

# Cognitive-Behavioral Interventions and the Quality of Life of Patients with Chronic Obstructive Pulmonary Disease



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Chronic obstructive pulmonary disease (COPD) has a profound effect on functioning and everyday life. Current estimates suggest that COPD affects nearly 11% of the adult population, and the incidence is increasing. Trends that indicate that the rate of COPD is increasing among women reflect the increase in tobacco use among women in the later part of this century.<sup>61</sup> Reviews of the medical management of COPD justify the use of symptomatic measures, including prescription of bronchodilators, corticosteroids, and antibiotic therapy. In addition, long-term oxygen therapy has been shown to be beneficial for patients with severe hypoxemia.<sup>24</sup> It is widely recognized, however, that these measures cannot cure COPD and that much of the effort in the management of this condition must be directed toward improving symptoms, patient functioning, and quality of life.

To achieve these outcomes, behavioral interventions are necessary and often include smoking cessation as part of a comprehensive pulmonary rehabilitation program. Many of the chapters in this book provide evidence for the value of behavioral interventions for smoking cessation,<sup>56</sup> exercise training,<sup>15</sup> upper extremity reconditioning exercise,<sup>20</sup> respiratory muscle training,<sup>2</sup> and diet.<sup>45</sup> In this chapter, evidence for the benefits of behavioral intervention is reviewed, and some of the work in the authors' research program is described.

Cognitive-behavior modification methods

have been shown to be useful for changing a wide variety of human behaviors.<sup>42</sup> These methods are based on modern learning theory and are supported by a substantial literature on human and animal learning. Most current behavioral intervention methods rely on specific behavioral techniques. These methods, which include self-monitoring, goal specification, stimulus control, self-reinforcement, behavioral reversal, and other techniques, have been shown to be efficacious. Mazzuca<sup>48</sup> reviewed studies that used interventions based on either didactic knowledge-based interventions or behavioral skill-based programs. Using meta-analysis methods, he found that didactic interventions had a relatively small and statistically nonsignificant effect on health behavior (0.26 Z units), whereas behavioral interventions had a significant positive influence on health behaviors (0.64 Z units). In other words, programs based on behavioral intervention are more than twice as effective as those based solely on knowledge. Mazzuca also reviewed physiologic outcomes (blood pressure, blood glucose, weight, and blood cholesterol).<sup>9</sup> In addition to effects on behavior change, behaviorally based programs, averaged across studies, had a strong and significant effect on physiologic outcomes, whereas didactic knowledge-based programs had a nonsignificant effect. Thus, behaviorally based programs can be extremely important for the optimal management of COPD.

## BEHAVIORAL INTERVENTION: COST-EFFECTIVENESS AND QUALITY OF LIFE

Over the last 15 years, the authors have conducted and reviewed a variety of studies that evaluate behavioral interventions for patients with COPD. Most of these studies evaluated the benefits of treatment using outcome measures that focused on dyspnea<sup>23</sup> and health-related quality of life.<sup>34</sup> To date, there is little consensus on which measures should be applied. The measure used most frequently is the Chronic Respiratory Questionnaire (CRQ), which was developed by Guyatt and colleagues.<sup>28</sup> Work by the authors has focused on a general outcome measure known as the Quality of Well-Being Scale (QWB), which can be used to quantify outcomes and to assess the cost-utility of treatment.

Within the last few years, there has been growing interest in using quality of life data to help evaluate the cost/utility or cost-effectiveness of health care programs. Cost studies have gained in popularity because health care costs have grown rapidly. Not all health care interventions are equally efficient in returning benefit for the expended dollar. Objective cost studies might guide policymakers toward an optimal and equitable distribution of resources. Cost-effectiveness analysis typically quantifies the benefits of a health care intervention in terms of years of life or quality adjusted life years (QALYs). Cost/utility is a special use of cost-effectiveness that weights observable health states by preferences or utility judgments of quality.<sup>38</sup> In cost/utility analysis, the benefits of medical care, behavioral interventions, and preventive programs are expressed in terms of well-years. These outcomes have also been described as QALYs,<sup>65</sup> discounted life years,<sup>40</sup> or healthy years of life.<sup>34</sup> Because the term QALYs has become most popular, it is used in this chapter. QALYs integrate mortality and morbidity to express health status in terms of equivalents of well-years of life.

If an adult dies of COPD at age 60 and he would have been expected to live to age 75, it might be concluded that the disease was associated with 15 lost life years. If 100 adults with a life expectancy of 75 years died at age 60, it might be concluded that 1500 (100 adults  $\times$  15 years) life years had been lost. Death is not the only outcome of concern in COPD. Many adults may be disabled over long periods of time. Because of respiratory problems, the quality of their lives has diminished. QALYs take into consideration the quality-of-life consequences of illnesses. For example, a disease that reduces qual-

ity of life by one half takes away 0.5 QALYs over the course of each year. If it affects two people, it takes away 1.0 year (equal  $2 \times 0.5$ ) over each year period. A medical treatment that improves quality of life by 0.2 for each of five individuals results in the equivalent of 1 QALY if the benefit is maintained over a 1-year period. This system has the advantage of considering both benefits and side effects of programs in terms of the common QALY units. The general measurement system is also capable of quantifying toxic effects of new treatments. Further, it can be used to evaluate the relative importance of side effects so that a net assessment of the treatment can subtract side effects from benefits.

