Abstract

**Objective:** To provide a review of the asthma management guidelines issued by the National Asthma Education and Prevention Program (NAEPP) and identify strategies pharmacists can implement to help patients meet the goal of asthma control.

**Summary:** Asthma affects approximately 8.2% of the adult population and 9.5% of children in the United States. The burden of the disease on individuals and the health care system is high. Each year, asthma accounts for approximately 15 million missed school days, 12 million missed work days, 14 million physician office visits, 1 million hospital outpatient visits, nearly 2 million emergency department visits, 400,000 hospitalizations, and more than 3,000 deaths. In response to this need, NAEPP issued asthma diagnosis and management guidelines with the goal of improving asthma control in affected individuals. Components of the guidelines include assessment and monitoring of severity and control, patient education, control of environmental factors and comorbid conditions, and medical management. The NAEPP guidelines call on all members of a patient’s health care team to be involved in asthma management. Pharmacists can play an active role in helping patients meet the goal of asthma control through education, monitoring, and consultation. Services already included in medication therapy management services may be adapted to include asthma-related patient and clinician partnerships.

**Conclusion:** Pharmacists are an integral part of the patient’s health care team throughout long-term asthma management. Strategies to increase their involvement include identifying patients with undiagnosed or inadequately controlled asthma, consulting with clinicians on recommended medications, reviewing written asthma action plans, teaching patients how to use peak flow monitors and inhalation devices, reviewing adherence, encouraging influenza and pneumococcal vaccination, and increasing awareness of environmental triggers.

**Keywords:** Asthma, National Asthma Education and Prevention Program, airflow obstruction, action plans, peak flow monitoring, adherence.

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**Learning objectives**

At the conclusion of this knowledge-based activity, the pharmacist will be able to:

- Describe the prevalence of asthma in the U.S. population.
- Define the levels of asthma severity and control according to the domains of impairment and risk.
- Identify asthma management strategies based on severity and control levels.
- Discuss strategies for controlling asthma using pharmacy services.
Asthma: A commitment to control

Asthma is a chronic inflammatory condition of the lung’s air passages that results in episodes of airflow obstruction that are characterized by coughing, wheezing, breathlessness, and chest tightness.\(^1\) Nearly 19 million adults in the United States (8.2% of adult population) have asthma.\(^2\) The prevalence of asthma in children exceeds 7 million (9.5% of population ≤17 years).\(^3\) Worldwide, asthma affects 235 million people.\(^4\)

In the United States, asthma is more common in adult women (prevalence 9.9%) compared with men (6.2%),\(^2\) but the reverse is true in children, with asthma being more common in boys (10.3%) than girls (8.8%).\(^3\) Among single-race groups, American Indians/Alaskan Natives have the highest prevalence (14.3%), followed by blacks (9.8%), non-Hispanic whites (8.3%), Hispanics (6.1%), and Asians (5.1%).\(^2\) Other risk factors associated with asthma include cigarette smoking and exposure to tobacco smoke, particularly in utero exposure to maternal smoking, antibiotic use, viral infections (for some children), socioeconomic factors, and genetic predisposition and genetic–environmental interaction.\(^5\)

Asthma’s toll on the lives of patients and families, as well as the on the health care system, is high. Nearly 15 million missed school days among children and 12 million missed work days among adults are attributable to asthma each year in the United States.\(^6\) Asthma results in more than 14 million physician office visits each year,\(^7\) as well as more than 1 million hospital outpatient visits\(^8\) and nearly 2 million emergency department visits.\(^9\) Annual hospitalizations due to asthma exceed 400,000, representing a total of 1.6 million days of care with an average length of stay of 3.6 days.\(^10\) In 2010, asthma caused 3,404 deaths.\(^11\)

In response to this high disease burden, the National Asthma Education and Prevention Program (NAEPP), coordinated by the National Heart, Lung, and Blood Institute of the National Institutes of Health, issued revised asthma diagnosis and management guidelines in 2007,\(^12\) and a revised “quick reference” guide, based on the 2007 guidelines, in 2012.\(^13\) In pragmatic terms, the goal of the guidelines is to “help people with asthma control their asthma so that they can be active all day and sleep well at night.”\(^1\) This emphasis on control is consistent with guidelines from the Global Initiative for Asthma, which also highlight asthma control as a key goal.\(^14\)

Healthy People 2020, the U.S. government’s health promotion and disease prevention agenda, lists as one of its objectives for respiratory diseases: “to increase the proportion of persons with current asthma who receive appropriate asthma care according to NAEPP guidelines.”\(^15\) This objective underscores the importance of asthma management for individual patients and the health care system. The NAEPP guidelines call on all members of a patient’s health care team to be involved in asthma management, the components of which include assessment and monitoring of severity and control, patient education, control of environmental factors and comorbid conditions, and medical management.\(^13\) Pharmacists are well placed to be among the health care providers involved throughout these care components.

### Diagnosing asthma

Patients with signs or symptoms of asthma should be fully evaluated to diagnose asthma and rule out other conditions that mimic asthma. The NAEPP guidelines provide three criteria that should be met to make a diagnosis of asthma:\(^12\):

- Symptoms of recurrent episodes of airflow obstruction or airway hyperresponsiveness are present.
- Airflow obstruction is at least partially reversible, as measured by spirometry.
- Alternative diagnoses have been ruled out.

