THE EFFECTS OF AN EDUCATIONAL PROGRAM ON PATIENTS WITH COPD

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We hereby recommend that the thesis prepared under our supervision by Elizabeth E. Hill entitled The Effects of an Educational Program on Patients with COPD

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DEDICATION

To my mother, Tommi, and Sharron

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CHAPTER 1

INTRODUCTION

As the cost of medical care and hospital expenses increases, health care providers and their clients need to become concerned with improved home care in order to help prevent the expense of hospitalization. Chronic health conditions become costly to both society and the individual when acute stages of the disease occur. Chronic obstructive pulmonary disease (COPD) is one of these conditions which has shown a steady increase in incidence and cost during recent years. COPD results in a progressive loss of respiratory function. The objectives of intervention in COPD are to decrease loss of respiratory function and increase ability to cope with the disease. As hospitalization for COPD can become extremely expensive, it is anticipated that intervention can help prevent acute stages of the disease leading to hospitalization.

In recognition of these facts, the American Lung Association of Texas/San Jacinto Area (Nursing Standards, 1981) has compiled and published a set of nursing standards for the home care of patients with COPD. These standards by the American Lung Association of Texas (ALAT) address tertiary prevention, or rehabilitation, of patients with

COPD. It is hoped that by using the standards nurses will help clients to prevent progression of the disease, prevent acute exacerbations requiring hospitalization, and learn to cope successfully with the disease.

Problem of Study

This study was aimed at determining whether home care teaching and procedures actually affected the client's respiratory function and ability to deal with the effects of COPD. The focus of the study concerned the client's response to a teaching program and what effect this program had on the client's respiratory function, knowledge about this disease, and perception of how well home care routines met his needs. The following research question was considered.

Will COPD outpatients from a chest clinic in a large federal hospital in an urban Texas area show a change in (1) knowledge of COPD, (2) perception of their ability to control their disease, and (3) actual respiratory function, after being provided with an educational program on knowledge of COPD and breathing retraining techniques?

Justification of the Problem

COPD is reaching epidemic proportions. It represents one of the major health problems in the United States,

accounting annually for more than 30,000 deaths (Mathews, 1980).

Several factors may be responsible for this increase in COPD. Cigarette smoking has increased. The increase of smoking among women has been followed by a subsequent increase in COPD among women. Air pollution from urbanization and industrialization has been strongly associated with morbidity and mortality related to COPD. Conquest of infectious diseases has increased longevity of the population, giving them more time to develop COPD (Miller, 1980). In 1975 the mortality rate from COPD was estimated at 19 per 100,000 population. Recent studies of general community populations indicated an 11% to 13% incidence of significant airflow obstruction. If only men with a history of smoking are studied, as high as 21% may have COPD (Miller, 1980).

As the frequency of COPD increases there is an additional financial burden placed on the individual and on society as a whole. In 1976 the total economic cost related to productivity losses from morbidity and mortality of COPD was estimated at $5.7 billion (Black, 1981). These figures do not indicate the cost of hospitalization, medication, and home care to the individual and society. COPD is the second leading cause of disability for male American workers today (Mathews, 1980).

While primary prevention and early diagnosis of COPD are important aspects in the study of this disease, the prevalence of diagnosed COPD patients indicates a great need for tertiary prevention, or rehabilitation. Rehabilitation may be defined as the restoration of the individual to the fullest physical, medical, mental, emotional, economic, social, and vocational potential of which he is capable (Lagerson, 1979). Evidence has shown that patients treated by a systematized care program are likely to remain functional for longer periods of time and become better able to cope with the demands of their daily living (Hodgkin, Balchum, Kass, Glaser, Miller, Hass, Shaw, Kimbel, & Petty, 1975). With an increased knowledge and understanding of the disease and an ability to use home care routines correctly, it may be possible for the client to remain functional and feel that he is learning to deal with the disease. This should increase perceptions of what he can do to help himself.

Conceptual Framework

Two models provided the conceptual framework for this study. The first was the Health Belief Model, which is concerned with the individual's perception of various aspects of disease as related to likelihood to take action against the disease. The second was Dorthea Orem's Self-Care Model,

which is concerned with an individual's ability to take responsibility for his own self-care activities.

The Health Belief Model (HBM) as described by Rosenstock (1974) is based on the concept that an individual exists in a life space which is composed of areas with positive, negative, and neutral valences. Disease is represented by areas of negative valence and its presence causes the individual to lack balance. Daily activities are conceived of as a process of being pulled by positive forces and repelled by negative ones. The HBM uses these concepts to formulate a model which states that in order to take action to avoid a disease, an individual must believe that he is susceptible to it, that the disease would have severe impact on some part of his life, and that taking some particular action would reduce his susceptibility to the disease. Barriers to taking action to avoid the disease include factors such as cost, convenience, pain, and embarrassment. An individual may receive cues to take action. These cues may be things such as mass media campaigns, advice from others, or illness of a family member or friend (Rosenstock, 1974).

Individuals may differ greatly in their perception of their susceptibility to a disease. One individual may deny any possibility of his contracting a disease, while another

may feel that he is in grave danger of contracting the disease. Perception of seriousness may also vary greatly from person to person. The degree of seriousness may be judged by the degree of emotional arousal created by the thought of the disease as well as the kind of problems created by the health problem. The individual may see the disease as a threat of death or disability, or a threat to his social and family life. Perceived susceptibility and severity have a strong cognitive component and are at least partly dependent on knowledge (Rosenstock, 1974).

An individual who has recognized his susceptibility to a disease that he believes to be serious has been provided with a force to take action. The direction that this action takes is thought to be influenced by beliefs regarding the relative effectiveness of known available alternatives in reducing the disease threat. An individual's behavior may then be determined by how beneficial he believes the various alternatives may be. These alternatives are likely to be seen as beneficial if they relate subjectively to the reduction of one's susceptibility to or seriousness of an illness. An individual's beliefs and perceptions are also influenced by the norms and pressure of his social groups (Rosenstock, 1974).

If readiness to take action is high and the negative aspects, or barriers, are seen as relatively low, the

individual is likely to take action. If readiness to act is low and barriers are strong, action is prevented. When readiness to act is high and barriers are strong, a conflict arises. An individual may attempt to remove himself from this conflict by engaging in activities which do not really remove the threat, or he may experience a marked increase in fear or anxiety (Rosenstock, 1974).

Orem's Self-Care Model (Orem, 1980) describes self-care as the practice of activities that individuals personally initiate and perform on their own behalf in order to maintain life, health, and well-being (Coleman, 1980). This self-care action is the response of an individual to a demand to attend to himself. The ability to do so reflects the individual's power of agency. In order to perform self-care activities, the individual must have the ability and skills to initiate and sustain self-care efforts, as well as the knowledge and understanding of self-care practices and their relationship to health and disease (Coleman, 1980).

The Self-Care Model describes nursing as a specific type of health care service based on the values of self-help and help to others (Coleman, 1980). The goal of nursing is to help an individual achieve health results through therapeutic self-care. Nursing practice is based upon the concept of self-care activities (Coleman, 1980).

There are three basic systems by which the nurse may intervene to provide assistance for the individual (Coleman, 1980). They are described as follows:

1. Wholly compensatory system: The patient has no active role in the performance of self-care. The nurse assists by acting for and doing for the patient.
2. Supportive-educative (developmental) systems: The patient is unable to perform or can and should learn required measures of therapeutic self-care but cannot do so without assistance. The nurse assists the patient by supporting, guiding, teaching, or providing the developmental environment needed by the patient.
3. Partly-compensatory systems: The patient and the nurse both perform therapeutic self-care measures. The distribution of responsibilities for performance of care measures to patient or nurse varies with the situation. The nurse assists the patient by acting for and doing for the patient, supporting, guiding, teaching, or providing the developmental environment required by the patient.

Orem describes four types of assisting techniques that may be utilized in the partly compensatory and supportive-developmental systems. These include helping the patient (1) perform self-care measures, (2) identify requirements

for assistance, (3) obtain resources, and (4) integrate the required self-care activities within the system of daily living (Coleman, 1980).

In conducting this study, the investigator used a teaching program to influence the individual's knowledge about COPD, perception of susceptibility to the effects of COPD, and perception of the seriousness of COPD. The program instructed the individual in the use of techniques which gave him the ability to improve or maintain his level of wellness through self-care activities. The teaching program and the literature provided served as the cues to take action against the disease. The individual maintained a record of the performance of these self-care activities at home, which helped to integrate the activities within the system of daily living. The nursing assistance given to this group of patients was supportive-educative.

Assumptions

The following assumptions were considered for the purpose of this study:

1. The use of home care procedures decreases the incidence of hospitalization.
2. Home care is less expensive than hospitalization.
3. Patients wish to be involved in their own care.

Research Questions

The following research questions were examined in this study:

1. Will an educational program increase the patient's knowledge about COPD?
2. Will breathing retraining techniques affect the COPD patient's respiratory function?
3. Will an increase in knowledge and the use of breathing retraining techniques affect the COPD patient's perception of his ability to improve control of the disease?

Definition of Terms

The following terms were defined for the purpose of this study:

1. Breathing retraining techniques--methods of breathing which will have a positive effect on the patient's respiratory function and on comfort in breathing, including pursed lip and diaphragmatic breathing.
   a. Diaphragmatic breathing--use of abdominal muscles to help raise and lower the diaphragm (Living with Lung Disease, 1978).
   b. Pursed lip breathing--breathing out slowly with lips semi-closed in order to decrease pressure

gradient between the lungs and the atmosphere (Living with Lung Disease, 1978).

2. Patients with chronic obstructive pulmonary disease--patients with chronic bronchitis, asthma, or emphysema who exhibit persistent obstruction of bronchial air flow (Chronic Obstructive, 1977). For the purpose of this study, COPD patients were those patients whose charts showed that doctors at the chest clinic had given them a diagnosis of COPD.
   a. Asthma--increased responsiveness of the trachea and bronchi to various stimuli, manifested by difficulty in breathing caused by generalized chronic narrowing of the airways (Chronic Obstructive, 1977).
   b. Chronic bronchitis--clinical disorder characterized by excessive mucous secretion in the bronchi and manifested by chronic or recurrent productive cough not attributable to other causes (Chronic Obstructive, 1977).
   c. Emphysema--enlargement of air sacs distal to the terminal nonrespiratory bronciole, with destruction of alveolar walls (Chronic Obstructive, 1977).
3. Home care routine--use of pursed lip and diaphragmatic breathing at home. To be practiced consciously at least three times a day until it becomes the standard

method of breathing. The patient was asked to keep a daily schedule and write down the times each day that the home care routine was practiced. This schedule was brought to the chest clinic by the patient on each visit during the educational program.

4. Knowledge of COPD--awareness of basic pathophysiology and care of COPD as measured by the Vermont Lung Association Breathing Workshop Patient Questionnaire on knowledge (Ashikaga, Vacek, & Lewis, 1980).
5. Perception of ability to affect course of disease--patient's perception of his ability to use a home care routine to improve respiratory function and increase comfort in breathing, as measured by a Likert-type scale adapted from Garner (1976).
6. Respiratory function--ability of lungs to exchange air volume as measured by the ratio of a forced expired volume in the first second of expiration to the forced vital capacity (FEV_1/FVC).
   a. FEV_1--forced expiratory volume in the first second as measured by spirometry.
   b. FVC--forced vital capacity as measured by spirometry.
   c. FEV_1/FVC ratio of less than 0.70 as measured by spirometry can be used as criteria for presence of airway obstruction (Miller, 1980).

7. Nursing--giving of direct assistance to a person when he is unable to meet his own self-care needs. Requirements for nursing are modified and eventually eliminated when there is progressive favorable change in the state of health of an individual, or when he learns to be self-directing in daily self-care (Caley, Dirksen, Engalla, & Hennrich, 1980).
8. Action--behavior that is deliberate and intended to affect something to which it is directed, to alter its condition. It is particular to the person who endeavors to change or prevent change or preserve the state of something (Caley et al., 1980).
9. Self-care agency--the capacity of the person to engage in self-care. It is deliberate or voluntary behavior and may involve habit and is in the interest of life, health, or well-being (Caley et al., 1980).
10. Therapeutic self-care demand--a complex set of objectively established requirements for actions that assist a person with the maintenance of present states of health or well-being, or with movement toward estimated desirable states (Caley et al., 1980).

