Approach to chronic obstructive pulmonary disease in primary care

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ABSTRACT

OBJECTIVE To review the diagnosis, assessment of severity, and management of chronic obstructive pulmonary disease (COPD) and to address the systemic manifestations associated with COPD.

SOURCES OF INFORMATION PubMed was searched from January 2000 to December 2007 using the key words COPD, practice guidelines, randomized controlled trials, therapy, and health outcomes. The Canadian Thoracic Society guideline on management of COPD was carefully reviewed. The authors, who have extensive experience in care of patients with COPD, provided expert opinion.

MAIN MESSAGE Chronic obstructive pulmonary disease is a common systemic disease caused primarily by smoking. Spirometry is essential for diagnosis of COPD and should be integrated into primary care practice. Pharmacologic and nonpharmacologic therapy improves symptoms, capacity for exercise, and quality of life. Smoking cessation is the only intervention shown to slow disease progression. The systemic manifestations and comorbidity associated with COPD need to be identified and addressed to optimize health and quality of life.

CONCLUSION An evidence-based approach to managing COPD along with a primary care chronic disease management model could improve quality of life for patients with COPD.

RÉSUMÉ

OBJECTIF Faire le point sur le diagnostic, l’évaluation de la gravité et le traitement de la maladie pulmonaire obstructive chronique (MPOC), et en rappeler les manifestations systémiques.

SOURCES DE L’INFORMATION On a consulté PubMed entre janvier 2000 et décembre 2007, à l’aide des rubriques COPD, practice guidelines, randomized controlled trials, therapy et health outcomes. Les directives de la Société Canadienne de Thoracologie ont été soigneusement revues. Les auteurs ont fourni des opinions expertes tirées de leur longue expérience du traitement de la MPOC.

PRINCIPAL MESSAGE La maladie pulmonaire obstructive chronique est une affection systémique fréquente causée principalement par le tabagisme. La spirométrie est essentielle au diagnostic et elle devrait faire partie de la médecine de première ligne. Les traitements pharmacologiques et non pharmacologiques améliorent les symptômes, la capacité à l’effort et la qualité de vie. L’arrêt du tabac est la seule intervention qui puisse en ralentir la progression. Il importe d’identifier et de prendre en charge les manifestations systémiques de la MPOC et la comorbidité associée afin d’optimiser la santé et la qualité de vie.

CONCLUSION Une prise en charge de la MPOC fondée sur des preuves et associée à un modèle de traitement des maladies chroniques en médecine primaire pourrait assurer une meilleure qualité de vie aux patients souffrant de MPOC.

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Chronic obstructive pulmonary disease (COPD) is a systemic disorder caused mainly by smoking and is characterized by progressive irreversible, or partially reversible, airflow obstruction; systemic manifestations; and recurrent exacerbations. Respiratory symptoms include dyspnea, wheezing, coughing, and sputum production. Systemic features include skeletal muscle dysfunction and hence limited ability to exercise, weight loss, depression and anxiety, osteoprosis, increased risk of cardiovascular disease including right heart failure, and polycythemia.

Most cases (85% to 90%) are due to cigarette smoking. Other causes include exposure to air pollutants and environmental toxins and hereditary factors, such as α1-antitrypsin deficiency. Reports indicate that at least 10% to 15% of smokers will be diagnosed with COPD based on conventional diagnostic strategies, although this is likely an underestimation of the proportion of smokers with COPD.

In Canada, COPD is a prevalent condition and is associated with substantial negative effects on health. Evidence from recent literature provides an approach to managing COPD that acknowledges the systemic manifestations of the disease and the many comorbidities that accompany it. Primary care providers have a unique opportunity to identify patients at risk through directed screening, to implement primary and secondary prevention strategies, and to provide care that encompasses a holistic approach to management. As the population ages, the burden of illness from COPD is expected to increase. Application of a simple approach to identifying and managing COPD could substantially improve patient care and the efficiency of practice.

