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INSTRUCTIONS

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pharmacy PRACTICE + BUSINESS

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Asthma Care

by Taylor Raiche, BSP, ACPR

Learning objectives

After completing this lesson, the pharmacy technician participant will be able to:

1. Describe the general approach to managing asthma with inhaled medications and identify drugs from the two major classes of inhaled therapies.
2. Recognize signs and symptoms of suboptimal asthma control.
3. Compare and contrast the advantages, disadvantages, and instructions for use for each type of inhaler device.
4. Interpret patient-specific factors that could aid in selecting a particular inhaler device.
5. Outline the role of the pharmacy technician in supporting asthma care.

Asthma is an inflammatory disorder of the airways characterized by difficulty breathing, chest tightness, wheezing, sputum production and cough, associated with variable airflow limitation and airway hyper-responsiveness to a number of stimuli.[1]

Asthma is the third most common chronic disease in Canada, affecting more than 3.8 million Canadians.[2] Often first diagnosed early in life, it is the most common chronic condition among children.[2] Nearly 20% of children are diagnosed with asthma by age 12 and its prevalence peaks in the age 10–14 group for males (22.2%) and age 15–19 for females (17%).[3] Asthma is more prevalent among Indigenous persons than among other Canadians.[4,5]

Background

Presentation

Not all people with asthma share the same symptoms, but generally most describe some variation of episodic shortness of breath, wheezing, chest tightness and chronic coughing.[6] These symptoms can become chronic and may decrease quality of life if treatment is suboptimal. People with asthma often have overlapping medical conditions such as allergic rhinitis and atopic dermatitis (eczema).[7]

Morbidity and mortality

Poorly controlled asthma is the leading contributor to absenteeism from school and hospitalizations in childhood.[2] Living with persistent, daily asthma symptoms can decrease quality of life and poor symptom control is clearly associated with increased risk of asthma exacerbations.[7] Severe exacerbations of uncontrolled asthma can be fatal, as can certain cases of controlled asthma triggered by an offending stimulus.

Diagnosis

Spirometry is an objective test that assists in confirming an asthma diagnosis. A person first inhales a large breath, then exhales into a tube attached to a spirometer that records the volume of air the person exhales and the speed with which they were able to exhale. Below-normal results can point toward asthma when taken with the clinical context of the patient's symptoms.

If the results improve after a dose of an inhaled bronchodilator (see Asthma therapeutics), the airways demonstrate reversibility, which differentiates asthma from chronic obstructive pulmonary disease (COPD). Reversible airway obstruction is the hallmark of the asthma diagnosis.

Not all patients using chronic inhaled therapies will have had documented spirometry. It is worth asking a patient if they have had a "lung test" or "breathing test" at the time of diagnosis or in follow-up. Patients should be encouraged to inquire with their primary care provider about spirometry testing if they do not recall previously having this assessed.

Triggers

In asthma, inflammation causes the airway lining to become irritated and swollen, which can exacerbate symptoms. Common triggers of inflammation include allergens like pollen, dust mites, dander and mold spores, as well as irritants such as strong scents, air pollution and tobacco smoke. Symptoms may be cyclic and flare at certain times of year (e.g., harvest in the fall, snow melt in spring). Viral respiratory infections, exercise, cold air, certain medications and strong emotions can also worsen asthma symptoms or provoke an acute flare by causing acute bronchoconstriction or narrowing of the airways.

Patients who choose to smoke and "vape" should always be encouraged to quit, regardless of whether they have a diagnosed respiratory disease or not. At every encounter, healthcare professionals, including pharmacy technicians, should ask patients who smoke or vape if they are interested in quitting (see Role of the pharmacy technician in asthma care).[8]

Goals of treatment

The main goals of asthma management are to achieve satisfactory symptom control to maintain normal daily activities, and to minimize the risk of exacerbations and asthma-related death.[7] Asthma is generally "well controlled" when patients experience symptoms on fewer than four days per week, need less than four doses per week of their fast-acting (reliever) medication, have no nighttime symptoms, or do not miss school or work because of asthma.[1] It is important to note that patients or their caregivers might define asthma "control" differently, such as how quickly the medication relieves their symptoms, so this should be clarified when talking to patients/caregivers.[7,9] Patients experiencing shortness of breath, difficulty breathing, or coughing fits should seek medical attention for a review of their asthma medications' appropriateness.

