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Multidisciplinary Care of the Patient with Chronic Obstructive Pulmonary Disease

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The National Emphysema Treatment Trial used a multidisciplinary team approach to implement the maximum medical care protocol, including adjustment of medications and outpatient pulmonary rehabilitation for all patients and nutritional and psychological counseling as needed. This article discusses the benefits of such an approach in the care of the patient with chronic obstructive pulmonary disease. Team member roles complement each other and contribute to the goal of providing the highest-quality medical care. The primary focus of the team is to reinforce the medical plan and to provide patient education and support. This article reviews the elements of the initial patient assessment and the functional and nutritional assessment. Patient education focuses on medication use, recognition and management of chronic obstructive pulmonary disease exacerbation symptoms, smoking cessation, advance directives, and travel.

Keywords: multidisciplinary team; nutritional assessment; patient education; advance directives; travel with oxygen

The National Emphysema Treatment Trial (NETT) used a multidisciplinary team approach to implement the maximum medical care protocol, including adjustment of medications and outpatient pulmonary rehabilitation for all patients, and nutritional and psychological counseling as needed. Team members included nurses, exercise specialists, social workers, dietitians, and physicians. Team member roles complemented each other and contributed to the goal of providing the highest quality medical care. The primary focus of the team was to reinforce the medical care plan and to provide patient education and support. Providing care to a group of patients with a progressive, complex disease such as chronic obstructive pulmonary disease (COPD) using a multidisciplinary approach was found to be beneficial, as evidenced by the adoption of the multidisciplinary model by many of the NETT centers' COPD and lung volume reduction clinics after the completion of the NETT. Recently, the Joint Commission on Accreditation of Healthcare Organization announced that it would begin certifying COPD programs as disease-specific centers of excellence. A similar certification process is in place for lung volume reduction. The maximal medical therapy model used in the NETT addresses all the components of a disease-specific program as outlined by the

Joint Commission on Accreditation of Healthcare Organization for certification.

A review of current treatment practices revealed a paucity of published reports assessing the needs of the patient with COPD and the implementation of guidelines for COPD treatment. A survey by the COPD Resource Network–National Emphysema COPD Assessment reported that 62% of patients are under the care of their primary care physicians for their COPD management, whereas 30% receive their care from a pulmonologist. In the survey, almost 40% of the patients considered themselves to be less than adequately informed about COPD; the majority of patients reported receiving information about COPD from their physicians (1). After establishing the diagnosis of COPD, the survey found that practitioners underprescribed safe, effective therapies and overused ineffective therapies (1). Mularski and colleagues assessed the quality of care delivered to COPD in the U.S. population and found that only 55% of patients received the recommended care, demonstrating that there is ample opportunity for improvement (2). Bourbeau and colleagues showed that patients with COPD who received educational interventions with supervision and support based in disease-specific self-management principles had improved outcomes and less hospital, emergency room, and urgent physician visits compared with the control (usual care) group (3). This article describes a comprehensive care model that may be adopted for use in the care of the patient with COPD (Table 1).

DEVELOPMENT OF THE PLAN OF CARE

Initial Patient Assessment

The development of a plan of care begins with the initial patient assessment. A complete history and physical examination is obtained from the patient and, if needed, with input from the support person. The respiratory assessment includes an evaluation of vital signs, pulse oximetry, chest auscultation, chest wall movement, presence of peripheral edema, accessory muscle use, presence of cough or sputum, and the ability to speak in full sentences. A history of previous hospitalizations related to a respiratory condition and/or prior intubation gives insight into the severity of the patient's disease and prognosis. Questions about the degree of dyspnea with daily activities help to determine the stability of the patient's condition.