Limitations

This study was limited to a group of patients from the chest clinic in a large federal hospital in Houston. Due to

the number of patients available and to the time limitations of the study, the patients were not randomly selected. Therefore the study findings cannot be generalized beyond this group of patients.

Other limitations of the study were concerned with its design. A one-group pretest-posttest design lacks a control group which allows the investigator to measure and control for the effects of external factors. A change in something such as weather, medications, or exposure to other factors during the time interval between pretesting and posttesting may affect the results of the study more than the educational program itself does (Polit & Hungler, 1978).

The use of a pretest may make the subjects more aware of some aspects of COPD and its treatment so that it becomes difficult to separate the effects of the treatment from the effects of testing (Polit & Hungler, 1978). Subjects taking the pretest may become more aware of the desirable answers to the questions and answer posttest questions accordingly. The increased awareness of these aspects may also cause them to be more attentive to other sources of information on COPD, making it difficult to measure the exact amount of change instituted by the educational program.

Summary

An individual's perception of his susceptibility to a disease and its severity are strongly influenced by knowledge of the disease. He may be influenced to take action against a disease by cues such as those from mass media or from educational programs by health care providers. The individual may be encouraged to initiate self-care activities for the maintenance of his own life, health, and well-being. In order to perform these activities, he must acquire certain knowledge and skills.

An educational program concerning basic knowledge of COPD and self-care skills was provided to a group of COPD patients. The investigator hoped to utilize the program to promote changes in the patients' knowledge of their disease, their ability to cope with the disease, and their actual respiratory function.

Chapter 2 presents a review of related literature. The procedure for collection and treatment of data is contained in Chapter 3. Chapter 4 provides the analysis of data and Chapter 5 is the summary of the study. This chapter also contains conclusions and recommendations for further study.

CHAPTER 2

REVIEW OF LITERATURE

As stated by Nett and Petty (1971), effective management of any disease must be based on a clear understanding of the specific disease processes. This requires education of both the persons delivering health care and those receiving health care. In order to cope with his disease, the patient with chronic obstructive pulmonary disease (COPD) must understand what causes the disease, how the disease affects him physiologically and psychologically, and how he can help himself to deal with it. This knowledge is especially important in an individual with a chronic disease such as COPD, as this individual may be responsible for his own care a large part of the time.

The following review of literature covers the types and causes of COPD, its physiological and psychological effects, and commonly accepted methods of helping patients to deal with the disease. A review of the theory of patient teaching is presented, and studies on home care and education of COPD outpatients are discussed, along with studies concerned with the use of Rosenstock's (1974) health belief model (HBM) in the provision of health care.

Chronic Obstructive Pulmonary Disease

In order to understand the pathology of obstructive airway diseases, one must have a basic understanding of the structure and function of the respiratory system. The last division of the bronchial tree consists of the terminal bronchioles, alveolar ducts, and alveoli (Mathews, 1980). The respiratory bronchioles, alveolar ducts, and alveoli from a single terminal bronchiole are called an acinus. This structure is involved in gas exchange and is surrounded by an extensive capillary plexus. In the normal lung, over 300 million alveoli provide a surface area for gas exchange of over 70 square meters. This allows for a large functional reserve capacity, explaining why marked pathology can exist in the lungs without obvious symptoms or deterioration in blood gases (Mathews, 1980). By the time symptoms occur, extensive and irreversible damage has been done.

The airway leading to these bronchioles is lined with ciliated psuedostratified columnar cells and goblet cells. Mucus is produced by mucous glands located in the trachea and bronchi. Cilia in the airways sweep mucus and particles of debris toward the upper airways (Chronic Obstructive, 1977).

The bronchioles are suspended in the lung by alveolar elastic tissue which connects the alveolar walls, air

passages, and vessels. The bronchiolar epithelium is ciliated, but is single layered and columnar or cuboidal. Beyond the bronchioles, the epithelium is flat and lined with a film of surfactant, which lowers surface tensions and helps keep air spaces from collapsing. Smooth muscle surrounds the walls of all bronchi, bronchioles, and alveolar ducts. When stimulated, it shortens and narrows the passages. Cartilage lends rigidity to the tracheal walls and large bronchi, but is smaller and found less frequently in smaller bronchi, and is absent in bronchi less than one millimeter in diameter (Chronic Obstructive, 1977).

Increased resistance to airflow in the lung can be caused by conditions: (1) inside the lumen, (2) in the wall of the airway, and (3) in the peribronchial region (West, 1977). In the first condition, the lumen may be partially occluded by excessive secretions such as in chronic bronchitis. Partial obstruction may also be caused by bronchiectasis, acute stages of pulmonary edema, aspiration of fluids, and retained secretions. Localized complete obstructions may be caused by inhaled foreign bodies (West, 1977).

In the second condition, the wall of the airway may be affected by contraction of bronchial smooth muscle as in asthma, hypertrophy of the mucous glands as in chronic

bronchitis, and inflammation and edema of the wall as in bronchitis and asthma (West, 1977).

The third condition has its effects outside the airway as when destruction of lung parenchyma causes loss of radial traction and consequent narrowing of the airway. This may occur in emphysema or by local compression of enlarged lymph nodes or neoplasms. Peribronchial edema may also cause narrowing of the airway (West, 1977).

Chronic obstructive pulmonary disease (COPD) occurs when an individual suffers from a group of chronic, usually progressive respiratory disorders which appear related but have no single cause. These individuals have chronic bronchitis, asthma, or anatomic emphysema which causes persistent obstruction of bronchial airflow (Chronic Obstructive, 1977). They complain of increasing shortness of breath over several years and are found to have a chronic cough, poor exercise tolerance, evidence of airway obstruction, over-inflated lungs, and impaired gas exchange (West, 1977). The three basic types of COPD are described below.

Chronic Bronchitis

Chronic bronchitis is characterized by excessive mucus secretion in the bronchi and is accompanied by a chronic or recurrent productive cough (defined as a minimum of three months per year for at least two successive years) in

patients in whom other causes of productive cough have been ruled out. An inflammatory infiltrate is noted in the bronchial wall, accompanied by hypertrophy and hyperplasia of the mucus-secreting bronchial glands and mucosal goblet cells, and loss of cilia. Distortion and scarring of the bronchial wall may result. Chronic bronchitis often precedes and accompanies emphysema (Chronic Obstructive, 1977).

Emphysema

Emphysema may be described as an enlargement of the air spaces distal to the terminal nonrespiratory bronchiole, with destruction of alveolar walls. The bronchioles may be obstructed partially or completely, temporarily or permanently, by thickening of their walls, collapse due to loss of lung elasticity, or thickening of exudate. Distal air spaces distend and disrupt, becoming confluent and reduced in number. This leads to a decrease in the alveolar-capillary membrane surface (Chronic Obstructive, 1977; Dirschel, 1973).

Emphysema can be broken into subgroups according to the part of the acinus primarily involved. Panacinar (panlobular) emphysema describes an abnormal permanent enlargement of all air spaces distal to a terminal bronchiole and destruction of their walls. Proximal acinar

(centrilobular) emphysema primarily involves the respiratory bronchioles in the proximal portion of the acinus (Black, 1981). Proximal acinar damage is most often seen in the lungs of smokers (Mathews, 1980). The two types often occur together and may be difficult to distinguish from each other.

Asthma

Asthma is characterized by increased responsiveness of the trachea and bronchi to various stimuli. Narrowing of the airways is dynamic and may change in degree either spontaneously or through therapy. There is a periodic increase in the contraction of smooth muscle and hypersecretion of bronchial mucus. The individual exhibits difficulty in breathing related to the generalized narrowing of airways and abnormally sticky and obstructive mucus. Patients who have had asthma for many years may also develop emphysema (Chronic Obstructive, 1977).

Diagnosing COPD

Many patients with mild COPD may be essentially asymptomatic, or may present with a history of an insidious but productive cough, usually more pronounced after arising. Early in the disease there may be a slight prolongation of forced expiration and slightly diminished breath sounds at

the bases of the lungs, as well as scattered ronchi or wheezes which disappear after coughing (Chronic Obstructive, 1977).

One of the most sensitive bedside tests available for COPD is to time a forced expiratory vital capacity (complete forced expiration following maximal inspiration). The forced vital capacity (FVC) should not exceed four seconds in a normal patient. This expiratory time can be determined by placing a stethoscope over the patient's trachea and having him breathe out forcefully following inspiration (Hodgkin, Balchum, Kass, Glaser, Miller, Haas, Shaw, Kimbel, & Petty, 1975).

Pulmonary function is also tested with the use of a spirometer. A ratio of forced expiratory volume in the first second to forced vital capacity (FEV_1/FVC) can be an indicator of the presence of airway obstruction when the ratio is less than .70 (Cohen, 1980; Miller, 1980).

As the disease progresses, the symptoms become more pronounced. There may be evidence of decreased rib expansion. The individual may become tachypneic at rest and may be seen using accessory respiratory muscles. There will be evidence of intercoastal muscle retraction and flaring of the nostrils. Lip pursing may be observed. Abnormal breathing habits may develop. The chest and abdomen will cease to move together on respiration. The most

common pattern of abnormal breathing can be described as follows: (1) in the first part of inspiration the abdomen moves outward, but soon reaches a plateau; (2) at the start of expiration the abdomen begins to move inward, then abruptly moves outward again; then (3) the abdomen slowly moves inward until the start of the next inspiration (Mathews, 1980). The use of the sternomastoid muscle in the process of breathing is so pronounced that a taut sternomastoid muscle has become a method of diagnosing COPD (Anderson, Shankar, & Scott, 1980).

The patient may also begin to develop generalized hyperresonance, decreased area of cardiac dullness, and diminished heart sounds at base. Anteroposterior distance of the chest may increase (Chronic Obstructive, 1977).

In advanced stages of COPD the above findings are more pronounced, and the patient may show weight loss, depression of the liver, hyperpnea and tachycardia with mild exertion, a low and relatively immobile diaphragm, contraction of the abdominal muscles on inspiration, inaudible heart sounds except in the xiphoid area, and cyanosis (Chronic Obstructive, 1977).

Blood gas studies may be used for assessing and diagnosing the COPD patient in the hospital. Hypoxemia and hypercapnea are commonly found in these patients. The

hypoxemia is largely the result of areas of perfused, underventilated lung that result in a physiologic shunt of blood through the lung. This is usually the case in patients with chronic bronchitis. In emphysema, the lung is both underventilated and not perfused (Froelich, 1979; Mathews, 1980).

As ventilation decreases, the patient becomes unable to maintain normal levels of carbon dioxide, resulting in chronic respiratory acidosis. The pH remains in balance, as an offsetting metabolic alkalosis develops with retention of bicarbonate ion by the kidney. This chronic increased retention of carbon dioxide blunts the normal respiratory drive normally stimulated by high levels of carbon dioxide. The COPD patient depends on lower levels of PaO_2 to stimulate respiration. If the PaO_2 rises above 50 to 60 mmHg the oxygen drive may be shut off, with resulting apnea and severe respiratory acidosis (Cardin, 1980; Froelich, 1979; Mathew, 1980).

Symptoms and Complications

The effects of chronic obstructive pulmonary disease may be seen in most systems of the body. These effects are discussed below.

Pulmonary

Excess mucus in the bronchial tree leads to productive coughing, especially upon arising. This symptom often goes unnoticed or is denied by the patient. The spouse or other family member may be more aware of this symptom (Black, 1981). Inspiratory rales and ronchi, expiratory wheezes, and expiratory prolongation may occur. Breath sounds may be decreased, especially in the presence of asthma and emphysema. Breath sounds may be absent in emphysema and in severe attacks of asthma (Hodgkin et al., 1975). Late in the course of COPD the patient may complain of dyspnea (Rhodes, 1979). Hemoptysis may also occur. This may indicate the necessity to evaluate for the presence of lung cancer. Recurrent and prolonged lower respiratory tract infections are common (Black, 1981).

