth, or of vomitus, but may predispose to such complications.[56] Even the cuffed tube is rarely used exclusively to exclude alimentary tract contents.[57] When the cuffed tracheostomy tube remains *in situ* for several days, the larynx loses its normal protective reflex of closing in reponse to everything but air.[58]

> If the esophagus is partially obstructed by the tracheostomy tube, liquids tend to overflow the opening into the esophagus and run into the trachea, either to be aspirated on down into deeper respiratory passages, or if there is an inflated cuff it rests in the trachea above the cuff until it is deflated.[59]

The presence of a rigid, indwelling nasogastric tube may keep the esophagogastric sphincter open and encourage esophageal reflux and regurgitation. Colored tube feedings help in

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[55] Audrey Latshaw Sutton, *Bedside Nursing Techniques in Medicine and Surgery* (Philadelphia: W.B. Saunders Co., 1964), p. 336.

[56] Reeve H. Betts, "Post-Tracheostomy Aspiration," *New England Journal of Medicine*, CCLXXIII (July 15, 1963), 155.

[57] Watts, *op. cit.*, p. 969. [58] Spence, *op. cit.*, p. 528.

[59] Betts, *loc. cit.*

determining if the tracheal aspirate contains contents of the stomach.[60]

After priods of prolonged asphyxia, the respiratory center may become insensitive to carbon dioxide stimulation and transitory apnea can result post-operatively.[61] As opposed to this type of transitory apnea, prolonged respiratory and cardiovascular collapse is due to the rapid reversal of respiratory acidosis or to fatal cardiac arrhythmias caused by alterations in serum electrolytes and blood pH. This apnea may be based upon vascular effects of respiratory acidosis. Carbon dioxide has a marked dilatory effect on the peripheral circulation which is masked by its stimulant effect on the medullary vasoconstrictor center. Reversal of the increased carbon dioxide level leads to withdrawal of the vasoconstrictor reflex with resulting drop in blood pressure, ischemia to the respiratory center, and apnea.[62]

Hypotension post-tracheostomy may be due to hemorrhage and hypovalemia as well as the acyanotic apnea mentioned above.

Stenosis or narrowing of the trachea is most common among children. As has been stated before, this narrowing can follow trauma or infectious processes and the formation of scar tissue. Incorrectly fitting tracheostomy tubes, improper regulation of the

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[60] Ibid.; and Eiseman and Spencer, op. cit., p. 685.

[61] Peter Oppenheimer and Francis B. Quinn, "Sudden Death Following Tracheostomy," Archives of Otolaryngology, LXXXII (September, 1965), 292-93.

[62] Ibid.; and Meade, op. cit., p. 522.

inflation and deflation of tracheostomy cuffs, and distortion of the trachea by unsupported respiratory equipment attached to the tube are also elements inherent in the formation of stenosis.[63] Crawford indicates that tight suturing of tissues around the tracheostomy tube, infection and incisions made too close to the cricoid cartilage are important factors in tracheal stenosis.[64]

The opposite condition to stenosis is tracheal dilatation. This condition, though uncommon, has been seen to occur when tracheostomy cuffs are inflated over and above the amount necessary to obtain an air tight seal. The cardinal sign of dilatation is the progressing need for increasingly larger volumes of air to obtain an airtight seal between the cuff and tracheal mucosa.[65]

In the consideration of infection as a problem with tracheostomy patients, Gotsman and Whitby point out that "the epidemiology of this infection differs very little from that of wound infection." It is very similar to a burn in that an exposed surface (bronchial and tracheal mucosa) is covered with a dead material and "this probably accounts for the patient's increased susceptibility to infection."[66]

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[63] Spence, loc. cit. [64] Crawford, loc. cit.

[65] J. W. Lloyd and R. M. A. McClelland, "Tracheal Dilatation an Unusual Complication of Tracheostomy," Lancet, I (January 11, 1964), 83-84.

[66] M. C. Gotsman and J. L. Whitby, "Respiratory Infection Following Tracheostomy," Thorax, XIX (January, 1964), 95.

Loss of the cleansing mechanism of the ciliated mucous membrane, disruption of the membranous lining by irritation, trauma, etc., passage of unsterile air directly into the lungs, introduction of septic materials into the trachea by way of aspirating catheters, etc., and the availability of media for bacterial growth; i. e.: blood, mucous, desquamated cells, etc., add to the increased probability that sepsis will occur in the tracheostomy patient.

Clinical signs of impending complications have been mentioned and the importance of the nurse being aware of these signs and symptoms cannot be overly stressed. In addition to those signs of complications already mentioned, Maythem summarizes the cardinal indications of obstructed or inadequate respiration in tracheostomy patients of which the nurse should be aware:

1. Sustained diastolic or systolic hypertension
2. Apprehension, restlessness, or anxiety.
3. Mental aberration
4. Signs of retained secretions in the tracheobronchial tree--decreased breath sounds, "rattle-like" sound, cyanosis, etc.
5. Fever and tachycardia
6. Blood pressure changes
7. Cyanosis.[67]

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[67] Maythem, loc. cit.

III. NURSING CARE PROCEDURES

In the performance of tracheostomy care, the nurse must consider the physiological implications of the tracheostomy itself. It must be remembered that the normal cleansing mechanisms of the ciliated lining of the nose and throat are absent, the patient's mechanisms of defense against infection have probably been overwhelmed, and that the severely ill patient is entirely dependent on medical personnel for maintenance of proper ventilation and health.[68]

Regarding post-operative care of tracheostomy patients, Nelson states that there are few other operations in which:

> . . . violation of the principles of post-operative care are so often attended by loss of life just saved by a skillfully executed operation. . . or major complications so frequently the result of post-operative mistakes rather than operative errors.[69]

Nursing care remains an essential part of the management of tracheostomy patients: ". . . tracheostomy is no substitute for good nursing."[70] The importance of good nursing care after tracheostomy is emphatically stated by Beaver: "It is not machines, but nursing which keeps these patients alive."[71]

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[68] Beland, op. cit., p. 411. [69] Nelson, op. cit., p. 60.