The patient's smoking history is obtained during the initial assessment. The patient should be assessed for evidence of comorbidities associated with COPD, including cardiovascular disease, depression, weight loss, osteoporosis, and muscle wasting and dysfunction (4). Compliance with influenza and pneumococcal vaccinations is assessed. Discussions and printed education material are useful in informing the patient about the value of vaccinations. Female patients should be queried about the date of their last mammogram and Papanicolaou test results, and male patients should be queried about their last prostate-specific antigen results. Education on the importance of these yearly screenings may persuade the breathless patient

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TABLE 1. COMPREHENSIVE PLAN OF CARE FOR THE PATIENT WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE

1. Patient assessment
Respiratory assessment
History of previous hospitalizations
Degree of dyspnea
Smoking history
Patient's coping skills
Depression/anxiety
Functional abilities
History of pulmonary rehabilitation
Learning needs
Nutritional status
Comorbidities
Influenza and pneumococcal vaccinations
2. Goals and plan of action
Individualized for each patient
Maximal medical therapy
Patient education
Symptoms of chronic obstructive pulmonary disease exacerbation
Medication schedule and use of devices
Smoking cessation education
Lung volume reduction surgery education
Nutritional strategies
3. Evaluation
Plan is continued or revised based on evaluation of outcomes

who avoids these tests to incorporate them into his annual health maintenance routine.

Assessment of the patient's coping skills offers insight into how well the patient is managing living with a chronic illness. Depression is a common comorbidity in patients with COPD (5) and requires treatment if symptoms persist. If depression is suspected, it is mandatory to review the symptoms of depression with the patient and support person, if appropriate. Symptoms include changes in appetite; changes in sleep (sleeplessness or early awakening); feelings of guilt, hopelessness, and despair; fatigue; withdrawal from others; lack of pleasure in once pleasurable activities; and thoughts of death or suicide. If depression is suspected, treatment may be started. The patient should be referred to the team psychologist for formal evaluation.

Anxiety is frequently seen in patients with COPD. Cognitive behavior treatment focusing on developing coping strategies such as relaxation techniques can help the patient deal with the physical symptoms of COPD. Psychopharmacology (6) and pulmonary rehabilitation (7, 8) also seem to be promising treatments (9) for depression and anxiety in COPD.

Functional and Activity of Daily Living Assessment

Evaluation of the patient's functional abilities is key to assessing their current and future capabilities for independent living and performing exercise. Functional assessments performed as part of a comprehensive evaluation include oxygen titration, six-minute-walk test, and the cardiopulmonary exercise test. These tests primarily assess exercise tolerance, dyspnea on exertion, and deconditioning. The functional assessment in conjunction with routine pulmonary function testing is used by the team to determine different treatment options for the patient, including suitability for outpatient pulmonary rehabilitation.

If suitable for pulmonary rehabilitation, the patient's strength, flexibility, gait, posture, and orthopedic and musculoskeletal limitations are assessed. These assessments are used to determine the patient's rehabilitation goals and exercise prescription. An exercise prescription that is tailored to the individual maximizes the potential benefits by eliminating barriers to success.

Energy is limited in the patient with COPD. Simple activities of daily living may deplete the patient's energy store, thus

limiting other activities. Quality of life and psychological well-being are compromised when daily routines leave little room for social activities with friends and family. An assessment of activities of daily living is important for evaluating the amount of effort used by the patient in his/her daily routine and in identifying whether assistive devices, such as a rolling walker or electric scooter for outdoor travel, may decrease energy expenditure, increase exercise capacity, and improve quality of life (10). Shower chairs and handheld showers reduce energy expenditure, and a rolling walker with a basket and a seat offers the oxygen-dependent patient more mobility.

PATIENT EDUCATION

Medication Education

Multiple comorbidities are a common occurrence in COPD, resulting in complex regimens of scheduled and as-needed medications to be administered by multiple routes for respiratory and nonrespiratory conditions (11, 12). Complex medication regimens increase the risk of nonadherence to the medical plan. Adherence is defined as "the extent to which a person's behavior (in terms of taking medications, following diets, or executing lifestyle changes) coincides with medical or health advice" (13). According to Johnson and colleagues (14), adherent patients have a greater understanding of their illness and the options for managing the illness and greater confidence that treatment will keep their illness under control. Adherent patients were also less likely to be confused about their medications, which might have been the result of their greater medication knowledge. Less adherent patients were more likely to deviate from their recommended management scheme, which could have adverse effects on their disease management program.