Symptoms of airflow obstruction include wheezing, cough, difficulty breathing, and chest tightness.\(^12\) These symptoms may be associated with or worsen with exercise, viral infection, change in weather, stress, strong emotion, exposure to irritants and allergens, or menstrual cycles. Of important note, symptoms often tend to occur or worsen at night, interrupting sleep.

Airflow obstruction should be objectively measured and quantified using spirometry.\(^12\) The two most common spi-
rometry measurements are the maximal volume of air forcibly exhaled from the point of maximal inhalation (forced vital capacity [FVC]) and the volume of air forcibly exhaled during the first second (forced expiratory volume in 1 second [FEV₁]). Reversibility is confirmed by an increase in FEV₁ of greater than 200 mL and at least 12% from baseline after inhalation of short-acting beta-2 agonist.¹²

A full diagnostic evaluation is needed to exclude alternative diagnoses, such as chronic obstructive pulmonary disease, vocal cord dysfunction, and a foreign body in the airway.¹² The evaluation may include a detailed medical history, a physical examination, and other studies as needed, in addition to spirometry, such as pulmonary function tests, bronchoprovocation, chest X-ray, allergy testing, and inflammation biomarkers.¹² After the asthma diagnosis is made, patient-specific precipitating triggers, such as tobacco smoke or inhalant allergens, should be identified. Comorbidities that may exacerbate asthma, such as allergic rhinitis, sinusitis, or gastroesophageal reflux disease, also should be identified.

**Assessing asthma severity**

Asthma severity should be determined following diagnosis or upon initial patient presentation.¹² The NAEPP guidelines define severity as the "intrinsic intensity of the disease process."¹² The severity classification is used to guide treatment decisions in patients who are not already receiving long-term control therapy. Severity is determined by assessing signs and symptoms of asthma within two domains: (1) impairment, which reflects asthma’s effect on the patient’s current quality of life and functional capacity, and (2) risk, which reflects asthma’s effect on the patient’s future risk of exacerbations and loss of pulmonary function.¹²

Based on the most severe component of impairment or risk, the patient’s asthma can be categorized as intermittent, mild persistent, moderate persistent, or severe persistent.¹²,¹³ Recognizing that any patient with asthma can experience severe exacerbations is important.¹ Table 1 shows how components of impairment and risk are used to classify asthma severity in patients 12 years or older.¹³ Although the relationship between severity and impairment/risk also apply to younger patients, the threshold criteria are different for patients 0 to 4 years and 5 to 11 years. Pharmacists should consult guideline tables for details on these age groups.¹³

### Impairment

Impairment is defined as the frequency and intensity of current or recent symptoms and functional limitations.¹² It is determined by the frequency of symptoms (wheezing, cough, chest tightness, and shortness of breath), nighttime awakenings, and short-acting beta-2 agonist use for symptomatic relief, the degree of interference with daily activities, and lung function during the previous 2 to 4 weeks.¹²,¹³

This information can be obtained from a careful history and pulmonary function tests.¹² Validated self-report questionnaires, such as the Asthma Control Test, the Childhood Asthma Control Test, the Asthma Control Questionnaire control index, and others, also may be helpful in determining impairment.¹² These self-report tools may not be appropriate for use in patients who are poor perceivers (i.e., those who underestimate their symptoms or degree of airflow obstruction), however. Pulmonary function tests, either spirometry or peak flow monitoring, provide objective measurement of airflow obstruction.¹² Interference with daily activities includes missed days at school or work or a reduction in school, work, home, or leisure activities as a result of asthma or as a result of being a caregiver for a child with asthma.¹²

<table>
<thead>
<tr>
<th>Table 1. Classifying asthma severity in untreated patients 12 years or older</th>
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<tbody>
<tr>
<td><strong>Severity components</strong></td>
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</tr>
<tr>
<td><strong>Impairment</strong></td>
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<tr>
<td>Symptoms</td>
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<tr>
<td>Nighttime awakenings</td>
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<tr>
<td>Short-acting beta-2 agonist use for symptom control</td>
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<tr>
<td>Interference with normal activity</td>
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<tr>
<td>Lung function</td>
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<tr>
<td>FEV₁ (% predicted)</td>
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<tr>
<td>FEV₁/FVC</td>
</tr>
<tr>
<td>Risk</td>
</tr>
<tr>
<td>Exacerbations requiring oral corticosteroids</td>
</tr>
</tbody>
</table>

Abbreviations used: FEV₁, forced expiratory volume in 1 second; FVC, forced vital capacity.

Source: Adapted from Reference 13.
Risk

Risk is defined as the likelihood of future asthma exacerbations, progressive loss of lung function (or for children, reduced lung growth), and medication adverse effects. It is determined by the frequency of asthma exacerbations that have required oral corticosteroid therapy over the last year. Clinicians should question patients about all exacerbations and evaluate their frequency, rate of onset, severity, and causes.

Generally, frequent severe exacerbations, such as those requiring urgent care, hospitalization, intensive care admission, and/or oral corticosteroids, indicate greater severity, though more data are needed to accurately link frequency of exacerbations with disease severity. In addition, frequency and intensity of exacerbations may fluctuate over time for patients in any severity category.

