

# Boost your

*By gaining a better understanding of asthma, you'll be able to respond more quickly to your adult patient's condition, begin appropriate intervention sooner, and help your patient deal with this difficult disease. We give you the tools you need.*

Margaret McCormick, RN, MS  
Clinical Assistant Professor

College of Health Professions, Department of Nursing • Towson University • Towson, Md.

The author has disclosed that she has no significant relationships with or financial interest in any commercial companies that pertain to this educational activity.



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You're caring for Karen Jones, a 35-year-old African American woman who was recently admitted to your unit because of increasing shortness of breath and cough. She has had a long history of asthma and has been classified as having severe persistent asthma by her healthcare provider. Responding to the call bell, you realize that Karen is anxious and pale and she's complaining of a "tight" airway. She can only speak in short sentences and she's leaning forward in a tripod position. Her heart rate is 110 beats/minute and her pulse oximetry value is 90%. Is Karen having an acute asthma exacerbation?

The U.S. government's healthcare initiatives for Healthy People 2010 include decreasing hospital deaths by asthma. Therefore, it's critical that nurses increase their knowledge about the disease. In this article, I'll help you boost your asthma IQ and learn the latest in care and management techniques.

## **Asthma 101**

Commonly seen in childhood (about 50% of patients are younger than age 10), asthma is a chronic inflammatory disease of the airways. It's estimated that over 20 million

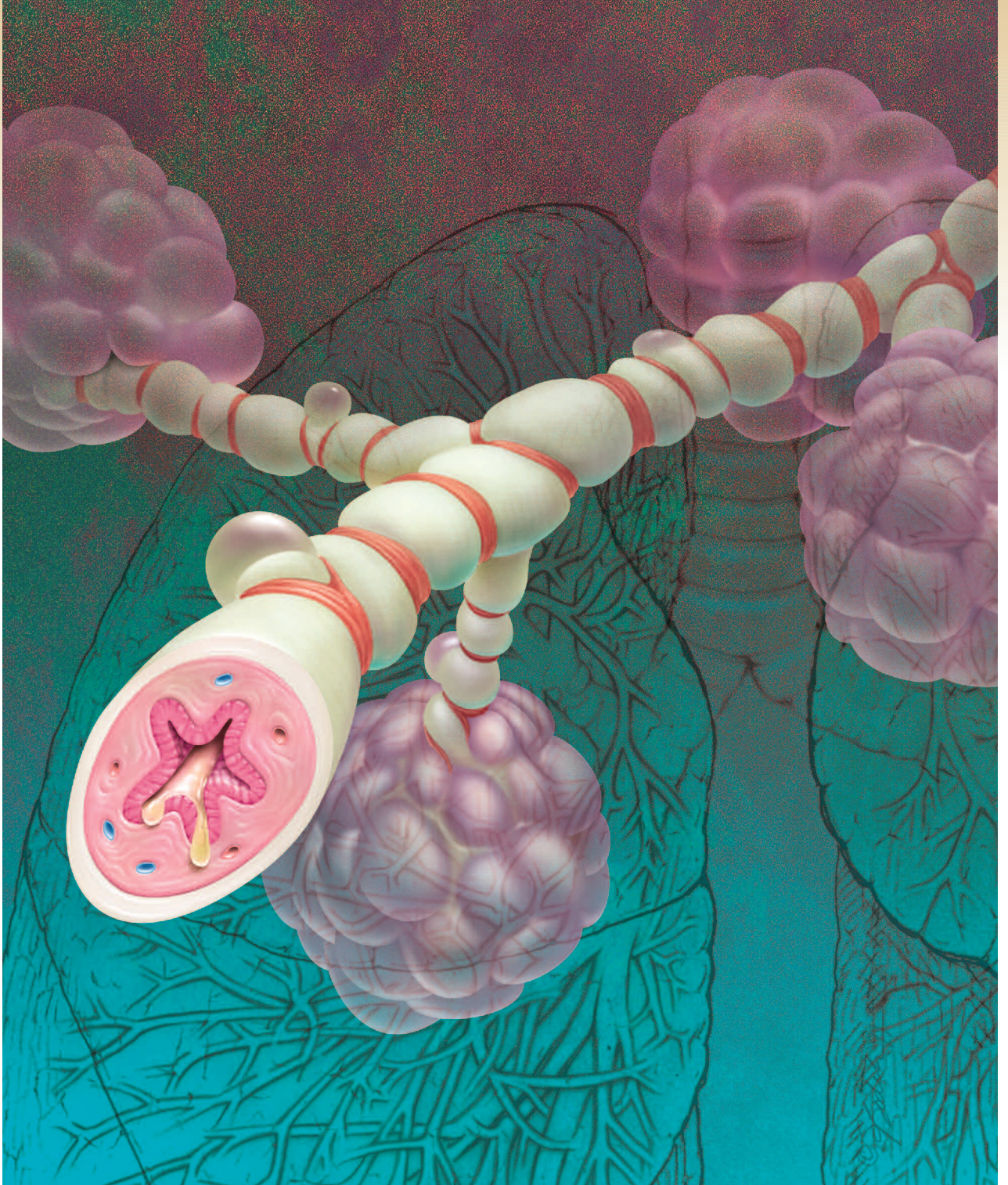
Americans are affected by this disease, accounting for 500,000 hospitalizations and approximately 5,000 deaths per year.

