CASE REPORT

Improving Dyspnea Management in Three Adults With Chronic Obstructive Pulmonary Disease

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This case report describes occupational therapy intervention for three adult outpatients with chronic obstructive pulmonary disease (COPD) at one large urban hospital. The occupational therapy intervention was based on the *Management of Dyspnea Guidelines for Practice* (Migliore, in press). The learning and practice of controlled breathing were promoted in the context of physical activity exertion in a domiciliary environment. In addition to promoting dyspnea management, the controlled-breathing strategies aimed to facilitate energy conservation and to increase perceived breathing control. Although no causality can be determined in a case study design, the patients' dyspnea with activity exertion decreased and their functional status and quality of life increased following goal-directed, individualized occupational therapy intervention combined with exercise training.

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Almost 16 million Americans are estimated to have COPD and it is the fourth leading cause of death in America (American Lung Association, 2000). COPD includes chronic bronchitis, peripheral airways disease, and emphysema. The primary cause of both emphysema and chronic bronchitis is smoking, accounting for 82% of deaths from COPD (American Lung Association, 2000). Dyspnea, the perception and experience of labored and uncomfortable breathing, is the main reason patients seek medical services and are referred to pulmonary rehabilitation (American Thoracic Society [ATS], 1999; O'Donnell, McGuire, Samis, & Webb, 1995).

The role of the occupational therapist in a pulmonary rehabilitation program is to assess and treat activity limitations associated with symptoms of COPD including dyspnea in order to maximize patients' ability to participate in activities of daily living (ADL), leisure, and vocational pursuits. The Management of Dyspnea Guidelines for Practice were recently developed by this author to be used by occupational therapists in the pulmonary rehabilitation of patients with COPD (Migliore, 2003). These practice guidelines promote learning and mastery of controlled breathing during and immediately after activity exertion for adults with COPD. The guidelines emphasize desensitizing patients to dyspnea with activity exertion and decreasing the work of breathing, in order to increase physical activity levels and dyspnea tolerance. The guidelines also address managing fatigue and increasing perceived control of dyspnea. Learning theory and desensitization theory underlie the guidelines. The effectiveness of the Management of Dyspnea Guidelines for Practice has not been investigated, so this case report is designed to document change in performance as a next step toward a future controlled study.

This case report describes the outcomes of an outpatient occupational therapy intervention, based on the Management of Dyspnea Guidelines, for three patients with COPD at a multidisciplinary cardiac and pulmonary rehabilitation center of a large urban hospital. Occupational therapy intervention was provided individually, and whenever possible, to patients in pairs. Occupational therapy in pairs was preferred to afford patients with vicarious experiences to optimize learning and positive behavior change, especially with respect to transfer of dyspnea management strategies to daily activity performance and reduction in physical activity avoidance. Occupational therapy took place in an apartment housed within the medical center. An adjacent outdoor garden and greenhouse could be accessed via the rear door of the apartment. This domiciliary environment allowed patients to physically practice controlled-breathing techniques combined with goal-directed, purposeful therapeutic everyday activities.

The future advancement of occupational therapy depends on clinicians both contributing to published evidence of the effectiveness of their interventions and implementing evidence-based practice. By documenting the value and unique contribution of occupational therapy in pulmonary rehabilitation, this article supports identification and application of clinical evidence to this area of practice.

Problems Characteristic of Chronic Obstructive Pulmonary Disease

An uncontrolled, inefficient breathing pattern can contribute to dyspnea in adults with COPD. Uncontrolled breathing consists of the following characteristics: a rapid, shallow-breathing pattern (with excessive movement of the upper thorax, shoulder girdle, and neck with limited diaphragm contraction of the diaphragm), gulping for air during inspiration, breath holding, maintaining the chest in an expanded position, displacing the abdomen inward while the upper chest moves outward during inspiration (abdominal paradox), forceful expiration, and uneven, erratic breaths. Uncontrolled breathing may contribute to dyspnea because it is inefficient in ventilating the lungs and increases the effort required for breathing. It may further impair the distribution and exchange of oxygen and carbon dioxide in the lungs. Rapid, forceful breathing is related to excessive air trapping in the lungs, with inspiration becoming increasingly difficult because there is little or no room in the lungs for more air. Individuals with COPD tend to rely on accessory muscles of breathing while keeping the diaphragm low and flat.