[70] K. H. Smith, "Tracheostomy in Head Injuries," Nursing Times, LX (November 29, 1963), 1513.

[71] R. Atwood Beaver, "Tracheotomy and Controlled Respiration," Journal of Laryngology and Otology, LXXV (February, 1961), 151.

The nurse's assessment and evaluation of the patient's condition underlies her ability to adapt procedures as necessary while considering those principles involved. Lewis and Gunn stated, "In nursing care we have the obligation to change what we can if such care imposes undue stress on the patient."[72] Nurses must be capable of giving optimum care with the equipment available regardless of where they may be located.

"The major purpose of aftercare," according to Nelson, "is to keep both the natural and artificial airways open."[73] This purpose is included in the following three principles upon which post-operative care of tracheostomy patients should be based:

1. Keep moist
2. Keep clean
3. Use "deep suction."[74]

Unless these three principles are followed and the airway is kept open, hypoxia can occur and the life of the patient is endangered. "Patency of the airway is threatened by secretions, encrustations, and infection which is predisposed to by the first two and intensifies both."[75]

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[72] Lewis and Gun, op. cit., pp. 303-04. [73] Nelson, loc. cit.

[74] Beland, op. cit., p. 413, citing John M. Lore, "Tracheostomy," Archives of Otolaryngology, LXVIII (December, 1958), 728.

[75] Ibid., p. 414.

Glas pointed out the importance of frequent cleansing of the inner cannula as well as prompt replacement of the tube. Secretions which form between the two cannulae will make removal of the inner cannula difficult if these secretions are allowed to dry and harden. If the cannula is not replaced within a relatively short period of time, secretions may form over the end of the tube which results in obstruction and the need for replacement of the entire tube.[76]

The inner cannula should be placed in hydrogen peroxide and water to soften the protein-containing mucous coating. This is faciliatated if the inner cannula is removed and placed in the solution before each aspiration of the trachea. To cleanse inside the cannula, some object should be used which is effective in removing secretions but does not leave lint, bristles, etc. in the cannula. Pipe cleaners or gauze strips which are pulled through the cannula can be used for this purpose. The cannula should then be scoured to remove tarnish, secretions, etc. from the outside of the tube; then it must be rinsed thoroughly and either boiled for two minutes or allowed to soak in a bacteriocidal agent for fifteen to twenty minutes. If the inner cannula is allowed to soak in a solution, it must be rinsed with sterile water or saline before it is reinserted.[77]

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[76]Glas, op. cit., pp. 57-60.

[77]Beland, op. cit., p. 412.

"If inspired atmostpheres are warmed and saturated with water vapor, dehydration of the tracheobronchial tree is avoided . . . secretions remain liquid and ciliary activity remains normal."[78] Spence remarked that humidification of inspired air to 100% saturation with water vapor reserves the activity of the ciliary streams to clear invading bacteria and prevent infection.[79] This activity is also enhanced when attention is paid to the maintenance of the patient's fluid intake.[80]

Humidification should begin immediately after tracheostomy and can be assured through several means: tents with high, heavily saturated mist,[81] a cold humidifier in the room, a tracheostomy shield or mask, or by dripping saline into the trachea via the oxygen catheter. Meade reports this latter method as being the simplest and most effective means of humidifying inspired air.[82]

In a study which Meade conducted regarding methods of managing tracheostomy patients post-operatively, he supports the use of a 25 gauge needle which is inserted into the oxygen catheter and through which a normal saline solution is instilled at the rate of four drops per minute. The bottle of solution should be hung at bed level to avoid a rapid flow rate. If secretions are

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[78] Erickson, op. cit., p. 617. [79] Spence, loc. cit.

[80] Beland, op. cit., p. 411.

[81] Totman and Lehman, op. cit., p. 97.

[82] Meade, op. cit., p. 520.

thick, then the rate of the saline drip should be increased accordingly.[83]

Often the amount of saline which is allowed to drip into the trachea is inadequate because personnel fear the patient might "drown." Eiseman and Spencer point out that "saline solution is readily absorbed from the tracheobronchial mucosa."[84] Also, it should be noted that any excess solution would not be allowed to pool if aspiration of the tracheostomy were accomplished frequently.

When tracheostomy masks and humidifiers are used, a mist within the plastic cup should be seen readily. (See Figure 2) In addition, Eiseman and Spencer advise the instillation of two to five milliliters of saline solution in the tracheostomy every hour prior to aspiration.[85]

Watts indicated that lack of humidification causes problems in the tracheostomy patient only during the first two or three weeks post-operatively. After this time, the mucous membrane, "in some obscure way, ultimately adapts itself to the altered external environment."[86]

There is much controversy over which techniques of aspiration and care of the tracheostomy should be followed. In accordance with Beland's view that compliance to principles takes

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[83] Ibid. [84] Eiseman and Spencer, op. cit., p. 686.

[85] Ibid. [86] Watts, op. cit., p. 967.

