

PULMONARY REHABILITATION

by Mary Gilmartin, R.N., R.R.T.

A pulmonary rehabilitation program is an important adjunct to medical therapy in treating patients with chronic obstructive pulmonary disease (COPD). Pulmonary rehabilitation includes interventions, such as:

- physical and functional evaluation;
- exercise conditioning;
- education;
- occupational therapy;
- breathing training; and
- psychosocial counseling.

The goal of a pulmonary rehabilitation program is to help the patient achieve the highest possible level of independent function.

Patients should be considered for pulmonary rehabilitation when their lung dis-

ease begins to have a significant impact on their daily activities. Ideal patients are willing and able to learn about their disease, and motivated to devote the time and effort required to benefit from the program.

However, patients with COPD are often depressed, anxious, and fearful because of their disease. Such patients can be motivated by an experienced pulmonary rehabilitation team that shows the patient that there is potential for symptom improvement with an active treatment regimen. Pulmonary rehabilitation is an effective method for

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reducing dyspnea, which is a critical goal because shortness of breath traps COPD patients in a dangerous, vicious cycle that involves dyspnea, fear, and deconditioning.

Dyspnea is one of the most frightening symptoms that a patient can experience, often arousing a fear of impending death. Because dyspnea often occurs following exercise, many COPD patients quickly learn to avoid physical activity. This results in deconditioning, which can eventually cause the patient difficulties in performing activities of daily life. In addition, deconditioning, with the associated inefficient cardiac and muscle function, increases dyspnea, which further mires the patient in a spiral of anxiety, inactivity, and shortness of breath.

This article describes the key components of a comprehensive pulmonary rehabilitation program, such as the one used by the Emphysema/COPD Clinic at National Jewish. The basic rehabilitation program lasts three weeks, and is administered on an outpatient basis.

Initial Evaluations

An initial evaluation of the patient is conducted with three goals in mind. First, the



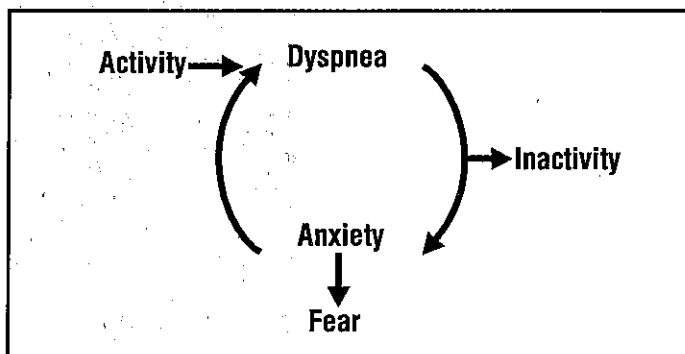
During a maximal exercise test, the therapist monitors the patient's heart function, oxygen saturation and oxygen consumption.

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The vicious circle of dyspnea. Activity in COPD patients causes shortness of breath, with resultant anxiety and fear, and leads to inactivity in an effort to prevent further dyspnea. Anxiety itself can cause dyspnea.

evaluation must determine whether the patient has significant underlying cardiac disease or other medical problems that may interfere with pulmonary rehabilitation. Second, the initial evaluation results provide a baseline against which the effects of the rehabilitation program can be measured. Finally, based on the patient's initial state, the treatment team and the patient together develop feasible goals for the subsequent rehabilitation program.

The evaluation looks at a broad spectrum of parameters, including the patient's level of oxygenation, exercise capacity, and other aspects of their cardiovascular and pulmonary health. A six-minute walk measures the maximum distance a patient can comfortably cover during the time interval, and serves as an indicator of the patient's functional capacity. This test is a shortened form of what originally was a 12-minute walk, and it shows a significant correlation to oxygen consumption during treadmill testing in COPD patients.

An occupational therapist gauges the patient's ability to accomplish simple daily-life tasks, such as making a bed. A psychosocial assessment delves into the patient's attitudes, learning ability, and memory.

A maximal exercise test reveals whether it is the patient's ventilation, cardiac function, or muscle endurance that is the primary factor limiting duration of exercise. During this test a technician monitors the patient's heart function, oxygen saturation, oxygen consumption, and carbon dioxide production.

The educational needs of the patient are also assessed. This includes determining what the patient knows about COPD and its treatment, oxygen requirements, nutrition, exercise, and sleep patterns.

Exercise Training

Exercise training is the most effective method for improving a patient's ability to perform activity. An exercise prescription generally has four basic components: the mode of exercise, intensity, duration, and frequency. The training program usually involves twice-daily sessions. Lower-extremity aerobic training is the cornerstone of a reconditioning program, with an emphasis on building up the patient's endurance and strength.

The appropriate intensity target for training patients with COPD has been controversial. In contrast to healthy individuals or cardiac patients, who usually start a program by trying to achieve a predetermined submaximal heart rate, COPD patients have been successfully trained using a heart rate goal that approaches or even exceeds their initial maximum exercise level.

