Asthma in Adults

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Goal: To assist pharmacy technicians with understanding basic monitoring and treatment concepts of asthma in adult patients

Objectives:
1. Describe the pathophysiology of asthma
2. Identify the signs and symptoms of asthma
3. List the common risk factors and triggers of asthma
4. Describe the approach to management of asthma

Introduction
Asthma is prevalent worldwide and is a major health problem in the United States. It is characterized by a chronic inflammatory disorder of the airway which results in an increase in airway hyperresponsiveness.

The prevalence of asthma has been rising in recent years. In the National Health Statistics Report of Asthma Prevalence, Health Care Use and Mortality in the United States (2005-2009), it was reported that asthma was prevalent in 8.2% of the U.S population (24.6 million people). The proportion of the population with at least one asthma attack in the previous year was 4.2%. In 2007, it is estimated that there were as many as 13.9 million visits to physician offices and 1.4 million visits to outpatient departments. Furthermore, there were 1.75 million asthma-related emergency department visits and 456,000 asthma hospitalizations.

Asthma was also found to be more common among females, children, persons of non-Hispanic black and Puerto Rican race or ethnicity, persons with family income below the federal poverty level, and those residing in the Northeast and Midwest regions.

Although the prevalence of asthma is increasing in the United States, the measures of significant morbidity (hospital admissions) and mortality from acute asthma exacerbations have decreased slightly over the past few years. Asthma accounted for 3,447 deaths in 2007. The most common cause of death from asthma is inadequate assessment of severity of airway obstruction by both the patient and the physician in addition to provision of inadequate therapy. Thus, the National Asthma Education and Prevention Program (NAEPP) advocates that the key to prevention of asthma related death, is education.

NAEPP was established in March 1989 to address the growing problem of asthma in the United States. The goal of NAEPP is to enhance the quality of life for patients with asthma and decrease asthma-related morbidity and mortality. NAEPP aims to raise awareness of patients, healthcare professionals and the public about asthma; ensure that the symptoms of asthma are recognized; and also to ensure the effective control of asthma by encouraging a close partnership among patients, physicians and other healthcare professionals to allow for appropriate and adequate asthma management.

In a recent study by Sullivan et al, data from the Medical Expenditure Panel Survey from 2003 and 2005 was analyzed. Adults with asthma incurred an additional $1,907 (2008 US dollars) annually and experienced higher health care use and comorbidity. The total national medical expenditure attributable to adult asthma was $18 billion. Medical expenditures were largely contributed by prescription drugs, followed by inpatient hospitalizations and home health care.

Etiology
Patient and environmental factors can lead to inflammation of the airways and the development of asthma. Patients who have a family history of asthma and who have underlying airway hyperresponsiveness are at risk of asthma. Gender also has a role to play in the development of asthma. In adults, asthma is more common among females, while in childhood, asthma is more prevalent in boys.

Environmental factors such as exposure to indoor and outdoor allergens, tobacco smoke, air pollution, respiratory viral infections, changes in weather and exercise can lead to the development of asthma. Furthermore, diet, drugs (e.g. aspirin, nonsteroidal anti-inflammatory drugs [NSAIDs], β-blocker) and obesity can increase one’s risk of asthma.

There are various agents or events that could trigger an asthma attack, either causing asthma or worsening the symptoms of asthma. A list of possible triggers and ways to avoid them is shown in Table 1.

Pathophysiology
Asthma is a chronic inflammatory disorder of the airways. The major characteristics of asthma are the presence of variable degrees of airflow obstruction from airway wall inflammation and bronchial smooth muscle narrowing. Many cells and cellular components are involved in the inflammatory process; in particular inflammatory mediators mast cells, eosinophils, T-lymphocytes, macrophages, neutrophils and epithelial cells.