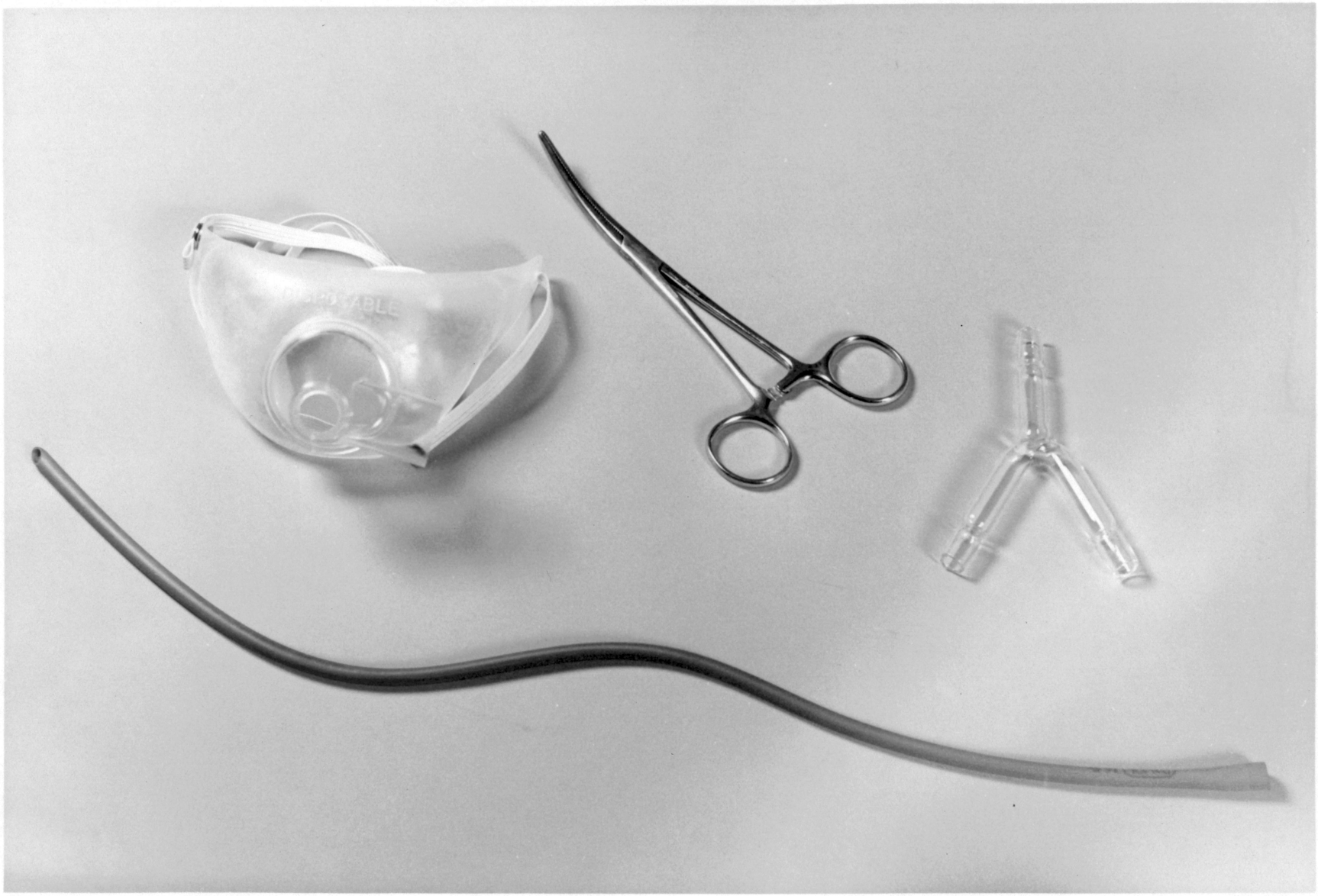

Figure 2. Tracheostomy Mask, Curved Hemostat, Y-Tube and Aspirating Catheter

precidence over specific procedural techniques,[87] the following criteria for technique innovation have been given:

1. The technique must be simple and effective and easily applied even during moments of stress.
2. The technique must not involve repeated "scrubbing up" by the nurse.
3. The apparatus used should be inexpensive.[88]

A review of methods attempted in England to achieve an aseptic technique revealed that the following techniques were rejected because the criteria mentioned above were not met:

1. Attempts to sterilize hands
2. Sterile forceps to manipulate the suction catheter
3. Disposable gloves
4. Sterilization of gloves in a solution

The use of disposable gloves would increase the cost of equipment, and if suction is required immediately, the nurse has little time to put on gloves or begin hand sterilization procedures, let alone retrieve gloves from a sterilization solution and then put them on. The forceps appear to be a ready answer for sterile passage of a catheter into the trachea, however, they are sometimes ineffective when difficulty is experienced in passing the catheter. "Sterility is too often abandoned for speed or greater

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[87] Beland, loc. cit.

[88] T. H. Taylor, et al, "Simple Aspetic Technique for Tracheal Suction," Lancet, I (January 9, 1965), 89.

made by nurses in suctioning patients are:

1. Fear of inserting the catheter too far
2. Use of unsterile, non-hygienic aspirating equipment (the same catheter for nose, throat and tracheostomy)
3. Overvigorous punching of the catheter into the trachea and bronchi.
4. Prolonged use of intense suction.[94]

It must be remembered that the lining of the trachea is not adapted to direct exposure to unconditioned air and can be injured by the catheter or suction procedures.[95] Plum and Dunning, in a study of the techniques employed in care of twenty-five tracheostomy patients, found that the following incorrect procedures were being performed:

1. Catheters were inserted into the trachea without first being lubricated with sterile saline, water, or etc.
2. Suction was turned on then the catheter was inserted until resistance could be felt.
3. The catheter was often left in postion as long as mucous could be aspirated.
4. The catheter was thrust vigorously back and forth within the tracheobronchial tree in an effort to increase the yield of aspirate.
5. When the catheter adhered to the mucous lining, it was pulled away and the catheter was advanced without interruption of suction.
6. The same catheter was used for the nose, throat, and tracheostomy.[96]

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[94]Nelson, op. cit., p. 62. [95]Beland, op. cit., p. 412.

[96]Fred Plum and Marcelle F. Dunning, "Technique for Minimizing Trauma to the Tracheobronchial Tree After Tracheotomy," New England Journal of Medicine, CCLIV (February 2, 1956), 193-94.

Proper aspirating techniques mentioned by serveral authorities are as follows:

1. Insert the catheter as far as it will go easily and deep enough to stimulate coughing.
2. Apply suction intermittently as the catheter is slowly withdrawn.[97]
3. Use a Y-tube to regulate suction precisely and intermittently. (See Figure 2, p. 29)
4. Rotate the suction catheter while withdrawing it to eliminate the possibility of attachment to the tracheal lining.[98]
5. Each aspiration should be ten to fifteen seconds in length.
6. The patient should be allowed to rest for at least one minute between each aspiration if at all possible.[99]

Avoiding application of suction while advancing the catheter minimizes injury to the tracheal mucosa and lessens the period suction is applied. A good rule for the nurse to follow in determining the length of time suction should be applied is for her to hold her breath for the period of time each aspiration is performed.[100]

A Y-tube is preferred over pinching the tube to avoid suction as pinching the catheter increases the negative pressure, and the tube will have a greater tendency to adhere to the membranous lining when the tube is opened.[101] At any sign that

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[97] Nelson, loc. cit. [98] Sutton, loc. cit.