Assessing asthma control

The NAEPP guidelines define asthma control as “the degree to which the manifestations of asthma (symptoms, functional impairments, and risks of untoward events) are minimized and the goals of therapy are met.” As with asthma severity, asthma control is determined by assessing signs and symptoms within the domains of impairment and risk.

Based on the most severe component of either impairment or risk, the patient’s asthma can be categorized as well controlled, not well controlled, or very poorly controlled. Table 2 shows how components of impairment and risk are used to classify asthma control in patients 12 years or older. Pharmacists should consult guideline tables for control criteria for younger patients.

Asthma control should be evaluated at each office visit by assessing asthma-related signs and symptoms, lung function, quality of life and functional status, exacerbations since last visit, adherence to and adverse effects of medication, and overall patient satisfaction. Visits should be every 2 to 6 weeks while getting asthma under control with medications, every 1 to 6 months to monitor control, and every 3 months if a step-down in medication is expected.

Impairment

A reduction in impairment is evidenced by prevention of symptoms, infrequent (two or less times/week) use of inhaled short-acting beta-2 agonist for symptom relief, maintenance of near normal lung function, full participation in normal daily activities, and overall satisfaction with asthma care. A review of patient symptoms should be limited to 2 to 4 weeks before assessment.

<table>
<thead>
<tr>
<th>Control components</th>
<th>Control classification</th>
</tr>
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<tbody>
<tr>
<td>Impairment</td>
<td></td>
</tr>
<tr>
<td>Symptoms</td>
<td>≤2 days/week</td>
</tr>
<tr>
<td>Nighttime awakenings</td>
<td>≤2 times/month</td>
</tr>
<tr>
<td>Short-acting beta-2 agonist use for symptom control</td>
<td>≤2 days/week</td>
</tr>
<tr>
<td>Interference with normal activity</td>
<td>None</td>
</tr>
<tr>
<td>Lung function</td>
<td></td>
</tr>
<tr>
<td>FEV1 (% predicted) or peak flow (% personal best)</td>
<td>&gt;80%</td>
</tr>
<tr>
<td>Validated questionnaires</td>
<td></td>
</tr>
<tr>
<td>ATAQ</td>
<td>0</td>
</tr>
<tr>
<td>ACQ</td>
<td>≤0.75</td>
</tr>
<tr>
<td>ACT</td>
<td>≥20</td>
</tr>
<tr>
<td>Risk</td>
<td></td>
</tr>
<tr>
<td>Exacerbations requiring oral corticosteroids</td>
<td>0–1/year</td>
</tr>
<tr>
<td>Progressive loss of lung function</td>
<td>Evaluation requires long-term follow-up care</td>
</tr>
<tr>
<td>Treatment-related adverse effects</td>
<td>Intensity of adverse effects do not correlate with level of control but should be considered in the overall assessment of future risk</td>
</tr>
</tbody>
</table>

Table 2. Classifying asthma control in treated patients 12 years or older

Abbreviations used: ACQ, Asthma Control Questionnaire; ACT, Asthma Control Test; ATAQ, Asthma Therapy Assessment Questionnaire; FEV1, = forced expiratory volume in 1 second; NA, not applicable.
Source: Adapted from Reference 13.
Patients should be taught to monitor the degree of asthma control in the impairment domain by tracking symptoms or monitoring peak flow. Both strategies are equally helpful for most patients. For a subset of patients, however, peak flow monitoring may be a better choice. This subset includes patients with moderate or severe persistent asthma, patients with a history of severe exacerbations, patients who are poor perceivers (i.e., those who do not adequately recognize airway obstruction or worsening symptoms), and patients who prefer the peak flow monitoring option.

**Risk**

A reduction in risk is evidenced by prevention of recurrent exacerbations, including minimized need for emergency care and hospitalization, prevention of progressive loss of lung function, prevention of reduced lung growth (in children), and optimal medications with minimal or no adverse effects. When assessing risk, exacerbations during the previous year or since the last visit should be considered.

### Management of asthma

The NAEPP asthma guidelines recommend specific pharmacologic therapies for daily long-term control medications according to a stepwise approach that includes the six steps shown in Figure 1. For some of the steps, the recommendations include a preferred regimen and an alternative regimen. All patients with a diagnosis of asthma, regardless of their step in therapy, should have a prescription for step 1.

![Figure 1. Stepwise asthma management](image)

- Step 1: Inhaled short-acting beta-2 agonist, as needed
- Step 2: Preferred: Low-dose inhaled corticosteroid. Alternative: Cromolyn, leukotriene receptor antagonist, or theophylline
- Step 3: Preferred: Low-dose inhaled corticosteroid + inhaled long-acting beta-2 agonist, or medium-dose inhaled corticosteroid. Alternative: Low-dose inhaled corticosteroid + either leukotriene receptor antagonist, theophylline, or zileuton
- Step 4: Preferred: Medium-dose inhaled corticosteroid + inhaled long-acting beta-2 agonist. Alternative: Medium-dose inhaled corticosteroid + either leukotriene receptor antagonist, theophylline, or zileuton
- Step 5: High-dose inhaled corticosteroid + inhaled long-acting beta-2 agonist and consider omalizumab for patients who have allergies
- Step 6: High-dose inhaled corticosteroid + inhaled long-acting beta-2 agonist + oral corticosteroids and consider omalizumab for patients who have allergies

*Consider subcutaneous allergen immunotherapy for patients who have persistent allergic asthma.

