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# Chronic Obstructive Pulmonary Disease (COPD)

By Lisa Kwok, B.Sc.Pharm., PharmD

**Statement of objectives**

Upon completion of this lesson, the pharmacy technician should be able to:

1. Understand the disease condition and symptoms of COPD.
2. Understand the treatments for COPD and their common side effects.
3. Recognize situations where a pharmacist consultation would be beneficial.

**Introduction**

Chronic obstructive pulmonary disease (COPD) is a lung disease characterized by progressive inflammation of the lungs, which leads to reduced airflow and decreased lung function.<sup>1</sup> It affects about four per cent of Canadian adults and was the fourth and fifth leading cause of death in men and women, respectively, in 1999.<sup>2</sup> Over the next 15 years, the impact of this condition on mortality and disability (such as hospitalization and sick leave) is predicted to increase.<sup>2</sup> Education and drug therapy are two important components of the overall management plan for patients with COPD. Pharmacists and pharmacy techs are readily accessible healthcare workers who can help patients better understand the condition, medication and strategies to slow disease progression.

**Description of COPD**

COPD is thought to result from inflammatory triggers, cigarette smoke in particular. Irritation provoked by triggers causes inflammatory mediators to release chemicals that are capable

of damaging and destroying the airways and lung tissue.<sup>2</sup> Continued irritation may lead the lungs to produce excessive mucus. Over time, restriction of airflow into the lungs occurs.

Symptoms include shortness of breath, chronic cough and increased sputum production. These progressively worsen with time and may exacerbate COPD. Patients may seek treatment only when symptoms become severe. Spirometry, a measure of lung function, is the gold standard for physicians to diagnose COPD.

COPD includes chronic bronchitis and emphysema. Chronic bronchitis is caused by excessive mucus secretion, resulting in airway obstruction due to swelling and inflammation of the bronchioles.<sup>4</sup> To be diagnosed with chronic bronchitis, chronic or recurrent mucus secretion with cough must be present on most days for at least three months of the year for at least two consecutive years.

Emphysema is characterized by an abnormal, permanent enlargement of lung airspace.<sup>4</sup> Destruction of the alveoli (small sacs in the lungs) occurs,

decreasing the surface area available for gas exchange. Without therapy, lung function slowly deteriorates.

COPD can be distinguished from asthma (see Table 1), although features of both conditions may be present in some individuals. Individuals with COPD may experience exacerbations due to excessive mucus production; however, this article will focus on the management of stable COPD and not treatment of these exacerbations.

**Risk factors**

Several risk factors exist for developing COPD. Cigarette smoking is the most significant,<sup>2</sup> accounting for 85-90% of cases.<sup>3</sup> Exposure to occupational dusts, chemicals and air pollution may also predispose an individual to COPD. Genetic risk factors include impaired lung growth, airway hyperresponsiveness and  $\alpha$ 1-antitrypsin deficiency.<sup>3</sup>

**Management**

Several guidelines have been published on the management of COPD.<sup>4,5</sup> Those issued by the Canadian Thoracic Society will be presented in this article.<sup>2</sup>

**Table 1: Clinical differences between COPD and asthma<sup>2</sup>**

	<b>COPD</b>	<b>Asthma</b>
<b>Age of onset</b>	<b>Usually &gt; 40 years</b>	<b>Usually &lt; 40 years</b>
Smoking history	Usually > 10 pack-years (e.g. 1 pack per day for 10 years)	Does not cause asthma, but may trigger an attack
Sputum production	Often	Infrequent
Allergies	Infrequent	Often
Disease course	Progressive worsening (with exacerbations)	Stable (with exacerbations)

There is no known cure for COPD. Treatments that are currently available help relieve symptoms and improve quality of life.<sup>2,4,5</sup>

Treatment goals are to prevent disease progression, relieve symptoms, improve exercise tolerance and prevent exacerbations. A stepwise approach is recommended based on the severity of symptoms, which can range from mild to severe.<sup>2,5</sup> For all patients, smoking cessation should be encouraged and education should be provided, including discussion of a self-management plan. Regular exercise should also be recommended to maintain a healthy lifestyle. Drug therapy, such as a bronchodilator, should be prescribed to control symptoms. As symptoms progress, some patients may benefit from inhaled corticosteroids, while supplemental oxygen should be reserved for those with severe disease.

#### Smoking cessation

Cigarette smoking is the single biggest cause of COPD<sup>2</sup> and

smokers should be encouraged to quit. Of all interventions, smoking cessation is the most important. It reduces the risk of developing COPD and is the only therapeutic measure shown to slow its progression.<sup>2</sup>

A comprehensive review of smoking cessation is addressed in the Spring 2006 issue of *Tech Talk CE*. PDF copies of lesson are available for download at [www.novopharm.com](http://www.novopharm.com).

#### Immunizations

All individuals should be encouraged to receive an annual influenza vaccine. Serious illness and death from influenza can be reduced by 50% in COPD patients who are vaccinated.<sup>5</sup> Anaphylactic-type egg allergy is a contraindication to receiving the influenza vaccine. Although the benefit of pneumococcal vaccination is less well established in COPD patients, it is still recommended.