Asthma can be caused by either extrinsic (atopic or type 1 hypersensitivity) or intrinsic factors. **Extrinsic** factors include an allergic response to environmental allergens, such as dust mites, pollen, molds, and animal dander. **Intrinsic** factors may be related to viral respiratory infections; medications, such as aspirin, nonsteroidal anti-inflammatory drugs, or beta-adrenergic antagonists; or an irritant, such as chemicals or secondhand smoke.

So what's going on in the airways? Asthma is a disease characterized by chronic inflammation—infiltration of lymphocytes, eosinophils, and neutrophils. It causes epithelial desquamation (thickening and disorganization of the tissues of the airway walls), smooth muscle hypertrophy, and fibroblast proliferation in the airway. Obstruction caused by these changes is usually reversible spontaneously or with medication.

The acute or early response of asthma typically occurs within 10 to 20 minutes of exposure to an allergen. Airborne antigens bind to mast cells coated with immunoglobulin E

# asthma IQ





Sudden shortness of breath, wheezing, and chest tightness mean asthma.

(IgE) antibodies lining the airways (see *How asthma happens*). Chemical mediators are released and cause bronchoconstriction, mucosal edema related to increased permeability of mucosal blood vessels, and increased mucus secretions, which lead to a decrease in the diameter of the airways.

The hallmark signs of asthma are sudden

dyspnea, wheezing, and tightness in the chest. Other signs and symptoms include:

- diminished breath sounds
- coughing
- thick, clear, or yellow sputum
- rapid pulse
- tachypnea
- use of accessory muscles for breathing.

## How asthma happens

### A case of exposure

#### 1st exposure

- 1 Allergens may enter through the nose and mouth.

Ragweed

Pollen grains (allergens)

- 2 Allergens are absorbed into the tissues.

Allergens  
Immune cell

- 3 Allergens trigger immune cells to make immunoglobulin (Ig) E antibodies.