Case description
A 58-year-old female smoker presents complaining of dyspnea associated with chronic cough and sputum production during the winter months. Her general health is good, and she is not taking any medications. She recently took early retirement to spend more time golfing but finds she is too short of breath to play more than 9 holes even though she now has the time. She gets breathless walking up a slight hill. She is 1.64 m tall, weighs 65 kg, and has a body mass index of 24. Results of respiratory and cardiac examinations are normal. Chest radiography shows hyperinflation. Office spirometry reveals moderate airflow obstruction.

Sources of information
PubMed was searched from January 2000 to December 2007 using the key words COPD, practice guidelines, randomized controlled trials, therapy, and health outcomes. The Canadian Thoracic Society’s guideline on management of COPD was reviewed extensively, and some of the references published before 2003 were gathered from this document. The approach we describe was developed based on the clinical experience of the authors and is supported by evidence when referenced. Generally, the recommendations on pharmacologic and nonpharmacologic therapy are based on data from randomized controlled trials (level I evidence).

Screening and diagnosis
Screening can be carried out with simple office spirometry. All smokers and ex-smokers 40 years old and older should be screened. Screening with spirometry is underused in primary care, and health care providers should consider developing a way of identifying smokers and ex-smokers in their practices in order to ensure that these patients are offered screening for COPD. Ways to identify these patients include flagging charts or using computerized reminders, particularly during periodic health visits. A recent prospective observational study that screened 818 smokers older than 40 with no known diagnosis of COPD found a prevalence of COPD of 18.9%. More than 40% of those with COPD had moderate to severe impairment in lung function. These results are consistent with those of other studies that have reported a prevalence of COPD of 7.4% to 18% in general practice. Preliminary results from the multinational Burden of Obstructive Lung Disease (BOLD) study demonstrated a prevalence of COPD of 10.7% based on a forced expiratory volume of air in 1 second (FEV1) of <80% and an FEV1/forced vital capacity ratio of <0.7.

Spirometry is inexpensive and is supported financially through most provincial health care programs. Although the cost-effectiveness of office spirometry has not been established, the early diagnosis it provides will identify patients who require more aggressive interventions aimed at smoking cessation and allow implementation of pharmacologic and nonpharmacologic therapy. A diagnosis of COPD requires a postbronchodilator FEV1/forced vital capacity ratio of <0.7. If this parameter normalizes over time, then the diagnosis must be withdrawn and an alternative diagnosis considered.

Classification of severity and prognosis
Once the diagnosis is confirmed, patients should be carefully evaluated to identify factors contributing to the disease, the effect of COPD on their lives, and prognosis (Table 1). Potential systemic manifestations of the disease must be identified, as they might strongly influence decisions about treatment. These systemic manifestations include pulmonary hypertension and cor pulmonale, coronary artery disease, hypercapnia, osteopenia or osteoporosis, peripheral muscle dysfunction and low
body mass index, depression and anxiety, and concomitant eosinophilic bronchitis.

Traditionally, the severity of COPD has been classified based on the degree of reduction in FEV₁. While FEV₁ is a useful measure, it does not accurately predict capacity for exercise or survival as well as other measures, such as formal laboratory-based exercise testing or symptoms of dyspnea. Measures other than FEV₁ should be used to establish disease severity in primary care practice. These measures include evaluating the degree of dyspnea using the modified Medical Research Council (MRC) dyspnea grade. The MRC dyspnea scale is easy to calculate and should be determined for each patient with COPD; it requires measurement of body mass index, spirometry, a 6-minute walk test, and evaluation of MRC dyspnea grade (Table 3). A higher score (out of 10) indicates a worse prognosis. The mortality hazard ratio associated with a 1-unit change in score is 1.34.

### Approach to management

It is crucial for physicians to be positive and supportive. Disease-specific education is important for all patients with chronic illnesses. If formal education programs are not available, information booklets on COPD are useful and are available through most provincial lung associations.

Nonpharmacologic therapy for COPD includes smoking cessation, yearly influenza vaccine, pneumonia vaccine every 5 to 10 years, and oxygen therapy (if patients have resting daytime hypoxemia). Smoking cessation counseling should be offered to all patients who continue to smoke. Cessation rates are higher when counseling is combined with smoking cessation aids, such as nicotine replacement therapy or newer therapies including bupropion or varenicline.