Although there are several different approaches for quantifying QALYs, most of them are similar.<sup>32</sup> The approach preferred by the authors involves several steps. First, patients are classified according to objective levels of functioning. These levels are represented by scales of mobility, physical activity, and social activity. The dimensions and steps for these levels of functioning are shown in Table 11-1. The reader is cautioned that these steps are not actually the scale, only listings of labels representing the scale steps. Standardized questionnaires have been developed to classify individuals into one of each of these scale steps.<sup>6,7</sup> In addition to classification into these observable levels of function, individuals are classified by the one symptom or problem that was reported to be the most undesirable (Table 11-2). About half of the population reports at least one symptom or problem on any day. These may be severe, such as serious chest pain, or minor, such as the inconvenience of taking medication or a prescribed diet for health reasons. The functional classification (see Table 11-1) and the accompanying list of symptoms or problems (see Table 11-2) were created after extensive reviews of the medical and public health literature.<sup>38</sup> Over the last decade, the function classification system and symptom list were repeatedly shortened until the current versions were arrived at. Various methodologic studies on the questionnaire have been conducted.<sup>8,9,37,39</sup> With structured questionnaires, an interviewer can obtain classifications on these dimensions in 7 to 12 minutes.

Once observable-behavioral levels of functioning have been classified, a second step is required to place each individual on the 0-to-1.0 scale of wellness. To accomplish this, the observable health states are weighted by *quality* ratings for the desirability of these conditions. Human value studies have been conducted to place the observable states onto a preference contin-

**TABLE 11-1**  
**Quality of Well-Being/General Health Policy Model: Elements and Calculating Formulas (Function Scales, with Step Definitions and Calculating Weights)**

| Step No.                             | Step Definition   | Weight |
|--------------------------------------|---|--------|
| <i>Mobility Scale (MOB)</i>          |   |        |
| 5                                    | No limitations for health reasons   | -0.000 |
| 4                                    | Did not drive a car, health related; did not ride in a car as usual for age (younger than 15 yr), health related, and/or did not use public transportation, health related; or had or would have used more help than usual for age to use public transportation, health related   | -0.062 |
| 2                                    | In hospital, health related   | -0.090 |
| <i>Physical Activity Scale (PAC)</i> |   |        |
| 4                                    | No limitations for health reasons   | -0.000 |
| 3                                    | In wheelchair, moved or controlled movement of wheelchair without help from someone else; or had trouble or did not try to lift, stoop, bend over, or use stairs or inclines, health related; and/or limped, used a cane, crutches, or walker, health related; and/or had any other physical limitation in walking, or did not try to walk as far as or as fast as others the same age are able, health related | -0.060 |
| 1                                    | In wheelchair, did not move or control the movement of wheelchair without help from someone else, or in bed, chair, or couch for most of all of the day, health related   | -0.077 |
| <i>Social Activity Scale (SAC)</i>   |   |        |
| 5                                    | No limitations for health reasons   | -0.000 |
| 4                                    | Limited in other (e.g., recreational) role activity, health related   | -0.061 |
| 3                                    | Limited in major (primary) role activity, health related  | -0.061 |
| 2                                    | Performed no major role activity, health related, but did perform self-care activities  | -0.061 |
| 1                                    | Performed no major role activity, health related, and did not perform or had more help than usual in performance of one or more self-care activities, health related  | -0.106 |

*Calculating Formulas*

*Formula 1.* Point-in-time well-being score for an individual (W):

$$W = 1 + (\text{CPXwt}) + (\text{MOBwt}) + (\text{PACwt}) + (\text{SACwt})$$

where "wt" is the preference-weighted measure for each factor and CPX is Symptom/Problem complex. For example, the W score for a person with the following description profile may be calculated for one day as:

|        |   |        |
|--------|---|--------|
| CPX-11 | Cough, wheezing or shortness of breath, with or without fever, chills, or aching all over | -0.257 |
| MOB-5  | No limitations  | -0.000 |
| PAC-1  | In bed, chair, or couch for most or all of the day, health related                        | -0.077 |
| SAC-2  | Performed no major role activity, health related, but did perform self-care               | -0.061 |

$$W = 1 + (-0.257) + (-0.000) + (-0.077) + (-0.061) = 0.605$$

*Formula 2.* Well-years (WY) as an output measure:

$$\text{WY} = [\text{No. of persons} \times (\text{CPXwt} + \text{MOBwt} + \text{PACwt} + \text{SACwt}) \times \text{Time}]$$

uum with an anchor of 0 for death and 1.0 for completely well. In several studies, random samples of citizens from a metropolitan community evaluated the desirability of more than 400 case descriptions. Using these ratings, a preference structure that assigned the weights to each combination of an observable state and a symptom/problem has been developed.<sup>39</sup> Cross-validation studies have shown that the model can be used to assign weights to other states of functioning with a high degree of accuracy ( $R^2 =$