[99] Watts, loc. cit. [100] Eiseman and Spencer, op. cit., p. 686.

[101] Plum and Dunning, op. cit., p. 194.

the mucous membrane has been suctioned into the tube, the Y valve should be opened to release the suction.[102]

Prolonged or intense aspiration may be a definite hazard to the patient because of a precipitous lowering of oxygen saturation and resultant hypoxia.[103]

> Any catheter in the trachea is an obstruction to the airway and should be withdrawn gently as soon as coughing is initiated. Otherwise a forced expiration against the catheter may increase the positive pressure within the chest and interfere with cardiac ciculation.[104]

The tracheostomy should be suctioned when the "rattle-like" sound of secretions or signs of dyspnea appear. During the first twenty-four to forty-eight hours post-operatively this could be every fifteen to thirty minutes.[105]

Rubber catheters tend to cause greater irritation to the tracheal lining, but they are less stiff than the plastic, synthetic ones. The plastic catheters allow for inspection of the material being aspirated as well as its passage up the catheter. The synthetic materials used in the catheters are less expensive than rubber, and thus they can be disposed of more economically. Whichever type catheter is used, the size selected should have an "outside diameter less than half the inside diameter of the

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[102] Beland, loc. cit. [103] Nelson, op. cit., p. 63.

[104] Totman and Lehman, loc. cit.

[105] Sutton, op. cit., p. 334.

CHAPTER III

PRESENTATION, ANALYSIS AND INTERPRETATION OF DATA

The data, obtained during each interview, were tabulated according to the following classifications: (See Appendix B)

1. Preliminary questions
2. Physiological changes that occur after tracheostomy
3. Possible complications and areas of observation
4. Nursing care procedures

I. PRELIMINARY QUESTIONS

Questions One, Two, and Three were included as preliminary questions as they were important in the categorizing of the nurses' responses. Question One considered the length of time the individual had been working as a nurse; Question Two included the area where most of the individual's experience had been gained and also the area in which she was presently working. Question three was concerned with the number of tracheostomy patients that each nurse cared for during the period of one year.

Knowledge of the area in which the nurse worked was used to classify the responses in the medical-surgical, pediatric, or I.C.U. group. Question Two, concerning the area in which most of the individual's work experience had been gained, helped the researcher eliminate respondents from the sample who had never worked with medical or surgical patients. Questions One and Three which asked for the number of years of nursing experience and the

number of tracheostomy patients cared for per year were included to determine if comparisons existed between those factors and greater understanding of tracheostomy care principles.

As shown in Table I, 68.6% of the thirty-five nurses interviewed were working with adult medical-surgical patients; 8.6% worked with children, and 22.8% were working in intensive care units. The median year of work experience of all thirty-five nurses was ten years and ranged from seven months to thirty-four years. The nurses from the intensive-care units had a higher mean average of work experience (16.2 years) than the other groups.

TABLE I

CLASSIFICATION OF NURSES BY WORK AREA
INCLUDING MEAN YEAR AND RANGE OF WORK EXPERIENCE
NUMBER, AND PERCENTAGE OF NURSES PER GROUP

Group	Number of Nurses in Group	Percentage of Nurses	Mean Yr. of Work Experience	Range of Work Experience
I.C.U.	8	22.8	16.2	7 mos.-34 yr
Pediatrics	3	8.6	13.3	7 yrs.-22 yr
Medical-Surgical	24	68.6	8.9	9 mos.-24 yr
Total	35	100.0	12.8	

The intensive care nurses cared for more patients per year than did the other groups. This could be expected from the specialized nature of their work area. These nurses cared for an average of seven to ten patients per year as compared with an average of zero to two tracheostomy patients per year cared for by

TABLE II

PHYSIOLOGICAL CHANGES MENTIONED BY GROUP
IN RESPONSE TO QUESTION FOUR

Physiological Changes	Medical-Surgical	Pediatrics	I.C.U.	Total
Physically easier to breathe	2		4	6
Speech loss	20	3	7	30
Ciliary cleansing impaired	10	1		11
Humidification and warming lost	9	2	5	16
Increase in Mucous	3	1	2	6
Better Oxygen Exchange	2		1	3
Don't Know	2		1	3

TABLE III

NUMBER OF RESPONSES TO PRE-OPERATIVE TEACHINGS THOUGHT IMPORTANT BY GROUP

Teachings	Medical-Surgical	Pediatrics	I.C.U.	Total
Purpose of the Tracheostomy	11	3	6	20
What the Tracheostomy Is	9		4	13
Increased Secretions	1	1		2
Speech Would be Lost	18	3	6	27
Suctioning	20	3	3	26
How to Communicate	4		1	5
No Response	1			1

Fifteen nurses stated that the patients with tracheostomies would experience an inability to humidify and warm inspired air, ten noted that ciliary cleansing would be absent, and seven said tracheostomy would relieve the work of breathing. Increased mucous secretion was mentioned by five nurses and three stated there would be a better oxygen exchange and improvement in electrolyte balance. Three nurses, including one nurse from I.C.U., stated that they did not know what physiological changes would occur.

Twenty-six nurses stated they would explain pre-operatively to the patients that suctioning would be performed, and twenty nurses would tell the patients the purposes of the tracheostomy as they understood them. Thirteen nurses also stated that they would tell patients what the tracheostomy was and how it would look. One nurse indicated she would tell the patient nothing as this was the responsibility of the physician in her opinion. Two other nurses mentioned they would explain only those things which had already been told the patient by the doctor.