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<th>Table 1. Initial evaluation of patients diagnosed with chronic obstructive pulmonary disease</th>
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<td>INVESTIGATION</td>
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<td>Dyspnea</td>
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<td>Exposure history</td>
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<td>Spirometry</td>
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<td>Bone densitometry</td>
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<td>Echocardiogram</td>
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<td>Screening for depression</td>
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**FEV₁—forced expiratory volume of air in 1 second.**

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<th>Table 2. Modified Medical Research Council dyspnea scale</th>
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<td>DYSPEANEA GRADE</td>
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Adapted from *Br Med J* 1959;2:257-66 with permission from the BMJ Publishing Group.
The benefits of pulmonary rehabilitation are well recognized and include decreased dyspnea, increased capacity for exercise, and better quality of life. The main limiting factors are patients’ motivation, the availability of rehabilitation programs, and failure to refer. It is now recognized that patients with all levels of disease can be enrolled in pulmonary rehabilitation programs, although those with more severe muscle weakness and exercise intolerance and less ventilatory limitation are likely better candidates. The role of education in COPD management has gained greater importance with the recognition that education and self-management programs substantially reduce the number of nonscheduled clinic visits, emergency room visits, and hospital admissions. We recommend that all patients with COPD receive counseling on the importance of regular structured physical activity. Patients should be encouraged to increase their physical activity and recognize that dyspnea is not a sign of harm.

There have been several recent advances in pharmacologic therapy for COPD. Chronic obstructive pulmonary disease is not asthma, and the role of bronchodilator therapy and corticosteroid therapy is unique in the treatment of COPD.

Short-acting bronchodilator therapy (salbutamol and ipratropium) should be used to reduce dyspnea and improve exercise performance and lung function. Combination therapy achieves greater bronchodilation although has no additional effect on dyspnea or quality of life. Long-acting bronchodilator agents, including long-acting β-agonsists (salmeterol and formoterol) and the long-acting anticholinergic agent tiotropium provide sustained improvements in lung function while also achieving improvements in dyspnea and quality of life. With greater understanding of the mechanisms responsible for dyspnea in COPD, it is now established that long-acting bronchodilator therapy, particularly tiotropium, exerts its beneficial effect by reducing dynamic hyperinflation and the resulting increased labour of breathing. This helps to alleviate dyspnea and improve capacity for exercise. A recent randomized controlled trial demonstrated a small but significant 5.7% absolute reduction in exacerbation rates in patients with severe COPD (mean FEV1 was 36% of predicted) treated with tiotropium compared with those taking placebo. The combination of tiotropium and ipratropium might cause excessive drying of the mouth and increased sputum viscosity and should, therefore, be used cautiously, if at all.

Inhaled corticosteroids (ICS) have been recommended for patients with moderate to severe airflow obstruction and frequent exacerbations based on data from randomized controlled trials. Recent studies evaluating the effect of ICS on mortality have had conflicting results. The TORCH trial, a large (n=6112), multicentre, randomized controlled trial, failed to show a statistically significant reduction in mortality in any of the treatment arms (fluticasone plus salmeterol, salmeterol alone, fluticasone alone) compared with placebo. Use of a combination of an ICS and a long-acting bronchodilator agent, though, has been shown to increase lung function, improve health-related quality of life, and reduce dyspnea compared with use of either agent alone.

In centres where sputum cell count measurement is available, we recommend measuring total and differential cell counts to evaluate for a concurrent diagnosis of eosinophilic bronchitis, which is present in up to 40% of patients with COPD. Identifying these patients is important because they will have a greater response to ICS therapy and might also have a greater reduction in exacerbations while receiving this therapy.

Identifying and managing the systemic manifestations of COPD is extremely important. Patients with pulmonary hypertension secondary to COPD and cor pulmonale require careful fluid and diuretic management while stable and during exacerbations. Patients with chronic hypercapnia are at increased risk of respiratory acidosis and hypercapnic respiratory failure with uncontrolled supplemental oxygen therapy, particularly during exacerbations. Ideally, these patients should be identified while they are stable in order to prevent the complications associated with excessive supplemental oxygen delivery during exacerbations. Patients with low body mass and peripheral muscle dysfunction might benefit more from respiratory rehabilitation than patients whose exercise capacity is limited primarily by their ventilatory function. Patients with COPD who have osteopenia or osteoporosis should be identified and treated with calcium, vitamin D, and bisphosphonate therapy, particularly when they have ongoing exposure to corticosteroids. Anxiety or depression can result from symptoms of COPD or arise independently. Anxious or depressed patients require careful evaluation and consideration of reversible causes, including excessive β-agonist use or oral corticosteroid therapy. In some situations, therapy directed at controlling symptoms results in a reduction in dyspnea-related anxiety. We have found it beneficial