0.96). The regression weights obtained in these studies are given in Tables 1 and 2. Studies have shown that the weights are highly stable over a 1-year period and they are consistent across diverse groups of raters.<sup>39</sup> Finally, it is necessary to consider the duration of stay in various health states. For example, 1 year in a state that has been assigned the weight of 0.5 is equivalent to 0.5 of a QALY. Table 1 provides an illustrative example of a calculation. Both reliability<sup>39</sup> and validity studies have been published.<sup>37</sup>

TABLE 11-2  
Quality of Well-Being/General Health Policy Model: Symptom/Problem  
Complexes (CPX) with Calculating Weights

| CPX No.<br>Weights | CPX Description   |         |
|--------------------|---|---------|
| 1                  | Death (not on respondent's card)  | -0.727* |
| 2                  | Loss of consciousness such as seizure (fits), fainting, or coma (out cold or knocked out)   | -0.407  |
| 3                  | Burn over large areas of face, body, arms, or legs  | -0.387  |
| 4                  | Pain, bleeding, itching, or discharge (drainage) from sexual organs—does not include normal menstrual (monthly) bleeding  | -0.349  |
| 5                  | Trouble learning, remembering, or thinking clearly  | -0.340  |
| 6                  | Any combination of one or more hands, feet, arms, or legs either missing, deformed (crooked), paralyzed (unable to move), or broken—includes wearing artificial limbs or braces                               | -0.333  |
| 7                  | Pain, stiffness, weakness, numbness, or other discomfort in chest, stomach (including hernia or rupture), side, neck, back, hips, or any joints or hands, feet, arms, or legs                                 | -0.299  |
| 8                  | Pain, burning, bleeding, itching, or other difficulty with rectum, bowel movements, or urination (passing water)  | -0.292  |
| 9                  | Sick or upset stomach, vomiting or loose bowel movement, with or without chills, or aching all over   | -0.290  |
| 10                 | General tiredness, weakness, or weight loss   | -0.259  |
| 11                 | Cough, wheezing, or shortness of breath, <i>with</i> or <i>without</i> fever, chills, or aching all over  | -0.257  |
| 12                 | Spells of feeling upset, being depressed, or of crying  | -0.257  |
| 13                 | Headache, or dizziness, or ringing in ears, or spells of feeling hot, nervous, or shaky   | -0.244  |
| 14                 | Burning or itching rash on large areas of face, body, arms, or legs   | -0.240  |
| 15                 | Trouble talking, such as lisp, stuttering, hoarseness, or being unable to speak   | -0.237  |
| 16                 | Pain or discomfort in one or both eyes (such as burning or itching) or any trouble seeing after correction  | -0.230  |
| 17                 | Overweight for age and height or skin defect of face, body, arms, or legs, such as scars, pimples, warts, bruises, or changes in color  | -0.188  |
| 18                 | Pain in ear, tooth, jaw, throat, lips, tongue; several missing or crooked permanent teeth—includes wearing bridges or false teeth; stuffy, runny nose; or any trouble hearing—including wearing a hearing aid | -0.170  |
| 19                 | Taking medication or staying on a prescribed diet for health reasons  | -0.144  |
| 20                 | Wore eyeglasses or contact lenses   | -0.101  |
| 21                 | Breathing smog or unpleasant air  | -0.101  |
| 22                 | No symptoms or problem (not on respondent's card)   | -0.000  |
| 23                 | Standard symptom/problem  | -0.257  |
| X24                | Trouble sleeping  | -0.257  |
| X25                | Intoxication  | -0.257  |
| X26                | Problems with sexual interest or performance  | -0.257  |
| X27                | Excessive worry or anxiety  | -0.257  |

\*Note: -0.727 for death becomes 0 when adjustments for mobility, physical activity, and social activity for death are included. A standard weight is used for symptoms 24-27 because specific scores are not available.

The well life expectancy is the current life expectancy adjusted for diminished quality of life associated with dysfunctional states and duration of stay in each state. Using the system, it is possible to consider simultaneously mortality, morbidity, and the preference weights for these observable behavioral states of function. When the proper steps have been followed, the model quantifies the health activity or treatment program in terms of the QALYs that it produces or saves. A QALY is defined conceptually as the equivalent of a completely well year of life, or a year of life free of any symptoms, problems, or health-related disabilities.

The QWB system is currently in use in several multisite clinical trials. For example, it was demonstrated to be sensitive to minor changes in health status in the multicenter clinical trial of Aurafin (oral gold) for patients with rheumatoid arthritis.<sup>18</sup> Among many clinical trials that have used the QWB system are the 15-center Modification of Diet in Renal Disease (MDRD),<sup>43</sup> trials evaluating the benefits of exercise in patients with noninsulin-dependent diabetes mellitus,<sup>41</sup> and a trial of exercise in cystic fibrosis.<sup>52, 53</sup> The measure has also been used in clinical trials evaluating Zidovudine for human immunodeficiency virus (HIV)-infected men,<sup>35</sup>

and specific validity data are available for HIV-infected patients. The National Center for Health Statistics estimates QWB scores based on similar questions in their National Health Interview and Health and Nutrition Examination Surveys.<sup>33</sup>

Studies using the QWB system suggest that psychosocial interventions may produce benefits for COPD patients at a cost comparable to many widely advocated surgical and medical programs in other domains of medical care.<sup>62</sup> The authors encourage more cost/utility studies in the future.

