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At present, some 750,000 Canadians are known to have chronic obstructive pulmonary disease (COPD). This number is believed to represent the tip of the iceberg, as COPD is often only diagnosed in the advanced stage. Respiratory symptoms or a previous smoking history are common among older adults yet they seldom trigger further assessment for COPD. Objective demonstration of airflow obstruction by spirometry is a simple procedure, even in older adults, and is the gold standard for diagnosis of COPD. Early intervention with routine nonpharmacological management includes partnering with the patient and family, providing education, smoking cessation, vaccination, collaborative self-management, and advice on exercise and pulmonary rehabilitation. Anticholinergic inhalers remain the gold standard for optimal bronchodilation and dyspnea relief in COPD, and new long-acting agents have underpinned new treatment algorithms, improving quality of life and exercise capacity as well as reducing exacerbations. For those with advanced disease, recent trials have reported further benefits with the addition of combination inhalers (inhaled corticosteroid and long-acting B₂-agonist) to core anticholinergic treatment. Physicians and patients can expect a promising future for COPD treatment as significant advances in management and improved outcomes in COPD are now being made.

Key words: chronic obstructive pulmonary disease, older adults, spirometry, diagnosis, management

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Introduction

Chronic obstructive pulmonary disease (COPD) is a respiratory disorder largely caused by smoking and is characterized by progressive, partially reversible airflow obstruction, systemic manifestations, and increasing frequency and severity of exacerbations. Patients with COPD may have elements of both chronic bronchitis (defined as daily cough and sputum on most days for a period of 3 months for 2 or more consecutive years) and emphysema, which is defined as chronic dyspnea (Figure 1).

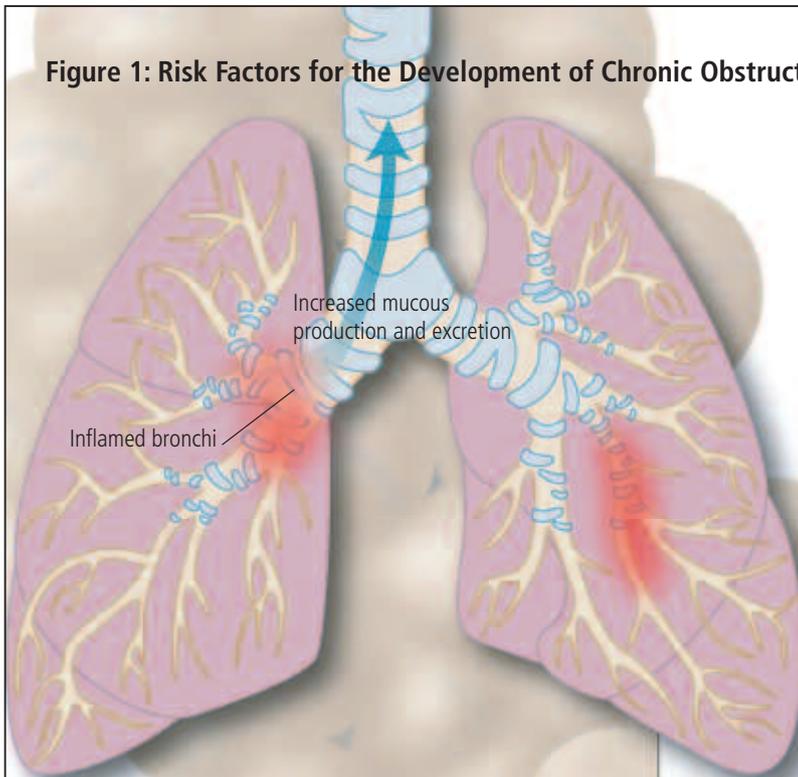
COPD is projected to become the third-leading cause of death worldwide by 2020. Currently COPD is the fourth-leading cause of death among Canadians, behind heart disease, cancer, and cerebrovascular disease (including stroke). Unlike other leading causes of death, COPD is the only disease in which mortality rates continue to rise.¹ It has been estimated that approximately 714,000 Canadians have been diagnosed with COPD, with studies suggesting that more than 50% of patients remain undiagnosed in the communi-

ty.¹ COPD is a commonplace condition not only for respirologists but also in the day-to-day practice of family physicians and geriatricians, who often deal with exacerbations during the fall and winter months. Unfortunately, this same familiarity has led to complacency in our approach to diagnosis, prevention of exacerbations, and modification of disease progression.