Several factors predispose patients with COPD to nonadherence. Management of COPD is complex, requiring the patient to make behavioral and lifestyle changes, such as smoking cessation and adherence to exercise therapy and medication regimens (15). Identifying the barriers to adherence, providing written and oral education about medications, and formatting a regimen that is easier for the patient to follow have been reported to be beneficial. "Routinization" (i.e., the ability to fit a medication regimen to one's daily routine) has been recognized as a major determinant of improved adherence (16). Developing a written time schedule for each medication that fits into the patient's lifestyle has been found to be helpful for the patient with a complex regimen. Written schedules are also helpful for the patient who is experiencing an exacerbation and has multiple new medication changes. When introducing a new or changed regimen or new materials to a patient, sufficient time must be dedicated by the treatment team to allow the patient to ask questions and feel satisfied that all relevant questions have been fully answered.

All patients with COPD who are symptomatic should be started on appropriate respiratory medications. The inhaled route is preferable because of ease of use and convenience to the patient. The patient's acceptance of the disease process and recommended treatment, the patient's knowledge about and confidence in the treatment, effective patient-clinician interaction, and routinization of drug therapy are critical for optimal medication adherence. When starting the patient on a new medication, the caregiver should explain that although there is no drug therapy that can alter the decline in lung function over time, improved symptoms, a reduction in exacerbation and hospitalization rates, increased exercise capacity, and an overall improvement in health status can be expected with the therapies that are available. The overall goal is to reduce breathlessness.

When new inhaler medications are prescribed, a team member should demonstrate the inhaler technique, explain what benefits and side effects are expected, provide written material, and observe the patient performing a return demonstration. This process should not be rushed. Common mistakes are the lack of a pause between puffs (inhaler discharges) and improper breath holding. Moreover, there is a range of different metered dose inhalers on the market, all of which have nuances in their mechanical operation. Patients may routinely use several devices that operate differently. To ensure proper operation of the device, the patient should be asked to demonstrate inhaler technique at each office visit.

As the patient's disease progresses and symptoms worsen or during an exacerbation, it may become appropriate to change the patient to a nebulizer. The patient using an inhaled or nebulized corticosteroid should be reminded of the importance of rinsing the mouth after each dose with water or mouthwash and how to recognize and treat the symptoms of oral thrush.

Teaching the Patient the Symptoms of COPD Exacerbation

COPD exacerbations typically involve episodic increases in shortness of breath (dyspnea) and cough and sputum production superimposed on the background of chronic airflow obstruction (17). Acute exacerbations are the most frequent cause of hospital admissions and death among patients with COPD (18). Frequent exacerbations reduce the quality of life in patients with COPD (19). Annually, 726,000 of the 10.7 million individuals in the United States who have COPD are hospitalized with COPD exacerbations (20). In a prospective trial of 101 patients with moderate to severe COPD followed for 2.5 years, Seemungal and coworkers (21) found that half the patients underreported the presence of an exacerbation. Underreporting limited the patients' ability to receive timely and effective preemptive care. On the basis of this research, the goal is to prevent an early-stage exacerbation from progressing to an acute exacerbation that requires intensive care, whether inpatient or at home. Continued and repeated education regarding the symptoms of a COPD exacerbation and the actions to take when an exacerbation has started cannot be overstressed. Education about COPD exacerbations includes the recognition of symptoms such as increased breathlessness from baseline, changes in color of mucus to yellow or green, changes in the amount of mucus, and recognition of when to call the physician. An early phone call to the physician for medication adjustment may prevent hospitalization. The patient treated at home is instructed on medication changes and the expected response and told to go to the hospital for severe symptoms or if symptoms are not relieved by maximal treatment at home. These symptoms include severe shortness of breath (i.e., respiratory distress while talking or inability to walk even a short distance), lightheadedness, dizziness, acute shortness of breath, chest pain, or any new nonpulmonary problem.

Smoking Cessation Education

Only smoking cessation (22) has been shown to change the natural history of COPD. Continued smoking is associated with progressive loss of lung function over 5 years (23). Smoking cessation in patients with mild airflow obstruction is associated with preserved lung function, improved symptoms, and improved mortality (24). Patients who continue to smoke should be asked about smoking habits and prior attempts at quitting and should be further assessed for readiness to quit, motivating factors, and social support (25). Cessation should be advised clearly: "My best advice is that you stop smoking." Health care providers can

acknowledge that this is difficult and can describe specific benefits to smoking cessation. The American Lung Association (ALA) offers several venues (self-help books, support groups, and chat rooms) to help the individual tailor their smoking cessation program to their lifestyle. Varenicline is a new medication that has the potential to aid smoking cessation by relieving nicotine withdrawal symptoms and reducing the rewarding properties of nicotine. It was found to be more effective than bupropion SR at the end of 12 weeks of drug treatment and at 24 weeks (26, 27). Other pharmacotherapies for helping patients stop tobacco use and reduce nicotine dependence (namely, nicotine patch, nicotine gum, nicotine inhaler, nicotine nasal spray, and sustained-release bupropion) are safe and have been determined to be advantageous for a select group of patients. This approach should be considered part of a tobacco treatment intervention program unless it is contraindicated (28).