## **BEHAVIORAL INTERVENTIONS TO IMPROVE COMPLIANCE**

Comprehensive pulmonary rehabilitation programs have been developed to provide a multidisciplinary therapeutic regimen tailored to the needs of the individual patient. As suggested in this book and elsewhere,<sup>5, 29</sup> rehabilitation efforts are well justified. Such programs may include several components, including individual assessment, education, instruction in respiratory and chest physiotherapy techniques, psychosocial support, and supervised exercise training. The primary goal of pulmonary rehabilitation is to restore the patient to the highest possible level of independent function. Successful programs can help patients to become better educated and more involved in their own care. In addition, patients may experience reduced symptoms,<sup>27</sup> improved exercise tolerance,<sup>16</sup> fewer hospitalizations and physician visits, and more gainful employment.<sup>54</sup> Pulmonary rehabilitation programs have expanded substantially in the last two decades and are now an accepted form of comprehensive therapy for patients with COPD. In 1981, the American Thoracic Society published a position statement supporting the use of pulmonary rehabilitation programs.<sup>5</sup> The American Association of Cardiovascular and Pulmonary Rehabilitation has published guidelines for practice and a review of evidence establishing the scientific basis of these programs.<sup>4</sup>

An important component of most pulmonary rehabilitation programs has been the establishment of a regular exercise regimen. Specific physical conditioning exercises, such as walking, can be undertaken by the patient to help to maintain physical functioning.<sup>14,16</sup> Improvements in patients with COPD following exercise training have been documented in several studies.<sup>17,19,57,60</sup> Specifically, appropriate physical

conditioning exercises can improve maximum exercise tolerance and endurance, reduce exertional breathlessness, and improve ventilatory and mechanical efficiency for exercise.<sup>16</sup>

There have been few controlled studies evaluating COPD rehabilitation programs or their components. Reports from nonrandomized studies typically suggest that rehabilitation objectives can be achieved.<sup>19,57</sup> A few controlled trials have documented the benefits of exercise programs for patients with COPD. Cockcroft and associates<sup>21</sup> randomly assigned 39 patients to a 6-week exercise training program or to a no-treatment control group. In comparison to the control group, patients in the exercise group experienced subjective benefits and increased the amount of distance they could walk in 12 minutes. The length of follow-up, however, was only 2 months. McGavin and coworkers<sup>49</sup> randomly allocated 24 patients with COPD to a 3-month unsupervised stair-climbing home exercise program or to a nonexercise control group. The 12 patients in the exercise group noted subjective improvements and an increased sense of well-being and decreased breathlessness. They also reported an objective increase in 12-minute walk distance and maximal level of exercise on a cycle ergometer. These changes did not occur in the control group. The length of follow-up, however, was limited to 3 months. Ambrosino and coworkers<sup>3</sup> randomly assigned 23 patients to a 1-month medical and rehabilitative therapy group and 28 patients to medical therapy alone (without exercise training). The experimental group improved in exercise tolerance and ventilatory pattern as evidenced by decrease in respiratory rate and increase in tidal volume. Again, these changes were not present in the control group.

## **BEHAVIORAL MODIFICATIONS TO IMPROVE COMPLIANCE WITH REHABILITATION**

Developing exercise programs for patients with COPD is difficult for several reasons. First, principles of training that have been well studied for normals or for cardiac patients do not necessarily apply to patients with COPD.<sup>60</sup> Adherence is often a major problem for the patient with COPD. Some studies suggest that the degree of benefits is associated with compliance to the exercise regimen.<sup>50</sup> Although patients can benefit from exercise, the routine is typically uncomfortable for them. Many participants in rehabilitation programs had become physically

deconditioned over a long period of time. Exertion may be not only uncomfortable, but also it commonly leads to the frightening symptom of breathlessness (dyspnea). Because of these problems, discontinuation of the exercise regimen is common.

Remarkably few studies have evaluated methods to improve adherence to an exercise regimen. In one experimental trial, patients with COPD underwent exercise testing and were given an exercise prescription. They were then randomly assigned to one of five experimental or control groups. The experimental groups were based on the principles of behavior modification or a variant of behavior modification known as *cognitive behavior modification*. These methods involve setting goals, analyzing the reinforcers, and using behavioral contracts. The experimental programs included six weekly walking sessions in the patient's home. One control group received attention but did not have the behaviorally based sessions, whereas the other control group received no treatment. After 3 months, there was greater compliance with the exercise program for the experimental groups by comparison with the two control groups (Fig. 11-1). These changes were reflected in improvements in exercise tolerance measured 1 month after the treatment (Fig. 11-2) despite an absence of significant changes in spirometric parameters.<sup>11</sup>

Several additional analyses were performed using a general quality-of-life measure<sup>30</sup> and a general health policy model.<sup>31</sup> Over the course of 18 months, the experimental and control groups showed significant differences on a quality-of-life index (Fig. 11-3). These analyses pooled together the three experimental groups and the two control groups. The differences were used to calculate QALYs and perform cost-effectiveness studies. There is considerable debate about the economic value of behavioral and rehabilitation programs. The cost-effectiveness analyses suggested that behavioral programs designed to increase adherence for patients with COPD produce an equivalent of a well-year for approximately \$23,000. This is comparable to other widely advocated health care programs.<sup>62</sup>

