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Management of Adult Asthma

By Karen Ng, BScPhm, ACPR

Statement of objectives

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

1. Identify the symptoms of asthma and understand the therapeutic approach to asthma treatment.
2. Identify the categories of medications used to treat asthma and the indications and common adverse effects of drugs in these categories.
3. Understand the proper technique for the administration of the various dosage forms used in the treatment of asthma.

Introduction

Asthma, a Greek word for "panting" was recognized more than 2000 years ago. The word itself was described by Hippocrates to mean episodic shortness of breath. Asthma now refers to a reversible inflammatory disease of the airways caused by over-activity to stimuli.¹ An estimated 2.7 million Canadians suffer from asthma. Although 287 Canadians died from asthma in 2003, mortality rates have fallen since the 1990s due to improved asthma education and advancements in drug therapy.² Pharmacists and pharmacy technicians play an important role as healthcare providers in educating and empowering people with asthma to better control their symptoms so they can lead active, healthy lives.

About the disease

Asthma is a chronic condition characterized by airway inflammation that results in episodes of airflow limitation and respiratory symptoms. Asthma symptoms include wheezing, breathlessness, chest tightness and cough. These symptoms are the result of exposure to allergens, viruses, and indoor or outdoor pollutants that trigger the release of inflammatory mediators, which in turn cause airway injury, hypersecretion of mucus and bronchospasm.¹ These symptoms can be more severe in the early morning and can be brought on by cold air or exercise.

Asthma can present during childhood, where allergies and positive family history are often predisposing

factors. However, 30 to 70% of children with asthma become symptom-free by adulthood.¹ Adult-onset asthma usually presents after the age of 20. It is more common in women, less likely to be caused by allergies, less commonly associated with a family history of asthma, but may be associated with exposure to occupational and environmental pollutants.¹ Asthma can also present seasonally, nocturnally or be exercise-induced. This lesson focuses on chronic adult asthma.

Management

The goal of treatment is to reduce bronchial inflammation and the resultant bronchial spasm and achieve long-term control of asthma. This is accomplished through avoidance of asthma triggers, early initiation of anti-inflammatory therapy, use of short-acting bronchodilators on an as-needed basis, and prevention of exacerbations. The various drugs used to control asthma are summarized in Table 1.³ Controlling the environment through minimizing exposure to indoor and outdoor allergens and pollutants is necessary for optimal management of asthma. Long-term control of asthma is defined by several criteria, such as daytime symptoms occurring on fewer than four days per week, no nighttime symptoms, occurrence of only mild exacerbations, and use of fewer than four doses per week of a short-acting beta₂-agonist (SABA).⁴

This article discusses the management of adult asthma according to the 2003 guidelines published in the Canadian



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Asthma Consensus report endorsed by the Canadian Thoracic Society.⁴ Based on the severity of symptoms, therapy follows a stepwise approach (see Table 2). In patients with very mild asthma, short-acting bronchodilators are used as needed to relieve asthma symptoms. The use of fewer than four doses of a SABA per week indicates good asthma control. In mild to severe asthma, daily use of maintenance anti-inflammatory medications, such as an inhaled corticosteroid (ICS), is recommended. If patients are still not optimally controlled, the addition of long-acting beta₂-agonist (LABA), leukotriene receptor antagonist (LTRA) or theophylline may be considered. In cases of very severe asthma, oral corticosteroids may be added to ICS therapy for a short period of time (5-10 days) to gain control of asthma symptoms. Once that is achieved, oral steroids can be discontinued.

Bronchodilators

Bronchodilators relax airway smooth muscles, thereby reducing constriction. Inhaled therapies are preferred, as they provide drug delivery directly to the airways, with less systemic effects than oral agents.