#### OTC products

Regular use of antitussives (e.g., dextromethorphan) is contraindicated in stable

COPD, as coughing may have a protective role.<sup>5</sup> There is limited information on the effectiveness of expectorants (e.g., guaifenesin) in patients with COPD. Pharmacy technicians who notice COPD patients self-selecting cough and cold remedies should direct them to the pharmacist for further assessment.

#### Bronchodilators

Bronchodilators are the cornerstone of COPD management. Beta<sub>2</sub>-agonists and anticholinergics (both administered by inhalation), as well as methylxanthines (administered orally) are the three major classes of bronchodilators used to treat COPD (see Table 2). They reduce airway smooth muscle tone, thereby opening up the airways and minimizing airflow restriction. Inhaled therapy is preferred over oral therapy as it targets the airways directly, with less risk of adverse effects.<sup>2</sup>

#### Beta<sub>2</sub>-agonists

All patients with infrequent, mild symptoms should be pre-

scribed a short-acting beta<sub>2</sub>-agonist (SABA) that may be used as needed (prn). When symptoms are more frequent or severe, regular scheduled dosing may be required. In general, as the disease progresses, patients will need to use bronchodilators regularly.<sup>7</sup>

SABAs have a relatively rapid onset of action, with bronchodilation taking place within five to 15 minutes. The duration of action is about two to six hours.

For individuals who require regular beta<sub>2</sub>-agonists throughout the day, a long-acting beta<sub>2</sub>-agonist (LABA) inhaler is more effective and convenient than multiple daily doses of a SABA.<sup>5</sup> SABAs should still be used prn for immediate symptom relief.

Beta<sub>2</sub>-agonists cause such central nervous system adverse effects as tremor, irritability and insomnia.<sup>2</sup> In patients with coronary artery disease, beta<sub>2</sub>-agonists may cause angina.<sup>2</sup>

#### Anticholinergics

When symptoms are present daily, regular use of an anticholinergic agent is recommended.<sup>8</sup> These agents are not useful on a prn basis for relief of acute symptoms, due to their slow onset of action.<sup>3</sup>

Ipratropium inhaler has an onset of action of 1.5 to two hours and a duration of action of four to six hours. It is usually administered three to four times daily. The combination of ipratropium and salbutamol may produce better bronchodilation than either agent

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**Pharmacy**  
PRACTICE

Table 2: Selected pharmacologic agents used to treat COPD<sup>10</sup>

	Drug Adult Dosage	Adverse effects
<b>Short-acting beta<sub>2</sub>-agonists (SABAs)</b>		
Salbutamol	100 µg/puff: 1-2 puffs q2-6h prn Max 8 puffs/day	Tremor, nervousness, tachycardia, palpitations
Fenoterol	100 µg/puff:same as above	See salbutamol
Terbutaline	100 µg/puff: max 6 puffs/day	See salbutamol
<b>Long-acting beta<sub>2</sub>-agonists (LABAs)</b>		
Salmeterol	MDI: 25 µg/puff: 2 puffs BID Diskus: 50 µg/inhalation: 1 inhalation BID	See salbutamol
Formoterol	12 µg/puff: 1 puff BID (May increase to 2 puffs BID if needed)	See salbutamol
<b>Anticholinergics</b>		
Ipratropium	20 µg/puff: 2-4 puffs TID-QID, up to 6-8 puffs TID-QID if tolerated	Dry mouth, metallic taste
Tiotropium	18 µg inhaled once daily	Dry mouth
<b>Anticholinergic/beta<sub>2</sub>-agonist combination</b>		
Ipratropium bromide/salbutamol	MDI 20 µg/100 µg/puff: 2 puffs q6hprn	See beta <sub>2</sub> -agonists, anticholinergic agents above
<b>Methylxanthines</b>		
Slow-release theophylline	300-900 mg/day	Nausea, vomiting, abdominal cramps, nervousness, tremor, insomnia, tachycardia
<b>Inhaled Corticosteroids</b>		
Beclomethasone	400-800 µg BID	Oral candidiasis, hoarseness
Fluticasone	200-500 µg BID	See beclomethasone
<b>Inhaled corticosteroid/long-acting beta<sub>2</sub>-agonist combinations</b>		
Budesonide-formoterol	200/6 µg: 2 inhalations BID	See beclomethasone, formoterol above
Fluticasone-salmeterol	125/50, 250/50µg: 1 inhalation BID	See fluticasone, salmeterol above

MDI=metered dose inhaler

alone; this combination is available in a single inhaler, which may be convenient for some patients.<sup>2</sup>

Tiotropium bromide has a longer duration of action than ipratropium, which enables once-daily administration. Its onset of action occurs within 30 minutes. Randomized controlled trials have shown that tiotropium improves symptoms as well as reduces exacerbations and hospitalization rates to a greater degree than ipratropium or placebo.<sup>2</sup> Tiotropium is delivered by dry powder inhalation. Patients should be instructed to load a capsule into the HandiHaler inhalation device. After puncturing the capsule, the contents can be inhaled. Tiotropium capsules are available in foil blister cards. Patients should be advised that once a strip is

opened, the shelf life of the remaining capsules in the strips is five days.<sup>9</sup>

Anticholinergic side effects (in addition to those listed in Table 2) include constipation, blurred vision and urinary retention.