Cardiovascular

Nocturnal dyspnea may be related to the COPD itself, or to left ventricular failure. Cardiac arrhythmias may occur because of primary cardiac disease, cardiac disease related to COPD, or drug therapy. Ankle edema may be caused by congestive failure or by stasis in dyspneic patients who must sit with legs dependent most of the time (Black, 1981; Weitzenblum, Louiseau, Hirth, Mirhom, & Rasaholinjanahary, 1979; Meador, 1980).

Gastrointestinal

Gastrointestinal symptoms are frequent in patients with advanced COPD. Esophageal dysfunction and diaphragmatic hernia may cause acid reflux, leading to aspiration, bronchospasm, and nocturnal dyspnea. A patient who is short of breath may swallow excessive amounts of air, which results in excessive belching and bloating. Patients often complain of fullness or tightness of the abdomen immediately after a meal. This may be partially prevented by having the patient eat more frequent, smaller meals. Weight loss often occurs, and can be partially related to decreased calorie intake caused by abdominal discomfort. However, this weight loss is found more frequently in patients with panacinar emphysema than in those with chronic bronchitis (Black, 1981).

Genitourinary

Urinary incontinence and occasional fecal incontinence are not uncommon in patients with severe COPD. When the patient is active and becomes severely dyspneic, he feels the urge to urinate and may lose control. When the physical activity stops and the dyspnea is resolved, the urge rapidly disappears. The symptom seems to be related to changes in intra-abdominal pressure or a neural reflex, or the combination of both (Black, 1981).

Neurologic

Headaches are a symptom which have been partially attributed to a rise in arterial carbon dioxide pressure ($PaCO_2$) at night. However, they sometimes occur even with minimal nocturnal CO_2 retention. Their severity varies with time. Cough syncope may occur when the individual develops repetitive coughing in bursts that impede venous return to the heart, thereby impairing cardiac output and leading to syncope. This can usually be controlled by the avoidance of bronchial irritants and by encouraging the patient to control the forcefulness and repetitiveness of the cough (Black, 1981).

Patients who have lost weight and sit with their legs crossed much of the time may develop pressure neuropathies involving the peroneal nerves. Patients who are severely dyspneic may spend a great deal of time leaning forward and resting on their elbows, leading to damage of the ulnar nerves (Black, 1981).

Psychological

Depression is a common problem of disabled dyspneic persons (Black, 1981). The individual must often make a great deal of adjustment and change in his life at home and at work. Providing rehabilitation and home care for COPD

patients must be closely related to the psychological aspects of the disease (Jacobs & Bowers, 1979).

Factors Contributing to COPD

Cigarette smoking is considered the most important contributor to COPD. A study by Black (1981) cited the smoking history of 511 men and 150 women seen at a COPD clinic in one year. Ninety-one percent of the men and 73% of the women were or had been cigarette smokers. Most, but not all, patients with chronic bronchitis had a history of cigarette smoking. Black noted that not all smokers developed chronic bronchitis, and not all patients who developed chronic bronchitis proceeded to develop emphysema or COPD. Although smoking is associated with both chronic bronchitis and emphysema, the diseases may occur independently of each other. Smoking may produce the two types of lung damage by different mechanisms (Black, 1981). When teaching patients, it is important to emphasize that ex-cigarette smokers have lower death rates from COPD than do continuing smokers, and that cigarette smokers have a higher rate of respiratory infections, a dangerous complication for COPD patients (Chronic Obstructive, 1977).

It has been noted that COPD occurs with unusual frequency in certain families, which gives rise to the influence of heredity as a contributing factor to COPD.

Individuals with homozygous genetic phenotype Pi22 may develop congenital emphysema early in life. The effect is compounded if the individual is a cigarette smoker. This syndrome presents with panlobular emphysema predominantly in the bases of the lungs, which is presumably related to a deficiency of an antitrypsin leaving the patient susceptible to auto-digestion of pulmonary tissue by naturally occurring proteases. Only 2 to 3% of all emphysema cases may be related to this deficiency. It may be important, however, in warning certain individuals of the increased importance of avoiding lung irritants (Miller, 1980).

Air pollution may prove to be a significant factor in COPD. A relationship has been shown between urban air pollution and chronic bronchitis. An individual who breathes polluted air and smokes cigarettes is more likely to develop severe COPD than is an individual who smokes but lives in an area with cleaner air. Exposure to smog may induce bronchospasm and mucosal edema, which results in increased airway resistance and dyspnea in COPD patients. Heavy air pollution has even contributed to an increase in the number of deaths of patients with cardiopulmonary disease (Chronic Obstructive, 1977).

Occupational hazards to COPD patients include exposure to irritating fumes and dusts. Silicosis may cause severe

disturbances of pulmonary function resulting from effects of lung fibrosis and focal emphysema. Exposure to vegetable dusts, cotton fiber, and molds and fungi in grain dust may cause permanent respiratory impairment. Other factors leading to sometimes permanent damage are exposures to certain gases such as chlorine and oxides of nitrogen and sulfur (Chronic Obstructive, 1977). While these factors are less important than cigarette smoking, their combination with smoking increases the likelihood of COPD.

The relationship of allergic factors to chronic bronchitis or emphysema has not been clearly determined. In many patients, history and skin testing demonstrate a relationship of various allergens to bronchial asthma. In some asthmatics the relationship is absent (Chronic Obstructive, 1977).

Treatment Modalities for COPD Patients

There are numerous methods of treatment available for the care of COPD patients. As this study is concerned with outpatient care, the following discussion is focused on ways patients can help themselves. The use of oxygen and drug therapy is described briefly, as it fits within the combination of several methods of treatment. Treatment of COPD is largely based on symptoms, and several methods may be required to work together in assisting the patient.

Drug Therapy

Bronchodilators. Black (1981) recommended the use of a single drug rather than one of the combinations of bronchodilators available for oral use, as the use of a single drug makes it simpler to adjust individual doses. Aminophylline is recommended as an effective but inexpensive theophylline derivative. The doses for the average patient would be 200 mg orally four times a day, with the dose then being adjusted to the therapeutic range of a serum level of 10 to 20 mg/liter. The most common side effects are nausea and vomiting. If these effects are severe, a substitution of 200 mg of choledyl could be attempted four times a day. Since many oral bronchodilators contain ephedrine, an occasional side effect is urinary retention. They may also aggravate symptoms of prostatism and should be avoided in the treatment of older men (Black, 1981).

Terbutaline is available in oral form, with a recommended dosage of 2.5 to 5 mg three times per day. This drug may cause a muscle tremor, and many patients are unable to develop a tolerance to this effect (Black, 1981).

Black (1981) advises administration of bronchodilators by the inhalation route when possible, as this allows for greater effects of bronchodilation with fewer side effects. Bronkosol is recommended over Isuprel or Vaponefrin

(epinephrine) as its activity is more selective to bronchodilation. Its major disadvantage is that it is effective only one to three hours. It is administered three or four times daily by nebulizer and air compressor. The patient is instructed to place 5 to 10 drops of Bronkosol and 15 to 20 drops of distilled water into the nebulizer and inhale the medication over 15 to 20 minutes. If palpitation or nervousness occurs, the patient may be advised to reduce the amount of Bronkosol drop by drop or administer it more slowly. The patient is advised to exhale to reserve volume, then inhale slowly to total lung capacity while the aerosol is generated, and hold the breath at that point for a few seconds. A pocket inhalor such as a Bronkometer may be prescribed, but the patient should be advised not to overuse this, and should be instructed to use it in the same technique as the Bronkosol with the nebulizer (Black, 1981).

Corticosteroids. Corticosteroids may be of benefit in individuals suffering acute attacks of intermittant bronchitis. An initial dose of 60 mg daily of prednisone (or other corticosteroid) is recommended for 4 to 7 days, until optimal improvement has occurred, then tapered off until discontinued within the next 7 to 10 days. In an asthmatic patient requiring longer therapy, a low dose such

as 5 to 10 mg of prednisone per day may prevent symptoms and be used for months or even years. It is important to maintain the lowest therapeutic dose possible in long-term use in order to avoid cushingoid side effects, osteoporosis, peptic ulcers, and other steroid related side effects (Hodgkin et al., 1975).

Influenza vaccines and antibiotics. As the major cause of increased mortality and morbidity among COPD patients is concerned with superimposed respiratory infection, prevention and cure of this type of infections is vital. These infections are also the precipitating factor in over 75% of the cases of acute ventilatory failure in COPD patients (Harrison & Speir, 1978).

Digitalis and diuretics. Digitalis may be indicated in patients with left ventricular decompensation and may have a therapeutic effect in patients with right ventricular failure. However, studies have indicated that digitalis toxicity is more likely to occur in patients with COPD and hypoxemia (Fisch, 1971). Diuretics may also be useful in patients with increased dyspnea, pulmonary edema, and left or right ventricular failure. Thiazide diuretics and furosemide may lead to hypokalemia, which predisposes to digitalis-toxicity and cardiac arrhythmia. These diuretics

may also contribute to metabolic alkalosis which in turn may lead to compensatory hypoventilation. The alkalosis also results in an increased affinity of hemoglobin for oxygen, resulting in tissue hypoxemia. A combination of Aldactone or Dyrenium with thiazides may help prevent hypokalemia and metabolic alkalosis, and a potassium chloride supplement may be recommended (Hodgkin et al., 1975).

Oxygen therapy. Certain COPD patients benefit from supplemental oxygen therapy. These patients are usually found at higher altitudes, although some patients may become severely hypoxemic at sea level. Their need for supplemental oxygen is often greatest during exercise and at night while the patient is in the recumbent position (Nett & Petty, 1971). When the resting PaO_2 falls below 55, oxygen therapy should be considered. Oxygen at two liters per minute by nasal prongs should elevate the PaO_2 satisfactorily. Caution must be used to prevent increasing the PaO_2 to a dangerous level (Black, 1981). Oxygen therapy has been found to improve exercise tolerance significantly (Nett & Petty, 1971).

Rehabilitation

COPD is recognized as a chronic condition which exhibits progressive debilitation and has a poor prognosis.

Patients often become depressed and frightened and restrict their physical activity even more than is necessary. They feel they have no control over their situation or of the condition of their health. A good rehabilitation program may improve the quality of the patient's day-to-day life and decrease hospital admissions (Stanley, 1978). Both subjective and objective improvement can be ascertained after pulmonary rehabilitation (Gimenez, Uffholtz, Terrara, Plouffe & Lacosta, 1979).

Agle, Baum, Chester, and Wendt (1973) and Unger, Moser, and Hanson (1980) found that a program of rehabilitation and education in self-care provided patients with increased autonomy in the control of symptoms. Breathing retraining improved their patients' ventilation and provided a tool by which the patients could combat shortness of breath and fear. A marked decrease in hospital admissions was noted following their training program.

Several methods of rehabilitation and patient education are used in the treatment of COPD patients. They are discussed below.

Pursed lip breathing. The theory behind pursed lip breathing is that the pressure gradient between the lungs and the atmosphere is decreased and the airways are less likely to collapse (Living with, 1978). This breathing

maneuver is often adopted instinctively by many COPD patients, and studies by Mueller, Petty, and Tilley (1970) as well as by Thorman, Stoken, and Ross (1966) and Burki (1979a,b) have indicated that it leads to a fall in respiratory rate, an increase in tidal volume, and an improvement in blood gas tensions. The technique is especially useful when the patient is performing some activity which leaves him short of breath. It is accomplished by having the patient inhale through the mouth or nose, then breathe out slowly through the mouth with the lips in a whistling position, so that there is a slight pressure of air against the lips. The exhalation should last approximately twice as long as the inhalation. The patient should attempt to breathe out most, but not all, of the air in the lungs (Living with, 1978; Miller, 1967).

Diaphragmatic breathing. The diaphragm in a normal individual does about 80% of the work of breathing. With the progression of COPD, air trapping gradually leads to hyperinflated lungs and a flattened diaphragm. The diaphragm becomes nearly immobile and accessory muscles take over the work of breathing (Living with, 1978). Anderson, Shankar, and Scott (1980) found that observance of the sternomastoid muscles in an individual at rest can be diagnostic of COPD. With constant use, these muscles become

firm and taut, and they are prominently visible in the neck.