Beta₂-agonists SABAs are the recommended agents for the relief of acute symptoms for all asthma patients and for the prevention of exercise-induced bronchoconstriction. They have an onset of action of one to five minutes, and duration of three to six hours after each inhalation. SABAs should only be used as rescue medications because regular use may be associated with deterioration of asthma control.³

In patients with moderate to severe asthma who are still experiencing symptoms despite

moderate doses of an ICS and who require frequent use of a SABA (more than twice daily), a LABA may be added as maintenance therapy. This provides long-term relief of symptoms, and helps to control nocturnal asthma.³ Although a LABA does not improve the underlying inflammatory process of asthma, several studies have found that adding a LABA to a lower dose of ICS is more effective in preventing asthma exacerbations than increasing the dose of ICS. LABAs have been found to reverse bronchoconstriction more effectively than a SABA, theophylline or LTRA, when used in addition to an ICS.⁴

Salmeterol and formoterol are the two currently available LABAs. They have an onset of action of 10 to 30 and 3 to 10 minutes, respectively: both have a duration of action of more than 12 hours. A LABA alone is not recommended as a rescue medication for acute asthma symptoms.⁵

Leukotriene receptor antagonists These agents are used to treat chronic asthma and to prevent exercise-induced bronchoconstriction. The LTRAs inhibit leukotrienes, which are inflammatory mediators produced in the airways during an asthma attack.³ Although LTRAs have anti-inflammatory properties, their potential to change the course of asthma has not been confirmed.⁶ They are therefore a second choice (i.e. an alternative to a LABA) as an add-on therapy to ICS.⁴ LTRAs have modest immediate bronchodilation effects, and improvement in asthma symptoms is usually seen within one week of therapy.⁷

Methylxanthines The methylxanthine theophylline is considered a third-line agent in the

treatment of severe asthma because of its weak bronchodilatory effects and potential for significant side effects. Theophylline may be used in situations where asthma control is still not achieved with other maintenance therapies, such as ICS, LABAs or LTRAs. Some anti-asthma effects of theophylline include improving the clearance of mucus and strengthening the contraction of respiratory muscles.¹ For treating asthma, sustained-release theophylline products are preferred, as they minimize fluctuations in drug levels within the body. Routine laboratory monitoring of theophylline blood levels to a target therapeutic range of 28-55 µmol/L is recommended. Higher levels may produce drug toxicity.⁸ Theophylline is metabolized by CYP 1A2 liver enzymes. Since many medications can affect the rate at which these enzymes metabolize theophylline, there is potential for many drug interactions.¹

Anticholinergics Anticholinergic agents, such as inhaled ipratropium, are not recommended as first-line agents in acute or chronic asthma. They are less potent bronchodilators than SABAs and have a slower onset of action. These agents can be used as rescue medications during acute exacerbations, in patients who are unable to tolerate SABAs. Their benefits in long-term asthma management have not been established.⁶

Corticosteroids

Inhaled The predominance of airway inflammation in the pathophysiology of asthma explains the importance of anti-inflammatory agents such as ICS. They are considered first-line therapy in chronic asthma and should be used as maintenance therapy in mild to severe

Table 1: Pharmacological agents used to treat asthma³

Drug Class	Example	Most Common Adverse Effects
Short-acting beta ₂ -agonist (SABA)	salbutamol, terbutaline	Tremor, tachycardia, palpitations
Anticholinergic	ipratropium	Dry mouth, metallic taste
Long-acting beta ₂ -agonist (LABA)	salmeterol, formoterol	Tremor, tachycardia, palpitations
Methylxanthines	theophylline sustained-release	Nausea, vomiting, headache, abdominal discomfort, nervousness, insomnia, tremor
Inhaled Corticosteroids (ICS)	fluticasone, beclomethasone, budesonide, ciclesonide	Candidiasis and hoarseness
Systemic (oral) Corticosteroids	methylprednisolone, prednisolone, prednisone	Adrenal suppression, skin thinning, hyperglycemia, fluid retention, weakened bones, mood changes, insomnia, nausea, vomiting
Inhaled Corticosteroids/ Long-acting beta ₂ -agonist combinations	budesonide/formoterol	Candidiasis, hoarseness, tremor, tachycardia, palpitations
	fluticasone/salmeterol	Candidiasis, hoarseness, tremor, tachycardia, palpitations
Leukotriene Receptor Antagonist (LTRA)	montelukast, zafirlukast	Headache, stomach upset