| Table 3. Points used to calculate the BODE index score |
| Variable | Points on the BODE index |
| FEV1 (% of predicted) | ≥ 65 | 50-64 | 36-49 | ≤ 35 |
| Distance walked in 6 min (m) | ≥ 350 | 250-349 | 150-249 | ≤ 149 |
| Medical Research Council dyspnea scale score (0-4) | 0-1 | 2 | 3 | 4 |
| Body mass index | > 21 | ≤ 21 |

FEV1—forced expiratory volume of air in 1 second. Adapted from Celli et al. © 2004 Massachusetts Medical Society. All rights reserved. Reprinted with permission.
to involve members of an interdisciplinary health care team, including social workers, psychiatrists, or respiratory therapists, in the care of these patients.

**Outpatient management of exacerbations**

Recurrent exacerbations are a principal feature of COPD and are defined clinically by increases in dyspnea, sputum volume, or sputum purulence. Exacerbations are associated with a substantial negative effect on quality of life, promote accelerated deterioration in lung function, and are associated with an increased risk of mortality.\(^{20}\) Primary care providers commonly manage outpatient exacerbations of COPD. A chest radiograph should be done if clinically indicated, as it could alter management in up to 20% of cases.\(^{36}\) Corticosteroids have been shown to reduce recurrent exacerbations, decrease length of time in hospital, and improve lung function in patients treated in hospital.\(^{36}\) There is now also strong evidence supporting corticosteroid therapy in outpatient management of exacerbations of COPD, and this therapy should be used routinely unless there are contraindications. Based on evidence from a recent randomized controlled trial,\(^{37}\) we recommend a 7- to 10-day course of prednisone (approximately 30 to 40 mg/d) for patients with exacerbations of COPD not requiring hospitalization. Antibiotics should be given to patients with infective exacerbations of COPD, which are usually characterized by increases in sputum volume and purulence. Patients could also benefit from increased doses of their usual short-acting bronchodilator therapy until the exacerbations resolve, although excessive use of short-acting anticholinergic therapy might cause sputum to become more viscous and make airway clearance more difficult. If an underlying cause is identified (eg, congestive heart failure), then therapy directed toward this cause is warranted. Patients with moderate to severe increases in symptoms or who appear unwell require evaluation in the emergency department and should be considered for hospitalization.

**Case resolution**

Smoking cessation was discussed, and the woman started taking a long-acting anticholinergic agent (tiotropium) once daily along with a short-acting bronchodilating agent (salbutamol), 2 puffs as needed up to 4 times a day. An exercise program was discussed and recommended. She was seen in follow-up in the fall, and influenza vaccine was provided. The patient reported that she had stopped smoking and had noticed an improvement in her dyspnea and capacity for exercise. She was also very happy to report that she was now able to complete all 18 holes of golf with her friends.

**Conclusion**

Chronic obstructive pulmonary disease is a common systemic disorder that is preventable, often underdiagnosed, and amenable to therapy. Patients with COPD who suffer from dyspnea could benefit from short- and long-acting bronchodilator agents and respiratory rehabilitation. Application of recent advances in management of COPD in office practice is practical\(^{48}\) and can provide physicians and patients with renewed optimism in managing COPD.

**Competing interests**

Dr McIvor has received honoraria for speaking events and attending advisory board meetings of pharmaceutical companies involved in chronic obstructive pulmonary disease, including AstraZeneca, Abbot, Bayer, Boehringer Ingelheim, GlaxoSmithKline, Nycomed, Merck Frosst, and Pfizer. Dr Cox has been sponsored by GlaxoSmithKline, Pfizer, AstraZeneca, and Boehringer Ingelheim to speak to...
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