Airways become inflamed when they are exposed to various risk factors as mentioned previously, and become hyperresponsive. The airways become obstructed and airflow is limited by narrowing of the airways, mucus plugs and increased inflammation. In asthma, airway obstruction within the lungs is often reversible either spontaneously or with treatment.

Clinical Presentation (Signs and Symptoms)

Acute asthma attack/exacerbation
The severity of asthma can range from mild with occasional symptoms to severe with persistent symptoms that could affect the quality of life. Asthma attacks or exacerbations occur in episodes; however, airway inflammation is present chronically. This means there are occasions when the patient experiences asthma attacks or he/she may not have any signs or symptoms at all (i.e. in remission). The classic triad of symptoms: shortness of breath, coughing and wheezing are associated with inflammation and narrowing of the airways. These symptoms can occur with exercise, but also occurs spontaneously or in association with known allergens.

A severe acute asthma attack can occur over several days or hours or can progress rapidly over 1 to 2 hours. The patient may be in acute distress and complain of severe shortness of breath, chest tightness or burning and may only be able to say a few words with each breath. These patients should be advised to seek medical attention immediately especially when they do not respond to their initial bronchodilator treatment or when their condition worsens.

On the other hand, patients who experience mild asthma attacks can usually be treated at home only if they are prepared and have a
Management of Asthma

Treatment Goals

The main goal of asthma care is to achieve and maintain control of the clinical signs and symptoms of asthma for prolonged periods and to prevent asthma attacks or exacerbations. With good clinical control of asthma, patients will be able to remain physically active, with minimal asthma attacks and symptoms throughout the day and night.

General Management of Asthma

One of the key components in the management of asthma is the development of a partnership between the patient and the health care team. A collaborative effort is needed to assist the patients in identifying and understanding their triggers and learning how to avoid them. The importance of monitoring and controlling symptoms as well as knowing when to seek medical attention should be reinforced. In addition, patients should have a good understanding of their medications (releaver vs. controller). It is also vital that patients remain adherent to therapy as they become less sensitive to their trigger factors when their asthma is under control.

Vaccination

Adults with asthma are at high risk of developing complications after contracting the influenza virus. According to a study by the Centers for Disease Control and Prevention (CDC) in 2003, approximately one-third of all asthmatic adults and one-fifth of asthmatic adults younger than 50 years of age receive the flu vaccine annually. Patients with asthma tend to develop more serious respiratory infections like influenza and these infections can lead to pneumonia and acute respiratory disease. Therefore, annual influenza vaccination should be recommended to asthma patients as part of their routine care. The Global Initiative for Asthma (GINA) guidelines recommend influenza vaccination for patients with moderate to severe asthma yearly or at least when vaccination of the general population is advised.

Pharmacologic Treatment

The management of asthma follows a stepwise approach to achieve and maintain control of asthma. The choice of treatment also takes into consideration individual response to symptoms relief and the potential for adverse effects.

Asthma medications can be broadly classified as releavers or controller medications.

The Relievers

Reliever medications are used on an as needed basis for immediate and quick relief of symptoms during an asthma attack, such as wheezing, chest tightness and cough. Reliever medications work by relaxing the smooth muscles of the airways, resulting in the widening of airways (bronchodilation) to relieve airflow obstruction.

Patients should be aware of how much reliever medication is used. If the patient is using the releavers regularly or if there is an increase in the frequency of use, it is an indication that asthma is not well-controlled. Patients should then be advised to visit their physician and discuss further management and control of the condition. Another consideration would be to assess the patient’s adherence to controller medications and whether patient non-adherence could have contributed to worsening asthma control. In this case, appropriate education should be initiated. Examples of reliever medications are rapid-acting inhaled β2-agonists (i.e., albuterol), oral glucocorticosteroids (i.e., prednisone) and anticholinergics (ipratropium). Long acting bronchodilators are also used to prevent awakening due to nighttime asthma attacks (nocturnal asthma). Besides using inhalers, oral steroids may sometime be needed during an acute asthma attack especially when delivery of inhaled drugs to the airways is reduced. Physical activity is also a common cause of asthma. Symptoms of exercise induced asthma may be prevented by taking medications prior to the strenuous activity (e.g. albuterol). A table of asthma medications is listed in (Table 2).