Patients may develop an "asthma action plan" with their physician, pharmacist or certified respiratory educator. The plan will provide them with directions on what to do when their asthma becomes symptomatic. Specifically, it includes patient-specific information about how to titrate their inhalers to maximum doses and intervals to control their symptoms, when to add in oral steroids and/or antibiotics, and when to seek urgent medical attention. An example of an asthma action plan can be found at: https://kidshealth.org/en/parents/action-plan-sheet.html. Pharmacy technicians can identify whether patients have a written plan and should encourage adherence to that plan with close follow-up from their pharmacist and primary care provider when symptoms seem to become less controlled.

Asthma therapeutics

There is currently no cure for asthma, but symptoms can be controlled with drug therapy and a healthy lifestyle. The first-line drug therapy treatments for asthma are delivered directly to the respiratory tract. Powders, mists and sprays inhaled through the mouth transport drugs to the airways where they work on specific receptors to either dilate the bronchioles or reduce underlying inflammation. Because they work locally in the respiratory system, absorption is minimal and systemic adverse effects can be largely avoided with proper device technique.

Unfortunately, up to 90% of people using inhaled drug delivery systems demonstrate critical errors when self-administering these medications.[10,11] Frequent inhaler education reinforces proper technique and has been shown to improve clinical outcomes, but people tend to deviate from optimal technique over time without frequent reinforcement.[12,13]

I. Major classes of inhaled drug therapies

Inhaled corticosteroids (ICSs)

Corticosteroids decrease inflammation to prevent future decline in lung function and associated exacerbations, and are necessary to control baseline symptoms. When inhaled, the corticosteroid works directly on the airways to address the underlying inflammation. Reaching the maximal benefit of these medications takes time, and patients may not necessarily be able to "feel" the medication working as they might with bronchodilators, as described below. All patients should be using an ICS. If asthma symptoms are infrequent (i.e. less than twice monthly), patients may use an ICS as needed at the same time as a beta2-agonist reliever medication (see Beta2-agonist bronchodilators). Moderate to severe asthma requires regular adherence to an ICS with as-needed beta2-agonist for symptom relief. Patients should be counselled to rinse their mouth with

water after use of an ICS to avoid getting oral thrush (fungal growth). If administering an ICS through a spacer with a mask, patients should wipe their mouth area with a damp cloth.

- Examples of inhaled corticosteroids: beclomethasone, budesonide, ciclesonide, fluticasone furoate, fluticasone propionate, mometasone

Beta2-agonist bronchodilators

Short- and long-acting inhaled beta2-agonists (SABAs and LABAs) work by dilating the airways to relieve shortness of breath and wheezing. SABAs provide relatively fast and noticeable relief of symptoms during acute exacerbations or when used for prevention of exercise-induced symptoms. While patients should be encouraged to carry a fast-acting therapy on their person to treat acute symptoms, it is crucial to ensure that patients using a SABA as needed for symptom relief are using an ICS regularly to control underlying airway inflammation, as previously mentioned. A combination of an ICS and LABA may also be used to give patients consistent anti-inflammatory and symptomatic relief, with use of a SABA for breakthrough symptoms. Patients using one particular combination device however, budesonide/formoterol†, can use this medication as both a controller with scheduled daily dosing, and as a reliever on as-needed basis to treat acute symptoms, as described in the subsequent section. Using budesonide/formoterol† in this instance would replace the need for a SABA.

- Examples of SABAs: salbutamol, terbutaline
- Examples of LABAs: formoterol†, salmeterol, vilanterol (Note: LABAs are only to be used in combination with an ICS in asthma treatment.)