It would appear that an understanding of the physiological changes which are not too obvious were not well understood by the majority of the nurses. The I.C.U. nurses apparently had no greater understanding of the physiological changes after tracheostomy than did the other nurses. Of the seven possible responses, the I.C.U. nurses gave an average of 2.2 responses per person. The number of responses of the entire group of thirty-five nurses

It is interesting to note that those nurses who reportedly cared for the greatest number of tracheostomy patients per year gave 0.7 fewer responses than did those nurses who cared for seven to ten patients per year. The expectation that nurses who care for the least number of tracheostomy patients would know less about physiological changes was supported by the low average number of responses given by the nurses in this group (0 to 2 pts.).

Reasons why there is a lack of understanding about physiological changes in tracheostomy patients did not come within the scope of this study, but some of the possible factors can be postulated. Perhaps the inability of the severely ill tracheostomy patients to communicate effectively to others what changes they are experiencing has something to do with the nurses lack of understanding. Explanation about these changes during the nurses' basic education and later while caring for these patients may be neglected. Perhaps the study of the normal physiology as well as the changes produced by tracheostomy is not emphasized or explained by doctors or taught by in-service programs.

III. COMPLICATIONS

Items concerning the knowledge of specific complications as well as observations by the nurse of the patient's condition were included in Questions Five and Seven. Question Six dealt with sterility of tracheostomy care equipment which is one factor in the occurrence of infectious complications.

Identification or naming of specific pathogenic conditions or complications by the nurse is considered by some as a diagnostic procedure and not a function ascribed to nurses; but meaningful observation of the patient's condition and recognition of of symptoms is a function of nursing and is an essential element in the treatment and prevention of further disease. "The degree to which one can observe and perceive a subject is usually proportionate to his knowledge and understanding of and his experience with the subject."[108]

Question Six, which dealt with sterility of tracheostomy care equipment, might be considered important only to the study of nursing care procedures, but it was included in this section because of its association with infection, a frequent complication of tracheostomy patients.

Of the fourteen possible responses to Question Five, twelve complications were mentioned at least once (see Table IV). No incorrect responses were given by any of the nurses.

Obstruction of the tracheostomy tube and infection were each given by twenty-seven nurses as conditions which might endanger the life and/or health of a patient. These two conditions were also mentioned most often in the literature. Displacement of the tracheostomy tube had the next greatest number of responses; five medical-surgical nurses and two I.C.U. nurses indicated

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[108]Katherine J. Bordicks, Patterns of Shock: Implications for Nursing Care (New York: The Macmillan Co., 1965), p. 61.

TABLE V

MAINTENANCE OF TRACHEOSTOMY CARE EQUIPMENT, EITHER STERILE OR CLEAN, REASONS AND NUMBER OF RESPONSES, BY GROUP

Responses	Medical-Surgical	Pediatrics	I.C.U.	Total
STERILE:	13	2	6	21
Cleansing Mechanism Lost	4	2	1	7
Mucous--Bacterial Growth Media	1		2	3
Decreased Resistance of Pt.	1			1
Prevent Outside Contamination	12		1	13
No Reason	2			2
CLEAN ONLY:	11	1	2	14
Air Normally Unsterile	3			3
Impossible to Keep Sterile	8	1	5	14
No Reason	3			3

of the complications that could occur than would the regular staff nurses. Fistula formation, tracheal stenosis, hemorrhage, aspiration, as well as pneumothorax and emphysema were not mentioned by the I.C.U. nurses. Infection was mentioned by seven of the eight I.C.U. nurses and half of the group (four) listed obstruction of the tracheostomy tube as a complication. The remaining complications mentioned by these nurses were mentioned by less than half of these nurses. The average number of responses per person was 2.5.

Of the fourteen possible complications which could have been mentioned, the nurses gave one to five responses per person with an average number of responses from all thirty-five nurses of 2.5 responses per nurse. When the nurses were divided according to number of years of work experience the average number of responses per nurse was:

Years of Work Experience	Number in Group	Average Number of Responses
Up to one year	4	2.3
1 to 4 years	10	2.5
5 to 9 years	5	2.3
10 to 14 years	7	2.9
15 to 19 years	5	2.6
20 years and more	4	2.3

Those nurses who had worked for ten to fourteen years evidenced greater understanding of complications than the other groups as they gave the greatest average number of responses.

When the nurses were divided according to the number of patients cared for per year, the nurses who cared for seven to ten patients mentioned more of the fourteen possible complications than did any other group of nurses:

Number of Pts. Cared for per Yr.	Number in Group	Average Number of Responses
0 to 2 patients	16	2.1
3 to 6 patients	8	2.1
7 to 10 patients	6	3.3
11 or more patients	5	2.6

The observations which the nurses deemed most important to note about the patient's condition are outlined in Table VI. The rate and character of respirations were given thirty-three responses and the tracheostomy care that had been performed was mentioned by twenty-one nurses. Breath sounds, which are most commonly considered important in the care of the critically ill patient, were mentioned by only three nurses from the medical-surgical area; no I.C.U. nurses mentioned this as being important to note.

The intensive care unit nurses evidenced no greater understanding of the observations which should be made than did the nurses from the other two work areas.

It might be surmized from the average number of responses given by the thirty-five nurses (2.9 per person) that these nurses did not know what was important to observe about tracheostomy patients. Of the nine possible observations which should be made, the nurses gave a range of two to six responses per person.

Eight nurses stated they would record symptoms of complications. The condition of the stoma, restlessness and all vital signs would also be important in assessing whether a complication was imminent. These latter responses as well as the character of the aspirate obtained with suctioning received less than eleven responses.

It was possible that the remaining twenty-seven nurses did not feel confident about their evaluation of what constituted symptoms of a complication and so would not consider their observation as being of value.

IV. NURSING CARE PROCEDURES

Crawford pointed out areas in which nurses must have a working knowledge, if adequate tracheostomy care is to be performed:

1. Purpose of the procedure
2. Equipment needed for the care
3. Techniques used in aspiration
4. Maintenance of sterile technique
5. Care of the tracheostomy cannula and other equipment
6. Management of humidification and secretions.[109]

Question Eight involved suctioning techniques that the nurse would teach a student of nursing. Phraseology of this question was intended to give the nurse the chance to mention all the procedural techniques of which she knew, whether she had had

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[109]Crawford, op. cit., p. 90.