A vicious circle typically occurs in which individuals avoid physical activity because of dyspnea intolerance and dyspnea-related anxiety (Sassi-Dambron, Eakin, Ries, & Kaplan, 1995). Patients may experience fear and sometimes panic associated with dyspnea because of concerns of suffocation and death. Increased inactivity associated with dyspnea in turn can result in increased dyspnea and fatigue caused by physical deconditioning. Patients also commonly experience decreased mastery, that is, decreased perceived control of their COPD symptoms (Guyatt, Berman, Townsend, Pugsley, & Chambers, 1987; Moody, McCormick, & Williams, 1990).

A Summary of the Management of Dyspnea Guidelines for Practice

The practice guidelines are intended to promote diaphragmatic breathing, thereby relieving dyspnea and facilitating efficient breathing. Diaphragmatic breathing is deep breathing involving movements of the diaphragm, lower chest, and abdomen. Increased movement of the diaphragm during breathing facilitates more effective exchange of oxygen and carbon dioxide of the lung alveoli, and decreases the level and duration of dyspnea during and following activity exertion. Diaphragmatic breathing is facilitated by compensatory positions and pursed-lips breathing to achieve dyspnea relief (Faling, 1993).

Compensatory positions promote spontaneous diaphragmatic breathing, that is, diaphragmatic breathing without significant conscious effort. Compensatory positions compress and push the diaphragm upward and outward, placing the diaphragm in a mechanically advantageous position for efficient breathing (ATS, 1999). These positions help to spontaneously contract the abdominal muscles and relieve dyspnea. The three compensatory positions include (1) supine lying, (2) a forward-leaning sitting position with the arms stabilized either on one's lap or on a table, and (3) standing while leaning sideways and slightly forward into a wall with arms supported and one foot in front of the other. Forward-leaning postures (as opposed to upright sitting and standing) also decrease reliance on accessory muscles of breathing (ATS). Limiting accessory movements of the upper ribcage and shoulder girdles can reduce dyspnea (Breslin, Garoutte, Kohlman-Carrieri, & Celli, 1990).

Combining diaphragmatic breathing with pursed-lips breathing may further enhance dyspnea relief. Pursed-lips breathing is a breathing pattern of expiring through the center of loose lips (that are almost closed) and inspiring through the nose. Potential benefits of pursed-lips breathing include helping to efficiently expel air, decreasing respiratory rate, and pacing breathing (Faling, 1993). Reducing the respiratory rate facilitates the lengthening of expiration to two or three times that of inspiration and hence dyspnea relief.

The practice guidelines promote gentle, active expiration in order to help to control and limit over-inflation of the lungs and obstruction with expiration. Active expiration may improve the efficiency of breathing and exchange of gases in the lungs (Hahn, 1987).

Coordinating breathing cycles of inspiration and expiration during particular parts of ADL are emphasized in the guidelines as a method to conserve energy and relieve dyspnea (Breslin, 1992; Rashbaum & Whyte, 1996). That is, inspiration is performed with moving the body against gravity, and with pulling movements and elevation of the arms. Expiration is coordinated with the strenuous parts of an activity, with moving the body toward gravity, and with pushing movements and lowering of the arms.

The guidelines include use of biofeedback to facilitate learning of controlled breathing. Biofeedback is defined as a process by which an individual can readily observe and monitor autonomic physiological processes, such as respiration and arterial oxygen saturation, in order to promote a target response including a slower, deeper breathing pattern. With auditory biofeedback individuals are taught to breathe according to the sequence and speed of simulated breath sounds. Visual biofeedback such as the display of an oximeter, a photoelectric monitoring device that attaches to a finger and measures the arterial oxygen saturation of an individual, is used to positively reinforce controlled breathing (Tiep, Burns, Kao, Madison, & Herrera, 1986).