The Canadian Thoracic Society Recommendations for Management of COPD (2004) was published in an effort to optimize the early diagnosis, prevention, and management of COPD.¹ As with many guidelines, major effort was placed on an evidence-based review of the literature and comparably little on implementation of the guidelines and assessment of knowledge transfer, change in practice, or improved COPD patient outcomes.

Current COPD management strategies consisting of combined pharmacotherapy and nonpharmacotherapeutic interventions (i.e., smoking cessation, pulmonary rehabilitation, and exercise training) have been shown to improve symptoms, activity levels, and quality of life among individuals with COPD, even those with severe COPD. Unfortunately, many patients are not optimally managed. They experience poor quality of life with frequent exacerbations. By integrating new outcome measures and recently described

Figure 1: Risk Factors for the Development of Chronic Obstructive Pulmonary Disease



Chronic Bronchitis

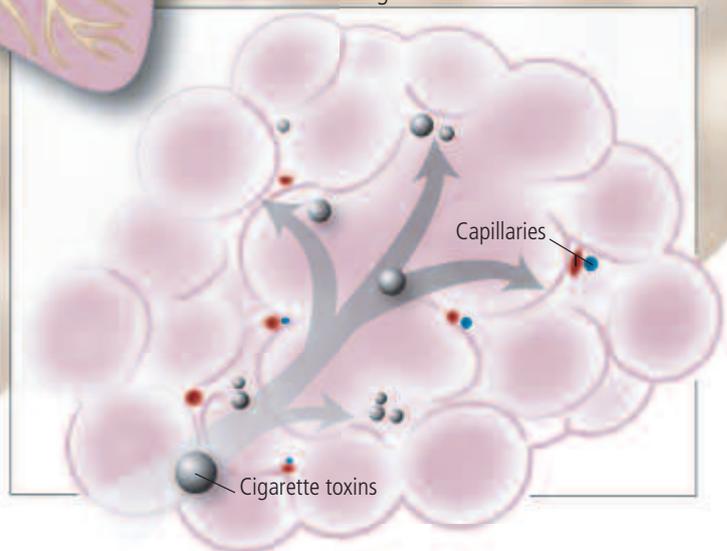
Chronic bronchitis is defined as a daily cough and sputum on most days for a period of 3 months for 2 or more consecutive years.

The bronchi are inflamed and mucous cells lining the airway increase in number and excretion rate. The bronchial passageways become narrower and airflow to the alveoli decreases. The cells lining the bronchi are continuously inflamed and the mucous cannot be efficiently removed and eventually builds up within the airways. If the mucous is not removed, bacteria will remain in the lower airways and increase the possibility of an infection.

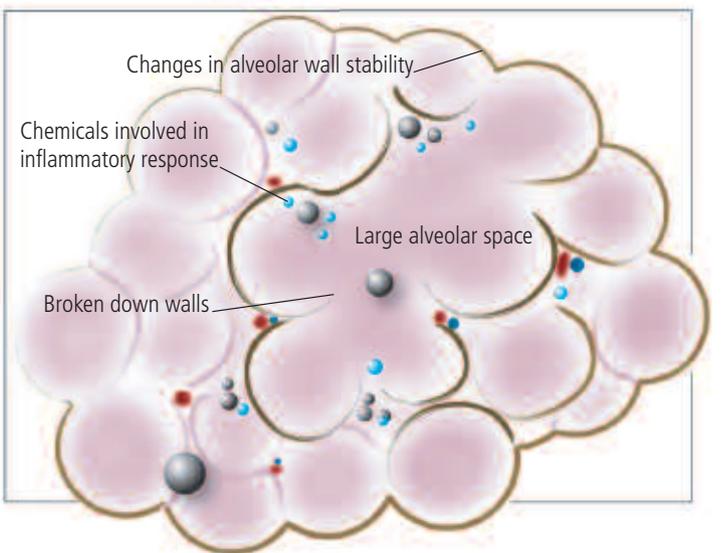
The Effects of Smoking on Alveoli

Emphysema

Emphysema is defined as chronic dyspnea or difficulty breathing. Similarly to chronic bronchitis, emphysema is often triggered by cigarette smoking. The toxins from the cigarette are taken into the alveoli where they cannot be removed and cause a localized inflammatory response.