Lung Volume Reduction Surgery Education

Lung volume reduction surgery (LVRS) benefits some patients with emphysema (29). Education should focus on the entire process required for LVRS, not just the surgical procedure. At the conclusion of the initial screening, the patient is informed as to potential eligibility for LVRS. The patient should be informed that the full screening process from beginning of testing to completion of rehabilitation may take approximately 12 weeks and that final eligibility for surgery is based on post-rehabilitation testing. Preoperative teaching includes expected outcomes, morbidity, and mortality. Following discharge after LVRS, the patient is retested at 6 months and annually thereafter. Nonsurgical lung volume reduction options, such as valves or hydroelastic gel, are in the development stage and are being tested in patients in industry-sponsored studies.

Nutritional Strategies

Any unexplained weight loss should be evaluated for an organic cause. A patient presenting with a body mass index less than 20, weight 130% of ideal body weight, or unplanned weight loss over one or more months should be referred to a dietician. The overweight patient will benefit from a specified caloric goal per day. Underweight patients with COPD, like overweight patients, should have their dietary habits and typical meals reviewed and misconceptions corrected. Patients benefit from nutritional education that includes information about how COPD affects their eating. Nutritional depletion is common in COPD and has a negative impact on respiratory and skeletal muscle function, contributing to the morbidity and mortality of COPD (30). In patients with severe COPD who had normal or low weight, loss of weight was associated with increased mortality, whereas weight gain was associated with reduced mortality. Schols and colleagues found that patients who increased their weight by more than 2 kg had a significantly better survival, independently of their initial body mass index (31). Prescott and colleagues found that weight gain had a protective effect in under- and normal-weight subjects with severe COPD (32).

For the low-weight patient with COPD, small meals spaced throughout the day may be easier to tolerate if the patient experiences symptoms of early satiety. The use of between-meal supplements or healthy convenience snacks is energy sparing, but the patient should be cautioned that these are used in addition to their meals and not as a substitution for meals. Controversy over fat-rich or carbohydrate-rich supplement exists. Vermeeren and colleagues found that there was no significant difference in metabolism or exercise capacity after either supplement but did report there was a change in shortness of breath

(SOB) after the fat-rich supplement (33). Randomized controlled studies are needed to look at the use of supplements and the effect of dietary change in all patients with COPD.

Appetite stimulants such as megestrol acetate and dronabinol may be prescribed for the underweight patient who has failed all other strategies. Fluid intake is restricted only if contraindicated by an existing comorbidity, although all patients should be instructed to limit fluid intake during meals to decrease early satiety. Patients on high-dose prednisone are instructed to limit additive salt and concentrated carbohydrates.

Because of the morbidity and mortality associated with underweight patients with COPD interventions should be extended to prevention and early treatment of weight loss, before patients are extremely wasted, and putting more emphasis on dietary change than on medically prescribed supplementation is needed (34).

Advance Directives

Health care professionals can help improve the end-of-life decision-making process for the patient by introducing the patient and support person to information about advance directives (ADs) when the patient's health is stable. The patient's values and beliefs should guide medical choices of life-sustaining treatment. The patient may need to be reassured that AD planning does not signify resignation to the disease process, nor that there is no hope for improvement nor that the end is near. An AD allows the patient some control and provides the family with direction. The Patient Self-Determination Act passed in 1991 requires health care institutions participating in Medicare and Medicaid to provide written information to patients about their legal rights with regard to ADs under state law. The Patient Self-Determination Act enables patients to make medical decisions regarding their care and treatment by completing an AD. Documentation of the presence or absence of an AD by the health care provider is now mandatory (35). Two of the most common advance directives are the living will and the durable health care power of attorney or proxy. The patient should be approached regarding the existence of ADs at a routine care visit or at the early stages of an admission. Due to COPD progression and changing circumstances, a patient's choices in advance care planning may change (36). Patients should be encouraged periodically to review the contents of their AD and to discuss their wishes with family members.