#### *Methylxanthines*

The methylxanthine theophylline has bronchodilatory properties, which may be beneficial in treating COPD.<sup>8</sup> Other known benefits include improving respiratory muscle functioning and stimulating the respiratory centre.<sup>4</sup> It is usually used if symptoms persist despite combined bronchodilator therapy.<sup>7</sup> A slow-release oral formulation is preferred, as it allows for more consistent serum concentrations and enhances patient compliance.<sup>7</sup>

Routine laboratory monitoring is recommended to ensure that theophylline levels remain in the recommended therapeutic range (about 10-15 mcg/mL).<sup>8</sup> Higher levels may produce adverse effects.

Theophylline is metabolized in the body by the enzyme cytochrome P450 1A2. Other medications may affect the rate at which this enzyme metabolizes theophylline, resulting in many drug interactions.

Frequent adverse effects of theophylline include nausea, vomiting, headache, anxiety, insomnia, tremor, diarrhea and irritability.

#### **Inhaled corticosteroids (ICS)**

In contrast to asthma, where ICS are considered agents of choice, ICS are recommended for patients with moderate to

severe COPD who experience frequent acute exacerbations.<sup>2</sup> They should not be considered first-line agents.

Side effects of ICS include hoarseness, sore throat and oral candidiasis. Gargling and rinsing of the mouth should be encouraged after using an ICS to minimize the development of oral candidiasis.

#### **Education**

Proper inhaler technique is important to ensure that the appropriate amount of drug is delivered to the lungs. Various types of inhaler devices are available, such as metered-dose, dry powder and disk inhalers. Inhalation technique should be reassessed periodically. Each time an inhaler prescription is picked up at the pharmacy, the pharmacy technician can reinforce the

importance of proper inhalation technique to achieve optimal benefits. Technicians may ask when the last reassessment of technique was performed. Using spacer devices (e.g., Aerochamber) may also be recommended with metered-dose inhalers to enhance drug delivery to the lungs.

### The technician's role

Pharmacy technicians can work with pharmacists to improve the health of patients with COPD.

Smoking status should be determined each time a new prescription is filled and all smokers should be encouraged by the pharmacy team to quit. Those who are ready to quit would benefit from further information from the pharmacist, such as behavioural counselling and information on smoking cessation aids. If patients are purchasing nicotine replacement therapy (NRT) products, the technician can congratulate and encourage the patient's efforts to become abstinent. Further questions about NRT side

effects or dosing can be referred to the pharmacist.

The pharmacy team can promote healthy outcomes for COPD patients by asking if they have received their annual influenza vaccination. Pharmacy technicians can also provide information on upcoming flu clinics offered at the pharmacy or within their local community.

In addition, technicians can stress the importance of using inhalers correctly. Those who need education or their periodic review of technique can be passed to the pharmacists for a consultation.

OTC medications have no role in COPD and pharmacy technicians can ensure that patients they know who have COPD be seen by a pharmacist to ensure these products are being used appropriately.

### Summary

COPD is a progressive condition characterized by reduced airflow into the lungs due to excessive mucus and damage to the airways and lung structure. Smoking cessation is the

only intervention that has been shown to reduce the rate of decline in lung function in COPD. Pharmacologic treatments help to relieve symptoms, and improve exercise ability and quality of life.

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## QUESTIONS

Please select the BEST ANSWER for each multiple choice question.

1. Symptoms of COPD include all of the following except:

- Cough
- Shortness of breath
- Wheezing
- Sputum production

2. Which of the following are OTC smoking cessation aids?

- Nicotine patch
- Nicotine inhaler
- Theophylline
- a & b
- a, b & c

3. Which of the following should be recommended for patients with COPD?

- Smoking cessation
- Antitussives

- Exercise
- a & b
- a & c

4. Bronchodilators include all of the following except:

- Terbutaline
- Formoterol
- Budesonide
- Ipratropium
- Theophylline

5. All of the following are recommended first- or second-line therapies in COPD except:

- Tiotropium
- Dextromethorphan
- Beclomethasone
- Salmeterol

6. Which bronchodilator(s) can be recommended for acute relief of symptoms?

- Salbutamol
- Formoterol
- Ipratropium
- a & b
- a & c

7. Which of the following drug combinations is/are likely to be used in practice?

- Salmeterol & fluticasone
- Salbutamol & ipratropium
- Tiotropium & ipratropium
- a & b
- a, b & c

8. Which of the following side effect(s) occur(s) with short-acting anticholinergic agents?

- Metallic taste
- Dry mouth
- Tachycardia
- a & b
- b & c

9. In a COPD patient who continues to smoke, which of the following medications would be affected?

- Theophylline
- Salmeterol
- Tiotropium
- Beclomethasone

10. Which auxiliary label(s) should be affixed to a fluticasone/salmeterol diskus inhaler?

- Shake well before using
- Rinse mouth after use
- Warning: Do not exceed recommended dose prescribed by your MD.
- b & c
- a, b & c

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