Chemicals such as trypsin and elastase remove the toxins from the alveoli. If the toxins continue to invade the alveoli, the chemicals will start to break down the walls of the alveoli, decreasing the number of alveoli while increasing their size. When the walls of the alveoli break down, there is less surface area for gas exchange and the body is forced to work harder in order to maintain an adequate exchange of oxygen and carbon dioxide.



Cessation of smoking can stop the progression of emphysema and chronic bronchitis. However, the structural damage to the bronchi and alveoli is permanent.

Hy

Table 1: Assessment for Chronic Obstructive Pulmonary Disease

I. Clinicians should prioritize covering the following issues:
Does the patient smoke? What is the number of pack/years smoked? (1 pkt/day for 1 year = 1pkt/year)
Take a careful history to determine whether the patient has chronic obstructive pulmonary disease (COPD), focusing on the cardinal symptoms: shortness of breath and inability to tolerate physical activity
Enquire about exacerbations: urgent care visits, antibiotics or oral corticosteroid prescription, hospitalization
Ask the patient about the presence of symptoms that suggest common comorbidities such as heart and circulatory diseases, asthma, anemia, depression
Look out for worrying features associated with COPD that merit specialist referral (see Table 2)
Explain to the patient that confirming the diagnosis requires a simple breathing test called spirometry and a chest x-ray
Spirometry is the gold standard for diagnosis and assessment of COPD-related impairment
Spirometry results showing a postbronchodilator forced expiratory volume in 1s (FEV ₁) of less than 80% of the predicted normal value and a ratio of FEV ₁ to forced vital capacity of less than 0.7 are both required for COPD to be diagnosed

concepts for care, knowledge transfer, and quality management initiatives clinicians can “breathe new life” into individuals at all stages of COPD, improving their health outcomes and quality of life.

Classification and Assessment of Disease Severity

Spirometry is the gold standard investigation for the diagnosis of COPD, and it should be made readily accessible for both patients and physicians.³ Pulmonary function laboratories should encourage diagnostic spirometry and provide open access. Full pulmonary function tests should not be performed as initial screening for obstructive disease.

To increase awareness about underdiagnosis of COPD, a project known as the Burden of Obstructive Lung Disease (BOLD) initiative is being commenced. Many countries, including Canada, are participating. One of the first groups to report their results was a group from Austria that surveyed a gender-stratified, population-based sample of 2,200 adults who were 40 years of age.⁴ For 1,258 participants with good-quality spirometry findings, the overall prevalence of COPD was 26.1% and was equal among men and women. A doc-

Table 2: Reasons for Early Specialist Referral in Chronic Obstructive Pulmonary Disease

Diagnostic uncertainty
Presentation under 40 years or having a first-degree relative with history of alpha-1-antitrypsin deficiency
Severe COPD
Frequent exacerbations
Haemoptysis
Difficulty controlling symptoms and/or possible need for oxygen therapy, pulmonary rehabilitation or surgery

tor’s diagnosis of COPD was reported by only 5.6% of these participants. The researchers concluded that one-quarter of residents of Salzburg County, Austria who were 40 years of age had at least mild irreversible airflow obstruction. This high prevalence of COPD highlights the impending health care crisis that will affect many countries as a result of this greatly underappreciated condition.

Table 1 details items that clinicians should prioritize covering in their COPD assessment, and Table 2 describes indications for early specialist referral.

COPD Is a Multisystem Disease

It is important to remember that COPD affects not only the lungs and breathing but has extrapulmonary effects such as muscle wasting and weight loss, pulmonary hypertension and cor pulmonale, and anxiety and depression. A true assessment of severity should therefore include not only spirometry (Table 3) but also the presence of other features such as breathlessness and exercise limitation, frequency of exacerbation, and weight loss.