Support Groups and Community Resources

The patient with COPD is encouraged to seek out other patients with COPD to find support, encouragement, and coping strategies. Local hospital-based outpatient pulmonary rehabilitation programs provide support groups for patients with COPD. Additional community resources may be found by contacting the local chapter of the ALA. Resources available through the Internet include www.lungusa.org, www.thoracic.org/sections/education/patienteducation/index.html, www.copd-alert.com, www.nlhep.org, and www.necacommunity.org.

Airway Clearance Devices

If a patient has difficulty expectorating secretions, mucus clearance may be facilitated through the use of an airway clearance device. High-frequency chest wall oscillation, accomplished with an inflated vest with an air pulse delivery system, reduces mucus viscosity and mobilizes secretions through external pressure applied to the chest wall. Another device is the flutter valve (Flutter Mucus Clearance Device; Axcan Scandipharm, Birmingham, AL), which is a portable, handheld, pipe-shaped device with a mouth-

piece that produces oscillations in air pressure and flow (37, 38). The positive expiratory pressure produced is thought to be about 6–20 cm H₂O (37, 38). By changing the slope of the flutter valve, the patient selects the position that results in the greatest resonance, which is perceived as a “fluttering” or vibration sensation within the chest, mobilizing the secretions. Alternatives to devices are chest physiotherapy and postural drainage. There are no large prospective randomized studies addressing the effectiveness of airways clearance devices in patients with COPD.

Traveling with Oxygen

Traveling can be daunting for the oxygen-dependent patient. Using portable oxygen on a commercial air carrier requires advance planning for a successful journey. Effective September 12, 2006, the Federal Aviation Administration allows five different portable oxygen concentrator (POC) devices to be taken on-board commercial airlines (39). Because the use of POCs on an aircraft is at the discretion of the airline (airlines are allowed to have these on-board but not required to permit them on-board), patients are encouraged to contact the airline in advance regarding their specific policies. The allowable types include: SeQual Eclipse, AirSep FreeStyle, AirSep Lifestyle, Respironics EverGo, and the Inogen One. These units work by filtering oxygen from nitrogen and other gases contained in ambient air and then dispersing it in a concentrated form to the patient (39). The patient must notify the airline that they are traveling with oxygen, confirm that their POC is allowed, and have a prescription on hand that indicates the oxygen liter flow. This new regulation is a victory for the patient who has struggled with travel issues due to the high cost of oxygen therapy on airplanes and the inability to bring oxygen. Arrangements should be made for a backup oxygen system to be available at the final destination before travel occurs. The keys to a successful journey with supplemental oxygen are detailed planning with the local oxygen supply company, the health care provider, and having the needed supplies in hand for the duration of the trip.

CONCLUSIONS

The care of the patient with COPD offers challenges in management. The multidisciplinary model described in this article defines the essential elements of a comprehensive plan. Ideally the team consists of a physician, nurses, exercise specialists, social workers, and dietitians. The team's focus is on providing education and reinforcement the medical plan. The medical plan includes not only the prescription of medications but also an assessment of the patient's ability to use the devices and understanding of how and when to use the medications and should include written instructions if needed. An assessment of the patient's coping skills and the presence of depression and or anxiety should be included. A nutritional assessment focusing on dietary habits should be completed on all patients with COPD. Preventing weight loss has been shown to decrease morbidity and mortality in the low- and normal-weight patient with COPD. A weight loss in the overweight patient may decrease breathlessness symptoms. The patient should be prescribed pulmonary rehabilitation. Providing the patient with information about advanced directives, traveling, smoking cessation and support groups, and community resources should not be overlooked in the plan.

Regular assessment of the patient and communication between team members is vital to the management of the patient with COPD. This approach offers the patient the greatest opportunity to maximize their respiratory potential.