These same patients were studied again 3 years after the beginning of the program. At this time, observed differences between the experimental and control groups remained for the quality of well-being measure,<sup>10</sup> yet substantial increases in variability precluded statistically significant effects. Analysis of the data using concepts derived from social learning theory<sup>12</sup> sug-

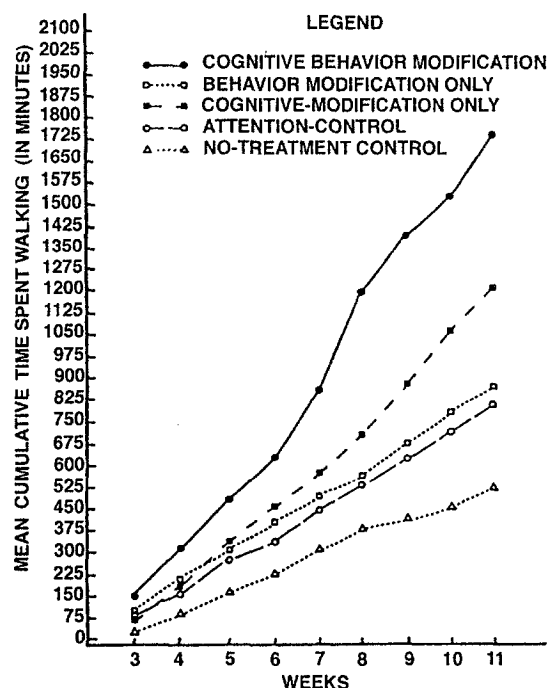


FIGURE 11-1. Cumulative self-reported walking in five groups. The three behavioral modification groups exceeded the two control groups. (From Atkins CJ, Kaplan RM, Timms RM, et al: Behavioral programs for exercise compliance in COPD. *J Consult Clin Psychol* 52:591-603, 1984.)

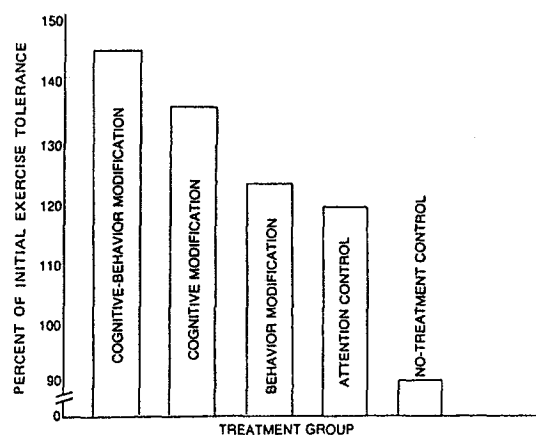
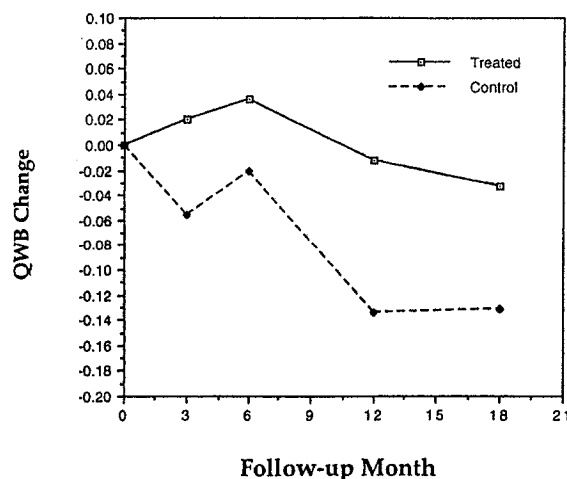


FIGURE 11-2. Percent of initial exercise endurance for five groups at three months. (From Atkins CJ, Kaplan RM, Timms RM, et al: Behavioral programs for exercise compliance in COPD. *J Consult Clin Psychol* 52:591-603, 1984.)



**FIGURE 11-3.** Change in quality of well-being (QWB) for three treatment groups (combined into treated line) and two control groups (combined into control line). (From Toeves CD, Kaplan RM, Atkins CJ: The costs and effects of behavioral programs in chronic obstructive pulmonary disease. *Med Care* 22:1088-1100, 1984.)

gested that perceived self-efficacy mediated changes in behavior and function.<sup>36</sup>

## LONG-TERM REHABILITATION OUTCOMES

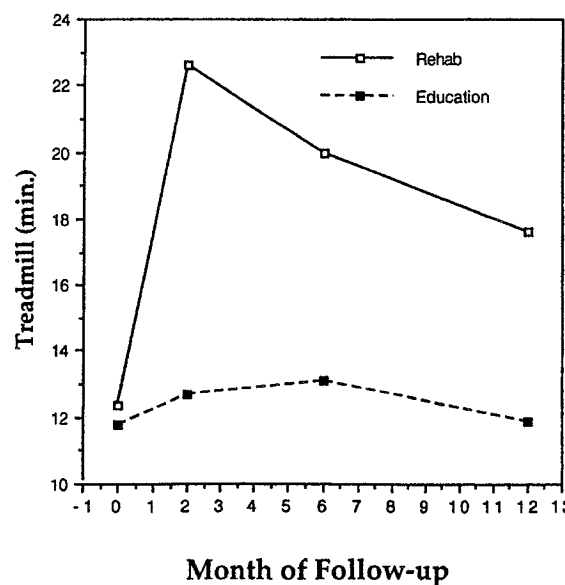
Although comprehensive rehabilitation is believed to improve functional and psychosocial outcomes in COPD patients, studies have not typically monitored patients for longer than 6 months. This has been problematic because the effects of behavioral intervention are often short-lived. A treatment effect that lasts only 1 year, for example, may be of limited value because behavior modification does not cure the condition. Instead, there must be continuing behavior change.