The Controllers

Controller medications have effects on the cells and cellular components involved in the inflammatory process of asthma. Controller or preventer medications are used daily to prevent asthma attacks, prevent symptoms and to improve lung function. They work by reducing inflammation, relaxing airway muscles and improving symptoms and lung function. Glucocorticosteroids are the most potent and effective anti-inflammatory used in the treatment of asthma to reduce airway inflammation, to reduce swelling and secretions if there is mucus in the airways, and also to prevent asthma attacks. Examples of controller medications include oral and inhaled glucocorticosteroids, theophylline, long-acting inhaled β2-agonists (e.g. salmeterol, formoterol) and leukotriene modifiers (e.g. montelukast).

There have been concerns with regards to the use of long-acting inhaled β2-agonists. Salmeterol has been associated with an increased risk of severe asthma exacerbations and asthma-related deaths. Current guidelines do not recommend the use of long-acting inhaled β2-agonists alone. These medications should be used as an optional add-on therapy to inhaled corticosteroids when they do not adequately control the patient’s asthma. A new drug, omalizumab, is an immunomodulator that is used as an adjunctive therapy for patients who have allergies and severe persistent asthma.

Combination Medications (Advair/Symbicort)

These medications usually consist of glucocorticosteroids and long-acting β2-agonists. Combination medications may help to improve patient compliance and possibly decrease the risk of side effects compared to increasing the dose of a single medication alone.

The Stepwise Approach

Generally, patients would be prescribed the appropriate medications according to the severity of asthma. If the patient is not controlled on their current regimen, treatment should be stepped up by increasing the doses of the medications, changing or adding more medications until asthma control is achieved. In difficult-to-treat asthma patients, a compromise may be needed to achieve the best level of control possible with minimal symptoms and potential for adverse effects and minimal disruption of daily activities.

A variety of reliever and controller medications are available for the treatment of asthma.

Monitoring to Maintain Control

Patients are monitored regularly to ensure that they maintain control of their symptoms with the least number of medications and with maximum safety.

Asthma medications can be adjusted according to the severity of the asthma symptoms. When asthma is not well-controlled with the current treatment regimen, step up of the therapy would be needed. Generally, improvements should be seen within one month.

If asthma control is maintained for at least three months, a gradual stepwise reduction in
treatment is recommended. The aim is to decrease treatment to the least medication necessary to maintain asthma control. It is important to note that even when a patient’s asthma is well-controlled, regular monitoring is still required to adjust the medications periodically in response to loss of control (worsening symptoms or development of an exacerbation).

Adjustments to the medications and the asthma management plan should be made after assessing the patient’s inhaler techniques, medication compliance and compliance to the avoidance of risk factors.

As mentioned previously, all patients with asthma should have an asthma action or management plan (Figure 1). The asthma action or control plan is a guide developed together with the health care team for patients to understand how to monitor and control asthma symptoms. It shows the patient’s daily treatment plan, such as what medications to take and how often to take them, and describes how to handle asthma attacks. The asthma action plan also advises patients when they should seek medical treatment.

**Basic Inhaler Techniques**

Asthma inhalers are devices that generate therapeutic aerosols. Examples of such devices are pressurized metered-dose inhalers (MDI), breath-actuated MDIs, dry powder inhalers ( DPI) (e.g. Accuhaler, Turbohaler) and nebulizers. Inhaled medications are preferred as they deliver medications directly to the Airways and reduce systemic absorption and systemic side effects. Health care professionals should be involved in educating the patients on inhaler techniques, and the frequency of reliever medications to be used, which is dependent upon the severity of the asthma attack.