BODE Index

The Body-Mass Index, airflow obstruction, dyspnea, and exercise capacity index in chronic obstructive pulmonary

Table 3: Consider Spirometry in Older Adults with Chronic Obstructive Pulmonary Disease

Smoker or ex-smoker >40 years old
Plus one or more symptoms:
Exertional breathlessness
Chronic cough
Regular sputum production
Frequent winter bronchitis
Wheeze

disease (BODE Index) is a multidimensional grading system that assesses both the respiratory and systemic components of COPD.⁵ It provides a composite measure that has been shown to better characterize and predict outcomes in COPD, including mortality, than single measures such as FEV₁.

The four factors comprising the BODE Index that predict mortality are the body mass index or BMI (B), the degree of airflow obstruction assessed by FEV₁ from spirometry (O), dyspnea assessed by the modified MRC dyspnea scale (D), and exercise capacity, measured by the six-minute walk test (E). The BODE Index is a simple 10-point scale. Patients with higher BODE scores are at higher risk of death: the hazard ratio for all-cause mortality per one-point increase in the BODE score is 1.34.

Pulmonary Rehabilitation

Pulmonary rehabilitation is defined as a multicomponent, multidisciplinary program of care for patients with chronic respiratory impairment that is tailored to an individual’s needs and designed to optimize the individual’s physical and social performance and autonomy. A typical program incorporates physical training, disease education, and nutritional, psychological, and behavioural intervention.

Ideally pulmonary rehabilitation should be offered to and available for all COPD patients functionally disabled by their disease (usually Medical Research Council (MRC) grade 3 and above, characterized by walking slower than contemporaries because of breathlessness or needing to stop for breath when walking at own pace).

Pulmonary rehabilitation is a limited resource, according to a recently published national survey that sought to characterize adult pulmonary rehabilitation across Canada in terms of program distribution, utilization, content, and outcome measures. It revealed that only 1.2% of the COPD population had access to pulmonary rehabilitation.⁶ It is paramount that we encourage all our patients with COPD to become more active and to optimize bronchodilators to reduce dyspnea and improve exercise tolerance.

Patient Management

Smoking cessation is paramount; smoking is the single most important cause of COPD. It is crucial to identify this and to discuss smoking cessation with all patients. Smoking cessation is the most important modifiable behaviour for preventing or slowing the progression of COPD. It is never too early or too late to quit for life, as it is beneficial at any stage of the disease. Cutting down on smoking has never been shown to have any medical benefit. Principles of COPD management are presented in Table 4.

Annual influenza vaccination is recommended for all persons with COPD. Pneumococcal vaccination should be administered once and revaccination considered after 5 to 10 years.

Pharmacotherapy should be individualized to obtain

optimal improvement in quality of life.¹ The initial focus should be on deflation of the lungs with optimal bronchodilation using anticholinergics. The once-a-day long-acting agent tiotropium offers significant clinical benefit over the four-times-a-day short-acting agents.⁷⁻⁹ This improved lung function occurs mainly through improvement in inspiratory capacity, which results in reduced dyspnea, improved function, improved quality of life, and decreased exacerbations.⁷⁻⁹

A large Canadian COPD study by Aaron *et al.*¹⁰ has just reported results from a 1-year study of 449 individuals with moderate to severe COPD (FEV₁=39%). Patients were all given core treatment with the long-acting anticholinergic tiotropium in combination with placebo, salmeterol, or fluticasone-salmeterol. All patients had rescue salbutamol. One-year results showed no reduction in overall exacerbation rates among the three groups, but researchers detected a significant improvement in lung function, quality of life, and reduction in hospitalization rates in the group randomized to the addition of fluticasone-salmeterol to core tiotropium.

In the same week, Calverley *et al.*¹¹ reported results from very large 3-year COPD (FEV₁=44%) trial assessing the potential of long-acting beta-agonists (LABAs) and inhaled corticosteroids either alone or in combination to affect survival. The all-cause mortality rates were 12.6% in the combination-therapy group, 15.2% in the placebo group, 13.5% in the salmeterol group, and 16% in the fluticasone group. This corresponded to a difference of 2.6 percentage points or a reduction in the risk of death of 17.5% (p=.052) for the combination therapy group versus placebo. As compared with placebo, the combination regimen reduced the annual rate of exacerbations, improved health status, and spirometry. Interestingly, both groups assigned to fluticasone at 500 mcg twice

Table 4: Management of Chronic Obstructive Pulmonary Disease

Follow national guidelines
Encourage smoking cessation
Give annual influenza vaccination
Provide education
Give pneumococcal vaccination, at least once and possibly every 5 to 10 years
Inhaled bronchodilators are the mainstay of COPD pharmacotherapy: titrate to relieve dyspnea
Short-acting beta 2-agonists p.r.n.: supplemented by stepwise addition of:
Regular short- or long-acting anticholinergic inhalers
Add combination of ICS and LABA, preferably in single inhaler

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daily reported significantly more episodes of pneumonia.