TABLE VII

FREQUENCY AND PERCENTAGE OF CORRECT AND INCORRECT RESPONSES OF THIRTY-FIVE NURSES ON SUCTIONING TECHNIQUES BY GROUP

Techniques	Medical-Surgical	Pediatrics	I.C.U.	Total Number	Total Percentage
CORRECT:					
Frequency	20	3	6	29	83
Position of Pt.	3	1	4	8	23
Suction Time	7	2	6	15	43
Depth of Catheter	11	1	6	18	51
Maintain Sterility	6	2	3	11	31
Use of a Y-Tube	4	2	8	14	40
Rinse Cath. in Sterile Solution	11	1	5	17	49
Remove Inner Cannula Before Suctioning	1			1	3
Rotate Tip of Cath. on Withdrawal	2		1	3	9
Suction Applied Only on Withdrawal of Catheter	22	3	8	33	94
INCORRECT:					
Position of Pt.	11	1	4	16	46
Suction Time	1			1	3
Depth of Catheter	6		2	8	23
Pinch Catheter	9			9	26
Inner Cannula Not Removed to Suction	7	1	4	12	34
Don't Know	2			2	6

Four nurses from the other two areas mentioned correct positioning of patients for suctioning. Sixteen nurses gave incorrect positions for suctioning.

All eight I.C.U. nurses expressed their preference for Y-tube useage during suctioning as did six other nurses. Nine nurses from the medical-surgical area preferred the incorrect method of pinching the catheter to eliminate suction while inserting the aspirationg catheter.

Eighteen nurses (51.4%) correctly indicated that the catheter should be advanced until the cough reflex was reached or resistance could be felt. Eight others, including two I.C.U. nurses, stated that the catheter should be advanced only to the tip of the tracheostomy tube. No nurses mentioned the use of forceps to advance the catheter, nor did they mention wearing sterile gloves.

One nurse correctly stated that when possible the inner cannula should be removed before suctioning the patient. Twelve nurses, including four from I.C.U., stated the inner cannula should be removed only for cleaning. One of those twelve nurses stated that the inner cannula should be cleaned more frequently than once or twice a day.

Two nurses from the medical-surgical group stated they had never suctioned a tracheostomy patient and said they had no idea how to perform any aspect of tracheostomy care.

Of the ten or more possible techniques that could have been mentioned, the I.C.U. nurses gave an average number of 6.7

responses, the pediatric nurses an average of 5.0 responses, and the medical-surgical group an average of 3.7 responses for a group total average of 4.9 responses per nurse. There was a range of zero to nine correct responses given per nurse.

When the nurses were divided according to years of work experience, the average number of responses was as follows:

Years of Work Experience	Number in Group	Average Number of Responses
Up to one year	4	6.0
1 to 4 years	10	3.5
5 to 9 years	5	4.6
10 to 14 years	7	5.9
15 to 19 years	5	4.6
20 years or more	4	3.5

Those nurses who had worked for less than one year as well as those who had worked for ten to fourteen years gave the most correct responses, thereby making it impossible to state that either new graduates or those who worked the longest knew the most about tracheostomy care procedures.

The average number of responses given by the nurses according to the number of patients they cared for was:

Number of Pts. Cared for per Yr.	Number in Group	Average Number of Responses
0 to 2 patients	16	2.8
3 to 6 patients	8	5.3
7 to 10 patients	6	6.0
11 or more patients	5	6.0

One might assume from these results that the more patients with

tracheostomies one cares for per year, the more one knows about tracheostomy care procedures.

All nurses correctly thought that suction equipment should be in the room when the tracheostomy patient arrived; thirty-four would have the tracheostomy care tray and solutions available. Seventeen nurses stated they would have a humidifier in the room and twenty mentioned that oxygen should be nearby. Of the five nurses that stated an extra tracheostomy tube should be kept at the bedside, four worked on medical or surgical units and one nurse was from the pediatric unit. None of the I.C.U. nurses mentioned the need for an extra sterile tracheostomy tube.

Although all of the ten possible correct techniques were not mentioned as frequently as one might expect, nurses who had worked in I.C.U. for less than one year and cared for more than seven tracheostomy patients during that time evidenced the greatest understanding of correct suctioning techniques.

The three essential principles of tracheostomy care; i.e.: keep clean, keep moist, and use deep suction, were not well understood by the majority of the nurses. Sterility maintenance was mentioned by eleven (31%) of the thirty-three nurses who gave responses to Question Eight. Two nurses mentioned the correct technique of lubricating the aspiration catheter with sterile saline or water before insertion, eighteen (51%) of the nurses knew the correct depth to insert the catheter, and fifteen (43%) mentioned the correct length of time suction should be applied.

Rotating the tip of the catheter to prevent trauma to the mucosa was mentioned by three (9%) of the nurses.

Three nurses mentioned the use of a tracheostomy cuff at some time during their interviews. No other nurses indicated a knowledge of tracheostomy cuff useage. Of the three that did mention tracheostomy cuffs, one stated the cuff should be deflated every two hours; the other two said the cuff should be deflated every six to eight hours.

V. SUMMARY

The data obtained through questioning during interviews were categorized and grouped according to their content, tabulated and analyzed.

Thirty-five nurses were interviewed; twenty-four worked in medical-surgical areas, three in pediatrics and eight in intensive care units (I.C.U.). The mean year of work experience was ten years and ranged from seven months to thirty-four years.

Although loss of speech seemed to be well understood as a physiological change occurring after tracheostomy, and air humidification and warming were acknowledged by sixteen of the thirty-five nurses, an understanding of the physiological changes experienced by the tracheostomy patient was not evidenced. The number of responses given ranged from zero to five per nurse out of the seven possible responses, and an average number of 2.5 responses per nurse was given by the group.

The pre-operative teaching of tracheostomy patients that the nurses indicated they would give did not include adequate explanation of the physiological changes that would occur. However, the purpose of the tracheostomy would be explained as well as what the tracheostomy would look like.