*Consider consultation with asthma specialist at step 3; consult with specialist if step 4 or higher is required.

*Refer to black box warning on product labels of all long-acting beta-2 agonists.

and access to a quick-relief inhaler, such as albuterol, for acute symptoms. Pharmacists are referred to the treatment charts within the guidelines for specific regimens and doses, as well as specific recommendations for patients 0 to 4 years, 5 to 11 years, and 12 years or older. In addition to pharmacologic therapy, control of environmental asthma triggers and comorbidities that can worsen asthma also is recommended.

The recommendations are not meant to supplant clinician judgment but rather to be a tool for clinicians to use in making treatment decisions. When choosing among drug options, clinicians should consider patient-specific factors such as comorbidities, drug–drug interactions, clinician–patient preferences, and special consideration (e.g., pregnancy, need for surgery, exercise-induced bronchoconstriction). In addition, clinicians should consider which domain—the domain of present impairment or the domain of future risk—is of greatest concern for a patient, as the two domains do not necessarily respond equally to therapy.

Inhaled corticosteroids are the preferred therapy for long-term asthma control, independent of patient age, because of their ability to suppress inflammation, the vast amount of evidence to support their use, and their ability to reduce airway remodeling.

### Untreated patients

For patients newly diagnosed or those not already on long-term control therapy, the appropriate step for initiating therapy is linked to the level of asthma severity. Table 3 shows the correspondence between treatment step (from Figure 1) and severity level (from Table 1) in patients 12 years or older. For example, a patient with a presenting severity of “mild persistent” should begin therapy at step 2, whereas a patient with a severity of “severe persistent” should begin therapy at step 4 or 5.

### Treated patients

For patients already on a long-term control regimen, their current level of asthma control determines whether to maintain, step up, or step down therapy. Table 4 shows which step-related actions correspond with each control classification for patients 12 years or older. The pharmacologic recommendation per step shown in Figure 1 relates to patients already on treatment and to untreated patients.

Before stepping up therapy in a patient with not well controlled or very poorly controlled asthma, adherence to control medications should be evaluated, as well as device technique, comorbidity status, and control of environmental triggers. If any of these areas is deemed suboptimal, corrective measures should be taken before making a change in therapy. Further, patients receiving an alternative regimen should be switched to a preferred regimen, if possible, before stepping up therapy. For example, if a patient who is currently at step 2 and using the preferred regimen presents with evidence of “not well-controlled” asthma despite good adherence, proper inhalation and device technique, controlled comorbidity status, and control of environmental triggers, then he or she should step up therapy to step 3. Patients with not well-controlled asthma should be reevaluated in 2 to 6 weeks after stepping up therapy. Patients who are classified with very poorly controlled asthma should be reevaluated in 2 weeks after a step up.

Stepping down therapy should only occur if the patient has been well controlled for at least 3 months. For example, a patient currently at step 3 but found to be well controlled for 3 months may step down to step 2.

### Management of exacerbations

For all steps and control classifications, the guidelines recommend that a short-acting beta-2 agonist be given to

<table>
<thead>
<tr>
<th>Severity classification</th>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
<th>Step 4 or 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermittent Mild</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Persistent</td>
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*Before stepping up treatment due to lack of control, review and correct the following, as needed: adherence to therapy, inhaler technique, control of environmental triggers, use of alternative rather than preferred therapy.

Source: Adapted from reference 13.
quickly relieve acute symptoms and exacerbations. In addition, a short course, or burst, of oral corticosteroids may be needed. Patients who are using a short-acting beta-2 agonist more than twice weekly, other than to prevent exercise-induced bronchospasm, should be evaluated for inadequate control and need to step-up therapy. In the community pharmacy setting, a pharmacist who sees that a patient is refilling an albuterol prescription more than once per month should consider calling the provider to discuss this patient’s level of asthma control or use it as an opportunity to talk with the patient about his/her symptoms.

**Control of environmental triggers and comorbid conditions**

All asthma patients should be evaluated for and educated about environmental factors that worsen asthma symptoms or trigger exacerbations. Patients with persistent asthma, as well as patients with intermittent asthma if clinically indicated, should be evaluated for sensitivity to allergens, including indoor inhalant allergens (e.g., dust mites, pet dander) or indoor pollutants (e.g., formaldehyde). Management of identified environmental factors should be multifaceted and can include reduced exposure, household modifications, and allergen immunotherapy. For some patients, sulfites in foods can trigger symptoms and if sensitive, should be avoided. All patients with asthma should be counseled to avoid tobacco smoke.

Patients with difficult-to-control asthma should be evaluated for comorbid conditions that have been associated with worsening of asthma symptoms. These conditions include gastroesophageal reflux disease, obesity, obstructive sleep apnea, allergic rhinitis, chronic sinusitis, and chronic stress/depression. Appropriate management of these conditions, if present, may contribute to asthma control.