Occupational Therapy Evaluation

This author, an occupational therapist, administered standardized outcome evaluations including the Chronic Respiratory Disease Questionnaire (CRQ; Guyatt et al., 1987) and the Pulmonary Functional Status and Dyspnea Questionnaire-Modified (PFSDQ-M; Lareau, Meek, & Roos, 1998; see Table 1) to three patients with COPD described in the case studies. The CRQ and PFSDQ-M were readministered over the telephone by this author.

The CRQ was developed for use as a health-related quality-of-life clinical outcome measure (Guyatt et al., 1987). The 20-item questionnaire incorporates patients' individualized goals for therapy by having them identify and rank five frequently performed activities that are most important to them and that cause them to experience dyspnea. The questionnaire, administered in an interview, is organized as four conceptually identified subscales: dyspnea, fatigue, emotional function, and mastery over the disease. It takes approximately 30 minutes to administer initially and up to 15 minutes for subsequent administrations. The test–retest reliability coefficients of the CRQ, administered twice on two consecutive days, to 40 patients with COPD ranged between .73 and .93 (Wijkstra et al., 1994). The CRQ has evidence of concurrent validity when compared against such measures as the transitional dyspnea index (between .34 and .59), oxygen cost diagram (between .25 and .30), and the global rating of dyspnea (between .46 and .61) (Guyatt, King, Feeny, Stubbing, & Goldstein, 1999).

The 30-item PFSDQ-M questionnaire consists of three subscales obtained empirically: change in activity (CA), dyspnea with activities (DA), and fatigue with activities (FA); in addition to 10 dyspnea and fatigue general survey questions (Lareau et al., 1998). For these three subscales, an 11-point scale is used that ranges from zero (indicating normality) to 10 (indicating a severe impairment or omission of an activity). It takes approximately 7 minutes to self-administer. Both reliability and validity of the PFSDQ-M were investigated with a sample of 50 male participants with COPD (Lareau et al., 1998). The PFSDQ-M has evidence for internal consistency (Cronbach's alphas between .93 and .95) and test–retest reliability (coefficients between .70 and .83 with a 2-week interval). The questionnaire demonstrates some evidence for criterion-related validity as scores of two items of the dyspnea with activities subscale and a general dyspnea survey question were found to be valid predictors of the rate of loss of pulmonary function.

Case Study: Mary

Mary is a 68-year-old White woman who was diagnosed with COPD and emphysema 6 years ago. Prior to intervention, she had a forced expiratory volume in one second (FEV1) of .77 liters as compared to a normal FEV1 score of between three to four liters. Her stage of COPD is severe. Her weight is normal with a body mass index (BMI) of 20.80 kg/m^2 (Schols, Slangen, Volovics, & Wouters, 1998). Prior to her quitting smoking 6 years ago, she had smoked a maximum of half a pack of cigarettes per day for 44 years. Mary is married and lives with her husband in a three-level house. She has four children; two of which live nearby. She has been retired for 4 years from her work as a secretary in a public school. Her interests include participating in church and family activities, socializing with friends, and traveling. Mary's mental status is normal as assessed by the Mini-Mental State Examination (MMSE).

Mary experiences dyspnea with the following activity exertion: overhead activities (such as hanging clothes and reorganizing her closets), bending activities, carrying groceries, walking outdoors, doing housework, shopping, walking upstairs, and preparing meals. Her tolerance for walking outdoors is severely limited by dyspnea. The evaluation findings indicate that Mary's function is limited the

Table 1. Health-Related Quality of Life (CRQ) and Functional Status Outcome Measures