Of the fourteen possible complications that can occur, obstruction of the tracheostomy tube and infection were mentioned by twenty-seven nurses. The other ten complications mentioned received seven or fewer responses. Emphysema and pneumothorax were not mentioned by any of the nurses. The nurses gave from one to five responses each with an average of 4.9 responses per nurse.

The majority of nurses stated that tracheostomy care equipment should be kept sterile, and eight nurses gave reasons based on the physiological changes requiring the use of sterile equipment.

Intensive care nurses mentioned more of the ten correct suctioning techniques per person than the other two groups. They gave 6.7 responses per person. Those who cared for seven to ten tracheostomy patients per year gave 6.0 responses per person. The nurses who had worked less than one year also gave an average of 6.0 responses per nurse. The nurses who had worked ten to fourteen years gave an average of 5.9 responses per person.

Thirty-three of the nurses indicated that aspiration of secretions should be accomplished as frequently as the patient

needed and that suction should be applied only while the catheter is being withdrawn from the trachea.

The most frequently mentioned incorrect techniques were those related to the postion of the patient during suctioning. Eight nurses (23%) gave correct positions and sixteen (46%) gave incorrect positions. Twelve (34%) of the nurses deemed it unnecessary to remove the inner cannula before suctioning and one nurse (3%) correctly stated that it should be removed each time before suctioning the patient.

The following findings should be noted:

1. One I.C.U. nurse and two medical-surgical nurses did not know what physiological changes occur after tracheostomy.

2. One nurse stated she would tell the patient nothing preoperatively and two others would give no explanations other than those already mentioned to the patient by the doctor.

3. Emphysema was not mentioned as a possible complication even though one intensive care unit had a patient with this condition at the time of the interviews.

4. Twenty-seven nurses mentioned that infection was a possible complication while twenty-one felt tracheostomy care equipment should be kept sterile. Three nurses stated it was impossible to keep tracheostomy care equipment sterile and two indicated the equipment should be kept sterile but didn't know why.

5. Two nurses stated they did not know how to suction a tracheostomy patient and had never done so.

6. There seemed to be a lack of knowledge about the use of tracheostomy cuffs. Three nurses mentioned them, and one of the three said the cuff should be deflated every two hours. The other two stated the cuff should be deflated every six to eight hours.

7. The I.C.U. nurses did not consider it important to have an extra sterile tracheostomy tube close to the patient.

CHAPTER IV

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

I. SUMMARY

The problem concerned with in this study was to find out what scientific principles were understood by nurses relative to the care of tracheostomy patients. Registered nurses should have an understanding of the basic principles underlying tracheostomy care because they are most often responsible for those patients. If these principles are well understood, the techniques of care can be adapted as necessary without consequence to the patient.

Supplementary questions also considered were to determine if nurses who work in intensive care units had a greater understanding of the basic principles of tracheostomy care and if there were any comparisons between the number of years of work experience or the number of tracheostomy patients cared for per year and the amount of understanding of tracheostomy care principles.

The assumptions were made that nursing care is essential to the prevention of further disease and restoration of health; that if nurses have the necessary understanding, they will put them into practice; and by determining the understanding nurses had relative to tracheostomy care, nursing care could be improved.

The descriptive method was chosen for this study. Literature was reviewed to identify principles involved in the care of

tracheostomy patients. The information gained from this review served as a background from which the data gathering tool was developed. The interview method was selected to obtain information pertinent to the study. A pilot study was conducted to refine the interview guide and prepare the researcher for the collection of data. Thirty-five registered nurses were selected from two community hospitals to participate in this study.

The sample of thirty-five nurses consisted of twenty-four nurses working in medical-surgical areas, three nurses from pediatrics, and eight from intensive care units. The mean year of work experience was 12.8 years and ranged from seven months to thirty-four years.

The findings indicated that the majority of nurses realized the nose and throat were by-passed by the tracheostomy during respiration and that speech was lost, but other essential physiological changes which follow tracheostomy were not well understood. Loss of the cleansing and conditioning mechanisms on inspired air were understood by eleven and sixteen nurses respectively. The four other physiological changes were mentioned by less than twenty percent of the respondents.

Obstruction of the tracheostomy tube and infection were complications mentioned by twenty-seven nurses. Emphysema and pneumothorax were not mentioned. These two omissions and the infrequent responses to the remaining ten complications indicated that the nurses did not well understand the physiological implications of tracheostomy.

Of the twenty-one nurses who felt tracheostomy care equipment should be kept sterile, seven attributed their belief to the loss of the patient's ciliary cleansing mechanisms. Three nurses indicated that the equipment should be kept sterile, but that it was impossible to do so. Fourteen nurses said the equipment should, in their estimation, be kept clean, which again indicates a lack of understanding of the physiological principles underlying tracheostomy care.

Nurses who worked in I.C.U. evidenced no greater understanding of the principles behind the care they gave than did the regular staff nurses. No greater understanding of these principles was evidenced by nurses who had worked the longest or had cared for the greatest number of tracheostomy patients.

There was a general understanding that patients should be told the purpose of the tracheostomy pre-operatively and that speech would be lost. Five understood the importance of telling the patient how he could communicate until speech was restored. One nurse reportedly would tell the patient nothing, her reason being that "this was the duty of the doctor."

Nurses' understanding of the techniques involved in suctioning patients was higher than their understanding of the principles involved. Of the ten possible correct responses to the question on suctioning techniques, the average number of responses was 4.9 per person and ranged from zero to nine responses per nurse. The question on physiological changes had seven possible responses; an average of 2.2 responses with a range of one to five

responses per nurse was given. The question on complications received an average of 2.5 responses with a range of one to five responses per nurse out of fourteen possible responses. Nurses in the intensive care units did respond most frequently to the question on suctioning techniques. They gave an average of 6.7 responses per person to this question. Those who cared for seven to ten tracheostomy patients per year gave 6.0 responses, which was the highest average number of responses of nurses grouped according to the number of patients cared for per year.

Although the majority of the nurses understood when secretions should be aspirated and when the suction should be applied, the responses given indicated a lack of understanding of the depth the catheter should be inserted, use of the Y-tube, rotation of the catheter on removal from the trachea, and maintenance of sterility as well as correct patient positioning. Two nurses indicated that they had never suctioned a patient with a tracheostomy and did not know how the procedure should be performed.