CDC recommends that all patients with asthma receive an annual influenza vaccine because of their increased risk of influenza-related complications. Patients 19 years or older with asthma also should receive the pneumococcal polysaccharide vaccine.

**Written asthma action plan**

A written asthma action plan should be developed based on collaboration among the patient, clinician, and patient’s family, as appropriate, to establish mutual commitment to long-term therapy and to guide treatment decisions. The asthma action plan can empower patients, and thus it is a tool for patient self-management. As part of the action plan, patients should commit to monitoring their asthma control by tracking symptoms or monitoring peak flow. The plan should be reviewed at each patient visit to confirm instructions and address areas of concern and difficulties with adherence. Table 5 shows the components of an action plan.

**Pharmacist-directed strategies for monitoring and control**

Pharmacists are an integral part of the patient’s health care team throughout long-term asthma management. Patient education is a key component of the NAEPP guidelines because asthma control depends considerably on patient adherence to medication, correct use of asthma devices, avoidance of environmental triggers, and ability to recognize and respond to evidence of asthma worsening. Partnerships between pharmacists and prescribers also contribute to asthma control through provision of information to clinicians on appropriate medication

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**Table 5. Components of a written asthma action plan**

**Daily management**
- Medications that should be taken daily, including the specific names of the medications and times of day patient should take
- Actions to take regarding avoidance of patient-specific environmental triggers

**Managing worsening asthma**
- Signs, symptoms, and peak flow measurements that indicate worsening asthma
- Medications to take in response to worsening asthma
- Signs, symptoms, and peak flow measurements that indicate urgent medical attention is needed
- Emergency telephone numbers for the clinician, emergency department, and person or service that can transport the patient

**Source:** Reference 12.
choices based on severity and control. Pharmacists also are uniquely situated to provide useful feedback to providers regarding patient adherence to controller medications and response. Delivery of asthma-related services fits within the medication therapy management (MTM) model, which includes services of medication therapy reviews; pharmacotherapy consults; disease management coach/support; health, wellness, and public health; medication safety surveillance; and others.20

Check out these tools for developing MTM services: www.pharmacist.com/getting-your-mtm-business-started.

Evaluation and diagnosis
Pharmacists can evaluate patients who present to the pharmacy to ask questions about respiratory symptoms or to purchase OTC items for allergies or other asthma-related products (such as the new racemic epinephrine product). By recognizing the signs and symptoms of asthma in patients, pharmacists can suggest that they see their physician for evaluation and possible diagnosis of asthma. Pharmacists also can provide educational materials about what asthma is, how to recognize it, and the importance of diagnosis and treatment in order to raise awareness in their patient population and to encourage self-identification and clinician follow-up.

Starting therapy based on asthma severity
Treatment consultation. Pharmacists can consult with physicians about the guideline-recommended medication and dose to be used for initial therapy based on a patient’s severity level (Table 1), age, and other relevant factors, such as comorbidities. When pharmacists have knowledge about a patient’s other prescription drugs, an assessment can be made about potential drug–drug interactions.

Action plan review. All newly diagnosed asthma patients should have a written asthma action plan developed in collaboration with their physician. At the time of first prescription filling, pharmacists can ask patients whether they have an asthma action plan and if they have questions about the plan. Pharmacists also can review the plan, looking for completeness or inconsistencies. If the plan is absent or presents any concerns, pharmacists can refer patients to their physician or contact the physician directly on behalf of patients.

Check out this written asthma action plan template: www.nihbi.nih.gov/health/public/lung/asthma/asthma_actplan.pdf. Or, use this interactive tool to create a plan: www.asthma-iaap.com/intro.html.

Device technique instruction and demonstration. Various types of inhalation devices are used by patients with asthma. The techniques for these devices can be different, and this is a source of confusion among patients. Up to 25% of patients with asthma report having received no verbal instructions about how to use an inhaler.21 For all inhaler devices, the most common error in inhaler technique is failure to exhale before using, followed by failure to hold one’s breath after inhaling.21 When filling a prescription for an inhaler, pharmacists should ask patients whether they have been shown how to use it. Pharmacists should demonstrate inhaler technique using a placebo device and the teach-back method (i.e., have the patient demonstrate correct use to the pharmacist for critique and feedback). At this time, pharmacists also can identify whether patients need a spacing device and, if so, demonstrate its proper use.

Peak flow meter instruction. Patients who will be monitoring their asthma control with peak flow monitoring will need to know how to use the meter correctly. At the time of purchase, pharmacists can provide information regarding predicted peak flow values, how to determine a “personal best,” and how to use the peak flow meter.

Use these tools from the American Lung Association to teach patients how to use a peak flow meter: print instructions (www.lung.org/assets/video/colorbox/pdfs/peak-flow-meter.pdf) and a video (www.youtube.com/watch?v=6oKupWgDu80).

Adherence education. If asthma medication is not taken as prescribed, asthma control cannot be achieved. Pharmacists should educate patients about the need for adherence, particularly at the time of the first prescription. To facilitate adherence, pharmacists should assist patients in setting specific action targets, such as exhaling before using the inhaler.22

Environmental trigger awareness. Pharmacists can provide information about environmental triggers associated with asthma and ways to control these exposures in their environment (e.g., home, work, school). Importantly, pharmacists should encourage patients to avoid tobacco smoke and to enroll in smoking cessation programs, if needed.

