
A Decentralized Rehabilitation Program for Chronic Airway Obstruction Disease Patients in Small Urban and Rural Areas of Wisconsin: a Preliminary Report

SHELDON R. BRAUN, MD
SUE DRISCOLL, BS, MS
ANGELIKA ANDEREGG, RRT
JAMES BARB, RRT
F. ROGER SMITH, RRT
WILLIAM G. REDDAN, PhD

CHRONIC AIRWAY OBSTRUCTION DISEASE (CAOD) is an increasing health problem (1). Several reports suggest that the disease produces progressive impairment (2,3); as function decreases, increased dyspnea and worsening of psychological symptoms—such as depression, hysteria, and conversion tendencies—occur (4). Multidisciplinary rehabilitation programs, such as those established by Petty and co-workers (5), benefit most patients, and other similar programs have been equally successful (4,6). In addition, patients in rehabilitation programs seem to require less hospitalization than patients not receiving such care (7).

Dr. Braun is assistant professor of medicine, Pulmonary Disease Section, Department of Medicine, University of Wisconsin. Ms. Driscoll is a pulmonary clinical nurse specialist, Ms. Anderegg is the RESTOR coordinator, Pulmonary Rehabilitation Services, Mr. Barb is a pediatric specialist, Respiratory Therapy Department, and Mr. Smith (deceased) was the technical director, Respiratory Care Services, all at the University of Wisconsin Center for the Health Sciences. Dr. Reddan is associate professor, Department of Preventive Medicine, University of Wisconsin School of Medicine.

Tearsheet requests to Sheldon R. Braun, MD, University of Wisconsin, Department of Medicine, 600 Highland Ave., Madison, Wisc. 53792.

The components of rehabilitation programs usually include optimal use of medications, cessation of smoking, physical therapy maneuvers (for example, postural drainage, relaxation exercises, breathing retraining, and pursed-lip breathing), use of oxygen at home when necessary, immunization against influenza, and an exercise training schedule. The presence or lack of a scientific basis for these modalities has been discussed (8,9). However, the combination of modalities generally has improved patients' quality of life (1,7). While it is still too early to determine whether these modalities also prolong life, some preliminary observations indicate that they do—especially for patients with cor pulmonale (10).

Although rehabilitation programs have been successful, the question of cost benefit must be considered. Some programs require relatively long hospitalizations—up to 2 to 3 weeks—for intensive training; it has been suggested that this approach can even improve pulmonary function (11). After the initial intensive program, regular followup is often continued at the same institution (4). To help reduce hospital costs,

home and outpatient programs have been established (12,13).

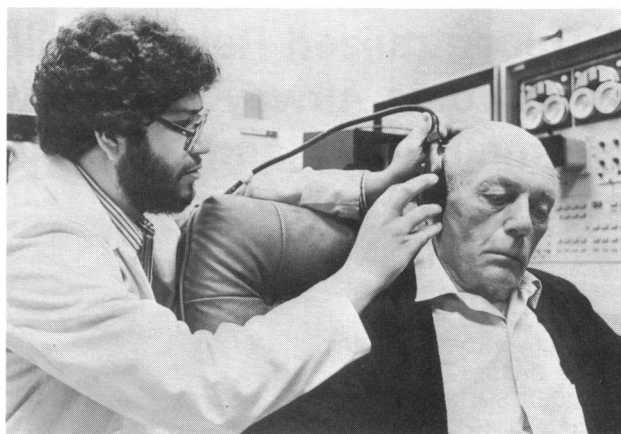
The concept of an intensive, centralized program is applicable in a large urban population, but in agricultural States such as Wisconsin it presents several important problems. First, many Wisconsin hospitals have fewer than 100 beds, and most physicians are family practitioners with extremely full schedules; thus, it is difficult to implement local programs. Second, because of the relatively great distances to larger urban areas outpatient programs in larger city hospitals are impractical and expensive. Third, patients often prefer to remain under the care of their own physicians. Finally, because of the long distances and the expenses entailed in outpatient visits long-term adherence to a program may not be possible. For these reasons, an alternative approach for delivering specialized rehabilitation services in Wisconsin was devised.

The RESTOR (Rehabilitation Education Services Through Organized Resources) program was established at the University of Wisconsin Center for the Health Sciences (UWCHS). The program was based on the concept that rehabilitation programs have improved the quality of life for CAOD patients. The RESTOR program is being used effectively in smaller urban and rural areas with patients' personal physicians and local community hospitals as resources.

Methods

The RESTOR program has two aspects. One aspect is a training session for health professionals (respiratory therapists, nurses, and physical therapists) interested in establishing programs at their community hospitals. These professionals are called RESTOR associates. During the 2-day session, basic concepts of the pathophysiology of CAOD are discussed, methods of patient management are reviewed, and specific warning signs of deterioration are outlined. Following the session, a UWCHS respiratory therapist spends a half-day at the community hospital to help establish the local program. The therapist also gives the RESTOR associate an extensive amount of reference material. In many instances, the RESTOR medical director discusses CAOD therapy with the community hospital's medical staff.