Combination therapy

New global recommendations in 2019 suggest that a preferred treatment option for all adults and adolescents with asthma is actually combination therapy with an ICS and a LABA in a single device, as an alternative to a scheduled ICS plus as needed SABA reliever. Caution should be exercised to ensure patients are aware of the maximum daily dose they can use, since using an ICS/LABA combination on an as-needed basis can excessively increase the daily ICS exposure on top of scheduled doses. Also, use of a LABA in these products for reliever therapy might increase the risk of tachycardia (fast heart rate) more than a SABA reliever.

- Single devices have been developed to deliver both an ICS and a LABA in the same dose. Combination inhalers prevent the use of a LABA as monotherapy, which has been associated with increased risk of death in asthma.[1]
  - Examples of ICS/LABA combinations: budesonide/formoterol†, fluticasone furoate/vilanterol, fluticasone propionate/salmeterol, mometasone/formoterol†

† Although LABAs typically have a longer onset of action and provide 12 hours of bronchodilation, formoterol has a rapid onset while maintaining this long duration of action. As such, the budesonide/formoterol inhaler has a unique indication for use as an as-needed reliever (rescue) therapy if the person is already using this combination inhaler as scheduled therapy. All other patients should use a SABA for their reliever medication.[7]

II. Adjunct inhaled drug therapies

Muscarinic antagonist (anticholinergic) bronchodilators

Long-acting muscarinic antagonists (LAMAs) also dilate the airways to relieve respiratory symptoms, but via a different mechanism than beta2-agonists. They are generally prescribed as add-on therapy for asthma uncontrolled by appropriate doses of a maintenance ICS and LABA. Short-acting muscarinic antagonists (SAMAs) and LAMAs are the cornerstone of chronic obstructive pulmonary disease (COPD) management, so they may also be used in patients with asthma-COPD overlap.

- SAMA example: ipratropium (not indicated for asthma maintenance therapy)
- LAMA example: tiotropium (other LAMAs approved for COPD are not indicated for asthma management)

III. Oral therapies

Leukotriene receptor antagonist (LTRA):

Montelukast is a second-line agent that may be used for patients with concomitant rhinitis. Specifically, it works by blocking the action of a molecule in the inflammatory pathway called leukotriene to prevent airway inflammation and bronchoconstriction resulting from exposure to triggers. Oral montelukast may be used in patients over two years of age who particularly struggle to use inhaled therapies. Montelukast has been associated with behavioural changes and suicidal ideation in all age groups, so therapy should be monitored closely, particularly in children and adolescents.

Methylxanthines:

Theophylline is an oral bronchodilator now uncommonly used due to a significant risk of systemic toxicity and the need to monitor theophylline blood levels.

IV. Injectable biologic therapies

In certain patients with severe uncontrolled asthma or severe eosinophilic asthma who undergo special immunology testing, injectable drugs that target specific pathways can be highly beneficial. Biologics are genetically engineered proteins that target cellular changes in the immune system that may occur in people living with asthma. Specific targets include an antibody called IgE that causes immune cells to release chemicals that set off an allergic-like reaction, and immune system proteins called interleukins that activate specific white blood cells. Generally, these drugs are prescribed by specialists. The biologics currently approved for asthma all end in -mab (mab = monoclonal antibody): omalizumab, mepolizumab, benralizumab, and reslizumab.

V. Oral corticosteroids

During severe asthma exacerbations, oral prednisone can be used as directed for a short course, as part of an asthma action plan, to regain symptom control. Oral prednisone has strong anti-inflammatory properties that make breathing easier by reducing the inflammation in the lungs. Due to numerous adverse effects associated with long-term or frequent use of oral prednisone, it is generally reserved for severe exacerbations.

Optimizing drug delivery to the lungs

Proper delivery of medications directly to the respiratory tract increases concentrations of the drug at the site of action and minimizes systemic adverse effects. Inhaled medications are drug-containing mixtures of solid drug particles in a gas or powder carrier. The drug is either released via pressure when an actuator (button) is pushed, or is breath-actuated, meaning that the drug is transferred from the device to the person's respiratory system at the rate and capacity at which they can inhale.