The patient should accomplish pursed lip breathing before being taught diaphragmatic breathing. The patient can locate his diaphragm by placing his fingers below his sternum and sniffing. The muscle he feels moving as he sniffs is his diaphragm. The patient should be instructed to choose a comfortable position, place one hand on the abdomen over the navel, and place the other hand on the upper chest. He then breathes in slowly through the nose. If breathing properly, the hand on the abdomen should move out, while the hand on the chest remains immobile. The patient breathes out slowly through pursed lips, pulling in the abdominal muscles. The abdomen must protrude on inhalation and contract on exhalation (Living with, 1978). Broussard (1979) has found deep breathing and relaxation in the COPD patient may decrease both pulse and respiratory rate.

Controlled coughing. The COPD patient can conserve energy and oxygen by learning to cough correctly. Kaufman and Woody (1980) recommend placing the patient in a sitting position with feet on the floor or on a stool. A pillow is placed against the stomach and supported firmly with the forearms. The shoulders are turned inward and the head

bent slightly downward. The patient takes a slow deep breath through the nose, using diaphragmatic breathing, holds the breath for two seconds, then bends forward slowly, pressing the pillow against the stomach and exhaling through pursed lips. He then returns slowly to a sitting position, breathing in through the nose. The procedure is repeated three to four times. It may be helpful to have the patient slowly sniff in while inhaling in order to increase aeration in lung bases (Living with, 1978; Lagerson, 1974). Fast, gasping breaths aerate only the upper part of the lung, producing a weak cough. Enough air must be taken in below the mucus to propel it out of the airway.

The patient then opens the mouth slightly, puts tongue forward, and produces two strong coughs while slowly bending forward, returns to a sitting position while inhaling, and repeats the cough as before. The entire coughing exercise should be repeated at least one more time (Kaufman & Woody, 1980). The patient's cough should begin in the lower chest rather than in the throat. The first cough should loosen and the second cough remove the sputum. The patient should be instructed to call the nurse or doctor if the color, amount, or smell of the sputum changes (Living with, 1978).

Postural drainage and percussion. The majority of COPD patients do not require postural drainage or percussion (Black, 1981). Occasionally a patient with excessive secretions, such as a patient with bronchiectasis, may benefit from these procedures. In these cases Cherniack and Lertzman (1977) recommend postural drainage, with the affected lobe uppermost, three to four times a day. Black (1981) suggests that the spouse be instructed in chest physiotherapy if the procedures are necessary, allowing the patient to remain at home. Although there is debate over the usefulness of these procedures, Billingsley (Roundtable, 1979) reported movies of cilia moving sputum upward more effectively during postural drainage accompanied by chest vibrations at 40 to 60 cycles per second. This was accomplished through the use of a padded mechanical chest percussor. These movies demonstrate that if ciliary damage is only patchy, the sputum will hang up at damaged areas, then be moved by vibration to healthy cilia on the other side of the damaged area.

Bronchial drainage should be ordered by the doctor and should specify use of any medications, specific positions, the use of percussion and vibration, and recommended frequency (Living with, 1978). The patient may lie over a pillow with (1) face down to drain posterior lower lung, (2) left side down to drain right lateral lung segments,

(3) right side down to drain left lateral segment, (4) back down to drain anterior lower lung segments, and sitting semi-upright to drain upper lung fields. Living with Lung Disease (1978) provides illustrations to demonstrate these positions. The chest area must be tilted at least 18 to 20 inches.

Percussion and vibration may be ordered to accompany postural drainage. Percussion is done with the hands cupped to produce a hollow, rather than a slapping, sound. A towel is placed over the area to be percussed. Percussion should be forceful, but not painful, and should be avoided in areas over the kidneys, vertebrae, or sternum (Living with, 1978).

Vibration is done after percussion, while the patient breathes out through pursed lips. The chest is vibrated with tensed hands by bending the elbows and tightening the arms, while lightly tensing outstretched fingers. The hands on the chest are then vibrated during exhalation for six pursed lip and diaphragmatic breaths. Sigmon (1979) provides illustrations of the procedures, or a mechanical vibrator may be used.

Intermittent positive pressure breathing. The value of home use of intermittent positive pressure breathing (IPPB) seems to have been over-rated. Long-term beneficial

effects have not been demonstrated for the typical COPD patient. It may be used as a short-term method of treatment for patients in acute stages of the disease, who have not responded to more routine treatments (Chronic Obstructive, 1977). In patients with a large sputum volume, IPPB may help to clear secretions, and it may help deliver bronchodilator aerosols to patients unable to take a deep breath on their own. It is not, however, used as a routine treatment (Fergus & Cordasco, 1977).

IPPB machines work by delivering a volume of gas under pressure to the patient's tracheobronchial tree (Cherniack, 1974). An inspiratory effort by the patient triggers the delivery of a set volume of gas. During expiration, the patient exhales against atmospheric pressure. There are numerous hazards involved in the use of IPPB. These include (1) possibility of pneumothorax or pneumomediastinum, (2) aggravation of bronchopulmonary bleeding, (3) gastric dilatation, (4) shock related to reduced cardiac output by impeding return of blood to the right side of the heart, (5) hyperventilation with too rapid decrease in arterial $PaCO_2$, with resulting respiratory alkalosis and possible coma, convulsions, and death, (6) infection from contaminated equipment, and (7) increased hypercapnea if high concentrations of oxygen were delivered during preceding treatment (Chronic Obstructive, 1977). As with all

equipment used to breathe or to breathe in medication, IPPB equipment must be cleaned daily with liquid dish detergent and water. Every third day it should be soaked in a solution of one-half cup vinegar and four cups tap water for one-half hour, then soaked for five minutes in clear water, and air dried (Living with, 1978).

Physical conditioning. Agle et al. (1973), in a study of factors improving psychologic state and performance in COPD patients, found progressive exercises to be an important factor. The COPD patient may find that he becomes dyspneic and easily fatigued with even minimal effort. To avoid this, he may refrain from any physical activity and becomes physically unconditioned. However, a program of daily, supervised exercise may double or even quadruple the patient's exercise tolerance (Neff & Petty, 1971). Walking and simple calisthenics may be appropriate for patients who have no problems of congestive heart failure, angina, or cardiac disease resulting in defective cardiac output. Patients who have a PaO_2 below 60 mm or significant pulmonary hypertension may require the use of a portable oxygen supply during their program of exercise (Chronic Obstructive, 1977). The conditioning program should be tailored to the individual patient. Warm-up and cool-down periods are essential with a target of 70% to 80%

predicted maximum heart rate for 10 to 15 minutes in the interval. The patient should be taken to the point of stress, without distress, and the work level gradually increased as tolerance improves. It may be useful to administer a bronchodilator prior to exercise (Miller, 1980).

General measures. Perhaps one of the most important aspects in the care of the COPD patient is the support provided by the health care personnel to both the patient and his family. Both patient and family should be educated in the physical and psychological aspects of COPD (White & Briggs, 1980). The patient should be instructed to try to stay at a little below his ideal weight. On the other hand, the patient with advanced respiratory insufficiency may find it difficult to maintain his weight, as the energy expended to eat and the breathholding required to swallow make eating too much of a task. A high caloric diet with multiple small feedings may help prevent this weight loss (Chronic Obstructive, 1977).

Some patients may find it helpful to avoid extremes in climate and elevations of 4,000 feet or more. The single most important factor in respiratory irritation, however, is cigarette smoking by the patient or people around him. All patients with COPD should be strongly

encouraged to stop smoking. Occupational exposure to dusts and fumes should be avoided, and patients should remain indoors when community air pollution levels are high. Houses should be kept as dust free as possible. These patients should avoid exposure to persons with respiratory tract infections and should avoid large gatherings during outbreaks of respiratory infections (Chronic Obstructive, 1977).

Theoretical Aspects of Promoting Self-Care

Lewis (1976) stated that the two purposes of nursing are: (1) to help the patient and/or family cope with the physiological, intellectual, spiritual, and social reactions to health/illness problems, and to maintain their integrity in the coping experience; and (2) to provide opportunity for the patient (or family) to move toward a goal of optimal health of the whole personality. In order to provide care and support for the patient, the nurse must recognize several components which contribute to the whole aspect of the patient's health. Lewis (1976) described these components as physical, intellectual, spiritual, social, and environmental.

The physical component is the biological being which determines the existence of life. This is the flesh, blood, organs, and tissues which grow, develop, and change from

conception to birth. Physical problems arise when the person is unable to perform the usual activities of daily living, or when he does these in a way not conducive to health. The highest potential for physical health is not only absence of disease but a functioning of every system of the body at an optimal level, so that the person has a harmonious sense of well-being.

The intellectual component provides the ability to think and learn. Intellectual problems may be created by disordered thought processes; underdeveloped or deteriorating mental ability; or the need for stimulation, learning, and intellectual growth. The emotional component may be related to the intellectual component, and consists of subjective states such as love, joy, fear, anger, and grief. Any of these emotions may be appropriate at certain times. Problems arise if the emotions are inappropriate to the situation or are harmful to the person or to other persons (Lewis, 1976).

The spiritual component revolves around the person's relationship to the object of his worship. Who and how the individual worships varies with the person and the religion to which he subscribes. These beliefs determine what the individual sees as right and wrong. Therapeutic programs that interfere with a person's beliefs and patterns of worship may be a problem to him. These same beliefs, when

recognized, can be utilized to help and support the individual with therapeutic programs (Lewis, 1976).

The social component concerns the individual's interactions with other people, family, community, work groups and the world. Social behavior is set by the individual's status in society and his role within groups. Illness may drastically alter the individual in these areas. This component may be included in the environmental component, which involves both physical aspects of the environment (temperature, humidity, microorganism) and social forces within the community (economic, political, technological). Social forces determine the kind and extent of health care available; the safety and degree of contamination of food, water, and air; housing available; and protection from harm (war, crime, injury). Both phsyical and social aspects are etiological factors in many diseases and may enhance or deter the therapy and rehabilitation of diseases (Lewis, 1976).

The individual with COPD may find that all these components of his life are affected by the disease. His physical health and sense of well-being deteriorate, and he has difficulty performing his normal activities of daily living. His intellectual processes and his energy level may be affected by hypoxemia, and he is likely to feel anxious

and depressed. His role in his family, his job, and his community may be altered. He is greatly affected by his physical environment and must adjust his life to avoid pollution, extremes in weather, and areas where he could contact infection. In order to educate this individual, and to encourage self-care activities, health care personnel must realize how each aspect of the person's life has been touched by his disease.

Orem (1980) identified universal requisites similar to those discussed by Lewis (1976): (1) intake of sufficient air, water, and food; (2) provision of care associated with elimination processes and excrements; (3) balance between activity and rest; (4) prevention of hazards to human life, functioning, and well-being; and (5) promotion of human functioning and development within social groups in accord with human potential, known human limitations, and the human desire to be normal. Orem (1980) stated that nurses should develop capabilities to: (1) identify self-care requisites of their patients, (2) select or confirm the general methods allowing each requisite to be met, and (3) identify the actions to be taken in order to meet each specific self-care requisite. In many situations, effective nursing care will lead to the patient becoming able to calculate his own self-care demands and execute the actions necessary to meet the demands.

The nurse educating the COPD patient should take all these aspects into consideration. A hurried and incomplete approach to the patient's problems may produce reactions that increase symptoms and cause further rejections of attempts at therapy.

Teaching Self-Care Activities

Time spent with the patient should afford the opportunity to provide education and an explanation of both physical and psychological aspects of the disease (Dudley, Glaser, Jorgenson, & Logan, 1980). Redman (1976) identified the principle that learning is more effective when the student is ready to learn, including both experiential and motivational readiness. In addition, moderate anxiety may be beneficial to the learning process. The individual should receive satisfaction from learning. This is partially accomplished by presenting learning steps which are neither too simple nor too difficult, with material which is meaningful to the individual.

Petty and Nett (1969) recommended a brief but comprehensive review of anatomy and physiology of the lungs using terms the layman can understand. This should be followed by instructions in the treatment modalities for COPD. They suggest individual or small group sessions by a nurse or physician, accompanied by simple pamphlets and visual

aids. At least one hour of general instruction with follow-up sessions is recommended (Petty & Nett, 1969). Among the methods which may be used for presentation of this material are: (1) lecture and discussion, (2) group teaching, (3) demonstration, and (4) printed materials.