The second aspect of the program covers evaluation and rehabilitation planning for each patient. This aspect is also a 2-day session, and in most cases it is carried out on an outpatient basis. The first day includes extensive evaluation; a history questionnaire is administered, a physical examination is performed by a pulmonary specialist, routine pulmonary functions are measured (including arterial blood gases), and a progressive exercise stress test is given. The multidisciplinary



The ear oximeter is a noninvasive way to evaluate oxygenation

plinary team meets between the first and second days of work with the RESTOR medical director in formulating a prescription for the patient's rehabilitation. During the second day, patient education is initiated; family members are included. This education includes several hours of individual sessions with a respiratory therapist, a nurse, and a physician; the patient's prescription is reviewed and various therapy modalities are explained. Next, an appointment is made for the patient with his or her physician. The physician reviews the detailed rehabilitation prescription forwarded from the RESTOR medical director, and, with this physician's approval, the training and education program continues at the community hospital—under the direction of the RESTOR associate and the physician. The associate reviews the prescribed program with the patient, reviews UWCHS material, and continues the patient's educational, therapeutic, and exercise program on an outpatient basis.

The UWCHS involvement in the program is ongoing. Continuing education of the RESTOR associates includes regular visits every 6 to 8 weeks by a member of the UWCHS multidisciplinary team. During these visits, the local program's records of patients' conditions are reviewed, and the associate gives updated information to the UWCHS member and the RESTOR medical director. Every 12 months, a 1-day seminar is held for the RESTOR associates at the UWCHS. Also, the UWCHS sends a newsletter that includes articles reviewing medical, technical, and operational problems to all the associates and physicians participating in the program. Patients are re-evaluated during 1-day visits to UWCHS every 6 months for 1 year, followed by yearly visits. Necessary adjustments are made in the rehabilitation program by team members. When immediate problems arise, the RESTOR

associate contacts the patient's physician or telephones the RESTOR team at the UWCHS.

The major costs of the program for the patient are for diagnostic tests and professional fees. The total cost for the 2 days is about \$400. Because it is chiefly an outpatient program, few inpatient costs are incurred. Additional costs at the home hospital are only for the outpatient visits to the associate. Many major health insurance programs usually pay for pulmonary evaluation at the UWCHS.

The community hospital pays no fee for the initial associate training program. Costs for visits by the RESTOR coordinator and additional educational inservices at the community hospital are covered by the University of Wisconsin Center for the Health Sciences.

Results

At the time of this report, 12 programs were being operated in regional communities of various sizes. These communities included the home program in Madison, with a population of 172,769; the remaining programs were in communities of less than 50,000. Two programs were in towns having 25,000–50,000 people, 2 were in towns having 5,000–10,000, and the rest were in areas having fewer than 5,000 people.

The 28 men and 14 women in the RESTOR program had moderate to severe disease, with moderate hypoxemia at rest; 19 had forced expiratory volume in the first second (FEV₁) of less than 1 liter; and 6 had PaCO₂ values greater than 45 mmHg. None had been in a rehabilitation program before.

The mean age of the 42 patients was 62.9, standard deviation ± 9.3 . Their pulmonary function was as follows:

Function	Number of patients	Mean	SD
FEV ₁	42	1,152	± 557
PaO ₂ (mmHg)	41	63.3	± 9.0
PaCO ₂ (mmHg)	41	39.0	± 6.6

Participation in the local program and the well-being of the patients was determined by the UWCHS RESTOR team during community hospital visits. Patients were considered to be doing "well" if, in the associate's opinion, the activity level and quality of life were markedly improved. If patients were stable or only minimally improved, they were considered to be in "fair" condition. Patients whose condition had deteriorated were placed in the "poor" category. As the following figures show, the majority of the 33 patients being seen by a RESTOR associate benefited from this contact.

Category	Number	Percent
Well	24	73
Fair	4	12
Poor	5	15

During their 6-month revisit, 11 patients were evaluated by means of their responses to a questionnaire and a repeat stress test. More than half reported improvement or stabilization of the following symptoms.

Symptom	More	Same	Less	None
Cough	0	5	5	1
Phlegm	3	3	4	1
Wheezing	0	4	6	1

Of the 11 patients, 8 reported doing the breathing exercises regularly; 6 were on a formal exercise program. Of the nine patients who responded to the question of changes in exercise tolerance, all reported improvement. Three of the nine could walk four times as far, two could walk two to three times as far, and five could walk farther, but not twice as far. Although there was little change in static pulmonary function, eight of the nine showed marked improvement on treadmill testing.

After the 2-day evaluation sessions with the 42 patients, it seemed that the objective of getting patients to participate in a rehabilitation program was being met. As shown in the following table, 79 percent of the 42 patients were involved with a RESTOR associate.

Participation with associate	Number of patients	Percent of total
Active	33	79
Frequent contact	24	57
Regular contact-maintenance program	4	10
Irregular contact	5	12
Not active	9	21
Does own program at home	3	7
No associate near patient	1	2
No interest in continuing	2	5
Associate did not contact patient ...	3	7

However, the five patients who had irregular contact with an associate cannot be considered to have had a successful outcome. Yet, three patients (7 percent) who never contacted their associate followed the prescribed program actively; at their 6-month followup, they had achieved remarkable progress. More than two-thirds of the 42 patients were actively participating in the prescribed rehabilitation program under the direct supervision of a RESTOR associate.