Study results indicate that even patients with advanced disease can be successfully trained at maximal exercise levels. By the end of the three-week session, a patient's ability to perform exercise may be doubled. Other benefits of an exercise program may be an increase in endurance, maximum oxygen consumption, and the ability to perform daily activities.

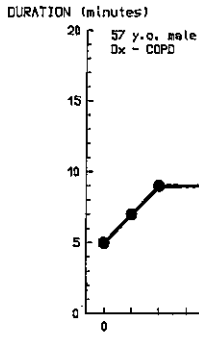
Because patients will, ideally, continue their exercise program for the rest of their lives, it is critical that they choose a mode of exercise that is enjoyable and convenient. In addition, patients must have the resources to continue this mode of exercise after they have left the program.

Patients have the option of exercising on a stationary cycle, treadmill, or by walking. Other components involve exercises with weights and range-of-motion exercises. A water-exercise program should be available for patients who enjoy swimming, and for those who need to avoid high-impact exercises that may exacerbate osteoporosis, arthritis, or compression fractures.

Some patients also benefit from an upper-extremity exercise program. COPD is associated with hyperinflation, a flattened diaphragm, and diminished diaphragm strength. These characteristics mean that when a COPD patient breathes, an added workload is placed on the accessory respiratory muscles of the shoulder girdle which assist breathing and are also involved in upper-extremity activity.

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BICYCLE ENDURANCE



Graph shows increased exercise tolerance in a patient on a training program

Respiratory muscle training involves breathing through an inspiratory resistance, which improves diaphragm strength. However, it is unclear whether inspiratory muscle training is beneficial when added to a lower-extremity aerobic exercise program. In addition, most studies of upper extremity exercise have shown that this mode of exercise is not well-tolerated by patients with COPD or even by healthy individuals.

Patient Education

The goal of education is to change the health beliefs of patients and their families so that the treatment plan is more readily accepted and compliance is enhanced. Patients in a rehabilitation program need to understand the program's purpose, the anticipated outcomes, and what is expected from the patient and family members. Studies have shown that even patients with severe disease can learn to better understand their illness.

An important prelude to the education component is a brief neuropsychiatric evaluation, which attempts to identify whether the patient has any cognitive limitations. In addition, the evaluation identifies the type of educational approach that works best for each patient. Some patients, for example, are visual learners, while others assimilate information best in a hands-on format.

Patient and family education includes both formal classes and the informal teaching that can occur when a health care provider explains a procedure, medica-

tion, or treatment. Formal educational sessions include both group and individual instruction. Patients should be offered classes in a variety of subjects, including:

- understanding your disease
- preventing or reducing dyspnea
- medications
- nutrition
- energy
- the benefits of exercise
- oxygen therapy
- coping
- stress management
- sexuality.

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Counseling of patients and family members is an important supplement to an educational program. Study results indicate that patients and families can develop a false expectation of improvement when information is given to them without counseling or open discussion.

Breathing Training

Many patients benefit from breathing training, which decreases dyspnea and allows patients to regain control of their breathing, particularly in stressful situations. The most common benefit from breathing training is improved clinical symptoms rather than measurable changes in physiologic parameters. Two types of breathing methods are commonly taught: diaphragmatic and pursed-lip.

Diaphragmatic breathing is initially taught to patients when they are in a comfortable position, preferably reclining on a bed or chair. The patient places one hand on the upper abdomen and the other on the chest, and is instructed to inspire with a maximal outward movement of the abdomen. Once the patient becomes familiar with the method, diaphragmatic breathing can be practiced while sitting or standing, or with functional activities. This method helps reduce dyspnea.

Some patients may find it easiest to learn diaphragmatic breathing while in the *Trendelenburg* position — lying supine with the head tilted downward and legs dangling over the edge of a table or bed. This position helps some patients feel the movement of their diaphragm. Breathing exercise sessions may last 10-15 minutes at a time.

Pursed-lip breathing is a modification of the diaphragmatic method that can improve oxygenation and reduce dyspnea. Patients are taught to exhale slowly for 10 seconds against the slight resistance created by lightly pursing the lips. This

method slows the respiratory rate and makes ventilation more efficient. Pursed-lip breathing also creates a back pressure in the airways that helps to prevent airway closure. About half of COPD patients can reduce their dyspnea using pursed-lip breathing.

Conserving Energy

One of the most important messages patients receive during rehabilitation is to slow down. The program should constantly stress to patients that they will go farther, accomplish more, and have a better chance of avoiding dyspnea if they moderate the speed and intensity at which they perform their activities. Patients are taught to schedule their days so that they have sufficient time to slowly perform each activity and also fit in rest periods between activities.