Table 2: Continuum of asthma management^{1,4}

Asthma severity	Symptoms	Treatment requirement
Very mild	Infrequent	None, or inhaled short-acting β_2 -agonist on demand prn
Mild	< 2 times a week	Occasional short acting β_2 -agonist and low-dose inhaled corticosteroid
Moderate	Daily	Short-acting β_2 -agonist prn and moderate doses of an inhaled corticosteroid with or without additional therapy.
Severe	Continual symptoms	Short-acting β_2 -agonist prn and high doses of an inhaled corticosteroid plus additional therapy.
Very severe	Continual symptoms	Short-acting β_2 -agonist prn and high doses of an inhaled corticosteroid, plus additional therapy and an oral corticosteroid.

asthma. They improve lung function, reduce the frequency of exacerbations and ultimately improve quality of life. The control of inflammation is most evident when ICS are used regularly. Patients should be controlled on the lowest possible dose of ICS to minimize systemic side effects. They should also be encouraged to rinse their mouth and expectorate after each inhalation, to reduce oropharyngeal deposition of the drug. A spacer, (e.g., an Aerochamber[®]) is a device that can be attached to the end of an inhaler to help patients receive their medications when they have difficulty with proper inhaler technique. The addition of a spacer to the inhaler will also help to decrease oropharynx deposition, and will enhance drug delivery to the lungs.

Oral Oral corticosteroid therapy is reserved for treating very severe persistent asthma. Short courses of oral or parenteral steroids may be used for the first few days of therapy to control an acute asthma exacerbation.^{4,6}

Combination products

There are two combination inhalers available for asthma: both contain a LABA and a corticosteroid (see Table 1). Both products are equally effective in controlling moderate to severe asthma. There is evidence that LABAs and ICS have complementary mechanisms of action, working synergistically to improve clinical effectiveness.⁹ Studies have shown that combination LABA and ICS therapy is more effective than ICS alone: combination therapy is also well tolerated, convenient and improves patient compliance.⁵

Recent evidence supports the use of the budesonide-formoterol combination inhaler as a single-inhaler for both maintenance and reliever therapy. It has been shown to be as effective as salbutamol in relieving acute asthma symptoms. This single-inhaler has also been shown in several studies to be more effective than using separate SABA and ICS inhalers for maintenance therapy

(i.e., to reduce the number and severity of asthma exacerbations). It is important to note that formoterol is faster-acting than the other LABA, salmeterol: therefore salmeterol-ICS combination products cannot be used as a rescue medication.⁹

OTC products

Patients may attribute symptoms of shortness of breath, coughing and sputum production to the common cold; however, these symptoms may in fact represent worsening asthma or other disease states, such as chronic obstructive pulmonary disease, pneumonia, or bronchitis. Nonprescription cold medications, such as antitussives (e.g., dextromethorphan), expectorants (e.g., guaifenesin), and decongestants (e.g., pseudoephedrine) are not recommended to be used in lieu of prescription products for asthma. The dependence on such nonprescription products could allow an underlying condition to go undiagnosed and/or unchecked. If pharmacy technicians observe a patient self-selecting a cough and cold product, they should direct the patient to the pharmacist for further assessment.