Metered-dose inhalers (MDIs) and soft mist inhalers (SMIs) are pressurized and release drug only when actuated via a button, whereas dry powder inhalers (DPIs) are breath-actuated.

Not all inhalers are created equally. When used correctly, however, clinical efficacy is comparable amongst devices.[14] Unfortunately, up to 90% of patients may demonstrate critical errors with their inhalation technique.[10,11] Therefore, it is important to ensure patients can comfortably and appropriately use their device(s) to get maximum benefit from the medication.[13]

Patient-specific factors to consider when examining the differences between inhalers: Understanding patient-specific factors that influence how a person takes their medication is important when assessing the appropriateness of a new prescription. These factors should also be periodically reviewed to ensure patients continue to benefit from their drug therapies as some of these factors may change over time. General patient-specific factors include age, sex and gender, weight, comorbidities, cognition, cultural and religious beliefs, past experiences, cost and coverage, and individual preferences. With respect to selecting an inhalation device, the following four patient-specific factors relate to comorbidities that can influence how a patient is able to self-administer their medication.

1. Inspiratory flow rate – The speed with which the patient can inhale and the total capacity they can inhale, determines their ability to receive the intended dose. DPIs require fast, deep inspiration to transfer the drug to the lungs. MDIs and SMIs do not necessarily require strong inspiratory drive as the drug is released from a pressurized canister when the actuator is pushed, regardless of how powerfully the patient inspires. Rather, MDIs and SMIs require a slow, deep inspiratory flow rate.

2. Inhalation-actuation coordination – Timing inhalation with the actuation of an MDI or SMI is incredibly important to ensure the entire dose is delivered to the patient. During inspiration, a negative pressure gradient develops in the lungs, which essentially pulls the drug deep into the lower respiratory system. To ensure the full dose is received, patients should begin inspiring just before actuating the device and continue taking a slow deep breath. With poor timing, sometimes the actuated spray will end up mainly on the back of the throat rather than getting carried into the lungs with the inspiratory airflow. When the force of the aerosol hits the back of the throat, some patients' natural reflex may cause them to stop inhaling. An MDI

TABLE 1 - Advantages, disadvantages, and instructions for each class of inhaler device[14,15]

Inhaler device	Mechanism	Advantages	Disadvantages	Instructions for use*
Metered-dose inhaler	Push-and-breathe concept: Pressurized solution requiring actuation by pressing down on a canister	- Generally low cost - Does not require strong inspiratory drive - Can be used with spacing device to reduce need for inspiration-actuation coordination	- Inspiration-actuation coordination essential - Pressing on the canister may be difficult if patient has small hands, arthritis, pain, or tremor - Some patients may be able to "taste" the dose - Devices may "clog up" with powder - Most devices do not have a dose counter - Must be kept in a temperature-controlled environment as can freeze if left in the cold	1. Shake well before use 2. Remove cap 3. Breathe out, away from inhaler 4. Place mouthpiece between teeth and close mouth around it 5. Start to breathe in slowly while pressing the top of the canister once 6. Keep breathing in slowly until a full breath is taken 7. Remove inhaler from mouth and hold breath for 5–10 seconds 8. Breathe out, away from inhaler 9. Wait 30 seconds before a second dose
Metered-dose inhaler with spacing device	Spacing device acts as a reservoir chamber for actuated dose, giving the patient time to inhale comfortably through the spacer on their own timing	- Improved drug delivery to lungs - Less need for inspiration-actuation coordination - Beneficial for children or older adults when caregivers are helping to administer - Decreases the risk of oral thrush with inhaled corticosteroids - Emits a whistling noise to alert patient that they are inhaling too fast	- Relatively large, occupies more space and is less portable - Must be washed periodically - Added cost	1. Shake MDI well before use 2. Remove caps from MDI and spacer 3. Put the MDI mouthpiece into the rubber end of the spacer 4. Breathe out, away from spacer 5. Put the spacer mouthpiece between teeth and close lips around it or place mask over mouth and nose to ensure proper fit 6. Press the top of the MDI canister once 7. Breathe in slowly until a full breath is taken OR take a few normal breaths, breathing both in and out with lips still wrapped around mouthpiece NOTE: If a whistling sound is heard, slow down the inhalation 8. Remove device from mouth 9. Wait 30 seconds before a second dose NOTE: Only actuate one dose from the MDI at a time