Ongoing management based on level of control
Treatment consultation. Pharmacists can consult with physicians about appropriate treatment adjustments based on assessments of asthma control. In addition, pharmacists can identify regimens for patients with complex comorbidities or intolerable adverse effects to previous asthma medications and help clinicians evaluate an individual patient’s poor response to a specific therapy.

Poor control recognition. Pharmacists can query patients about their level of perceived asthma control when they present to the pharmacy for a prescription refill or to purchase asthma-related OTC products. In some cases, signs and symptoms of poor asthma control may be evident. When inadequate control is identified, pharmacists can refer those patients to their physician for evaluation. Pharmacists also can take that opportunity to educate patients about the need for ongoing asthma control.

Quick relief guidance. Patients may call or present to the pharmacy in need of relief for acute symptoms. Pharmacists should make recommendations based on the quick-relief treatment prescription and refer patients to their written asthma action plan for instruction on using their quick-
relief inhaler. As needed, pharmacists can recommend that patients see their physicians for treatment adjustments if sustained poor control is indicated. Patients with signs and symptoms of a severe exacerbation, such as dyspnea at rest or while talking, or peak expiratory flow less than 50% predicted or personal best, should be referred for immediate medical attention.12

Adherence and device review. At the time of prescription refill, pharmacists should review patient profiles for controller adherence and reinforce the need to continue to take their asthma medications as prescribed. This is particularly important for patients with refill histories suggesting nonadherence. Reviewing device and peak flow monitoring technique also is important. Device technique instruction should be done upon initial prescription and with each refill. Correct device technique has been shown to diminish over time if not reinforced with additional instruction or review.23

Influenza vaccination. Pharmacists can specifically target asthma patients in their announcements of annual influenza vaccination and provide education about their increased risk for influenza complications. Despite CDC’s recommendation, only 40% of asthma patients aged 18 to 64 years are vaccinated annually.24 Asthma patients should receive inactivated forms of the influenza vaccine.25

Impact of pharmacist-delivered asthma services
Numerous trials have demonstrated the impact of pharmacist-delivered asthma services.26–30 Two trials serve as good examples: the Asheville Project,31 because of its long duration, and the AFasma study,32 because of its emphasis on asthma control.

Asheville Project. The Asheville Project, a 5-year longitudinal study, evaluated the effect of an MTM program on asthma outcomes in 207 enrolled patients.31 The program included education by a certified asthma educator and long-term follow-up by a pharmacist, with relevant recommendations to physicians. Outcomes were measured by changes in FEV₁, asthma severity classification, symptom frequency, impact of asthma on daily life, existence of an asthma plan, emergency/hospital events, and asthma-related costs.31 At the time the study was conducted, the researchers chose to measure changes in asthma severity as an outcome measure. Currently, evaluating patients on their degree of asthma control would be more appropriate.

At last follow-up of patients who participated in the program for at least 1 year, the proportion of enrolled patients whose asthma was severe or moderate persistent decreased from 82% at baseline to 49% and the proportion whose asthma was mild persistent or intermittent increased from 18% at baseline to 51%.31 At every yearly time interval from 12 months through 5 years, the severity classifications improved significantly (P < 0.0008). The average FEV₁ increased from 81% of predicted at baseline to 90%, and the proportion of patients with normal FEV₁ increased from 50% at baseline to 75%. The proportion of patients with a written asthma plan increased from 63% at baseline to 99%. Emergency department visits decreased from 9.9% to 1.3% annually, and hospitalizations decreased from 4% to 1.9%. Self-reported high symptom frequency fell from 35% to 16%, and self-reported low symptom frequency increased from 50% to 75%. More patients were sleeping through the night, with the proportion of patients reporting being awakened at least twice weekly because of asthma symptoms decreasing from 28% to 12%. Importantly, each of the five categories in the Asthma Outcomes Monitoring System, reflecting quality of life and functional factors, also improved significantly.

Costs improved significantly during the 5-year program, with a savings of $161,187 in reduced direct costs to the health care payer.31 Indirect costs also improved, as evidenced by a decrease in annual per-patient asthma-related lost work days (2.5 days at baseline vs. 0.5 days following enrollment) and hours missed to presenteeism (65.5 hours at baseline vs. 16.8 hours following enrollment).

AFasma study. A recent trial in Spain demonstrated the impact of pharmacist-delivered interventions on asthma control.32 The AFasma study was a 6-month randomized controlled trial enrolling 50 pharmacies to an intervention or control group and involving 336 patients. The primary outcome was asthma control, which was measured by patient and pharmacist score on the Asthma Control Questionnaire (ACQ). Secondary outcomes included medication adherence and inhaler technique, which was measured by a 10-step checklist. Patients in the intervention group received a protocol-based intervention over a period of three to six visits, which included verbal instructions, physical demonstration, and written information on inhaler technique. Patients who were determined to be nonadherent to their medications were further evaluated for barriers to adherence. Asthma control and goals for the next visit were discussed at each visit. Patients in the control group received only typical dispensing and medication-taking advice. Pharmacists in the intervention group had a 1-day training class on asthma control, adherence, and inhaler technique. Pharmacists in the control group were informed about the study protocol during a phone call preceding the start of the study.