	Score Changes Mary			Score Changes Tom			Score Changes Carl		
Evaluation	Pre-OT	Post-OT	5-wk F/u	Pre-OT	Post-OT	6-wk F/u	Pre-OT	Post-OT	5-wk F/u
Chronic Respiratory Disease Questionnaire (CRQ) 1 = worst score; 7 = best score									
Dyspnea	2.6	4.2	4.4	4.2	5.4	5.6	4.6	5.0	5.6
Fatigue	3.3	4.0	4.3	5.5	6.0	5.8	2.8	4.0	4.3
Emotional Function	4.0	4.9	5.6	5.4	4.9	4.7	3.9	4.9	5.7
Mastery	3.5	4.8	5.3	4.3	5.0	5.5	4.0	5.0	5.8
Total	13.4	17.8	19.5	19.4	21.3	21.6	15.2	18.9	21.3
Pulmonary Functional Status & Dyspnea Questionnaire-Modified (PFSDQ-M) 0 = normal; 10 = severe impairment									
Changes in Activity	6.9	5.4	5.4	3.57	1.67	3.78	3.1	0	.6
Dyspnea With Activities	6.8	4.7	4.6	3.5	1.2	2.5	3.5	1	1
Fatigue With Activities	6.6	4.7	4.5	2.3	.8	2.4	3.1	.7	.8
Total	20.3	14.8	14.5	9.37	3.67	8.68	9.7	1.7	2.4

Note. F/u = Follow-up; OT = occupational therapy; wk = week.

most by dyspnea and to a lesser degree by increased fatigue and decreased sense of mastery. Her exertion during physical daily activities is limited to three metabolic equivalent levels (METs) at baseline. Mary uses two liters per minute of supplemental oxygen at home with nasal cannula for activity exertion. She also uses portable supplemental liquid oxygen for performing community ADL. On admission, Mary is tearful and expresses strong feelings of frustration caused by the disabling effects of her lung disease.

Mary is unfamiliar with the breathing techniques encompassed by controlled breathing. She demonstrates a shallow, rapid breathing pattern. She is not able to correctly coordinate displacement of the abdomen with breath cycles.

With activity exertion, Mary tends to over-rely on her accessory muscles of breathing as noted by excessive rising of the upper rib cage and protruding neck muscles during inspiration. She tends to rush and move quickly when performing physical activities, further increasing her dyspnea on exertion. She is unfamiliar with using coordinated breath cycles.

Mary acknowledges her high dyspnea-related anxiety. She reports anxiously reaching for supplemental oxygen with any slight sensation of dyspnea at home with activity exertion. Because of her dyspnea-related anxiety, she avoids exertion during activities requiring reaching above shoulder level, housework activities, and walking outdoors.

Her intervention goals therefore are to (1) report decreased dyspnea with activity exertion including self-care, (2) demonstrate ability to respond appropriately to dyspnea (rather than excessively depending on supplemental oxygen for dyspnea relief), (3) report increased activity tolerance, independence, and confidence in home management activities involving bending, carrying, and reaching overhead (for example, bedmaking, hanging several items of clothing at one time, and meal clean-up), (4) report increased walking endurance indoors at home, (5) report resumption of outdoor walking for short distances, and (6) document increased health-related quality of life.

Case Study: Tom

Tom is a 71-year-old White man who was diagnosed with chronic bronchitis 3 years before his rehabilitation admission. Tom had smoked for 56 years, smoking up to two packs of cigarettes a day before quitting 4 months prior to his admission. He lives with his wife and has three grown daughters, two of whom live nearby. He is a retired psychologist and continues to manage several residential properties. His interests include gardening, home maintenance and repair work, and carpentry. He has a medical history of two myocardial infarctions and coronary artery disease.

Tom identifies several activities that he performs frequently and that are important to his daily life that cause him to experience dyspnea: getting dressed, walking uphill, home maintenance and repair work (including overhead and squatting activities), carpentry work in his home workshop, talking, and shopping. He is unable to climb more than a few stairs, limited by dyspnea.

His CRQ and PFSDQ-M scores on admission reveal that moderate dyspnea and decreased sense of mastery, in particular, significantly limit his health-related quality of life and functional status (see Table 1). Tom reports a moderate reduction in his involvement in physical activities compared to before he developed breathing problems. He demonstrates normal cognitive function on the MMSE.