In one of the authors' studies, 119 COPD patients were randomly assigned to either comprehensive pulmonary rehabilitation or to an education control group. Pulmonary rehabilitation consisted of 12 4-hour sessions distributed over an 8-week period. The content of the sessions was education, physical and respiratory care, psychosocial support, and supervised exercise. The education control group attended four 2-hour sessions that were scheduled twice per month but did not include any individual instruction or exercise training. Topics included medical aspects of COPD, pulmonary medicine, pharmacology, nutrition, and respiratory ther-

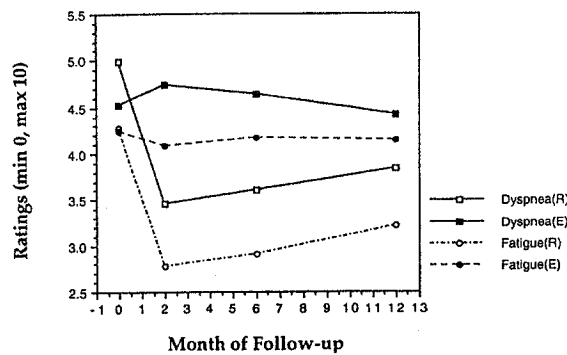
apy including breathing techniques, and there were a variety of interviews about smoking, life events, and social support. Outcome measures included lung function, maximum and endurance exercise tolerance, perceived breathlessness, subjective fatigue, self-efficacy for walking, Centers for Epidemiologic Studies Depression (CES-D), and the QWB.

In comparison to the educational group, the pulmonary rehabilitation group showed greater improvements in maximum level and endurance measures of exercise performance (Fig. 11-4). In addition, the rehabilitation groups showed greater improvements for resolving breathlessness and in self-efficacy (Fig. 11-5). There were no differences between groups for measures of lung function, depression, or general quality of life. Both groups, however, experienced reductions in quality of life. For exercise variables, benefits tended to relapse toward baseline after 18 months of follow-up.<sup>58</sup>

The effects for pulmonary function were not unanticipated. Nearly all previous studies have also failed to show significant changes in lung function.<sup>3,13,21,26,49,51,55,60</sup> Failure to demonstrate benefits of pulmonary rehabilitation on measures of quality of life and depression was somewhat unexpected. Long-term benefits beyond 12 months were observed only for measures of exercise endurance and perceived breathlessness.



**FIGURE 11-4.** Exercise endurance by group during follow-up period.



**FIGURE 11-5.** Perceived dyspnea and perceived fatigue by group (R = rehabilitation, E = education control) during follow-up period.

There are several possible explanations for the failure to demonstrate long-term benefits from comprehensive pulmonary rehabilitation. Behavioral interventions, such as rehabilitation, may be inadequate to produce long-term change. Long-term maintenance of behavioral changes has also been difficult to demonstrate in research on smoking cessation,<sup>25</sup> weight loss,<sup>64</sup> and exercise adherence.<sup>47</sup> The finding that patients experience behavioral changes that are not maintained after treatment has also been seen with a variety of other behavioral interventions.<sup>44</sup> The failure to obtain significant differences on quality-of-life outcomes may be explained by the insensitivities of these measures to small changes in general health status from interventions of this type. The QWB measure, however, has been used in a variety of outcome studies and has correlated significantly with clinical parameters for patients with lung diseases.<sup>23,37,52,53</sup> It is possible that questionnaires that are more specific to COPD may need to be developed.

## FOCUS ON DYSPNEA

Dyspnea is the symptom most commonly associated with disability for patients with COPD. One hypothesis is that treatment that focuses on dyspnea results in improved functional outcomes. In one study, the authors evaluated patients for dyspnea and examined the effectiveness of a treatment program designed to train patients to cope with this one symptom. Eighty-nine patients with COPD were randomly assigned to either 6 weeks of treatment or to a general health education program. The treatment was specifically designed to help patients cope with dyspnea. Patients assigned to the treatment

protocol were given instruction in progressive muscle relaxation, breathing exercises, pacing, self-talk, and panic control.

To evaluate the effectiveness of the treatment, all patients were evaluated by a 6-minute walk test, the QWB, and a series of psychological measures. In addition, they completed six different measures of dyspnea. The measures were administered before the treatment, after the treatment, and 6 months later.