The key difference between the metered dose inhaler and the dry powder inhaler is the breath actuation technique. A slow and deep inspiration is required for pressured metered-dose inhalers. Use of the metered-dose inhaler requires coordination of actuation and breathing. Hence, using metered dose inhalers with spacer devices would allow easier breathing in patients who have problems with coordination.

Using the Accuhaler:
1. Hold the Accuhaler with the mouth piece towards the patient and slide the lever away until it clicks. This allows the dose to be available for inhalation.
2. Hold the Accuhaler level, breath out gently away from the device and put the mouth piece in the mouth and suck in steadily and deeply. (deep and forceful)
3. Remove Accuhaler from the mouth and hold breath for about 10 seconds or as long as the patient feels comfortable. The dose indicator window on the device shows the number of doses left.

Similar to the Accuhaler, the Turbohaler is also a dry powder inhaler. The basic inhaler techniques for both devices are similar. The Turbohaler should be held upright and the grip twisted forwards and backwards as far as it will go until a click sound is heard. It is important to note that a shaking sound would still be present when the medicine is empty. This sound is produced by a drying agent, not the medication.

In addition, patients should be advised to rinse their mouth after using steroid-containing inhalers due to the risk of developing oral thrush (a fungal infection).

Spacer devices are used in patients who are unable to coordinate their breathing with the inhalation. These devices makes the inhalers easier to use and reduce systemic absorption and side effects of the inhaled glucocorticosteroids (reduces oral thrush). Spacer devices also minimize deposition of the medications to the oropharynx and enhance drug delivery to the lungs. Spacers should also be used as an alternative in patients who are unable to use the dry powder inhalers.

**Cleaning the Spacer Device**

Spacer devices should be washed weekly. The device could be soaked in detergent and lukewarm water for about 20 minutes before washing. The inner surface of the spacer should not be scrubbed and should be air dried after washing.

**Peak Flow Meter**

Peak expiratory flow measurements are used as an assessment of lung function, and can be an important aid in both the diagnosis and monitoring of asthma. Periodic daily peak flow measurements allow the patient to assess his/her status of asthma and may be useful to evaluate response to changes in treatment. Peak flow measurements should be compared with the patient’s own previous best measurements using his/her own peak flow meter and it allows the patient to monitor his/her asthma control. Many physicians require for all patients with severe asthma to monitor their peak flow measurement.

**Conclusion**

Asthma is a chronic respiratory condition and successful control of asthma requires the collaborative effort between the patient and the health care team. Pharmacy technicians play a vital role as part of the health care team in the management of asthma. With good asthma control, most patients can go on to lead normal lives with relatively good quality of life and minimal limitations to physical activity. Recognizing asthma symptoms, understanding the benefits and side effects of medications, avoiding trigger factors, maintaining compliance, and utilizing accurate inhaler techniques are essential for effective control of asthma.