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Inhaler device	Mechanism	Advantages	Disadvantages	Instructions for use*
Dry powder inhaler	Drug is released from the device only when the patient inhales quickly enough to disperse the drug into the proper sized particles for inspiration, drawing it out of the device and into the airways	- Inspiration-actuation coordination not required - Ability to take multiple breaths from same dose to ensure entire dose received - Certain devices require only one step to load the dose - Cannot usually taste or feel the dose - Many devices have a dose counter (do not assume the device still has doses by listening for powder rattling when shaken as this is the sound of a drying agent, not drug)	- Requires strong inspiratory flow - Twisting base can be difficult for patients with arthritis, pain, or poor grip strength - May require dexterity and cognitive capacity to load capsules into a device for each dose - Possible to load two doses at once with certain devices - Dose can be "dumped" if device is tipped over after being loaded - Users must exhale away from the device as breathing into it after loading a dose may cause the dose to be lost - May be sensitive to high humidity, must be stored in cool and dry place	**Turbuhaler, Twisthaler** 1. Unscrew cap and take it off, holding inhaler upright 2. Twist coloured grip as far as it will go then twist all the way back until it clicks 3. Breathe out away from the device 4. Close lips around the mouthpiece without blocking the air vents 5. Breathe in forcefully and deeply 6. Remove inhaler from mouth and hold breath for 5–10 seconds 7. Breathe out, away from inhaler 8. Wait 30 seconds before a second dose **Diskus, Diskhaler, Ellipta** 1. Hold device upright and use thumb to push the cap until it clicks into place NOTE: patients should not "play" with the cap as opening and closing it without inhaling the dose will cause the dose to be lost 2. Breathe out away from device 3. Close lips around the mouthpiece without blocking the air vents with fingers 4. Breathe in deeply until a full breath is taken 5. Remove inhaler from mouth and hold breath for 5–10 seconds 6. Breathe out, away from inhaler 7. Wait 30 seconds before a second dose **Aerolizer, Breezhaler, Handihaler** 1. Remove a capsule from blister package just before use 2. Flip off the lid on device 3. Flip open the mouthpiece 4. Put the capsule in the hole 5. Flip the mouthpiece closed, ensuring it clicks 6. While holding the device upright, press the button on the side of the device to puncture the capsule 7. Breathe out away from device 8. Breathe in deeply until a full breath is taken NOTE: the capsule may be heard rattling during inspiration, indicating good inspiratory flow 9. Remove inhaler from mouth and hold breath for 5–10 seconds 10. Breathe out, away from inhaler 11. Take another breath without loading a new dose to ensure the whole dose was received. 12. Discard the capsule and wash hands
Soft Mist inhaler	Drug in solution is released from a pressurized canister in a slow-moving, fine mist	- Higher lung deposition compared to MDI - Does not require strong inspiratory drive - Actuator (button) easier to push than canister in MDI - Device has a dose counter and locks once last dose is used	- Inspiration-actuation coordination essential - Twisting base can be difficult for patients with arthritis, pain, or poor grip strength - Requires patients to close lips tightly around mouthpiece without closing air vents to ensure mist does not escape - Relatively short expiry date (3 months once package is opened) - Must be kept in a temperature-controlled environment as can freeze if left in the cold	**Respimat** 1. Prime SMI according to package instructions 2. Turn clear base ½ turn until it clicks 3. Open the cap 4. Breathe out away from device 5. Place mouthpiece between teeth and close mouth around it without blocking the air vents 6. Start to breathe in slowly while pressing the button to release the dose 7. Keep breathing in slowly until a full breath is taken 8. Remove inhaler from mouth and hold breath for 5–10 seconds 9. Breathe out, away from inhaler