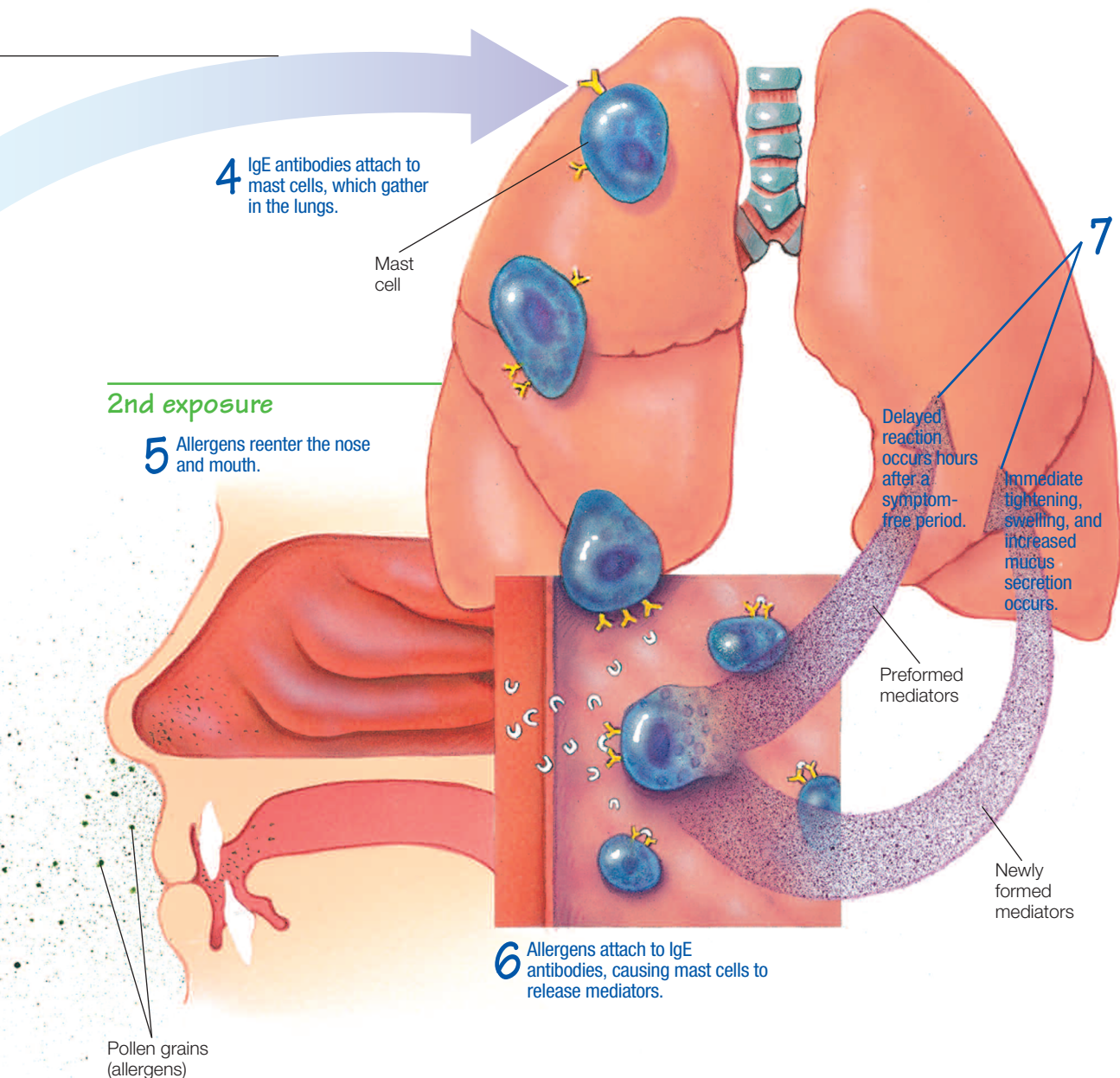
IgE antibody

Ragweed

## Predicting trouble

Asthma involves a complex interaction of genetics and environmental factors. Localized type 1 hypersensitivity reactions appear to have a genetic component, and patients with asthma often have other allergic conditions, such as hay fever, hives, and

eczema. Common indoor household triggers for asthma include dust mites, animal dander, and fungus or mold. *Alternaria*, a black- or grey-colored fungus that causes mold and is commonly found indoors on window sills or frames, can be the culprit. Air pollution, tobacco smoke, and occupa-



tional fumes are all irritants that may aggravate asthma symptoms. Respiratory infections, especially those caused by viruses such as respiratory syncytial virus, rhinovirus, influenza A or B, and adenoviruses, can also precipitate an asthma attack.

### Classifying severity

A patient has asthma if she experiences:

- symptoms of asthma in response to a trigger (airway hyperreactivity)
- repeated episodes of symptoms (recurrence)
- response to treatment (reversibility).

Classification of severity is based on daytime and nighttime symptoms. Developed by the National Heart, Lung, and Blood Institute, the four categories used to determine appropriate treatment plans are as follows:

- **intermittent.** The patient experiences cough and shortness of breath or wheezing on 2 days of the week or less and on less than 2 nights per month.
- **mild persistent.** The patient has daytime symptoms more than twice per week but less than once per day. In general, nighttime symptoms occur more than twice per month. She experiences minor limitations of normal activity due to symptoms.
- **moderate persistent.** The patient suffers from asthma symptoms every day and on more than 1 night per week. She experiences some limitations of normal activity due to symptoms.
- **severe persistent.** The patient has continuous daytime symptoms and frequent nighttime symptoms. She experiences extreme limitations of normal activity due to symptoms.