The trial met its primary outcome of improving asthma control.32 Mean ACQ scores decreased significantly in the intervention group (0.66 points, P < 0.001) but not in the control group. Further, the proportion of patients with controlled asthma in the intervention group increased significantly from 28% at baseline to 58.1% at 6 months (P < 0.001), with no significant increase in the control group. Secondary outcomes also were met. At baseline, 38.2% of patients in the intervention group were adherent compared with 78.5% at 6 months (P < 0.001). Similarly, prevalence of correct inhaler technique increased in the intervention group from 19.5% at baseline to 75.7% at 6 months (P < 0.001). No significant improvement in the control group was observed for either secondary outcome.

Pharmacist education and skill development
Pharmacist training is essential for the success of pharmacy-
delivered asthma services. Training topics should include communication skills such as motivational interviewing; a review of asthma pathophysiology; proper use, expected efficacy, and safety of both quick-relief and long-term control asthma medications, including drug–drug interactions and warnings/precautions; adherence factors; device and peak flow meter techniques; NAEPP guidelines; common asthma triggers; and other topics as needed to meet needs of the patient population being served.

Barriers to pharmacy-delivered asthma services

Common barriers to pharmacist involvement in asthma management include lack of time, routine reimbursement, private consultation space, and administrative support. Lack of caregiver interest also has been identified as a barrier for pediatric consultations. An additional barrier is the lack of access by pharmacists to treatment plans and other relevant health records of asthma patients for whom they are dispensing medications, though this barrier may be reduced as electronic medical records fully penetrate health care systems.

To overcome common barriers to pharmacist involvement, Berry et al. developed the Asthma Friendly Pharmacy model as part of the Controlling Asthma in St. Louis project. Using this model, pharmacists and pharmacy technicians can deliver brief and directed interventions to asthma patients and exchange information with prescribers regarding need for written asthma action plan, a switch in therapy, or nonadherence. The Asthma Friendly Pharmacy model is integrated into the pharmacy’s routine workflow, aided by a workflow algorithm, bag tags to trigger pharmacist–patient communication at the time of prescription pick-up, standardized screening questions the technician should ask patients, and fax templates to use for communication with prescribers. Pharmacist training for the program has been integrated into the advanced pharmacy practice experience community care rotation of all St. Louis College of Pharmacy students in their last year of the program. This model can be adapted for use in other systems and pharmacy settings, particularly if opportunity exists for integration into a college of pharmacy curriculum.

Conclusion

Pharmacists can play an active role in helping patients meet the goal of asthma control, as emphasized in the current NAEPP asthma guidelines, through education, monitoring, and consultation. Services already included in MTM services may be adapted to include asthma-related patient and physician partnerships that will have considerable impact on the lives of individual patients and the health care system.

References


Consider becoming a certified asthma educator. Find out more at http://naecb.com.


CPE assessment

Instructions: This exam must be taken online; please see “CPE information” for further instructions. The online system will present these questions in random order to help reinforce the learning opportunity. There is only one correct answer to each question.

1. The prevalence of asthma in the United States among adults is:
   a. 5.1%.
   b. 8.2%.
   c. 10.3%.
   d. 14.3%.

2. Among single-race groups in the United States, which of the following groups has the highest prevalence of asthma?
   a. American Indians/Alaskan Natives
   b. Blacks
   c. Non-Hispanic whites
   d. Hispanics

3. Annually in the United States, asthma results in more than how many physician office visits and nearly how many emergency department visits?
   a. 2 million and 400,000
   b. 5 million and 1 million
   c. 10 million and 4 million
   d. 14 million and 2 million

4. Asthma severity levels (i.e., intermittent; mild, moderate, or severe persistent):
   a. Are used to guide treatment decisions in patients who are not already receiving long-term control therapy.
   b. Predict which patients will have severe exacerbations.
   c. Are determined by signs and symptoms within the domain of impairment only.
   d. Are based on the frequency and intensity of current or recent symptoms rather than the risk of future exacerbations.

5. The criteria for severity and control levels and for stepping up or down therapy:
   a. Are the same across age groups.
   b. Vary according to three age groups (0–4, 5–11, and ≥12 years).
   c. Vary according to two age groups (≤17 and ≥18 years).
   d. Vary according to two age groups (≤11 and ≥12 years).

6. An adult asthma patient who is not currently on long-term control therapy presents with nighttime awakenings at a frequency of three to four times per month as his most severe asthma sign or symptom. What is this patient’s level of asthma severity?
   a. Intermittent
   b. Mild persistent
   c. Moderate persistent
   d. Severe persistent

7. A forced expiratory volume in 1 second (FEV1) of 60% to 80% predicted is consistent with which asthma severity level in an adult asthma patient?
   a. Intermittent
   b. Mild persistent
   c. Moderate persistent
   d. Severe persistent

8. Asthma control levels:
   a. Are used to guide treatment decisions in patients who are already receiving long-term control therapy.
   b. Use spirometry measurements rather than peak flow measurements.
   c. Are determined by signs and symptoms within the domain of risk only.
   d. Are based on the risk of future exacerbations rather than the frequency and intensity of current or recent symptoms.