* The instructions for use outlined in Table 1 provide general guidance. Patients should be encouraged to follow the manufacturer's specific instructions for use, as information related to each product may differ slightly. Pharmacy technicians should refer to each product's package insert for detailed guidance when discussing technique with patients. Patients should be reminded to rinse, gargle, and spit with a small amount of water after administering an ICS via any of these devices.

spacer slows down the speed of the particles and negates the need for coordinated timing and force of inhalation.

3. Manual dexterity – Some inhalers require multiple manipulations of the device in order to load the dose. For example, some devices have to be twisted once or twice and others have to be loaded with a capsule into a small hole prior to each dose. MDIs and SMIs require sufficient hand strength to push down the canister or actuator in coordinated timing with inhalation. Patients with arthritis, chronic pain, carpel tunnel syndrome, tremor, poor grip strength or decreased cognition may find it difficult to prepare the dose appropriately.

4. Eyesight – As above, particularly with devices that require loading a capsule, patients have to be able to see the small pieces in order to effectively load the dose. Similarly, patients should be able to read and interpret the label and dose counter on each device.

Role of the pharmacy technician in asthma care

As frontline healthcare providers, pharmacy technicians can play an important role in supporting patients living with asthma.

Pharmacy technicians often interact with patients and their caregivers at the point of care when dropping off prescriptions and picking up medications. These frequent interactions with patients offer technicians the opportunity to gather information and identify patients who may benefit from further assessment by a pharmacist. For example, technicians can identify first fills of inhalers to the pharmacist so that the patient can receive appropriate disease state counselling and medication education. Technicians can also highlight to the pharmacist instances in which it appears a patient is either filling their short-acting reliever (SABA) excessively frequently or filling their inhaled corticosteroid (ICS) or combined ICS/LABA at intervals longer than the provided supply was intended to last. Patients who present with acute shortness of breath, wheezing, or uncontrollable coughing should be urgently referred to the pharmacist for further assessment and triage.

Nonadherence to inhaled therapies is often due to more than just patient reluctance to use the medication. Patients can carry certain beliefs that medications are unsafe or can lead to dependence, that their symptoms aren't "bad enough" to warrant escalation of therapy, or that their use of inhalers is too time-consuming.[15] Some patients may struggle to pay for their medications or believe that the cost is not worth the benefit. Often, patients may not be able to identify a noticeable improvement in symptoms when using an ICS. Even though patients may feel better after using their SABA, bronchodilators only temporarily open up the airways to improve symptoms and are not, in fact, addressing the underlying problem of airway inflammation. Reinforcing that inflammation is improved with regular use of the ICS may improve adherence. Bringing any of these concerns to the pharmacist's attention can help them to identify and solve drug therapy problems to improve outcomes for patients.

At each visit, pharmacy technicians can also ask patients if they are experiencing any adverse effects, changes in efficacy or difficulties in administration and draw any issues to the attention of the pharmacist.

Nonpharmacologic management and education regarding identification and avoidance of triggers are large components of optimal asthma management that can also be provided by the pharmacist in these interactions. Pharmacy technicians may pick up on patients' self-identified triggers and this should be communicated to the pharmacist for appropriate documentation. Furthermore, it has been recommended that all patients be asked about tobacco use and willingness to quit at every clinical encounter.[8] Pharmacy technicians can ask patients if they smoke or "vape" and refer patients who indicate a willingness or interest to quit to a pharmacist to discuss potential quitting strategies. Pharmacy technicians can also ask patients if they are up to date on their vaccinations, including their annual influenza vaccine and pneumococcal vaccines. Annual influenza vaccination reduces the risk of contracting influenza illness, which may decrease the risk of asthma exacerbations.[7] Two pneumococcal vaccines are available in Canada, and one, or both, may be indicated for patients with respiratory disease.

