Breathing Light on COPD

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Chronic obstructive pulmonary disease (COPD) is a common systemic disorder caused mainly by smoking and is characterized by progressive, irreversible, or partially reversible, airflow obstruction, recurrent exacerbations and systemic manifestations (including weight loss, depression, right heart failure, polycythemia and skeletal muscle dysfunction).[1]

Diagnosis and severity

Previously published diagnostic criteria may have a tendency to over-diagnose COPD in select populations. The recent Canadian Thoracic Society (CTS) guidelines provides new criteria for the diagnosis of COPD—a post-bronchodilator FEV_1 (forced expiratory volume in one second) of < 80% and an FEV_1/FVC (forced vital capacity) ratio of < 0.7. If there is normalization of either of these parameters over time, an alternate diagnosis must be considered.[1]

Once the diagnosis of COPD has been confirmed by measuring FEV_1 with spirometry, a thorough evaluation is indicated to assess the severity of the disease (Table 1).

Traditionally, COPD severity has been classified according to the degree of reduction in FEV_1. This is too simplistic, since it does not accurately predict exercise capacity or survival as well as other measures, such as formal exercise testing or symptoms of dyspnea.[2,3]

In light of the need to describe COPD severity in more informative terms, the CTS has proposed a new classification scheme (Table 2) based on exercise

Bonnie's Breathing

- Bonnie, 68, has a 40 pack-year smoking history.
- She experiences exertional dyspnea while walking on an incline and, lately, has been having difficulty keeping up with her peers.
- Bonnie has a daily morning cough productive of clear to white sputum.
- Her symptoms have been stable during the past year.
- She has a history of hypertension.
- She has no allergies.
- Bonnie's physical examination is normal.
- Spirometry reveals an FEV_1 of 68%, predicted with an FEV_1/FVC ratio of 56%, with no significant change after bronchodilator administration.
- Her chest X-ray is unremarkable.

What should you do with Bonnie? For the answer, go to page 84.

FEV_1: Forced expiratory volume in one second
FVC: Forced vital capacity

Table 1

Initial assessment of patients with COPD

History

- Ongoing exposure to respiratory toxins (including cigarette smoke)
- Family history (alpha-1 antitrypsin deficiency)
- Degree of dyspnea
- Frequency and severity of exacerbations
- Current therapy

Physical examination

- Usually not diagnostic
- Evidence of right heart failure
- Body mass index

Investigations

- Spirometry (confirm diagnosis and assess baseline lung function)
- Chest X-ray (rule out other respiratory co-morbidities)
- Arterial blood gas measurements or oximetry*
- Formal assessment of exercise capacity (six-minute walk test or cardiopulmonary exercise test)*

* Indicated if more severe

COPD: Chronic obstructive pulmonary disease

Table 2

Severity of COPD

COPD stage	Symptoms
At risk	Asymptomatic smoker, ex-smoker or chronic cough/sputum, but post-bronchodilator FEV_1/FVC ≥ 0.7 and/or FEV_1 ≥ 80% predicted
Mild	Shortness of breath from COPD when hurrying on level ground or walking up a slight hill
Moderate	Shortness of breath from COPD causing the patient to stop after walking about 100 m (or after a few minutes) on level ground
Severe	Shortness of breath from COPD resulting in the patient being too breathless to leave the house, breathless after undressing or the presence of chronic respiratory failure or clinical signs of right heart failure

COPD: Chronic obstructive pulmonary disease
FEV_1: Forced expiratory volume in one second
FVC: Forced vital capacity

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capacity and modified from the Medical Research Council dyspnea scale.[1]

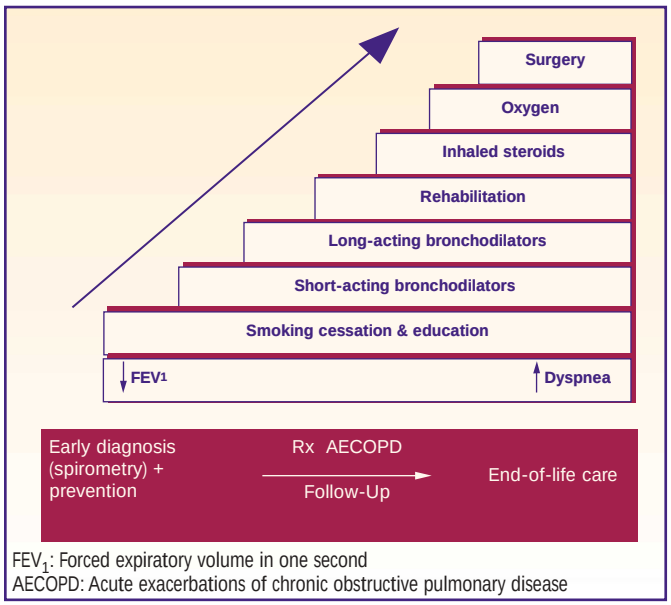
Treatment

Non-pharmacologic therapy includes smoking cessation, routine influenza and pneumonia vaccination,[1] and long-term supplemental oxygen therapy in patients with resting hypoxemia who meet criteria.