Tom's breathing pattern tends to be uncontrolled as evidenced by the following behaviors: (1) excessive movement of his shoulders and upper chest with inspiration (due to overuse of his scalenes and inspiratory accessory muscles), (2) poor coordination and decreased movement of the diaphragm and abdominal wall, (3) overly forceful expiration, and (4) poor technique of pursed-lips breathing.

With activity exertion, Tom occasionally gulps for air on inspiration. His breathing pattern becomes more uncontrolled with increased activity exertion. For example, his respiratory rate becomes very rapid and uncontrolled when climbing stairs, which he approaches at a fast pace. Tom reports that he avoids stair climbing, heavier carpentry tasks, overhead work, and squatting and kneeling postures to avoid dyspnea sensation.

Tom's intervention goals are "to be as functional as possible with my limitations." More specifically, his goals are to (1) report decreased dyspnea with activities including talking and getting dressed and undressed, (2) demonstrate the ability to resume climbing two consecutive flights of stairs, (3) report resumption of carpentry projects that he had commenced and subsequently avoided, (4) report regaining a more active role in home repairs and gardening activities involving walking while maintaining control of his breathing, and (5) report improved health-related quality of life.

Case Study: Carl

Carl is a 78-year-old White man who was diagnosed 3 years ago with severe COPD, with an unknown etiology. He reports having never smoked. He is married and has one adult daughter who lives nearby. He is a retired financial vice president. His interests include playing golf and exercising. He has a forced expiratory volume in one second (FEV1) of 1.52 liters. He is overweight with a BMI of 29.3 kg/m^2. A screening of depression using the Center for Epidemiologic Studies Depression Scale shows that Carl has symptoms of depression.

Carl's initial evaluation using the CRQ shows that fatigue is the symptom that most limits his health-related quality of life. His functional status is limited by fatigue and to a slightly greater extent dyspnea (see Table 1). His cognitive function is assessed to be normal.

During inspiration, Carl tends to hyperextend his neck and to breathe forcefully. Little movement of his diaphragm and abdominal muscles are noted with breathing, particularly in sitting and standing positions. Abdominal breathing training is difficult for Carl. In addition, he requires repeated verbal cueing to correctly use compensatory positions promoting diaphragmatic and abdominal movements.

Carl has a tendency to gulp for air and to breathe very rapidly with activity exertion. He also tends to use a valsalva maneuver when transferring between sitting and standing. He reports avoiding the following activities due to dyspnea-related anxiety: walking, stair climbing, and bending or squatting activities. Carl's intervention goals are to: (1) report comfortably resuming ADL that he has been avoiding, (2) report decreased dyspnea with activity exertion to a level that does not interfere with his participation in the following prioritized activities: shopping, carrying heavy items, raising arms overhead, bending, and walking outside and uphill respectively, and (3) report improved health-related quality of life.

Occupational Therapy Intervention

A total of five or six weekly 1-hour occupational therapy sessions were implemented based on the Management of Dyspnea Guidelines for Practice. Occupational therapy focused on teaching patients how to reduce and manage their dyspnea with activity exertion. The therapy was individualized based on patients' abilities, goals, interests, and baseline scores. Individualized feedback and instructions were given to patients with an emphasis on addressing breathing patterns characteristic of uncontrolled breathing.

Patients first practiced breathing techniques at rest before combining them with activity exertion. Controlled breathing was practiced in the following respective positions: supine, sitting leaning forward with arms stabilized, followed by standing leaning forward into a wall with arms supported to facilitate spontaneous, coordinated movement of the diaphragm. Breathing techniques were practiced that aimed to reduce the effort of breathing, promote smooth, rhythmic breathing, and increase patients' sense of breathing control. The importance of expiration and beginning a breathing cycle with expiration were consistently emphasized and practiced in order to address air trapping.

Visual biofeedback, using the display of a pulse oximeter, was used to teach controlled breathing. By observing the display of oxygen saturation, patients adjusted the pace and force of their breathing. The visual biofeedback positively reinforced the benefit of controlled breathing using a forward leaning posture.