**References**

Table 1. Strategies for Avoiding Asthma Trigger Factors

<table>
<thead>
<tr>
<th>Triggers</th>
<th>How to avoid them</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Allergens</strong></td>
<td></td>
</tr>
<tr>
<td>Animal dander</td>
<td>• Best to keep furred or feathered pets out of your home</td>
</tr>
<tr>
<td></td>
<td>• Alternatively: Keep the pet out of your bedroom and other sleeping areas at all times, and keep the door closed.</td>
</tr>
<tr>
<td></td>
<td>• Remove carpets and furniture covered with cloth from your home. If that is not possible, keep the pet away from fabric-covered furniture and carpets</td>
</tr>
<tr>
<td></td>
<td>• Use air filters</td>
</tr>
<tr>
<td>Dust mites</td>
<td>• Encase mattress, pillow in a special dust-proof cover</td>
</tr>
<tr>
<td></td>
<td>• Wash sheets and blankets on your bed weekly in hot water</td>
</tr>
<tr>
<td></td>
<td>• Remove carpets from your bedroom</td>
</tr>
<tr>
<td></td>
<td>• Keep stuffed toys out of the bed or wash toys weekly in hot water or cooler water with detergent and bleach</td>
</tr>
<tr>
<td>Cockroaches (dried droppings and remains)</td>
<td>• Keep food and garbage in closed containers. Never leave food out.</td>
</tr>
<tr>
<td></td>
<td>• Use poison baits, powders, gels, or paste (for example, boric acid), or traps</td>
</tr>
<tr>
<td>Indoor Mold</td>
<td>• Fix leaky faucets, pipes or other sources of water that have mold around them</td>
</tr>
<tr>
<td></td>
<td>• Clean moldy surfaces with a cleaner that has bleach in it</td>
</tr>
<tr>
<td>Pollen and Outdoor Mold</td>
<td>During your allergy season</td>
</tr>
<tr>
<td></td>
<td>• Try to keep your windows and doors closed</td>
</tr>
<tr>
<td></td>
<td>• Stay indoors with windows closed from late morning to afternoon if possible (highest mold and pollen counts)</td>
</tr>
<tr>
<td></td>
<td>• Ask your doctor whether you need to take or increase anti-inflammatory medicine before your allergy season starts</td>
</tr>
<tr>
<td><strong>Irritants</strong></td>
<td></td>
</tr>
<tr>
<td>Tobacco Smoke</td>
<td>• If you smoke, ask your doctor for ways to quit smoking</td>
</tr>
<tr>
<td></td>
<td>• Do not allow smoke in your house or car</td>
</tr>
<tr>
<td>Smoke, Strong Odors and Sprays</td>
<td>• Do not use wood-burning stove, kerosene heater</td>
</tr>
<tr>
<td></td>
<td>• Try to stay away from strong odors or sprays such as perfume.</td>
</tr>
<tr>
<td>Other asthma triggers</td>
<td></td>
</tr>
<tr>
<td>Sulfites in foods and beverages</td>
<td>• Do not drink beer or wine or eat dried fruit, processed potatoes, or shrimp if they cause asthma symptoms</td>
</tr>
<tr>
<td>Cold air</td>
<td>• Cover your nose and mouth with a scarf on cold or windy days</td>
</tr>
</tbody>
</table>

Adapted from: National Heart, Lung & Blood Institute (NHLBI)
### Table 2. Asthma Medications*

#### A. Controllers

<table>
<thead>
<tr>
<th>Medication</th>
<th>Brand Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glucocorticosteroids</td>
<td></td>
</tr>
<tr>
<td>Inhaled Corticosteroids</td>
<td></td>
</tr>
<tr>
<td>Beclomethasone</td>
<td>QVAR 40 or 80</td>
</tr>
<tr>
<td>Budesonide</td>
<td>Pulmicort</td>
</tr>
<tr>
<td>Fluticasone</td>
<td>Flovent</td>
</tr>
<tr>
<td>Mometasone</td>
<td>Asmanex</td>
</tr>
<tr>
<td>Triamcinolone</td>
<td>Azmacort</td>
</tr>
<tr>
<td>Oral Corticosteroids</td>
<td></td>
</tr>
<tr>
<td>Sodium cromoglycate / Cromolyn Sodium</td>
<td>-</td>
</tr>
<tr>
<td>Nedrocromil</td>
<td>-</td>
</tr>
<tr>
<td>Long acting β&lt;sub&gt;2&lt;/sub&gt;-agonists (LABA)</td>
<td></td>
</tr>
<tr>
<td>Inhaled</td>
<td></td>
</tr>
<tr>
<td>Formoterol</td>
<td>Foradil</td>
</tr>
<tr>
<td>Salmeterol</td>
<td>Serevent</td>
</tr>
<tr>
<td>Antileukotrienes</td>
<td></td>
</tr>
<tr>
<td>Montelukast</td>
<td>Zafirlukast</td>
</tr>
<tr>
<td>Zileuton</td>
<td></td>
</tr>
<tr>
<td>Combination Medications for Asthma (Controller/Maintenance)</td>
<td></td>
</tr>
<tr>
<td>Fluticasone propionate/salmeterol xinafoate</td>
<td>Advair Diskus</td>
</tr>
<tr>
<td>Budesonide/formoterol</td>
<td>Maintenance and Relief Medication</td>
</tr>
<tr>
<td>Mometasone/formoterol</td>
<td>Dulera</td>
</tr>
</tbody>
</table>