CPE information

To obtain 2.0 contact hours (0.2 CEUs) of CPE credit for this activity, you must complete the online Assessment and Evaluation. A Statement of Credit will be awarded for a passing grade of 70% or better on the Assessment. You will have two opportunities to successfully complete the CPE Assessment. Pharmacists who successfully complete this activity before October 1, 2016, can receive CPE credit. Your Statement of Credit will be available upon successful completion of the Assessment and Evaluation and will be stored in your ‘My Training’ page and on CPE Monitor for future viewing/printing.

CPE instructions:
1. Log in or create an account at pharmacist.com and select LEARN from the top of the page; select Continuing Education, then Home Study CPE to access the Library.
2. Enter the title of this article or the ACPE number to search for the article, and click on the title of the article to start the home study.
3. To receive CPE credit, select Enroll Now or Add to Cart from the left navigation and successfully complete the Assessment (with randomized questions), Learning Evaluation, and Activity Evaluation.
4. To get your Statement of Credit, click “Claim” on the right side of the page. You will need to provide your NABP e-profile ID number to obtain and print your Statement of Credit.
Live step-by-step assistance is available Monday through Friday from 8:30 am to 5:00 pm ET at APhA Member Services at 800-237-APhA (2742) or by e-mailing education@aphanet.com.
9. An adult asthma patient who is on long-term control therapy presents with nighttime awakening (one to three times per week) and symptoms such as wheezing and chest tightness (more than twice per week) as his most severe asthma signs or symptoms. What is this patient’s level of asthma control?
   a. Well controlled
   b. Not well controlled
   c. Very poorly controlled
   d. Not enough information provided to distinguish between not well controlled and very poorly controlled

10. A peak flow of 60% to 80% of personal best is consistent with which asthma control level in an adult asthma patient?
   a. Well controlled
   b. Not well controlled
   c. Very poorly controlled
   d. Not enough information provided to distinguish between control levels

11. Which of the following is the preferred long-term control therapy for an untreated adult patient with mild persistent asthma?
   a. Inhaled short-acting beta-2 agonist, as needed
   b. Low-dose inhaled corticosteroid
   c. Low-dose inhaled corticosteroid plus inhaled long-acting beta-2 agonist
   d. Medium-dose inhaled corticosteroid

12. Medium-dose inhaled corticosteroid plus inhaled long-acting beta-2 agonist is the preferred therapy for which of the following asthma treatment steps?
   a. Step 2  
   b. Step 3  
   c. Step 4  
   d. Step 5

13. Cromolyn, a leukotriene receptor antagonist, or theophylline are alternative therapies for which of the following asthma treatment steps?
   a. Step 2  
   b. Step 3  
   c. Step 4  
   d. Step 5

14. An adult asthma patient currently being treated at step 2 is determined to be not well controlled. Which of the following is the best immediate next step?
   a. Step up therapy to step 3
   b. Step up therapy to step 4
   c. Consider a short course of oral systemic corticosteroids
   d. Evaluate the patient’s adherence

15. An adult asthma patient currently being treated at step 2 is determined to be very poorly controlled despite good adherence, inhaler technique, and control of comorbidities and environmental triggers. Which of the following is the best next step?
   a. Step up therapy to step 3
   b. Step up therapy to step 4
   c. Step up therapy to step 3 or 4
   d. Step up therapy to step 3 or 4 and consider a short course of oral systemic corticosteroids

16. An adult asthma patient currently being treated at step 3 meets criteria for well-controlled asthma. Which of the following is the best next step?
   a. Plan to stay at step 3
   b. Reevaluate in 2 weeks
   c. Immediately step down to step 2
   d. Monitor for at least 3 months

17. A written asthma action plan:
   a. Is written collaboratively by the patient’s health care team for their use.
   b. Should instruct the patient to only use peak flow to monitor asthma control.
   c. Is a tool for individual patient self-management.
   d. Can be developed as a generic document and given to asthma patients at the time of diagnosis.

18. Mr. N has just been diagnosed with asthma and presents to the pharmacy to fill his first prescription for an inhaled medication. When demonstrating correct device technique, the pharmacist tells Mr. N that the most common error made is:
   a. Failure to hold one’s breath after inhaling.
   b. Failure to exhale before using.
   c. Incorrect inhaler position.
   d. Incorrect mouthpiece positioning.

19. An adult patient presents to the pharmacy to quickly refill her prescription for a short-acting beta-2 agonist to relieve her acute asthma symptoms. She tells you that today her peak expiratory flow is 49% of her personal best. Which of the following is the most appropriate immediate response?
   a. Recommend that she call her physician because she likely needs to be evaluated in the office
   b. Refer her for immediate medical attention
   c. Refill her prescription and remind her to tell her physician about this episode at her next visit
   d. Review her inhaler and peak flow meter technique

20. A need exists for pharmacists to educate asthma patients about their increased risk of influenza-related complications, as only this percent of asthma patients aged 18 to 64 years receives an annual influenza vaccination.
   a. 15%
   b. 25%
   c. 40%
   d. 55%