II. CONCLUSIONS

The following conclusions, drawn from the findings of the study, indicate that the respondents in general lacked understanding of the principles relative to the care of patients with tracheostomies:

1. Registered nurses in this study lacked knowledge of the physiological changes which occur after tracheostomy.

in order to improve the nurses' understanding of these principles and ultimately improve patient care.

2. It is recommended that nurses who are selected to work in intensive care units be given additional instruction, if necessary, that they might better understand the principles underlying the care of tracheostomy patients.
3. A study comparing the level of understanding of tracheostomy care principles and programs from which the nurse respondents have graduated would be helpful in determining which curricula should be implemented.
4. Further research is recommended to discover through observation whether nurses apply the principles stated in their care of tracheostomy patients.
5. Further research is recommended to discover the reasons for the lack of understanding of the principles underlying tracheostomy care.

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APPENDICES

APPENDIX A

LETTER TO DIRECTORS OF NURSING SERVICE

660 Wedgewood Avenue
Upland, California
February 2, 1966

Dear Director:

From reports in the professional literature and personal experience, nurses have frequently been found to be afraid or otherwise unable to give adequate care to patients with tracheostomies. A reason for the inadequate care could be because nurses don't understand the principles involved in this type of care. I believe that further study is important in order to increase the nurses' understanding of the principles of tracheostomy care.

I would like your permission to contact and interview a number of the registered nurses at your hospital, especially those who would be most likely to care for patients with tracheostomies; i.e.: those who work in I.C.U., pediatric, and medical-surgical divisions.

The findings of this study would be used to complete requirements for my Master's Degree at Loma Linda University. If you are willing to participate in this study, I will be happy to send you the results for use at your institution.

Thank you for your help.

Sincerely yours,

(Miss) Mary Ann Featherstone

INTERVIEW GUIDE

1. How many years have you been employed in nursing? _____

2. In which area have you worked the most?
   _____ Medical-Surgical
   _____ Pediatrics
   _____ I.C.U.

   Where are you now working? _____

3. Approx. how many patients with tracheostomies do you care for per year?
   _____ None to two
   _____ 3 to 6
   _____ 7 to 10
   _____ 11 to 14
   _____ 15 or more

4. In what ways do you think a tracheostomy changes the normal body processes of a patient?
   _____ It doesn't
   _____ Dead air space lessened
   _____ Inability to speak
   _____ Inability to cough
   _____ Ciliary cleansing of inspired air absent
   _____ Inability to humidify and warm air
   _____ Improve electrolyte balance
   _____ Mucous secretion increased
   _____ No response
   _____ Other:

5. How can a tracheostomy endanger the health and/or life of a patient?
   _____ It doesn't
   _____ Crust formation
   _____ Obstruction of the tube
   _____ Hemorrhage
   _____ Infection
   _____ Emphysema
   _____ Displacement of the tube
   _____ Fistula formation
   _____ Erosion of tissues
   _____ Pneumothorax
   _____ No response
   _____ Other:

6. Do you think tracheostomy care equipment should be kept sterile?

   YES
   _____ Normal body cleansing mechanisms absent
   _____ Increased mucous good media for bacteria
   _____ No response
   _____ Other:

6. (continued)
NO
_____ Pt. receiving antibiotics
_____ Inspired air normally unsterile
_____ Impossible to keep equipment sterile
_____ No response
_____ Other:

7. What things do you consider important to observe about the patient's condition?
_____ Character and rate of respirations
_____ Breath sounds
_____ Color change
_____ Symptoms of Complications
_____ Tracheostomy care performed
_____ Chracter of aspirate
_____ Other vital signs
_____ No response
_____ Other:

8. What would you teach a nursing student regarding suctioning?
_____ Frequency
_____ Position of patient
_____ Length of time suction applied
_____ Depth of catheter
_____ Maintenance of sterile technique
_____ Use of Y tube
_____ Rinsing of catheter in sterile solution
_____ Removal of inner cannula

9. What would you tell an alert patient to expect after tracheostomy?
_____ Purpose of tracheostomy
_____ What it is
_____ Increased secretions
_____ Inability to talk
_____ Inability to cough
_____ Suctioning techniques
_____ No response
_____ Other:

10. What would you do to prepare for a tracheostomy patient coming to your unit?
_____ Suction equipment
_____ Tracheostomy care tray
_____ Extra sterile tracheostomy tube
_____ Humidifier
_____ Oxygen
_____ No response
_____ Other

LOMA LINDA UNIVERSITY

Graduate School

PRINCIPLES UNDERSTOOD BY NURSES RELATIVE TO THE CARE OF TRACHEOSTOMY PATIENTS

by

Mary Ann Featherstone

An Abstract of a Thesis

in Partial Fulfillment of the Requirements

for the Degree Master of Science

in the Field of Nursing

June 1966

ABSTRACT

A descriptive study was conducted to determine what scientific principles were understood by nurses relative to the care of tracheostomy patients. A random sample of thirty-five nurses: twenty-four from medical-surgical units, three from pediatric units, and eight nurses from intensive care units, were selected from nurses working at two community hospitals. The interview method was used to obtain the data. An interview guide was developed from information gained in the literature review and findings of the pilot study.

The findings of the study indicated that the nurses realized speech would be lost with tracheostomy, but other essential physiological changes were not well understood. The complications of tube obstruction and infection were mentioned by twenty-seven nurses, the other twelve possible complications were mentioned by zero to seven nurses. The majority of the nurses evidenced a lack of understanding of the correct techniques used in suctioning. Of the ten correct suctioning techniques possible, the nurses gave an average of 4.9 responses.

Nurses from intensive care units evidenced no greater understanding of the principles underlying tracheostomy care, nor did those nurses who cared for large numbers of tracheostomy patients or those who had the greatest number of years of experience.

Recommendations were made for further research and implementation of education programs to improve the nurses' understanding of the principles and ultimately improve patient care.