Discussion and Conclusions

The distribution of Wisconsin's population and medical resources led to the CAOD rehabilitation program, which is designed to deliver rehabilitation services by use of less-expensive local resources. The success rate

General medical service hospital data for Wisconsin, excluding Milwaukee County and Madison area hospitals, 1978

Hospital characteristics	Number of beds					Total
	0-49	50-99	100-199	200-399	400 or more	
Number of hospitals	39	35	24	20	3	121
Average number acute care beds	38	69	135	287	459	118
Average number active medical staff	5.5	12.1	35.4	83.3	142.3	29.6
Average number staff internists	1.4	1.8	4.0	9.7	14.7	5.3
Number hospitals with internists	8	16	21	19	3	67
Average number pulmonary specialists	1.0	1.2	2.0	1.4

SOURCE: Wisconsin Hospital Association.

in establishing local programs is encouraging. If the preliminary patient success rate continues, the future success rate will not differ much from that reported by Petty and co-workers (5).

This program has several unique advantages:

- Delivery of specialized medical care to geographically distant points allows high-level care without a great deal of travel by patients.
- Personal physicians can maintain management of their patients' medical courses.
- Each community program can fully use its assets to deal with specific problems of patients.
- The program provides a model for using a university medical center as a resource for the community in general, without negating the contributions of local community health professionals.
- Costs to the patients are lowered.

Although the general quality of life can be improved with rehabilitation programs for CAOD, they usually require several weeks of intensive training in a large medical center. Since Wisconsin has only two large urban areas, most of the people live in rural areas or towns of less than 25,000. The majority of hospitals outside of Madison and Milwaukee (see table) have fewer than 100 beds and few specialists. Only hospitals with more than 100 beds have pulmonary specialists. Thus, establishment of separate rehabilitation programs may be impractical.

The data presented here in regard to outcome are preliminary. Followup was very short; almost all patients were followed less than 1 year. This initial study, however, does indicate that a decentralized program with much less intensive education and training than in a centralized program can be successful. Most of the patients did improve. They used the exercise and physical therapy maneuvers they were taught. At the first followup visit, exercise tolerance was both subjectively and objectively increased. Although this was an expected finding (14), it indicates that—at

least initially—exercise tolerance can be improved just as in an intensive program.

References

1. American Lung Association: Chronic obstructive pulmonary disease. Ed. 5. New York, 1977.
2. Renzetti, A. D., McClement, J. H., and Litt, R. D.: Veterans Administration cooperative study of pulmonary function. III. Mortality in relation to respiratory function in chronic obstructive pulmonary disease. *Am J Med* 41: 115-129 (1966).
3. Burrows, B., and Earle, R. H.: Course and prognosis of chronic obstructive lung disease. *N Engl J Med* 280: 397-404 (1969).
4. Kimbel, P., Kaplan, A. S., Alkalay, I., and Lester, D.: An in-hospital program for rehabilitation of patients with chronic obstructive pulmonary disease. *Chest* 60 (supp.): 6s-10s (1971).
5. Petty, T. L., et al.: A comprehensive care program for chronic airway obstruction. Methods and preliminary evaluation of symptomatic and functional improvement. *Ann Intern Med* 70: 1109-1120 (1969).
6. Miller, W. F.: Rehabilitation of patients with chronic obstructive lung disease. *Med Clin North Am* 51: 349-361 (1967).
7. Petty, T. L.: Basics of RD-pulmonary rehabilitation. American Thoracic Society, New York, 1975.
8. Hodgkin, J. E., et al.: Chronic obstructive airway diseases—current concepts in diagnosis and comprehensive care. *JAMA* 232: 1243-1260 (1975).
9. Lertzman, M. M., and Cherniack, R. M.: Rehabilitation of patients with chronic obstructive pulmonary disease. *Am Rev Res Dis* 114: 1145-1165 (1976).
10. Neff, T. A., and Petty, T. L.: Long-term continuous oxygen therapy in chronic airway obstruction—mortality in relationship to cor pulmonale, hypoxia, and hypercapnia. *Ann Intern Med* 72: 621-628 (1970).
11. Gimenez, M., et al.: Exercise training with oxygen supply and directed breathing in patients with chronic airway obstruction. *Respiration* 37: 157-166 (1979).
12. Neff, T. A., and Petty, T. L.: Outpatient care for patients with chronic airway obstruction—emphysema and bronchitis. *Chest* 60 (supp.): 11s-17s (1971).
13. Farrington, J. F.: Rehabilitation of pulmonary cripple in private practice. *Chest* 60 (supp.): 18s-20s (1971).
14. Pierce, A. K., Taylor, H. F., Archer, R. K., and Miller, W. F.: Response to exercise training in patients with emphysema. *Arch Intern Med* 113: 28-36 (1964).