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References

- Barr RG, Celli BR, Martinez FJ, Ries AL, Rennard SI, Reilly JJ, Sciruba FC, Thomashow BM, Wise RA. Physician and patient perceptions in COPD: the COPD Resource Network Needs Assessment Survey. *Am J Med* 2005;118:1415.
- Mularski RA, Asch SM, Shrank WH, Kerr EA, Setodji CM, Adams JL, Keesey J, McGlynn EA. The quality of obstructive lung disease care for adults in the United States as measured by adherence to recommended processes. *Chest* 2006;130:1844–1850.
- Bourbeau J, Julien M, Maltais F, Rouleau M, Beaupre A, Begin R, Renzi P, Nault D, Borycki E, Schwartzman K, et al. Reduction of hospital utilization in patients with chronic obstructive pulmonary disease: a disease-specific self-management intervention. *Arch Intern Med* 2003;163:585–591.
- Watz H, Magnussen H. Comorbidities of COPD. *Internist (Berl)* 2006;47:895–896, 898–900 [in German].
- van Manen JG, Bindels PJE, Dekker FW, Ijzermans CJ, van der Zee JS, Schadé E. Risk of depression in patients with chronic obstructive pulmonary disease and its determinants. *Thorax* 2002;57:412–416.
- Borson S, McDonald GJ, Gayle T, Deffebach M, Lakshminarayan S, VanTuinen C. Improvement in mood, physical symptoms, and function with nortriptyline for depression in patients with chronic obstructive pulmonary disease. *Psychosomatics* 1992;33:190–201.
- Emery CF, Schein RL, Hauck ER, MacIntyre NR. Psychological and cognitive outcomes of a randomized trial of exercise among patients with chronic obstructive pulmonary disease. *Health Psychol* 1998;17:232–240.
- Gayle RC, Spitler DL, Karper WB, Jaeger RM, Rice SN. Psychological changes in exercising COPD patients. *Int J Rehabil Res* 1988;11:335–342.
- Brenes GA. Anxiety and chronic obstructive pulmonary disease: prevalence, impact, and treatment. *Psychosom Med* 2003;65:963–970.
- Cully J, Graham D, Stanley M, Ferguson C, Sharafkhaneh A, Soucek J, Kunik M. Quality of life in patients with chronic obstructive pulmonary disease and comorbid anxiety or depression. *Psychosomatics* 2006;47:312–319.
- Dolce JJ, Crisp C, Manzella B, Richards JM, Hardin JM, Bailey WC. Medication adherence patterns in chronic obstructive pulmonary disease. *Chest* 1991;99:837–841.
- Chryssidis E, Frewin DB, Frith PA, Dawes ER. Compliance with aerosol therapy in chronic obstructive lung disease. *N Z Med J* 1981;94:375–377.
- Haynes RB, Taylor DW, Sackett DL. Compliance in healthcare. Baltimore, MD: Johns Hopkins University Press; 1979. pp. 1–7.
- Johnson G, Kong D, Thoman R, Stewart K. Factors associated with medication nonadherence in patients with COPD. *Chest* 2005;128:3198–3204.
- Pauwels RA, Buist AS, Calverley PM, Jenkins CR, Hurd SS. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease: NHLBI/WHO Global Initiative for Chronic Obstructive Lung Disease (GOLD) workshop summary. *Am J Respir Crit Care Med* 2001;163:1256–1276.
- Ryan GW, Wagner GJ. Pill taking “routinization”: a critical factor to understanding episodic medication adherence. *AIDS Care* 2003;15:795–806.
- Voelkel NF, Tuder R. COPD: exacerbation. *Chest* 2000;117:376–379.
- Regueiro CR, Hamel MB, Davis RB, Desbiens N, Connors AF, Phillips RS. A comparison of generalist and pulmonologist care for patients hospitalized with severe chronic obstructive pulmonary disease: resource intensity, hospital costs, and survival: Study to Understand Prognoses and Preferences for Outcomes and Risks of Treatment. *Am J Med* 1998;105:366–372.
- Seemungal TA, Donaldson GC, Paul EA, Bestall JC, Jeffries DJ, Wedzicha JA. Effect of exacerbation on quality of life in patients with chronic obstructive pulmonary disease. *Am J Respir Crit Care Med* 1998;157:1418–1422.
- Mannino DM, Homa DM, Akinbami LJ, Ford ES, Redd SC. Chronic obstructive pulmonary disease surveillance: United States, 1971–2000. *MMWR* 2002;51:1–16.