Following the 6-week intervention, there were no differences between the treatment and control groups on any outcome measure. At the 6-month follow-up, there was a significant difference for only one variable: the dyspnea index.<sup>46</sup> The results of this study suggest that management of dyspnea alone is not enough to produce significant outcome changes for patients with COPD. Although the program may have had some small effect on dyspnea, it did not have an effect on exercise tolerance, quality of life, or any measure of anxiety or depression. As a result of this experience, the authors now believe that programs must include other behavioral components. In particular, exercise training is probably one of the most important components of any program.<sup>59</sup>

## ISSUES

Often, behavioral intervention strategies assume that all or most patients respond in the same way. Clearly, that is not the case. In designing behavioral programs, several individual variables must be considered. In the next sections, three issues that may be of importance are reviewed: compliance, depression, and self-efficacy.

### Compliance

The rehabilitation programs prescribed for COPD patients are often difficult to follow. Typically, patients are asked to participate in education, physical and respiratory therapy, and often uncomfortable and anxiety-provoking exercise training. In a controlled study, COPD outpatients participated in 12 exercise training sessions. During these sessions, they walked on a treadmill and performed upper body exercises. The speed of the treadmill was individually determined based on a maximum exercise tolerance test. Patients were individually instructed to translate the treadmill walking into a free walking regimen that included a number of minutes



to be walked and steps per minute. The patients were then asked to walk twice daily at the prescribed pace and duration for the 2 months' duration of the program. In addition, they were asked to keep a daily log of the time and distance they had walked for at least 8 weeks.

Each week the logs were reviewed by program staff. A compliance score of the average minutes per day walked was calculated for each patient by dividing the total number of recorded minutes walked during the 8-week period by the total number of days that the patient could have walked. To determine whether compliance was related to outcome, an exercise endurance walk was performed before the program and after 12 weeks. During this test, the patients were urged to walk on the treadmill as long as possible up to a maximum of 20 minutes at the target work load and an additional 10 minutes at a higher work load.

The results of the study indicated a dose-response relationship between compliance with walking prescriptions and improvements in exercise endurance (Fig. 11-6). Thus, compliance with the exercise program was a significant predictor of improved exercise endurance. A variety of analyses were conducted to determine if other variables explained these improvements. The relationship was not diminished by statistical controls for initial levels of disease severity or any other patient characteristic. Thus, it appears that volitional behavior is an important factor for achieving improvements in exercise endurance for patients undergoing pulmonary rehabilitation. In other words, patients' choices to

comply with daily exercise prescriptions may have a significant effect on health outcome.<sup>47</sup>

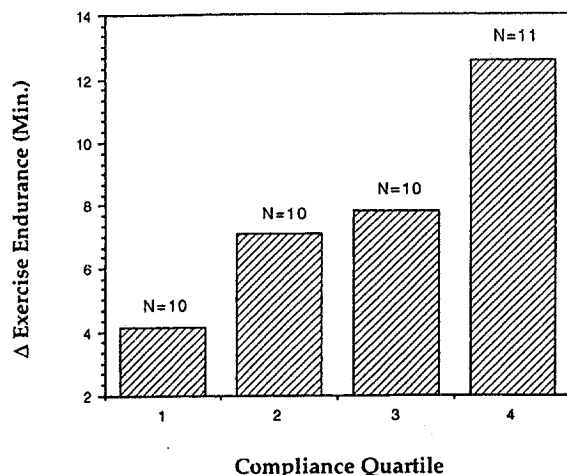
## Depression

A variety of studies demonstrate that patients with chronic illness experience more psychological distress than nondisabled populations. This has clearly been shown in a variety of studies involving patients with COPD.<sup>22</sup> One explanation of the high levels of depression in patients with COPD is that disability prevents patients from obtaining the reinforcers of everyday life. Abramson and colleagues<sup>1</sup> defined hopeless depression as an individual expectation that highly desired outcomes will not occur or highly aversive outcomes will. This definition emphasizes that depression results when people have no control over important events. If this theory is correct, behavioral interventions that give patients more control and improve their activities of daily living might result in reduced depression.

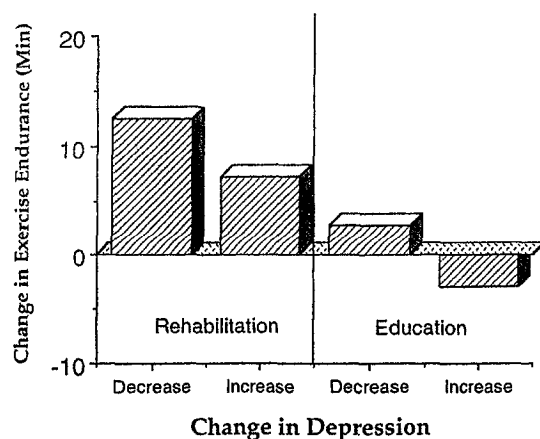
This hypothesis was evaluated in the authors' experimental trial of rehabilitation. Depression was measured using the CES-D Scale. This is a 20-item scale that assesses dimensions of depressed mood, feelings of guilt and worthlessness, appetite loss, sleep disturbance, and energy level.<sup>66</sup>

Although patients randomly assigned to rehabilitation improved on functional outcomes, they did not demonstrate lower levels of depression. Differences between the education and rehabilitation groups were not significant. Within each treatment group, however, other comparisons were made. The patients were subdivided into two groups: One included those who had increased depression (50 patients), and the other included those whose depression had decreased between the baseline and the posttreatment follow-up (52 patients). The data were reanalyzed as a function of treatment circumstances with depression (increased versus decreased) serving as a categorical independent variable. In the rehabilitation group, the patients who had decreases in depression levels showed a significant increase in exercise endurance performance. For those in the education group, increasing or decreasing depression was unrelated to improved exercise endurance (Fig. 11-7).