The benefits of pulmonary rehabilitation are well-established and include increased exercise capacity, decreased dyspnea, increased quality of life and a trend toward reduced utilization of health-care resources.[1,4] Unfortunately, lack of availability limits access to this valuable intervention for many patients.

Surgical options include lung volume reduction surgery (LVRS) and bullectomy. However, only a minority of patients are suitable candidates. Data from the Canadian Lung Volume Reduction Project demonstrate that LVRS is feasible and results in an improvement in dyspnea, pulmonary function, exercise capacity and quality of life.[5,6]

The largest trial evaluating LVRS, The National Emphysema Treatment Trial, recently demonstrated an improvement in survival



FEV_1: Forced expiratory volume in one second
AECOPD: Acute exacerbations of chronic obstructive pulmonary disease

Figure 1. Stepwise approach to therapy. Reproduced with permission of Can Resp J 2003; 10(4):184.

and exercise capacity in patients who had predominantly upper-lobe emphysema and a reduced exercise capacity.[7] Patients who did not have these characteristics benefited less and, in some, there was an increased risk of death.[7]

With the realization that COPD is different from asthma, there have been several recent advances in the approach to pharmacologic therapy. The CTS guidelines recommends an individualized, stepwise approach to therapy based on symptoms, the degree

More on Bonnie

Smoking cessation is discussed and recommended. Bonnie is advised to have a yearly influenza vaccination and a pneumonia vaccination every five to 10 years.

She is started on an albuterol and ipatropium inhaler, two puffs, four times daily as needed for symptoms of dyspnea, and a cardiopulmonary exercise test is arranged.

To find out what happened to Bonnie, go to page 86.

of functional impairment and the frequency of exacerbations (Figure 1).[1]

Short-acting bronchodilator agents and long-acting bronchodilator agents (LABDs) improve lung function and reduce dyspnea.[1] From a mechanistic perspective, it is now recognized that LABDs, particularly tiotropium, reduce dynamic hyperinflation and the subsequent work of breathing,[8] which helps to alleviate dyspnea and improve exercise capacity.

Although inhaled corticosteroids (ICS) should be routinely used in asthma, they are not considered first-line therapy in COPD. Studies evaluating ICS[9] have led to the CTS recommendation that they be used in patients with moderate to severe COPD who have three or more exacerbations per year.[1] Oral corticosteroid trials to assess ICS responsiveness have poor predictive capability in determining who will benefit and, therefore, are no longer routinely recommended.[1,9]

Phosphodiesterase inhibitors, such as theophylline, may be used in patients who remain symptomatic despite optimal inhaler therapy. Recently developed selective second-generation phosphodiesterase-4 inhibitors, including cilomilast and roflumilast, have anti-inflammatory effects that produce improvements in quality of life and lung function and reduce exacerbations.[10] Although these agents show promise, they are not yet available for use in Canada.

Recurrent exacerbations are a cardinal feature of COPD. Routine treatment is outlined in the CTS guidelines.[1] Exacerbations promote an accelerated deterioration in lung function and are associated with a substantial impact on quality of life and increased mortality.[1] In-hospital treatment with parenteral corticos-

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teroid followed by oral corticosteroids for a total of two weeks has shown to reduce recurrent exacerbation rates over the subsequent three months, decrease hospital stay and improve lung function.[11] Similar benefits using a 10-day course of prednisone has also been observed in outpatients.[12]

Prognosis

Although recent advances in COPD therapy provide a sense of optimism, the disease remains a major cause of morbidity and mortality. Dyspnea has been shown to be more predictive of mortality than FEV_1[3] and exacerbations are independently associated with increased mortality rates. Reduced functional capacity as assessed by the cardiopulmonary exercise test is also predictive of mortality.[13] Celli *et al.* recently developed the Body mass index, airflow Obstruction, Dyspnea and Exercise capacity (BODE) index, which predicts survival based on a cumulative score derived from the aforementioned factors.[14] These indexes may help to identify individuals with a higher mortality risk who should receive more intensive therapy and followup.

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Is Bonnie Better?

Bonnie returns two months later and reports that she has cut back on her smoking. She has less dyspnea when using the salbutamol and ipatropium inhaler.

Her exercise test shows mild impairment in exercise capacity. Bonnie is referred to a pulmonary rehabilitation program for education and exercise training.

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