Lecture and discussion are two forms of teaching often used with patients. A lecture is usually a presentation of highly structured information to a group of learners. It is at best an efficient and interesting way of teaching information and influencing attitudes. Its weaknesses are that it does not allow students to ask questions or insure that they are thinking about the material being presented. If exchange between the learner and teacher is required, a discussion occurs, which is often very motivating and increases learning. Lecture and discussion can be adapted to various socioeconomic levels (Redman, 1976).

Group teaching may be utilized as an economical and time-saving method of teaching. The experience of being part of a group may increase learning. A small group, however, is necessary if discussion is to be part of the learning process (Redman, 1976).

Demonstration involves an acting out for learners. It may include showing an intellectual skill or an attitude as well as showing how to do a motor skill. The purpose is

to give the learner a clear mental image of how the skill is performed. Therefore, it is important that the demonstration can be adequately seen. The learner should be able to redemonstrate the motions immediately after the teacher does them and should be encouraged to practice the skills on his own (Redman, 1976).

Printed material can also be useful in teaching, as it partially relaxes time requirements and is more efficient than oral language for learners who can read. It is helpful to the learner to be able to take printed materials home to study at his leisure. Adding the use of pictures to other methods of teaching has been found to increase recognition and recall, especially if these pictures are colorful (Redman, 1976).

Studies on Rehabilitation Programs for COPD Patients

Many types of rehabilitation programs for COPD patients have been developed throughout the years. Some of the most popular of these programs include breathing retraining exercises, education, progressive physical conditioning, and psychotherapy. A comprehensive approach appears to be the most successful. Research involving breathing retraining, physical conditioning, education, and comprehensive programs will be discussed below.

Breathing Exercises in Rehabilitation of COPD Patients

Breathing exercises in the rehabilitation of COPD patients were studied by Campbell and Friend (1955). Twelve patients were studied before and after breathing exercises. Maximum breathing capacity was measured by spirometry. Studies were made within two months of the completion of exercise instructions. Among changes noted were: (1) a decrease in rate and increase in depth of breathing, (2) an increase in effective tidal volume, and (3) a prolongation of respiration. No change was found in pulmonary function tests or pattern of activity of the sternomastoid muscle, although use of abdominal muscles in respiration was increased.

Physical Conditioning in Rehabilitation of COPD Patients

As COPD patients begin to experience greater difficulty in breathing, their level of physical activity often decreases sharply. Some research studies indicate that a program of physical conditioning can be extremely beneficial to these patients. Nine male patients with severe obstructive pulmonary disease and evidence of generalized physical disability were included in a study by Pierce, Taylor, Arch, and Miller (1964). Patients with signs of left ventricular disease, multiple premature ventricular contractions, or

marked cyanosis were not included. Ventilatory capacities, arterial blood gases, and measurement of heart rate, respiratory rate, oxygen consumption and CO_2 production were obtained prior to, during, and at the completion of a program of exercise using a treadmill. Results of the study indicated that physical training in patients with COPD improves their efficiency in performing physical work, as demonstrated by a decrease in heart rate, minute ventilation, oxygen consumption, carbon dioxide production, and oxygen cost of exercise at any given level of activity. Patients also exhibited a more rapid return of these parameters to resting levels after exercise and were able to walk longer at the same speeds and walk at faster speeds. Although there was no change in measured pulmonary functions, results indicated that COPD patients are benefited by regular physical exercise, and no ill effects were noted from the program.

Angle et al. (1973) studied both physiological and psychological aspects of rehabilitation in COPD patients. Twenty-one patients were studied by physiologic and psychologic methods before, immediately following, and one year after an intensive inhospital rehabilitation program. Significant improvement in exercise tolerance was noted in some patients. The change correlated positively with

psychologic factors but not with physiologic state. Patients who did well in rehabilitation began with fewer symptoms of depression and anxiety and showed more improvement than patients who did poorly in rehabilitation. It was noted that progressive exercise led to a decrease in fear of activity and dyspnea, and that education in self-care led to increased autonomy in the control of symptoms.

A program for rehabilitation of COPD patients was described by Braun, Driscoll, Anderegg, Barb, Smith, and Reddan (1981). This program was being used in smaller urban and rural areas with patients' personal physicians and local community hospitals as resources. The program had two basic aspects: (1) a two-day training session for health professionals, and (2) evaluation and rehabilitation planning for each patient. Patients in the programs have moderate to severe disease. Initial studies of the program indicate that a decentralized program with much less intensive education and training than in a centralized program can be successful. Most patients used the exercise and physical therapy maneuvers they were taught and did show improvement. Exercise tolerance was found to be both subjectively and objectively increased.

Education in the Rehabilitation of COPD Patients

The importance of education in the rehabilitation of COPD patients has become widely accepted. Barstow (1974) stated that the sick role in American culture is not easily adopted, as great emphasis is placed on self-reliance. Phillips (1965) found that self-reliance was a deterent to individuals seeking medical help. Education was the one variable that influenced the relationship. Education made individuals more aware of the need for assistance in planning self-help activities. Kassebaum and Baumann (1965) recommended allowing the patient as much autonomy as possible, helping him to reach the optimum level of role performance. Educating the patient about his disease and ways he can learn to cope with his disease will help him to reach this level.

A program based on education in home care, rather than on direct care services, was tested by Ruppel (1976). The general goal was to provide education for the patient and family. The specific objectives were to minimize hospitalizations, improve the patient's ability to achieve symptomatic control in both acute and chronic phases of COPD, improve the patient's capacity to carry out normal activities of daily living, and to prevent common complications. The program used four methods to meet these objectives:

(1) predischarge care classes; (2) monthly classes, including lectures, films, discussions, and demonstrations; (3) a monthly newsletter, and (4) distribution of patient education literature.

The monthly classes attracted 50 to 100 persons, and the newsletter went to 250. A questionnaire has shown that 50% of the patients thought the program had helped them to avoid complications requiring medical attention, and 70% said they had been helped to avoid everyday problems such as shortness of breath (Ruppel, 1976).

Anxiety levels during illness as related to health teaching were studied by Nield (1971). Fifty-nine patients with COPD were included in the study. No significant difference was noted in the anxiety levels of patients who received health teaching as opposed to patients who received no extra teaching. The author noted that this lack of difference may be related to the short period of time between completion of the health teaching and final measurement of anxiety.

Comprehensive Rehabilitation Programs

The use of comprehensive rehabilitation programs has been found to be quite successful for COPD patients. The following studies are concerned with several of these comprehensive programs.

A program of breathing workshops for COPD patients and their families was conducted by Ashikaga, Vacek, and Lewis (1980). Six two-hour workshops covered topics such as medication, complications, nutrition, effective coughing, breathing retraining, relaxation and mobility exercises, physical endurance building, and basic respiratory anatomy and physiology. Small group discussions were used to aid patients in identifying and coping with problems arising from living with COPD. Results of the study indicated that the patients attending the workshops showed an increase in their perceived understanding and knowledge of COPD. They also showed increased readiness to seek health care and increased compliance in self-help activities.

Petty, Nett, Finigan, Brink, and Corsello (1969) performed a study of 182 COPD patients over a two year period of time. A comprehensive care program was provided for the patients using systematic, organized outpatient and home care and very few personal and hospital facilities. Clinical care was based on patient education, bronchial hygiene, breathing retraining, and physical conditioning. The program resulted in marked subjective improvement in the majority of patients, along with a highly significant increase in exercise tolerance. A modest but significant improvement in pulmonary function was observed in patients

with up to one year of follow-up. A return to gainful employment was possible in some patients, and a reduction in necessary hospitalization in the group was noted.

The effects of a comprehensive rehabilitation regime on COPD patients were tested by Lustig, Haas, and Castillo (1972). Forty-five patients were divided into: (1) an experimental group, who received pulmonary rehabilitation, (2) the first control group, who received only psychotherapy, and (3) the second control group, who received no treatment. Results of the study indicated that: (1) COPD patients lack knowledge of their medical condition-treatment and rehabilitation; (2) patients who receive either rehabilitation or psychotherapy improve psychologically to a significantly greater extent than those who receive no treatment; (3) psychotherapy alone does not lead to greater engagement in vocational activities, as does learning to use cardiopulmonary reserves effectively; and (4) an all inclusive program consisting of relaxation exercises, breathing exercises, psychosocial and vocational counseling are essential for total rehabilitation of COPD patients.

Studies Utilizing the Health Belief Model

Numerous studies have been concerned with research using the HBM in other health care areas. Multiple regression analysis was used to assess ability of the HBM to account

for variation in a variety of preventive health behaviors (PHB) in 383 urban adults (Langlie, 1979). PHB were measured by questionnaires concerning driving behavior, pedestrian behavior, smoking, personal hygiene, seat belt use, medical checkups, dental care, immunizations, screening exams, exercise, and nutrition. A Health Belief scale measured perceived vulnerability, perceived benefits of PHB, perceived barriers/costs of PHB, and perception of ability to have some control over one's health. Results indicated that the specific attributes affecting PHB were: (1) the perception that one has some control over one's health, and (2) the perception that the benefits of PHB are high or that the costs are low, or both.

A client-oriented approach to the delivery of interventions, the Individual Management Plan (IMP), was tested by Glanz, Kirscht, and Rosenstock (1981a,b). Subjects in the study were 432 hypertensives. The study, based on concepts from the HBM, addressed two broad questions: (1) do interventions have different effects on individuals who differ with respect to initial attitudes or knowledge, and (2) to what extent do interventions produce changes in the factors thought to mediate their effects on behavior? Analyses were performed for adherence to medication regimens, dietary sodium restrictions, and weight-loss recommendations. Four educational and behavioral

intervention strategies were tested in a factorial design, using a control and an experimental group. Patients were measured for self-report of compliance with aspects of their medical regimen. This included: (1) medication and side effects, (2) diet and weight, (3) pharmacy records of purchases of hypotensive agents, (4) specially kept medical records in physicians' offices, including all contacts by patients, (5) regularity of appointment keeping, and (6) drug prescriptions.

Intervention one, consisting of printed materials, was found to increase knowledge about hypertension, but did not affect pharmacy adherence scores. Treatment groups showed a trend toward higher self-reported medication scores. Intervention two consisted of a telephone call from a nurse, who asked about the medical regimen and blood pressure status and provided reinforcement for any regimens the patient was attempting. This approach was found to have a positive effect on medication compliance, as measured by both self-report and pharmacy records, although self-reported diet and weight adherence were not affected. Intervention three included the use of self-monitoring techniques such as use of home blood pressure cuff and recording blood pressure readings, charting of daily medications, diet, side effects, and other prescribed behaviors. There was a positive effect on self-reported weight

reduction, but medication and diet adherence showed no effect. In intervention four, a nurse and a social support person of the patient's choosing met with individual patients (Glantz et al., 1981a,b).

The plan then developed, enlisting the social support person's assistance, was found to have a positive impact on drug adherence based on pharmacy scores and yielded a positive trend for self-reported medication and weight control adherence. Diet adherence scores showed no effect. As a whole, results showed only minimal support for the use of the IMP. This may have been partially related to the fact that most of the patients had been diagnosed as hypertensive more than five years previously and had established behavior patterns for management of their hypertension that were not readily modifiable (Glantz et al., 1981a,b).

Kirscht and Rosenstock (1977) studied 132 hypertensive patients using the concept of the HBM for their choice of interventions. They found that patient beliefs about their susceptibility to the effects of hypertension, the severity of the condition, and the efficacy of the regimen prescribed were all associated with compliance. Patients who found it difficult to comply with the regimen exhibited a lesser degree of adherence, as did less educated patients.

The HBM was also evaluated in terms of its ability to predict and explain mothers' adherence to a diet prescribed

for their obese children (Becker, Maiman, Kirscht, Haefner, & Drachman, 1977). Two levels of fear arousing communications were also tested for their ability to enhance the prescribed regimen. Data were gathered on health motivation, illness threat, potential diet benefits and success, barriers to compliance, and control over health matters. Subjects were randomly assigned to three intervention groups: high fear, low fear, and control. Dependent variables included changes in the child's weight over a two-month period and mother's previous appointment-keeping behaviors. Significant correlations were found between each major dimension of the HBM and the outcome measures. The usefulness of the model as a whole was supported.