With the regulation of the profession, the expanded scope of practice now allows registered pharmacy technicians to engage in activities that support clinical services. The role of the technician goes beyond tasks associated solely with technical functions, and now into the realm of patient education. These activities include "providing instructions on how to operate medical devices" and "providing medication information to patients that does not require application of therapeutic knowledge".[16] Practically, technicians can remind patients which medications are asthma controllers (ICS) and which are relievers (SABA). Technicians might notice that a patient has several different inhaler types and could suggest that the pharmacist assess to see if the inhalers could be changed to all one device type for simplicity. Furthermore, pharmacy technicians can educate patients to use their inhalers based on the instructions outlined in Table 1 and specific product information.[17] The Lung Association also has instructional videos available at https://www.lung.ca/lung-health/get-help/how-use-your-inhaler that can be recommended to patients to reinforce techniques previously reviewed. The "teach-back" strategy, wherein patients demonstrate their inhaler technique back to the healthcare professional after receiving education, may be a tool pharmacy technicians can use to verify correct technique.[19] Technique tends to worsen over time, but repetitive inhaler education has been shown to increase the proportion of patients who retain proper form.[20] Pharmacy technicians can offer to periodically reassess technique using the "teach-back" strategy at refill encounters. Using this approach, technique errors and other patient-specific factors as discussed above (inspiratory flow, inhalation-actuation coordination, manual dexterity, and eyesight) that may necessitate a change in therapy can be identified and brought to the pharmacist's attention for further discussion with the patient.

Conclusion

Patients living with asthma and other chronic respiratory diseases represent a large proportion of patients who interact with pharmacy technicians on a regular basis. Inhaled therapies are a mainstay of asthma treatment, often with combinations of different inhalers used to optimize treat-

ment. Patients benefit from frequent review of their inhaler technique as critical errors are prevalent and adherence is often sub-optimal. Registered pharmacy technicians are able to provide inhaler technique education and through this, may identify errors or patient-specific factors that impede the optimal delivery of medication to the lungs. Technicians play an important role in asthma care by identifying patients who may benefit from pharmacist intervention for adherence counselling, smoking cessation, immunizations, nonpharmacologic strategies, and drug therapy interventions that suit the unique patient's needs.

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QUESTIONS

Please select the best answer for each question and answer online at eCortex.ca for instant results.

1. Approximately what percentage of children are diagnosed with asthma by their teenage years?
a) 5% b) 10%
c) 20% d) 30%

2. Which of the following is not a typical symptom of chronic asthma?
a) Chest tightness
b) Sputum production
c) Shortness of breath
d) Wheezing

3. Which of the following statements would indicate that a patient's asthma is not well-controlled?
a) Experiencing shortness of breath with moderate to vigorous exercise
b) Experiencing coughing when abruptly exposed to cold air
c) Needing fast-acting reliever medication during the day, once every two weeks
d) Needing fast-acting reliever medication after going to bed

4. What is the role of inhaled corticosteroids in asthma management?
a) Decrease airway inflammation
b) Dilate airways to improve airflow
c) Improve symptoms when used on an as-needed basis
d) Help to clear mucus from the lungs

5. What class of inhaled drug therapy does budesonide belong to?
a) Short-acting beta agonists (SABA)
b) Long-acting beta agonists (LABA)
c) Short-acting muscarinic antagonists (SAMA)
d) Long-acting muscarinic antagonists (LAMA)
e) Inhaled corticosteroids (ICS)

6. Which long-acting beta agonist (LABA) has been approved for use in a single combination device with budesonide for as-needed reliever therapy?
a) Formoterol b) Olodaterol
c) Salmeterol d) Vilanterol

7. Which of the following statements is false regarding MDI spacing devices?
a) Spacing devices decrease deposition of drug in the back of the throat by slowing the flow rate of the drug.
b) Spacing devices may be beneficial for patients who struggle to coordinate dose actuation with inspiration.
c) Patients should remove their mouth from the mouthpiece after each inhalation and should be taught not to exhale back into the device.
d) It is recommended to wipe around the mouth with a damp cloth after administering an inhaled corticosteroid through a spacing device with a mask.