- Seemungal TA, Donaldson GC, Bhowmik A, Jeffries DJ, Wedzicha JA. Time course and recovery of exacerbations in patients with chronic obstructive pulmonary disease. *Am J Respir Crit Care Med* 2000;161:1608–1613.
- Ohar J. Gender differences in chronic obstructive pulmonary disease: CME/CE disclosures. Presented at: American Thoracic Society 2005 International Conference; 2005 May 20–25; San Diego, CA.
- Anthonisen NR, Connett JE, Kiley JP, Altose MD, Bailey WC, Buist AS, Conway WA, Enright PL, Kanner RE, O’Hara P, et al. The effects of smoking intervention and the use of an inhaled anticholinergic bronchodilator on the rate of decline in FEV₁: the Lung Health Study. *JAMA* 1994;272:1497–1505.
- Anthonisen NR, Connett JE, Murray RP. Smoking and lung function of Lung Health Study participants after 11 years. *Am J Respir Crit Care Med* 2002;166:675–679.
- Hartman K. Tools to put cessation intervention into practice. Presented at: American College of Obstetricians and Gynecologists 48th Annual Clinical Meeting; 2000 May 20–21; San Francisco, CA.
- Gonzales D, Rennard SI, Nides M, Oncken C, Azoulay S, Billing C, Watsky EJ, Gong J, Williams KE, Reeves KR. Varenicline, an $\alpha 4\beta 2$ nicotinic acetylcholine receptor partial agonist, vs sustained-release bupropion and placebo for smoking cessation: a randomized controlled trial. *JAMA* 2006;296:47–55.
- Douglas E, Jorenby DE, Hays JT, Rigotti NA, Azoulay S, Watsky EJ, Williams KE, Billing CB, Gong J, Reeves KR. Efficacy of varenicline, an $\alpha 4\beta 2$ nicotinic acetylcholine receptor partial agonist, vs placebo or sustained-release bupropion for smoking cessation: a randomized controlled trial. *JAMA* 2006;296:56–63.
- Watts S, Noble S, Smith P, Disco M. First-line pharmacotherapy for tobacco use and dependence. *J Am Board Fam Pract* 2002;15:489–497.
- National Emphysema Treatment Trial Research Group. A randomized trial comparing lung-volume-reduction surgery with medical therapy for severe emphysema. *N Engl J Med* 2003;348:2059–2073.
- Ferreira I, Brooks D, Lacasse Y, Goldstein R. Nutritional support for individuals with COPD. *Chest* 2000;117:672–678.
- Schols AM, Slangen J, Volovics L, Wouters EFM. Weight loss is a reversible factor in the prognosis of chronic obstructive pulmonary disease. *Am J Respir Crit Care Med* 1998;157:1791–1797.
- Prescott E, Almdal T, Mikkelsen KL, Tofteng CL, Vestbo J, Lange P. Prognostic value of weight change in chronic obstructive pulmonary disease: results from the Copenhagen City Heart Study. *Eur Respir J* 2002;20:539–544.
- Vermeeren M, Wouters EF, Nelissen LH, van Lier A, Hofman Z, Schols AM. Acute effects of different nutritional supplements on symptoms and functional capacity in patients with chronic obstructive pulmonary disease. *Am J Clin Nutr* 2001;73:295–301.
- Schols AM. Nutritional and metabolic modulation in chronic obstructive pulmonary disease management. *Eur Respir J* 2003;22:81s–86s.
- Habel M. Advance directives: an unrealized goal [Internet]. [Accessed 2008 Jan 8]. Available from: http://www2.nursingspectrum.com/ce/self-study_modules/course.html?CCID=2715
- Lynn J, Harrold J; Center to Improve Care of the Dying. Handbook for mortals: guidance for people facing serious illness. New York: Oxford University Press; 1999. pp. 119–138.
- Lindemann H. Evaluation of VRP1 physiotherapy. *Pneumologie* 1992;46:626–630.
- Ambrosino N, Gallegari G, Galloni C, Brega S, Pinna G. Clinical evaluation of oscillating positive expiratory pressure for enhancing expectoration in diseases other than cystic fibrosis. *Monaldi Arch Chest Dis* 1995;50:269–275.
- Federal Aviation Administration. Use of certain portable oxygen concentrator devices onboard aircraft. Final rule. *Fed Regist* 2005;70:40155–40164.