Summary

Even with the use of currently available methods of treatment for COPD, the prognosis for patients with this problem is very poor. By the time COPD has reached an advanced state, even cessation of smoking does not reduce the mortality rate (Chronic Obstructive, 1977). However, research has shown that patients with COPD may have a longer and more satisfying life by learning and using various methods of treating the disease.

By learning the steps to take to minimize their symptoms, patients may feel improvement both physiologically

and psychologically. They can learn to feel less helpless about their disease and more in control of their lives. Education of health care personnel, COPD patients, and their families or other support groups is necessary in order for these patients to live a full and comfortable life. While the disease can seldom be cured or its progression stopped, patients and their families can learn to provide much of their own care and to decrease the incidence of acute stages requiring hospitalization.

CHAPTER 3

PROCEDURE FOR COLLECTION AND TREATMENT OF DATA

An exploratory pre-experimental approach with a one-group pretest-posttest design was used for this study. For the purpose of this study the independent variable was a program of teaching concerning knowledge of basic physiology and home care of COPD to patients diagnosed as having COPD. The dependent variables were defined as follows for the purpose of this study:

1. Knowledge of basic physiology and home care of COPD as measured by the Vermont Lung Association Breathing Workshop Patient Questionnaire (Ashikaga, Vacek, & Lewis, 1980).
2. Perception of ability to use home care techniques to improve control of COPD as measured by a Likert-type scale adapted from a study done by Garner (1976) using patients with COPD.
3. Patient's respiratory function as measured by a ratio of forced expiratory volume in the first second of expiration to forced vital capacity (FEV_1/FEV) with the use of spirometry.

Setting

The chest clinic in a federal hospital in Houston, Texas, was used as a setting for this study. Approximately 30 to 40 patients were seen at the clinic each Tuesday and 25 to 30 patients each Thursday. Spirometry testing was done in the clinic. Two small rooms off the clinic were available for pretesting and posttesting of knowledge and for teaching purposes. Teaching was done to small groups of two to three patients for each session.

Population and Sample

Outpatients in the chest clinic at a federal hospital in Houston, Texas, were used for the study. COPD patients recommended by clinic personnel as needing teaching and breathing retraining were chosen. The study was limited to patients who had no record of acute stages of disease or of change in prescribed medications during the two weeks prior to the study or the two weeks in which they participated in the study.

The clinic met twice weekly. Each of these times patients with a diagnosis of COPD were requested to participate in the study until a total of 15 patients had been chosen. The sample was one of convenience. Due to the small patient population and to time limitations, there was no control group. One patient was dropped because of a

medication change, and four did not complete the study for personal reasons, leaving a total of 10 subjects.

Protection of Human Subjects

In order to protect the confidentiality and anonymity of the subjects in this study, the following considerations were met:

1. All guidelines of the Texas Woman's University Human Research Review Committee and the federal hospital in Houston were followed (Appendix A).
2. Subjects received an oral description of the study, including an explanation of the procedures and their purpose, any associated risks or discomforts, and a description of the possible benefits. They were told that their name would not be used in release of data and that they were free to withdraw at any time.
3. Names of the subjects as related to data collected were known only to the investigator. Data were coded by numbers and records of data containing subjects' names were destroyed at the completion of the study.
4. Subjects signed the oral consent form from Texas Woman's University and the consent form from the hospital (Appendix B).
5. All findings were reported by total sample only.

6. Findings of this study were available to all subjects upon their request to the investigator.

Instruments

The effects of the independent variable, a program of teaching concerning knowledge of basic physiology and home care of COPD, were measured after the educational program was completed. The educational program is described below.

A flipchart on chronic lung disease by Hilary Sigmon (1979) was used as a visual aid, accompanied by verbal instruction from the investigator. This instruction covered: (1) the basic types and causes of COPD, (2) the function of the respiratory system, (3) instructions for pursed lip and diaphragmatic breathing and controlled coughing, and (4) suggestions for preventing acute exacerbations of chronic lung disease. To provide patients with reinforcement of the above information to take home and read, pamphlets from the American Lung Association as well as written objectives accompanied the lectures:

1. A list of 11 objectives developed by the investigator (Appendix C). Each patient was instructed to read these objectives and concentrate on them during home study.
2. Help Yourself to Better Breathing (1980)
3. Community Resource Handbook for Patients with COPD (1981)

4. As You Live You Breathe (1980)
5. Diseases of the Respiratory System (1974)
6. Emphysema (1979)
7. Cigarette Smoking (1979)
8. Chronic Bronchitis (1979)
9. Postural Drainage to Help Clear Your Lungs (1979)
10. The Do's and Don'ts of Walking (1979)
11. Cleaning instructions for nebulizers, from Living with Lung Disease (1978)
12. Instructions for controlled coughing from Living with Lung Disease (1978)

This educational program was divided into two sessions. Each teaching session lasted approximately 45 minutes, not including pre and posttesting time. During these lecture sessions, patients were encouraged to consciously practice breathing retraining at least three times per day and to try to make these techniques their standard method of breathing.

The Vermont Lung Association Breathing Workshop Patient Questionnaire, the Home Care Routine Questionnaire, and spirometry testing for FEV_1/FVC were used as pre and posttests in this study. They assessed for knowledge of COPD, for perception of ability to affect the course of the disease, and for actual improvement of respiratory function.

Vermont Lung Association Breathing Workshop Patient Questionnaire (VLABWPQ)

The instrument to be used for testing knowledge of the basic physiology and care of COPD was developed by Ashikaga, Vacek, and Lewis (1980) for the Vermont Lung Association. It was used as a pretest and posttest for breathing workshops which covered topics such as breathing retraining, effective coughing, nutrition, medications, and complications. Rosenstock's Health Belief Model (HBM) was used as a framework for both the breathing workshops and the questionnaire. The questionnaire designed for and used by the Vermont Lung Association focused on 10 specific areas, including knowledge of COPD and its treatment, attitudes regarding subject's disease, and performance of self-help behaviors.

For the purpose of this study, only the section of the questionnaire regarding level of knowledge about COPD was used (Appendix D). The reliability of each scale was estimated from the average inter-item correlation by the Spearman-Brown formula. For the scale measuring the respondent's knowledge of COPD, the coefficient of reliability was estimated by the split-half method. Reliability for the instrument on knowledge of COPD was established at $r = .77$. The population on which reliability was tested was predominantly male, with a heterogeneous educational

background. A two-year pilot phase of the study was done on 60 patients with COPD. Content validity was established by having the questionnaires reviewed by a steering committee comprised of a respiratory disease physician, three registered nurses, two physical therapists, an educator, and a biostatistician (Ashikaga et al., 1980).

The questionnaire consisted of 17 statements with which the participant could agree or disagree. These statements were concerned with items such as knowledge of what cilia in the airways are and what purpose they serve, the best ways to avoid having trouble breathing, and things that people with COPD should or should not do. The level of measurement was interval. Subjects received two points for a correct answer and one point for an incorrect answer. The maximum score was 34 and the minimum score 17.

Home Care Routines Questionnaire

This instrument is an adaptation from a scale developed by Gärner (1976) in a study of patients with COPD who were adjusting to the limitations of physical mobility. It is a five point Likert-type scale which asks for the patient's perception of how well his home care routine is working for him. It includes items such as whether the routine takes too much time and whether it helps the patient to feel better (Appendix E). Measurement of the dependent variable

of the usefulness of the home care routine was ordinal. Scores were on a five-point scale from strongly agree to strongly disagree, with the most favorable answer receiving the high score of five points and the least favorable answer receiving the low score of one point. The maximum possible total score was 50 points and the minimum possible total score 10 points. Reliability of the instrument was established on posttest data in this study at $\underline{r} = .75$ using Cronbach's alpha. Content validity was established by having the instrument reviewed for applicability and clarity by three registered nurses, a nurse specializing in pulmonary care, and staff of San Jacinto area American Lung Association of Texas (ALAT).

Measurement of FEV_1/FVC by Spirometry

This is a measurement used to determine respiratory function. According to Miller (1980) spirometry is the best overall test among pulmonary function tests. FEV_1 is a measure of the forced expiratory volume in the first second. FVC is the forced vital capacity. This measurement was obtained by having the subject expire as forcefully and rapidly as possible into a waterless spirometer from maximal inspiration. The volume was read from a spirographic tracing, allowing for measurement of volume expired in both the first second of expiration and the total expiration. A ratio of FEV_1/FVC of less than .70 was used as a

criterion for the presence of airway obstruction (Miller, 1980). Measurement of the FEV_1/FVC as the dependent variable was ratio.

Data Collection

The chest clinic at the federal hospital met twice weekly. On each of these days, patients were chosen upon the recommendation of staff in the clinic, until a total of 15 patients were obtained. These were patients who were identified by clinic personnel as being in need of a teaching program on basic knowledge of COPD, and on breathing retraining techniques (home care routines). Each patient was seen a total of three times.

Two small rooms near the chest clinic were used for testing, teaching, and demonstration of breathing retraining techniques. This allowed for a quiet environment with few distractions. Time allotted for obtaining the initial sample of patients to be tested was limited to one month. This partially controlled for changes in respiratory function which might be attributed to weather or other environmental effects.

At the first meeting with the patient, the study was explained as described in Appendix F. Each patient signed a consent form for Texas Woman's University and for the federal hospital. He was then given three pretests by the

investigator: (1) the Vermont Lung Association Breathing Workshop Questionnaire, (2) the Home Care Routine Questionnaire, and (3) the spirometry testing for FEV_1/FVC.

This was immediately followed by the first 45 minute teaching session. Items 1 through 28 in Sigmon's (1979) flipchart were presented to the patients by the investigator. Diaphragmatic and pursed lip breathing and controlled coughing were demonstrated by the investigator, with immediate repetition of the techniques by the patients. Questions were encouraged throughout the session. The handouts (pamphlets available from San Jacinto Lung Association) as well as the objectives were presented to each patient. Each patient was instructed to read the objectives and concentrate on them during home study. The patients were also asked to read the handouts during the following two weeks, paying special attention to Help Yourself to Better Breathing (1980), as it was believed to be the most comprehensive. Patients were requested to consciously practice pursed lip and diaphragmatic breathing at least three times a day, placing a check mark and time of day on a chart for each of these three times and bringing the chart with them each time they met with the investigator (Appendix G). Patients were then instructed to practice these breathing exercises whenever they became short of breath and to write down any

questions they wanted to ask at the next session. They were instructed to return in one week for further teaching.

At the second session, one week later, items 28 through 49 in Sigmon's (1979) flipchart were presented by the investigator. The patients were again asked to demonstrate diaphragmatic and pursed lip breathing and controlled coughing, and immediate feedback on technique was provided by the investigator. All questions the patients asked were answered by the investigator, and patients were asked to comment on how well their breathing exercises were working for them. They were instructed to continue their breathing exercises at least three times a day and when short of breath, and to continue studying their handouts. They were asked to return in one week for posttesting.

At this time (the third meeting) the patients were given the following posttests by the investigator: (1) the Vermont Lung Association Breathing Workshop Questionnaire, (2) the Home Care Routine Questionnaire, and (3) the spirometry testing for FEV_1/FVC. The patients were informed that their part in the study was now complete.

Treatment of Data

In order to determine whether knowledge of COPD, perception of ability to affect the course of disease, and actual pulmonary function were changed by the teaching

program, data were compared by the following statistical methods.

Vermont Lung Association Breathing Workshop Patient Questionnaire

Pretest and posttest data from this instrument were compared using Wilcoxon matched-pairs signed-ranks test in order to determine whether the patients' knowledge of COPD had increased. This is a type of inferential statistic which is useful when comparing two related samples whose level of measurement is ordinal. Although the level of measurement here was interval, there had been no randomization of subjects, which made the use of a *t*-test inappropriate. Use of inferential statistics provided a means for drawing a conclusion about the population being studied (Polit & Hungler, 1978).

Home Care Routine Questionnaire

Pretest and posttest data from this instrument were also compared using Wilcoxon matched-pairs signed-ranks test in order to determine whether the patients' perception of their ability to affect the course of their disease had changed. Level of measurement in this scale was ordinal.

Measurement of FEV_1/FVC by Spirometry

Pretest and posttest spirometry readings were compared using Wilcoxon matched-pairs signed-ranks test in order to

determine whether the patients' pulmonary function had improved. Although the level of measurement was interval, it would be considered inappropriate to use a *t*-test for correlated samples as there had been no random selection of subjects.