Auditory biofeedback was also provided, using tapes of simulated, paced breath sounds, to teach paced breathing. A portable cassette tape player and tape of paced sounds were given to patients to use at home both at rest and with activity exertion; the cassette tape player was clipped to patients' waists. Two breath cycle lengths were used: 4 seconds for expiration, 2 seconds for inspiration; alternatively 6 seconds for expiration, 3 seconds for inspiration.

Specific information and instruction about controlled-breathing techniques were provided using handouts, educational videos, demonstration, and practice opportunities. Information was repeated to aid memory storage and recall. To reduce forceful breathing with exertion, patients were initially instructed to expire into a tissue at arm's length away, allowing it to only lightly ripple. To facilitate understanding of abdominal breathing, patients were instructed to imagine their lungs are like a balloon; the abdomen expands with inspiration (like a balloon inflating with air) and the abdomen contracts with expiration (like a balloon deflating of air). Tactile feedback (placement of hands over abdomen and upper chest) and proprioceptive feedback (sniffing and breathing practice in different postures) were also provided. For those patients having difficulty, sniffing initially helped them outwardly displace the abdomen during inspiration.

The patients were encouraged to practice controlled breathing for a minimum of 5 to 10 minutes in compensatory positions daily as part of a home program. At each intervention session, progress with implementing their home program was positively reinforced.

The patients were provided with opportunities to practice controlled breathing combined with appropriately physically challenging purposeful activity as measured by level of perceived exertion and perceived dyspnea scales (Borg, 1982, as cited and adapted in Scanlan, Kishbaugh, & Horne, 1993). They performed activity exertion mostly requiring between light and moderate effort and experienced between slight and moderate (to strong) dyspnea with activities. Such activities included, for example, bedmaking, gardening, sweeping outdoors, using a hand vacuum, lifting and carrying household loads of less than 10 pounds, walking outdoors, getting dressed, wiping clean high and low shelves, woodworking, and stair climbing. Patients practiced performing these activities more slowly than they were performed previous to intervention. They were also instructed to avoid moderate to maximum forward bending of the trunk, which restricts diaphragmatic movements causing dyspnea (Janson-Bjerklie, Carrieri, & Hudes, 1986). A diagram of the vicious circle of dyspnea was shown and discussed to positively reinforce an active lifestyle for dyspnea management (Sassi-Dambron et al., 1995).

The patients practiced coordinating breathing cycles of inspiration and expiration during particular parts of ADL. For example, with stair climbing, they practiced climbing steps on expiration and stopping to rest on inspiration.

Intervention emphasized desensitizing the patients to dyspnea in order to decrease their avoidance of realistic physical activities. Patients were repeatedly exposed to dyspnea during activity exertion using a nonthreatening therapeutic environment and positive reinforcement. The therapeutic environment included close supervision and monitoring of vital signs and oxygen saturation levels before, during, and after each therapeutic activity. The patients were afforded opportunities to observe each other engaging fearlessly in activity exertion while practicing controlled breathing (Carrieri-Kohlman, Douglas, Gormley, & Stulbarg, 1993; Gift, 1993). Patients' misconceptions of dyspnea were addressed with reassurance that dyspnea was not necessarily a danger sign (Smoller, Pollack, Otto, Rosenbaum, & Kradin, 1996).

Patients were prompted to stop exertion when arterial oxygen saturation fell below 90%. They used a dust mask during activities in which they were exposed to dust particles, such as woodwork, to limit lung irritation. They were given dust masks for use at home.

In addition to occupational therapy as described above, patients also received a total of 15 physical therapy exercise training sessions. Patients exercised on exercise equipment, especially the treadmill, and received upper-body training. Chest physical therapy, which included such techniques as controlled cough, postural drainage, and percussion, was given as needed to clear airways of mucus. Physical therapists sometimes encouraged patients to use breathing techniques during exercise, although no formal, structured program of controlled-breathing training was implemented in physical therapy.