#### B. Asthma Medications – Relievers

<table>
<thead>
<tr>
<th>Medication</th>
<th>Brand Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short acting β&lt;sub&gt;2&lt;/sub&gt;-agonists</td>
<td></td>
</tr>
<tr>
<td>Albuterol/Salbutamol</td>
<td>Proair HFA</td>
</tr>
<tr>
<td>Levalbuterol</td>
<td>Xopenex HFA</td>
</tr>
<tr>
<td>Pirbuterol</td>
<td>Maxair MDI</td>
</tr>
<tr>
<td>Terbutaline</td>
<td>Terbutaline (Generic)</td>
</tr>
<tr>
<td>Anticholinergics</td>
<td></td>
</tr>
<tr>
<td>Ipratropium bromide</td>
<td>Atrovent HFA</td>
</tr>
<tr>
<td>Oral Corticosteroids</td>
<td></td>
</tr>
<tr>
<td>Sodium cromoglycate / Cromolyn Sodium</td>
<td>-</td>
</tr>
<tr>
<td>Nedrocromil</td>
<td>-</td>
</tr>
<tr>
<td>Long acting β&lt;sub&gt;2&lt;/sub&gt;-agonists (LABA)</td>
<td></td>
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<tr>
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<tr>
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<td>Mometasone/formoterol</td>
<td>Dulera</td>
</tr>
</tbody>
</table>

*Adapted from National Heart, Lung, and Blood Institute, and National Asthma Education and Prevention Program
Figure 1. The National Heart, Lung, and Blood Institute recommends this sample asthma action plan.

**Asthma Action Plan**

**Doing Well**
- No cough, wheeze, chest tightness, or shortness of breath during the day or night
- Can do usual activities

And, if a peak flow meter is used,

**Peak flow:**
- more than _________
  (80 percent or more of my best peak flow)

My best peak flow is: _________

**Take these long-term control medicines each day (include an anti-inflammatory).**

<table>
<thead>
<tr>
<th>Medicine</th>
<th>How much to take</th>
<th>When to take</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

Before exercise: 7

- 2 or 4 puffs
- 5 to 60 minutes before exercise

**Asthma Is Getting Worse**

**GREEN ZONE**
- Cough, wheeze, chest tightness, or shortness of breath, or
- Waking at night due to asthma, or
- Can do some, but not all, usual activities

- Or-
  - Peak flow: _________
    (50 to 79 percent of my best peak flow)

**YELLOW ZONE**

**First**
- Add: quick-relief medicine—and keep taking your GREEN ZONE medicine.
  - 1.2 or 1.4 puffs, every 20 minutes for up to 1 hour
  - Nebulizer, once

**Second**
- If your symptoms (and peak flow, if used) return to GREEN ZONE after 1 hour of above treatment:
  - Continue monitoring to be sure you stay in the green zone.
- Or-
  - If your symptoms (and peak flow, if used) do not return to GREEN ZONE after 1 hour of above treatment:
    - Take: _________
      (short-acting beta₂-agonist)
      1.2 or 1.4 puffs or
      Nebulizer
    - Add: _________
      (short-acting beta₂-agonist)
      mg per day
      For _________ (3 to 10) days
    - Call the doctor before/within _________ hours after taking the oral steroid.