Summary

A teaching program concerning COPD and breathing retraining for COPD patients was presented to 10 patients chosen from the chest clinic of a large federal hospital in Houston. Pretests and posttests were administered to these patients. Statistical analyses of these tests were done to determine if the teaching program caused a significant change in the patient's knowledge of COPD, perception of ability to control his disease, and/or actual respiratory function.

CHAPTER 4

ANALYSIS OF DATA

This exploratory, pre-experimental study was conducted to test for the effects of an educational program on compliance and knowledge in patients with COPD. Specifically, dependent variables were: (1) knowledge of basic physiology and home care of COPD as measured by the Vermont Lung Association Breathing Workshop Questionnaire (VLABWQ), (2) perception of ability to use home care techniques to improve control of COPD as measured by the Home Care Routine Questionnaire (HCRQ), and (3) respiratory function as measured by a ratio of forced expiratory volume in the first second to forced vital capacity (FEV_1/FVC). Data were collected by pre and posttesting on 10 patients over a period of one and one-half months. This chapter concerns the presentation and analysis of the data obtained from the sample.

Description of the Sample

A sample of convenience was selected from a group of outpatients attending a chest clinic in a large federal hospital in Texas. All patients in the sample had a medical diagnosis of chronic obstructive pulmonary disease (COPD).

They were patients also identified by clinic personnel as needing teaching and breathing retraining. The sample was limited to subjects who had no medication changes and no acute exacerbations of their disease in the two weeks prior to the time the study began or during the study. Patients were in varying stages of the progression of their disease. All subjects were male and ranged in age from the mid-20s to early 60s.

Discussion of Findings

This study attempted to answer the following research questions:

1. Will an educational program increase the patient's knowledge about COPD?
2. Will breathing retraining techniques affect the COPD patient's respiratory function?
3. Will an increase in knowledge in the use of breathing retraining techniques affect the COPD patient's perception of his ability to improve control of the disease?

The first area tested was that of knowledge. The VLABWQ was administered to the subjects prior to and following the educational program. Table 1 shows the number of correct answers made on the test by each subject. Pretest and posttest data were compared using Wilcoxon matched-pair signed-ranks test. Statistical analysis showed

a Wilcoxon T of 1.5, with a significance of p<.003. This indicates a significant improvement in overall knowledge of COPD (Siegal, 1956).

Table 1

Frequency of COPD Patients' Correct Answers on Pre and Posttesting with VLABWQ

Patient Number	Number of Correct Answers		
	Pretest	Posttest	Difference
1	10	13	3
2	6	11	5
3	9	12	3
4	5	8	3
5	7	9	2
6	7	9	1
7	7	6	-1
8	7	10	3
9	9	9	0
10	6	9	3

Note: Wilcoxon T = 1.5, p<.003

The second area tested was that of the subject's perception of how well his home care routine worked to help give him control of his disease. This was measured by the HCRQ, with possible scores ranging from a low of 10 points to a high of 50 points. Table 2 shows pretest and posttest scores. The Wilcoxon matched-pairs signed-ranks test showed a Wilcoxon T of 1.5 with a significance of p<.003. This again indicates a significant improvement in the

subjects' perception of how well these routines were working for them, and their ability to at least partially control their disease.

Table 2

COPD Patients' Pre and Posttest Scores on HCRQ

Patient Number	Pretest	Posttest	Difference
1	38	44	6
2	29	39	10
3	40	45	5
4	34	40	6
5	28	39	11
6	34	32	-2
7	44	46	2
8	32	40	8
9	28	38	10
10	28	49	21

Note: Wilcoxon $\underline{T}$ = 1.5, $\underline{p}$<.003

The third area tested was that of FEV_1/FVC. Pretest and posttest measures were obtained by spirometry readings. Table 3 shows pretest and posttest data. A Wilcoxon matched-pairs signed-ranks test was run on pretest and posttest FEV_1/FVC, with a resulting Wilcoxon $\underline{T}$ of 20.5 and significance of $\underline{p}$<.458, indicating no significant difference in scores (Siegel, 1956).

Table 3

COPD Patients' Respiratory Function as Measured by FEV_1/FVC Pretest and Posttest Readings

Patient Number	FEV_1		FVC		FEV_1/FVC		
	Pre	Post	Pre	Post	Pre	Post	Change
1	2.20	2.10	3.20	3.20	69%	66%	-3%
2	3.70	3.80	5.40	5.25	69	72	3
3	0.98	1.10	2.50	2.50	39	44	5
4	1.40	1.50	2.50	2.50	56	60	4
5	0.90	0.90	1.60	1.75	56	51	-5
6	1.70	1.50	2.60	2.60	65	58	-7
7	2.75	2.80	4.25	4.25	65	66	1
8	2.00	1.90	2.90	2.80	69	68	-1
9	2.25	2.25	3.60	3.75	63	60	-3
10	0.80	0.75	1.75	1.80	46	42	-4

Note: Wilcoxon $\underline{T} = 20.5$, $\underline{p} < .458$

Table 4 shows the percentage of compliance with the home care routine. No analysis was done on this group of data. The subjects were asked to keep these records in order to provide motivation to practice the breathing exercises at home. It was hoped that keeping these records would make them more inclined to practice the exercises. The average percentage of compliance was 90%.

Summary of Findings

The results of this study show a significant improvement in the subjects' knowledge of COPD and a

Table 4

COPD Patients' Compliance with Home Care Routine
(Maximum Times=42)

Patient Number	Patient Documented Occurrences	
	Number	Percent
1	40	95
2	39	93
3	36	86
4	36	86
5	34	81
6	33	79
7	40	95
8	42	100
9	42	100
10	37	88

Mean = 90%

significant improvement in their perception of how well they could control their disease with the use of their home care routine of breathing techniques. No change was seen in actual respiratory function as measured by FEV_1/FVC. The average percentage of compliance with the home care routine was observed to be 90%. While knowledge and perception of ability to control their disease improved, respiratory function did not.

CHAPTER 5

SUMMARY OF STUDY

The increase in the incidence of COPD along with the increase in expense of hospitalization has led to the need for education and improved home care for patients with COPD. This study used an educational program on knowledge of COPD and breathing retraining techniques in an attempt to affect the subjects' knowledge of their disease, their perception of their ability to control their disease, and their respiratory function.

Summary

Ten patients with COPD were given three pretests: (1) the Vermont Lung Association Breathing Workshop Questionnaire (VLABWQ) concerned with basic knowledge of the physiology and care of COPD: (2) the Home Care Routine Questionnaire (HCRQ) concerned with the subjects' perception of their ability to affect the course of their disease; and (3) spirometry testing of the ratio of forced expiratory volume in the first second of expiration to the forced vital capacity (FEV_1/FVC), a test that is highly diagnostic of COPD and the amount of damage that has been done to the lungs by the disease.

The subjects were then given two 45-minute lectures concerning knowledge and care of COPD, accompanied by explanation and demonstration of breathing retraining techniques. Subjects were given pamphlets on lung disease which were provided by the Lung Association, and they were asked to keep a record of performing their home care routine at least three times daily. They were given a list of objectives to meet from material presented in the lectures and the pamphlets.

Comparison of pre and posttesting data showed a significant improvement in the subjects' knowledge of COPD ($p<.003$) and in their perception of how well they could control their disease by using a home care routine of breathing techniques ($p<.003$). No significant change was found in respiratory function as measured by FEV_1/FVC.

Discussion of Findings

The findings of this study suggest that knowledge of COPD can be taught through lecture and literature concerning COPD. This supports previous studies by Ashikaga, Vacek, and Lewis (1980) and by Ruppel (1976), who found that subjects' knowledge of COPD did increase through education. Findings in this study are also similar to the studies of Ashikaga et al. (1980) and Ruppell (1976) in that subjects felt the program of education and breathing

retraining helped them have some control over their disease and helped them avoid medical complications and shortness of breath.

The lack of change in FEV_1/FVC cannot be conclusive, as the period of time allowed for change was quite short. Additionally, there is no way of knowing whether the subjects actually did the exercises each time they gave themselves credit for doing them. Previous studies, however, have shown little change in respiratory function that can be related to teaching of breathing retraining techniques. Campbell and Friend (1955) found a decrease in rate of breathing and an increase in effective tidal volume, but no change in pulmonary function tests. Several studies using breathing retraining techniques do suggest an increase in exercise tolerance after the teaching of these techniques (Petty, Nett, Finigan, Brink, & Corsello, 1969; Braun, Driscoll, Anderegg, Barb, Smith, & Reddan, 1981). Lustig, Haas, and Castello (1970) found that an all inclusive program of relaxation and breathing exercises and psychosocial and vocational counseling are essential for total rehabilitation of COPD patients.

Conclusions and Implications

Based on the findings of this study, the following conclusions are drawn:

1. It appears that an educational program and the use of breathing retraining techniques can contribute to the well-being of the patient with COPD.
2. Both subjects' knowledge and perception of control of their disease improved significantly in a very short period of time, although this may be partially related to the Hawthorne effect (Polit & Hungler, 1978).
3. While actual respiratory function did not change after breathing retraining, patients in this study did indicate they felt more able to deal with their disease.

Implications generated by the conclusions are:

1. The importance of education for COPD patients has been supported in this study; however it is likely that a longer period of time for this education and for question and answer sessions would be beneficial.
2. A program such as the one used in this study might be especially beneficial to patients with newly diagnosed COPD, in order to increase their knowledge and give them some feeling of control over the course of their disease, and to help them maintain the highest possible levels of activities of daily living.

Recommendations for Further Study

Several recommendations for further study can be derived from this information:

1. This study could be implemented to help form COPD patients' self-help groups, or breathing clubs. Groups could be pretested, given education and breathing retraining techniques, and then posttested for comparison to groups who did not receive the teaching. A longer period of time between pre and posttesting, with more extensive teaching, might be beneficial. Special attention might be paid to respiratory function over a longer period of time, in order to observe the rate of loss of pulmonary function in patients who utilized breathing techniques on a regular basis as opposed to those patients not using the techniques.
2. An investigation of COPD patients' exercise tolerance as related to the use of education and breathing retraining techniques should be undertaken. Unmeasured observations from this study indicated that exercise tolerance may increase after breathing retraining.
3. Measurements of the COPD patients' level of anxiety pre and post education and breathing technique retraining should be done.
4. A study could be implemented using experimental and control groups of COPD patients to survey readiness to seek health care and compliance in self-help activities as related to education and breathing retraining techniques.

APPENDIX A

APPROVAL FORMS

TEXAS WOMAN'S UNIVERSITY
Box 23717 TWU Station
Denton, Texas 76204

HUMAN SUBJECTS REVIEW COMMITTEE

Name of Investigator: Elizabeth E. Hill Center: Houston

Address: 1110 Shawnee Date: Jan. 26, 1982

Houston, Texas 77034

Dear Ms. Hill

Your study entitled "Patients' ability to cope with COPD as related to knowledge of COPD and use of Breathing retraining Techniques"

has been reviewed by a committee of the Human Subjects Review Committee and it appears to meet our requirements in regard to protection of the individual's rights.

Please be reminded that both the University and the Department of Health, Education, and Welfare regulations typically require that signatures indicating informed consent be obtained from all human subjects in your studies. These are to be filed with the Human Subjects Review Committee. Any exception to this requirement is noted below. Furthermore, according to DHEW regualtions, another review by the Committee is required if your project changes.

Any special provisions pertaining to your study are noted below:

____ Add to informed consent form: No medical service or compensation is provided to subjects by the University as a result of injury from participation in research.

____ Add to informed consent form: I UNDERSTAND THAT THE RETURN OF MY QUESTIONNAIRE CONSTITUTES MY INFORMED CONSENT TO ACT AS A SUBJECT IN THIS RESEARCH.

____ The filing of signatures of subjects with the Human Subjects Review Committee is not required.

____ Other:

_X_ No special provisions apply.