Dosage forms

As previously explained, to minimize systemic adverse effects, most asthma medications are given by the inhalation route. There are a number of dosage forms available for use by inhalation and they can be divided into two basic categories: dry powders and metered dose inhalers (MDIs). The MDI has an ingredient called a propellant that aids in the release of the drug from the inhaler. The second type of inhaler includes several different dosage forms, where the drug is a powder, and the patient draws these medications into the lungs by inspiration. Compared to the MDI, the strength of the individual's inspiration must be stronger to move the drugs into the lungs with the powder dosage forms. These powdered dosage forms are often referred to as breath-activated and they

include turbuhalers, diskhalers, diskus and handi-halers. Each of these devices is used slightly differently. It is beyond the scope of this article to describe them in detail. An additional dosage form is a nebulizer or liquid used in a nebulizer. It requires the addition of the drug as a liquid (and usually a diluent) to a machine called a nebulizer, which vaporizes the medication and the patient breathes the drug through a mask. This dosage form is used for patients who do not have the inspiratory strength to inhale medication into their lungs.

The technician's role

Under the supervision of a pharmacist, technicians can contribute to improving asthma management in numerous ways. Patients should be educated about the two different roles of asthma medications—those being used to prevent and control asthma versus those used only to relieve acute symptoms. Since there are numerous types of inhaler devices (e.g., dry powder, MDIs) assessing proper inhaler technique is important to ensure that the medication is being adequately delivered to the lungs. Technicians should familiarize themselves with each dosage form by reviewing the package insert for directions on proper inhaler technique. Each time an inhaler is dispensed, the pharmacy technician can reinforce the importance of proper inhaler technique and can direct the patient to the pharmacist for technique reassessment.

Pharmacy technicians can also play a vital role in monitoring medication use by notifying the pharmacist when asthma medications are being refilled too early or too late. In such instances, this may be a sign of poorly controlled asthma or noncompliance.

Lastly, smoking status should be determined each time an asthma medication is being filled. Smoking worsens lung function, increases airway inflammation and recent studies have shown that it may decrease the effectiveness of cortico-

steroid therapy.¹⁰ Smoking cessation should be encouraged by the pharmacy team. Pharmacy technicians should refer patients interested in quitting to the pharmacist for further information and counselling on products.

Summary

Asthma is a chronic inflammatory disease of the airways. Pharmacists and pharmacy technicians can help improve the management of asthma by teaching patients about environmental control measures, and appropriate use of their medications. Patients equipped with such knowledge and effective drug therapy are in a better position to control their asthma.

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► QUESTIONS

Please select the best answer for each question or answer online at www.pharmacygateway.ca for instant results.

1. The following are symptoms of asthma except:

- Wheezing
- Hypersecretion of sputum production
- Chest tightness
- Cough

2. Asthma symptoms can be triggered by:

- Animal dander
- Workplace pollutants
- Tobacco smoke
- All of the above

3. Which of the following contributes to good long-term control of asthma:

- Avoiding triggers
- Use of prn anti-inflammatory agents
- Frequent use of SABAs
- Exposure to indoor/outdoor pollutants

4. Bronchodilators include which of the following:

- Theophylline
- Salmeterol
- Prednisone
- A and B

5. All the following are true, except:

- Patients with moderate asthma may require as needed SABA, maintenance ICS and LABA.
- Theophylline has many side effects and requires laboratory monitoring.
- Salbutamol, salmeterol and ipratropium can all be used as rescue medications.
- ICS, LABAs, LTRAs and theophylline are all options for maintenance therapy.

6. Potential side effects of systemic corticosteroids include all of the following except:

- Hypoglycemia
- Thinning skin
- Fluid retention
- Mood changes

7. Which drug combinations can be used in asthma management?

- Salbutamol and fluticasone
- Fluticasone and montelukast
- Budesonide and formoterol
- All of the above

8. The following are steps for appropriate metered-dose inhaler use except:

- Shake the inhaler.
- Breathe out before inhalation.
- Hold breath for 10 seconds after inhalation.
- Press down inhaler and breathe in rapidly.

9. Which auxiliary label(s) should be affixed to a Flovent® inhaler

- Shake well before use.
- Rinse mouth after use.
- a and b are both correct
- neither a or b are correct

10. Which of the following is considered first-line therapy in chronic asthma:

- Theophylline
- ICS
- Formoterol
- Prednisone

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