Canadian guidelines¹ have always emphasized the beneficial role of anticholinergic inhalers in COPD as a safe, non-steroidal core management strategy. The role of inhaled corticosteroids (ICS) has always been controversial in COPD as opposed to asthma in which they have revolutionized the management and outcomes. It is important to remember that ICS are not first-line therapy for COPD, and there is presently no evidence to support initial maintenance therapy with combination products (combining ICS and LABAs) in COPD. New updates of guidelines will have to integrate the results from the two major new trials just reported. It is my opinion that in mild or moderate COPD long-acting anticholinergic therapy should remain the core therapy. For adherent individuals not responding or for those with severe impairment of lung function, as with many other conditions, addition of additional therapy—preferably a combination product with ICS and LABA in a single inhaler—will best compliment core anticholinergic therapy.¹⁰

It is crucial to remember that inhaler therapy and technique are not intuitive. Patients require careful instruction from all health care providers; in addition, adherence and inhaler technique should be checked and corrected at every visit. Spacer devices are particularly important for older adults using a meter dose inhaler. Access to a practice nurse or local COPD Certified Respiratory Educator is optimal.¹²

Long-Term Oxygen Therapy

Current evidence supports the prescription and administration of domiciliary oxygen (more than 15h/day to achieve Sa O₂ greater than 90%) in stable COPD patients with severe hypoxemia (Pa O₂ less than 55 mmHg) or in cases of right heart failure or erythrocytosis (hematocrit greater than 56%). Long-term oxygen therapy (LTOT) is further described in Table 5.

Survival benefit of domiciliary oxygen has been documented by the Medica Research Council (MRC) and Nocturnal Oxygen Therapy Trial (NOTT) study group randomized controlled trials.^{13,14} Both studies were conducted in hypoxemic COPD patients (oxygen pressure Pa O₂ < 60 mmHg), mostly males. Conclusions from these trials have been extrapolated to a variety of other circumstances and pathological conditions that were not part of the original studies, perhaps resulting in clinical practice extending beyond the scientific basis of effectiveness.

Table 5: Long-Term Oxygen Therapy

Long-term oxygen therapy (LTOT) is life prolonging for stable COPD patients with resting hypoxemia

There is little evidence to support prescribing LTOT during transient sleep or exercise-induced hypoxemia, or for dyspnea

The role of LTOT for smokers remains controversial

There are significant regional disparities in the reimbursement of LTOT

Table 6: Internet Resources: Guidelines and Tools

Global Initiative for Chronic Obstructive Lung Disease
www.goldcopd.com

Canadian COPD Guidelines www.copdguidelines.ca

Spirometry in Practice. A Practical Guide to Using Spirometry in Primary Care. 2nd Ed. British Thoracic Society (BTS) COPD Consortium. <http://www.brit-thoracic.org.uk/download347.html>

olated to a variety of other circumstances and pathological conditions that were not part of the original studies, perhaps resulting in clinical practice extending beyond the scientific basis of effectiveness.

Chronic Disease Management

Individuals with COPD benefit from regular follow-up and education. Canadian colleagues have demonstrated this. Dr. Jean Bourbeau, a physician practicing in Quebec, has implemented an extensive “Collaborative Self-Management” model for COPD and studied the outcomes from his program.^{15,16}

In the initial paper, individuals discharged from hospital after an exacerbation of COPD were assigned to a self-management program or usual care.¹⁵ The intervention consisted of a comprehensive patient-education program administered initially through weekly visits by trained health care professionals over a 2-month period, with monthly telephone follow-up. Prospective assessment over 12 months demonstrated hospital admission for exacerbations of COPD were reduced by 39.8% in the intervention group compared to usual care (p=.01) and admissions for other health problems by 57.1% (p=.01). Emergency department visits were reduced by 41% (p=.02) and unscheduled physician visits by 58.9% (p=.003).