Intervention Outcomes

Patients' health-related quality of life and functional status as measured by the CRQ and PFSDQ-M improved following five or six occupational therapy sessions combined with exercise training (see Table 1). Although both Mary and Carl had previously completed pulmonary rehabilitation programs (2 years ago and 3 months ago, respectively), on admission all three patients were unfamiliar with controlled-breathing strategies emphasized in occupational therapy activity training. By discharge, the three patients demonstrated the ability to use controlled breathing effectively with activity exertion.

Intervention Outcomes: Mary

Mary expresses that she experiences less frustration associated with her limited energy reserves and ventilatory capacity. She reports using controlled breathing during and following activity exertion at home. Mary experiences less panic associated with dyspnea on exertion. She practices controlled breathing at home using the tape of simulated paced breath sounds. She has resumed walking outdoors while pushing a manual wheelchair. Mary initiates using a compensatory, forward leaning position to rest during and to recover from activity exertion. She demonstrates the ability to perform physical activities more slowly. Mary is able to recover very quickly following activity exertion using controlled breathing. Breathing room air during paced activity exertion of up to five METs, Mary's arterial oxygen saturation levels range between 89 and 98%.

Intervention Outcomes: Tom

Tom reports increased activity levels and less dyspnea on exertion. He has resumed climbing two flights of stairs using a coordinated breathing pattern and a slower pace. He continues to use auditory biofeedback with his morning exercise routine on the treadmill. For the most part he is able to sustain pursed-lips breathing with activity exertion; rarely, he gulps for air during an inspiration when his attention is completely diverted away from controlled breathing and is focused on performing a meaningful physical activity. Tom's report of temporary abdominal muscle soreness provides evidence of increased use of these muscles.

Intervention Outcomes: Carl

At discharge, Carl's involvement in physical activities has increased to premorbid levels associated with significantly less dyspnea and fatigue with activity exertion. He demonstrates increased breathing depth. At home he uses a forward-leaning sitting posture both at rest and to recover from activity exertion. He has established a routine of daily breathing practice. He practices controlled breathing every day in a semireclined position to accommodate his orthopnea.

Carl has weaned off auditory biofeedback. During therapy, Carl was able to synchronize his breathing to the slower (6:3) simulated breath sounds at rest. With exertion, he had some difficulty synchronizing his breathing to the 4:2 paced sounds. For activity exertion, a 1 second pause after each simulated breath cycle may have been helpful to try (i.e., expiration 4, pause 1; inspiration 2, pause 1).

Conclusions

All three outpatients documented improvements in performance after occupational therapy intervention, combined with exercise training, as evidenced by their outcome scores and self-report of satisfaction and improvement. The occupational therapy provided was individualized, purposeful, and goal-directed. The structured program aimed to facilitate patients' learning and mastery of controlled-breathing strategies. Dyspnea management strategies emphasized in occupational therapy were practiced in the context of physical activity performance within a safe, domiciliary environment. The patients' motivation appeared to play an important role in the effectiveness of the occupational therapy interventions described.

At discharge, patients' functional status scores improved, as did their quality-of-life scores. The increases in patients' quality-of-life subscale scores (those ranging from .5 to 1.6) represent on average small to large clinically important changes (Redelmeier, Guyatt, & Goldstein, 1996). Although there was a small decrease in Tom's CRQ emotional subscale score at discharge, his other CRQ subscale and total quality-of-life scores all improved; this decrease was also inconsistent with his verbal reports. At follow-up evaluations, many gains were maintained but not all. Some of the patients' follow-up quality-of-life scores improved potentially facilitated by their home programs of controlled breathing.

Reliable and valid evaluation of dyspnea is essential for rigorous pulmonary rehabilitation outcome research and to contribute to evidence supporting occupational therapy. Further development of dyspnea scales that capture the behavioral, affective, cognitive, and sensory dimensions of dyspnea would enhance future outcome research and the evidence resulting from this research.

The current health care environment requires that occupational therapists integrate available evidence into their clinical decision making. This case report can be used by occupational therapists to guide their practice with rehabilitating adults with COPD. Randomized controlled trials are needed to further test the effectiveness of dyspnea management strategies in occupational therapy as a component of an interdisciplinary pulmonary rehabilitation program for outpatients with COPD.▲

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