Sincerely,

R. P. Lovett

Chairman, Human Subjects
Review Committee

at Houston Center

TEXAS WOMAN'S UNIVERSITY
COLLEGE OF NURSING
DENTON, TEXAS 76204

DALLAS CENTER
1810 INWOOD ROAD
DALLAS, TEXAS 75235

HOUSTON CENTER
1130 M. D. ANDERSON BLVD.
HOUSTON, TEXAS 77030

AGENCY PERMISSION FOR CONDUCTING STUDY*

THE _____

GRANTS TO Elizabeth E. Hill, R.N.,B.S.N.
a student enrolled in a program of nursing leading to a Master's Degree at Texas Woman's University, the privilege of its facilities in order to study the following problem: Patients' ability to cope with COPD as related to knowledge of COPD and use of breathing retraining techniques.

The conditions mutually agreed upon are as follows:

1. The agency (~~may~~) (may not) be identified in the final report.
2. The names of consultative or administrative personnel in the agency (~~may~~) (may not) be identified in the final report.
3. The agency (wants) (~~does not want~~) a conference with the student when the report is completed.
4. The agency is (willing) (~~unwilling~~) to allow the completed report to be circulated through interlibrary loan.
5. Other _____

Date: 2-11-82

_____
Signature of Agency Personnel

Elizabeth E Hill, R.N., B.S.N.
Signature of Student

Elizabeth T. Lindsey
Signature of Faculty Advisor

* Fill out and sign three copies to be distributed as follows: Original-Student; First copy - agency; Second copy - TWU College of Nursing.

TEXAS WOMAN'S UNIVERSITY
HOUSTON CAMPUS
HUMAN RESEARCH REVIEW COMMITTEE
REPORT

STUDENT'S NAME Elizabeth E. Hill

PROPOSAL TITLE PATIENTS' ABILITY TO COPE WITH COPD AS RELATED TO KNOWLEDGE OF COPD AND USE OF BREATHING RETRAINING TECHNIQUES

COMMENTS:

DATE: 1-26-82

William D Watt

Disapprove Approve

Disapprove Approve

Disapprove Approve

Disapprove Approve

APPENDIX B

CONSENT FORMS

Consent Form
TEXAS WOMAN'S UNIVERSITY
HUMAN SUBJECTS REVIEW COMMITTEE

(Form B)

Title of Project: _____

_____

Consent to Act as A Subject for Research and Investigation:

I have received an oral description of this study, including a fair explanation of the procedures and their purpose, any associated discomforts or risks, and a description of the possible benefits. An offer has been made to me to answer all questions about the study. I understand that my name will not be used in any release of the data and that I am free to withdraw at any time. I further understand that no medical service or compensation is provided to subjects by the university as a result of injury from participation in research.

_____ _____
Signature Date

_____ _____
Witness Date

Certification by Person Explaining the Study:

This is to certify that I have fully informed and explained to the above named person a description of the listed elements of informed consent.

_____ _____
Signature Date

_____
Position

_____ _____
Witness Date

One copy of this form, signed and witnessed, must be given to each subject. A second copy must be retained by the investigator for filing with the Chariman of the Human Subjects Review Committee. A third copy may be made for the investigator's files.

PART I-AGREEMENT TO PARTICIPATE IN RESEARCH
BY OR UNDER THE DIRECTION OF THE VETERANS ADMINISTRATION

DATE

I, _____, voluntarily consent to participate as a subject
(Type or print subject's name)

in the investigation entitled _____
(Title of study)

2. I have signed one or more information sheets with this title to show that I have read the description including the purpose and nature of the investigation, the procedures to be used, the risks, inconveniences, side effects and benefits to be expected, as well as other courses of action open to me and my right to withdraw from the investigation at any time. Each of these items has been explained to me by the investigator in the presence of a witness. The investigator has answered any questions concerning the investigation and I believe I understand what is involved.

3. I understand that no guarantees or assurances have been given me about the results and risks of an investigation are not always known beforehand. I have been told that this investigation has been carefully planned, that the plan has been reviewed by knowledgeable people, and that every reasonable precaution will be taken to protect my well-being.

4. In the event I sustain physical injury as a result of participation in this investigation, if I am eligible for medical care as a veteran, all necessary and appropriate care will be provided. If I am not eligible for medical care as a veteran, humanitarian emergency care will nevertheless be provided.

5. I realize I have not released this institution from liability for negligence. Compensation may or may not be payable, in the event of physical injury arising from such research, under appropriate federal laws.

6. I understand that all information obtained about me during the course of this study will be made available only to doctors who are taking care of me and to qualified investigators and their assistants where they serve to the information is appropriate and authorized. They will be bound by the same requirements to maintain any privacy and anonymity as apply to all medical personnel within the Veterans Administration.

7. I further understand that, where required by law, the appropriate federal officers or agency will have free access to information contained in this study should it become necessary. Generally, I may expect the same respect for my privacy and anonymity from these agencies as is afforded by the Veterans Administration and its employees. The provisions of the Privacy Act apply to all agencies.

8. In the event that research in which I participate involves certain new drugs, information concerning my response to the drug(s) will be furnished to the sponsoring pharmaceutical house(s) that made the drug(s) available. This information will be given to them in such a way that I cannot be identified.

I, _____
NAME OF VOLUNTEER

HAVE READ THIS CONSENT FORM. ALL MY QUESTIONS HAVE BEEN ANSWERED, AND I FREELY AND VOLUNTARILY CHOOSE TO PARTICIPATE. I UNDERSTAND THAT MY RIGHTS AND PRIVACY WILL BE MAINTAINED. I AGREE TO PARTICIPATE AS A VOLUNTEER IN THIS PROGRAM.

9. Nevertheless, I wish to limit my participation in the investigation as follows:

VA FACILITY	SUBJECT'S SIGNATURE
WITNESS'S NAME AND ADDRESS *(Print or type)*	WITNESS'S SIGNATURE
INVESTIGATOR'S NAME *(Print or type)*	INVESTIGATOR'S SIGNATURE

☐ Signed information sheets attached. ☐ Signed information sheets available at

SUBJECT'S IDENTIFICATION NO. *(Name or give number if not shown above)*

SUBJECT'S I.D. NO. | NAME

AGREEMENT TO PARTICIPATE IN RESEARCH BY OR UNDER THE DIRECTION OF THE VETERANS ADMINISTRATION

CONSENT FORM VA FORM 10-1086

APPENDIX C

OBJECTIVES

At the end of this chronic obstructive pulmonary disease (COPD) educational program you should be able to:

1. Demonstrate pursed lip breathing
2. Demonstrate diaphragmatic breathing
3. Demonstrate controlled coughing
4. Describe the basic parts of the lungs:
   a. Trachea: Large breathing tube
   b. Bronchi: Smaller breathing tubes going to each lung
   c. Bronchioles: Smallest breathing tubes going to the air sacs
   d. Alveoli: Small air sacs
   e. Cilia: Tiny hair-like sweepers that help clean out your breathing tubes
5. Name three types of COPD
6. Give a brief description of the changes that occur in your lungs with:
   a. Emphysema
   b. Chronic bronchitis
   c. Asthma
7. Name three things you should avoid if you have COPD
8. Name three methods of treatment for COPD
9. Describe how you would do postural drainage and percussion if your doctor ordered them
10. Describe how you would clean your breathing equipment if your doctor feels that you need to use this equipment
11. Describe what happens to your lungs when you smoke

APPENDIX D

VERMONT LUNG ASSOCIATION BREATHING WORKSHOP PATIENT QUESTIONNAIRE

Here are some statements about respiratory disease. Place an "X" in the appropriate box next to each statement, indicating whether you agree or disagree with the statement.

Statement	Agree	Disagree
a. Deep breathing machines and other respiratory equipment should be cleaned after every 2 or 3 uses	___	___
b. If you have chronic bronchitis, there is very little you can do to avoid getting emphysema.	___	___
c. The cilia (tiny hairlike projections in the airways) help push air into the lungs.	___	___
d. Breathing exercises should be used while doing postural drainage	___	___
e. If you have trouble breathing, you should breathe through your mouth, because you get more air in that way	___	___
f. If you have trouble breathing, you should try to breathe in through your nose and out as hard as you can through your mouth	___	___
g. Cigarette smoke causes the cilia to work faster.	___	___

Statement	Agree	Disagree
	1	2
h. People with emphysema or chronic bronchitis should be careful to never exercise enough to make their heart beat faster	___	___
i. You should decide how much fluid to drink by whether you are thirsty or not.	___	___
j. If a person has a heart condition, his/her doctor may say not to drink a lot of fluids.	___	___
k. If you IPPB treatment isn't helping as much as it used to, you should increase the length of each treatment	___	___
l. Only a trained health professional should do percussion/vibration (shaking and pounding the chest to loosen mucous). . . .	___	___
m. In emphysema and chronic bronchitis, the main problem is in getting air into the lungs.	___	___
n. Medihalers (hand nebulizers) should be used whenever you feel like you can't get enough air into your lungs	___	___

Statement	Agree	Disagree
	1	2
o. The way to cough up the most mucous is to take a short, deep breath, then cough as hard as you can	___	___
p. Using a spray nebulizer may influence the effectiveness of the medicine your doctor has prescribed	___	___
q. Postural drainage helps reduce chances of lung infection	___	___

APPENDIX E

HOME CARE ROUTINE QUESTIONNAIRE

The following statements are designed to show how you feel about your home care routine of pursed lip and diaphragmatic breathing. Please read them and circle the answer which most agrees with the way you feel.

SA	A	?	D	SD
Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree

My Home Care Routine

1.	It really helps me feel better.	SA	A	?	D	SD
2.	It does no good whatever.	SA	A	?	D	SD
3.	I follow it when I feel bad.	SA	A	?	D	SD
4.	It is a waste of time.	SA	A	?	D	SD
5.	I could not start my day without it.	SA	A	?	D	SD
6.	I don't understand what I'm supposed to do.	SA	A	?	D	SD
7.	It takes too much time.	SA	A	?	D	SD
8.	It requires too much effort.	SA	A	?	D	SD
9.	It helps when I have a cold.	SA	A	?	D	SD
10.	I can do more activities when I follow my home care routine.	SA	A	?	D	SD

APPENDIX F

EXPLANATION OF STUDY

Your participation in this study will require that we meet in small groups three times, once a week, for 45 minutes at each meeting. You will be given three pretests. One of these is a test on how much you know about chronic obstructive pulmonary disease (COPD) and its treatment. It contains 17 questions with which you are asked to agree or disagree.

One test is a ten item scale. You will read a statement on home care routines for COPD and indicate how strongly you agree or disagree with the statement on a scale of one to five.

The last test involves taking a deep breath and blowing it into a spirometer as forcefully as possible. This will allow me to see how much air you can breath out in the first second of expiration as compared to your forced vital capacity, or the total amount of air you can breathe out forcefully.

I will then give you two 45 minute lectures, one per week. They will be concerned with knowledge and care of COPD and the use of certain breathing exercises. I will explain and demonstrate the exercises and ask you to demonstrate them to me and to keep a chart of doing them at home. You will receive some material from the American Lung Association for you to take home and read. You will then repeat the tests you took before the lectures, and I will compare them for differences.

All data will be coded so that no names are [illegible] on tests. I will have a single master code list which will be destroyed after data is collected. Your name or the hospital's name will not be released in the study. Results of the study will be available to you upon re-

quest.

Possible risks to you as a subject include (1) Improper release of data and (2) slight chance of transient dizziness related to forceful expiration into the spirometer and/or to breathing exercises.

Potential benefits to you as a subject include (1) improved knowledge of the disease, (2) improved ability to cope with the disease, and (3) possible improvement in respiratory function.

Potential benefits for health care personnel include an improved understanding of methods to use in the treatment of COPD patients.

No medical service or compensation is provided to subjects by Texas Woman's University as a result of injury from participation in research. You will be asked to sign consent forms from Texas Woman's University and from Veteran's Administration Hospital.

You are free to withdraw from the study at any time. If you have any questions now or at any time during the study, I will be glad to answer them to the best of my ability.

APPENDIX G

BREATHING EXERCISE CHECK-OFF

Breathing Exercise Check-Off

Day 1	____	____	____
2	____	____	____
3	____	____	____
4	____	____	____
5	____	____	____
6	____	____	____
7	____	____	____
8	____	____	____
9	____	____	____
10	____	____	____
11	____	____	____
12	____	____	____
13	____	____	____
14	____	____	____

Please fill in time of day exercises were done and bring with you each time you meet with me.

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