8. Which of the following statements is correct regarding soft mist inhalers (SMIs)?
a) Drug delivery from the SMI is breath-actuated so hand-lung coordination is minimally important.
b) Patients are at risk of losing some of the dose if they do not tightly wrap their lips around the mouthpiece.
c) It is important to cover the small vents on the mouthpiece of the SMI with the lips to ensure the entire dose is received.
d) Patients using a spacing device with their metered-dose inhaler should also administer their SMI through the spacing device.

9. Which of following proprietary devices is not an example of a dry powder inhaler?
a) Diskus
b) Ellipta
c) Handihaler
d) Respimat

10. Which drug delivery device is most dependent on sufficient inspiratory drive?
a) Metered-dose inhaler
b) Metered-dose inhaler with spacing device
c) Dry powder inhaler
d) Soft mist inhaler

11. Which patient-specific factor is most likely to make a soft mist inhaler (SMI) difficult to use?

a) Poor inspiratory drive
b) Poor breath-holding capacity
c) Severe osteoarthritis of the hands
d) Living in a high humidity climate

12. Which device might be most appropriate if caregivers are administering medications to patients with good inspiratory flow?

a) Metered-dose inhaler
b) Soft mist inhaler
c) Dry powder inhaler
d) Any of these inhalers are equally appropriate in this case

13. A patient demonstrates their technique to you using the Turbuhaler device and you note that they take the following steps: removes the cap, twists the base fully one way, exhales away from the device, seals lips around the mouthpiece, breathes in forcefully, exhales away from mouthpiece, and replaces the cap. What suggestion(s) can you make to improve their technique and improve drug delivery?

a) Check to see if the device is empty first by shaking it before each dose
b) Twist the base back to its starting position until it clicks
c) Hold breath for 5 – 10 seconds after inhaling the dose
d) B and C
e) A, B and C

14. Mr. D is a 56-year-old interior painter asking for a refill at the drop-off counter. He shows you an orange inhaler that says fluticasone on the canister, but the printed label with sig instructions is worn off. It appears the expiry date has passed. He says he has been increasingly short of breath in the past two weeks so has been using this 2-4 times per day to try to get his symptoms under control. You check his file and see that he has unused refills for both fluticasone and salbutamol. What is the best plan of action for the technician?

a) Tell him his fluticasone inhaler is a controller and fill his salbutamol rescue inhaler instead.
b) Fill his fluticasone and ask if he wants to fill his salbutamol rescue inhaler at the same time.
c) Fill his fluticasone but tell him he really only should be using it scheduled and as prescribed.
d) Fill his fluticasone inhaler, ask if he needs a new rescue inhaler, and ask the pharmacist to educate him about adherence to his controller and symptom control with a rescue inhaler.

15. Which of the following statements illustrate the role of the registered pharmacy technician in asthma care?

a) Monitoring dispensing frequency of short-acting inhaled therapy and referring to the pharmacist for suspected poorly controlled asthma.
b) Encouraging up-to-date immunizations, including offering flu vaccine when applicable.
c) Identifying patients who smoke or vape and referring to the pharmacist for smoking cessation counselling.
d) Identifying patient-specific factors that may impede use of certain devices and referring to the pharmacist to explore alternate options.
e) Reviewing inhaler technique with patients at initial and refill inhaler pick-up.
f) All of the above are potential roles of the registered pharmacy technician.

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2. a b c d	**5.** a b c d e	**8.** a b c d	**11.** a b c d	**14.** a b c d
3. a b c d	**6.** a b c d	**9.** a b c d	**12.** a b c d	**15.** a b c d e f

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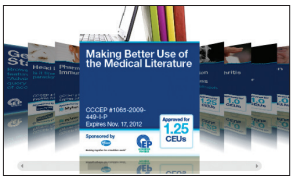

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