The long-term impact of this self-management program “Living well with COPD” was recently reported.¹⁶ At 2 years, a statistically significant and clinically relevant reduction persisted in all-cause hospitalization of 26.9% and in all-cause emergency visits of 21.1% in the intervention group as compared to standard care group. These patients had advanced COPD with a mean FEV₁ of 1 litre and almost half reporting a dyspnea score of 5/5 (modified MRC).

Acute Hospital Admission

Patients admitted to hospital with an exacerbation of COPD account for about 10% of hospital admission (second only to CHF) and represent a substantial proportion of hospital cost, mainly due to the significant number of comorbidities and the fragile state of their health. Despite the heavy burden of COPD on acute care hospitals, few studies have explored the process or quality of care provided.

In a retrospective chart review of 105 COPD patients

admitted to a Toronto teaching hospital, 84% had at least one care gap identified.¹⁷ A more recent study evaluated the quality of care provided for COPD in 360 hospitals throughout the United States with a total sample of 69,820 patients hospitalized for acute exacerbations of COPD.¹⁸ Although 66% of patients received all the predefined recommended care processes, 45% of patients were provided with at least one nonrecommended care element. Individual hospital performance varied widely and, interestingly, those with a higher annual volume of admissions for COPD were not associated with improved hospital performance.

Urgent/ER Visits

Acute exacerbations of COPD and their complications are major drivers of health care utilization, including hospitalization. The risk of rehospitalization is high among individuals with COPD, with 40% of patients requiring readmission in the 12 months after their initial hospitalization.

Many patients also return to the emergency department frequently if the initial therapy is not optimal and follow-up not arranged. A study from Ottawa randomized 147 patients with COPD exacerbations suitable for discharge from the ER to a 10-day course of oral prednisone 40 mg once daily versus placebo.¹⁹ All patients received bronchodilators and a broad-spectrum antibiotic. The percentage of patients returning to the ER or for an unscheduled physician visit was reduced from 43% to 27% ($p=.05$) at 30 days in the prednisone group.

Many physicians approach even the common presentation of a patient with a COPD exacerbation quite differently. Initial therapy for COPD in the ER can be standardized by the development of preprinted, standing orders for the ideal management regimen for a person with COPD.^{18,20} Standing orders encourage guideline-based best standard of care and encourage a team consensus on common components of care such as the delivery of controlled oxygen therapy, optimal bronchodilation with inhaled medications, and prompt early therapy with oral prednisone and antibiotics.

Conclusion

COPD is a major health care issue among older adults. It is crucially important that we integrate this new information into practice and provide a positive approach for our patients, as COPD is both preventable and treatable. As physicians with an interest in health care of older adults, we should be championing opportunities within our institutions and in partnership with our primary care and allied health care professionals colleagues to facilitate an integrated approach to COPD based on guideline implementation, knowledge transfer, and improved outcomes for our patients.



No competing financial interests declared.

Key Points

Spirometry is the gold standard investigation for the diagnosis of COPD, and it should be made readily accessible for both patients and physicians.

COPD affects not only the lungs and breathing but may also induce muscle wasting and weight loss, pulmonary hypertension and cor pulmonale, anxiety, and depression; therefore, patients should be assessed for other features such as breathlessness and exercise limitation, frequency of exacerbation, and weight loss.

The BODE index is a composite measure that has been shown to better characterize and predict outcomes in COPD, including mortality, than single measures such as FEV₁.

Ideally, pulmonary rehabilitation should be offered to and available for all COPD patients functionally disabled by their disease (usually MRC grade 3 and above).

Smoking cessation is the most important modifiable behaviour for preventing or slowing the progression of COPD.

Pharmacotherapy should be individualized to obtain optimal improvement, initially focusing on deflation of the lungs with optimal bronchodilation using anticholinergics.

There is presently no evidence to support initial maintenance therapy with combination products (combining inhaled corticosteroids and long-acting beta-agonists) in COPD.

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