**RED ZONE**

- Very short of breath, or
- Quick-relief medicines have not helped, or
- Cannot do usual activities, or
- Symptoms are same or get worse after 24 hours in Yellow Zone

- Or-
  - Peak flow: less than _________
    (50 percent of my best peak flow)

**Medical Alert!**

**Take this medicine:**

<table>
<thead>
<tr>
<th>Medicine</th>
<th>How much to take</th>
<th>When to take</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Then call your doctor NOW. Go to the hospital or call an ambulance if:
- You are still in the red zone after 15 minutes AND
- You have not reached your doctor.
Asthma in Adults QUIZ

To receive continuing education credit, please provide the following information:

1. Complete the participant information in the spaces provided. Use **BLUE** ink only.
2. Mail the completed form for scoring to the address listed below. The quiz must be postmarked by the expiration date. Faxed CE quizzes WILL NOT be accepted.
   - Mail to: **APA, 1211 Carmichael Way, Montgomery, AL 36106**
3. CE processing is free for APA members. Non-members must include a processing fee of $20 per quiz.
4. No more than 3 quizzes will be accepted per month per individual.
5. Credit will be awarded for a passing grade of 80% or better. If you fail the exam, you may retake it once, and corrected answers must be in **RED** ink.

**Participant Information:**

AL License #______________
Name _______________________
Address _____________________
City_________________________ State____ Zip__________
E-mail_______________________
NABP e-Profile #____________
MM/DD (month/day of birth)_____
How long did it take you to read the program and complete this test?
_________ hours ___________ minutes
My signature certifies that I have independently taken this CE examination.

**Program Evaluation - Must be completed for credit.**

Please rate the following items on a scale from 1 (poor) to 4 (excellent).

1. Overall quality of the article 1 2 3 4
2. Relevance to pharmacy practice 1 2 3 4
3. Value of the content 1 2 3 4

Please answer each question, marking whether you agree or disagree.

4. This course met the learning objectives.  □ Agree  □ Disagree

Impact of the Activity

The information presented (check all that apply):

5. □ Reinforced my current practice/treatment habits
   □ Will improve my practice/patient outcomes
   □ Provided new ideas or information I expect to use
   □ Adds to my knowledge

6. Will the information presented cause you to make any changes in how you do your job? □ Yes □ No

7. How committed are you to making these changes?
   (Not committed) 1 2 3 4 (Very committed)

8. Do you feel future activities on this subject matter are necessary and/or important? □ Yes □ No

Follow-Up

As part of our ongoing quality-improvement effort, we would like to be able to contact you in the event we conduct a follow-up survey to assess the impact of our educational interventions on professional practice. Are you willing to participate in such a survey? □ Yes □ No
Asthma in Adults Quiz

True or false

1. Asthma is a chronic inflammatory disorder of the airways.

2. Which of the following represents the national medical expenditure attributable to adult asthma?
   a. $8 million
   b. $18 million
   c. $8 billion
   d. $18 billion

3. Which of the following is/are risk factors for asthma?
   a. Environmental factors
   b. Family history of asthma
   c. Gender
   d. All of the above

True or false

4. Severe acute asthma attacks can occur over several days or hours or can progress rapidly over 1 to 2 hours.

5. Semi-annual influenza vaccinations are recommended for asthma patients.

6. Which medications are used on an as needed basis for immediate and quick relief of symptoms during asthma attacks?
   a. Relievers
   b. Combination medications
   c. Inhaled glucocorticosteroids
   d. Leukotriene inhibitors

True or false

7. A slow and deep inspiration is required for pressured metered-dose inhalers.

8. Which of the following is used as an assessment of lung function?
   a. Peak expiratory flow
   b. Spacers
   c. Metered-dose inhalers
   d. Dry powder inhalers

9. Which of the following is a component of an asthma action or management plan?
   a. Medication name
   b. Medication frequency
   c. Stepwise approach for handling attacks
   d. All of the above

10. How often should spacer devices be washed?
    a. Daily
    b. Weekly
    c. Monthly
    d. Annually