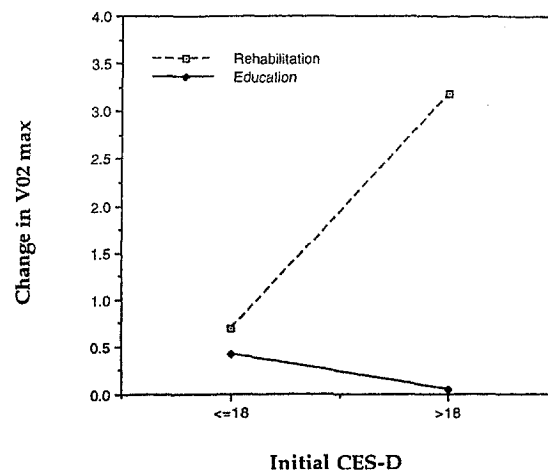
Another series of analyses separated the patients who were depressed at baseline ( $N = 25$ ) from those who were not ( $N = 74$ ). The frequency of depression at baseline was approximately equal in the rehabilitation and the education-only groups. Depression was defined as a



**FIGURE 11-6.** Change in exercise endurance by quartile of compliance. (From J Cardiopulmon Rehabil 12:108, 1992.)



**FIGURE 11-7.** Changes in exercise endurance among rehabilitation and education patients who increased or decreased in depression. (From Toshima MT, Blumberg E, Ries AL, Kaplan RM: Does rehabilitation reduce depression in patients with chronic obstructive pulmonary disease? *J Cardiopulmon Rehabil* 12: 261-269, 1992.)



**FIGURE 11-8.** Changes in  $\dot{V}O_2$  max as a function of initial depression for rehabilitation and education patients. (From Toshima MT, Blumberg E, Ries AL, Kaplan RM: Does rehabilitation reduce depression in patients with chronic obstructive pulmonary disease? *J Cardiopulmon Rehabil* 12:261-269, 1992.)

CES-D score greater than or equal to 18. Eight patients had to be eliminated from the analysis because of missing data. The analyses demonstrated that, for some variables, there was a differential response to treatment as a function of baseline depression. This was most apparent for changes in exercise tolerance ( $\dot{V}O_2$  max) for which there were no differences between the education-only and rehabilitation programs for those who initially had low depression scores. For patients who were initially depressed and assigned to the rehabilitation program, however, there were significant improvements in exercise tolerance. In other words, the rehabilitation program was particularly useful for patients who were initially depressed (Fig. 11-8). This finding is particularly interesting because several authors have suggested that depressed patients be screened out of rehabilitation programs. These data suggest that depressed patients may, indeed, gain even more from the rehabilitation interventions.

Depression is likely to be a comorbidity for patients with any chronic illness. Although it is difficult to make comparisons across studies, it appears that about 40% of patients with COPD experience depression. In the authors' work, 29% of patients had clinically significant levels of depression at their initial assessment as determined by CES-D scores greater than 18. The measurement of depression for patients with COPD is difficult because most assessments are based on the general population. For example,

items on the CES-D and other depression measures assess decreased sleep, poor appetite, decreased energy, and so on. These are often symptomatic experiences of lung disease. It is not uncommon for patients with COPD to have trouble sleeping or decreased energy because of dyspnea. Further, many patients with COPD report decreased appetite because of the discomfort associated with a full stomach pressing on the diaphragm. Therefore, scores on depression measures may not accurately reflect the level of clinical depression in patients suffering from chronic diseases such as COPD. Currently, no data are available concerning disease-appropriate depression associated variables, so it is impossible to determine how many patients who report depressionlike symptoms actually have the affective disorder. Considerably more work on the importance of depression and the role of behavioral intervention is needed.<sup>63</sup>

## SUMMARY AND CONCLUSION

Traditional models of medical care are challenged by the growing number of older adults with chronic illnesses. COPD, similar to other chronic illnesses, has no cure and typically results in progressive loss of physiologic function over the course of time. Cognitive-behavioral interventions may help patients adapt to loss of function and, when successfully used in a comprehensive rehabilitation program that includes training in energy conservation and the use of

assistive devices, may even help to increase function. As a result, behavioral interventions can improve quality of life for patients with chronic pulmonary disease.

Relatively few controlled studies have evaluated behavioral and rehabilitation interventions. The authors' studies suggest that comprehensive pulmonary rehabilitation can enhance exercise endurance and improve self-efficacy. Programs that focus only on the symptom of dyspnea and that do not include exercise training do not result in significant functional gains. Likewise, compliance with the exercise regimen correlates with better outcomes. Further, patients who are initially depressed have been shown to experience significant gains in rehabilitation programs. Thus, outcomes research tends to support the use of more comprehensive programs. To date, however, few systematic outcome studies have appeared. The authors encourage additional systematic outcome studies to evaluate behavioral interventions in comprehensive rehabilitation programs.

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