A physician, nurse, or therapist may need to review a patient's daily schedule and suggest specific planning and pacing techniques. Patients are often helped by intelligent planning and devices such as electrical appliances, which reduce the energy a patient has to expend when performing activities.

The occupational therapy program helps patients learn new ways to perform their everyday activities so that they expend the limited energy they have in the most efficient manner. For example, the program shows patients how to bathe in a way that conserves their energy. Other energy-conserving techniques include modification of a work area, and introducing patients to devices such as electrical appliances and movable carts. Patients could place all the kitchen utensils they use on a cart, rather than always carrying the items back and forth.

Guest Lecturers

National Jewish faculty members frequently travel to national and international conferences and to other institutions to talk about their clinical and research findings. Guest speakers can be requested through the Office of Continuing Medical Education.

T. Corbridge, MD	September 2, 1993 Boulder Community Hospital Boulder, CO Grand Rounds "Acute Asthma"
E. Gelfand, MD	October 1, 1993 Latin American Congress of Allergy and Immunology Margarita Is, Venezuela "Management of Steroid Dependent Asthma with Intravenous Gammaglobulin"
L. Rosenwasser, MD	October 8, 1993 Autumn Allergy Update New York, NY "Mechanisms of Asthma: Immune & Other"
H. Nelson, MD	October 30, 1993 Kaiser Permanente Fall Allergy Symposium Berkeley, CA "The Role of Beta Agonist in the Treatment of Asthma" & "Immunotherapy — Therapeutic Considerations"
S. Szefer, MD	October 31, 1993 American Academy of Pediatrics Washington, D.C. "Inhaled Steroids in the Treatment of Asthmatic Children"

Psychosocial Counseling

About 40-75% of COPD patients develop a reactive depression because their disease limits their employment, physical independence, sexual potency, social interactions, and self-esteem. Psychosocial counseling can increase a patient's self-esteem, and also help family members cope with the patient's chronic illness. Patients should also undergo screening for major depressive illness, which may respond to treatment with antidepressant medications and psychiatric therapy.

A variety of emotions, including anxiety, can precipitate dyspnea. Patients are often successful using relaxation techniques to reduce dyspnea and regain self-control. Relaxation methods include biofeedback, progressive muscle relaxation, yoga, transcendental meditation, hypnosis, and listening to music and relaxation audiotapes.

In addition, reassurance to the patient that dyspnea is not, by itself, life-threatening can interrupt the vicious cycle of dyspnea in which patients are often trapped.

Patients in a rehabilitation program need to understand the program's purpose, the anticipated outcomes, and what is expected from the patient and family members.

Nutrition

Malnutrition is common among patients with severe COPD. Patients may be able to reduce their dyspnea by improving their diet and thereby

increasing their strength and respiratory muscle mass. Malnourished patients must be identified, and their diets changed to a more healthful one.

Some patients tend to have dyspnea episodes following meals. These patients often benefit from eating smaller meals, and eating more frequently so that their total intake remains unchanged.

Continuing at Home

After the three-week training and education program is complete, patients should receive a regimen to follow at home. The take-home program is designed to continue a gradual increase in exercise training, and is geared to what is reasonable for the patient to accomplish at home or at a nearby club or

gymnasium. Patients need to receive explicit written instructions on how to accomplish their program, and arrangements must be made to periodically review the patient's progress.

Patients should be encouraged to train

daily, or at least a minimum of three to five times a week. In addition, patients should periodically check that their oxygenation level remains satisfactory, and should undergo monitoring with a pulse oximeter while exercising.

COPD is a chronic disease. Patients have to be taught to expect that they will have an occasional worsening of their condition because of a cold, pneumonia, or bronchitis. The recovery time from these illnesses is usually longer than in patients with no COPD.

Patients should continue their exercise program, even when their activity is limited by illness. Although a patient may be weakened, a small amount of exercise, even if it's a fraction of the usual program, will help them feel better and will stave off serious deconditioning. Patients who stop exercising completely when ill typically become significantly deconditioned and find it discouraging to resume their rehabilitation program once they have recovered.

Benefits from Rehabilitation

Patients enter rehabilitation with a spectrum of goals. Some want to be able to return to work; others want to be able to once again perform their activities of daily life, like shopping or cooking, and some want to be able to participate in a favorite

sport, such as golf. At National Jewish, rehabilitation programs are tailored so that they can best help each patient achieve the goals that they have identified as most important.

Two important outcomes for all patients are to take more responsibility for their self-care, and to adapt their lives to their new functional status without losing their self-identity.

Each patient in our program receives a quality-of-life questionnaire prior to the start of the rehabilitation program, and at the end. A research protocol is in progress at our clinic, designed to systematically assess the identifiable outcomes that result from pulmonary rehabilitation.

The key outcome that decides whether a rehabilitation program achieves meaningful results is how it has affected the patient's self-assessment of quality-of-life. Achieving improvements in objective clinical measures is of secondary importance.

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