## Classifying asthma severity

Listed below are the classifications of asthma severity based on symptoms for children age 5 years and older and adults who are not taking medications for long-term management.

### Intermittent

- Symptoms twice a week or less and nighttime symptoms twice a month or less
- Symptoms don't cause interference with normal activity
- Using a short-acting beta<sub>2</sub>-agonist inhaler 2 days or less a week for control of symptoms

### Mild persistent

- Symptoms more than twice a week but less than once a day and nighttime symptoms three to four times per month
- Minor limitation with normal activity because of symptoms
- Using a short-acting beta<sub>2</sub>-agonist inhaler more than 2 days a week, but not daily for control of symptoms

### Moderate persistent

- Having daily symptoms and nighttime symptoms more than once per week, but not every night
- Some limitation of normal activity because of symptoms
- Using a short-acting beta<sub>2</sub>-agonist inhaler daily for control of symptoms

### Severe persistent

- Having continual daytime symptoms and frequent nighttime symptoms, often seven times per week
- Extreme limitation of normal activity because of symptoms
- No control of symptoms

Source: National Heart, Lung, and Blood Institute. Expert panel report 3: guidelines for the diagnosis and management of asthma (2007). <http://www.nhlbi.nih.gov/guidelines/asthma/asthgdln.pdf>.

cheat

sheet

## Looking for clues

Begin the physical exam by first performing a general appraisal of your patient. A patient experiencing an asthma exacerbation may have a worried look, a cough, and decreased activity tolerance. She may be unable to complete a sentence or may speak in short phrases or incomplete sentences. Auscultate the patient's lungs for the presence of wheezing or diminished or absent breath sounds. Remember that an absence of wheezing may be a sign of a worsening

condition. Also note the presence of nasal flaring, sternal retractions, or use of accessory muscles. These may indicate an increased work of breathing. Some patients with chronic asthma can develop a change in the structure of their airway as a result of thickening of the reticular layer of the basement membrane, also known as airway remodeling (see *Picturing an asthmatic bronchus*).

As noted earlier, our patient Karen is short of breath, speaking in short phrases, leaning forward in a tripod position, and complaining of a “tight” airway. Upon auscultation, you note that Karen has a prolonged expiratory phase and diminished breath sounds. You also hear wheezing due to bronchoconstriction. It’s obvious that Karen is experiencing an acute exacerbation of her asthma.

## Understanding diagnostics

Spirometry, lab tests, sputum and nasal cytology, a bronchial methacholine challenge test, skin sensitivity tests, and chest X-ray may be used to diagnose asthma. Let’s take a closer look.

Spirometry measures forced vital capacity (FVC), forced expiratory volume in 1 second ( $FEV_1$ ), and  $FEV_1$ /FVC values. The FVC value indicates the degree of lung and chest expansion. It measures the total amount of air that can be blown out as rapidly and forcefully as possible. The  $FEV_1$  value indicates the patency of large airways and measures the amount of air forcefully exhaled during the first second of the effort. It gives some indication of large and small airways. The ratio of  $FEV_1$ /FVC indicates how much of the FVC is blown out during the first second. A reduced  $FEV_1$ /FVC ratio (less than 80%) may indicate airway obstruction. Spirometry also allows the healthcare provider to evaluate the progression of the disease.

Lab tests for asthma include a radioallergen sorbent test for an elevation of allergen-specific IgE and a complete blood cell count for an elevated eosinophil count, both of which may indicate the patient is experienc-

ing asthma due to an allergic response.

Sputum and nasal cytology may be used to determine if nasal eosinophils and sputum mast cells are elevated, typically seen in airway hyperresponsiveness.

A bronchial methacholine challenge test is performed by giving the patient a nebulized inhalation of methacholine in increasing doses in an attempt to produce at least a 20% drop in  $FEV_1$ . In a skin sensitivity test, small amounts of suspected allergy-causing substances are placed on a pricked or scratched area of the patient’s skin or injected to determine allergic reaction.

It’s often routine for the healthcare provider to order a chest X-ray for a patient with suspected asthma; however, hyperinflation of the lungs may be observed in acute exacerbations.

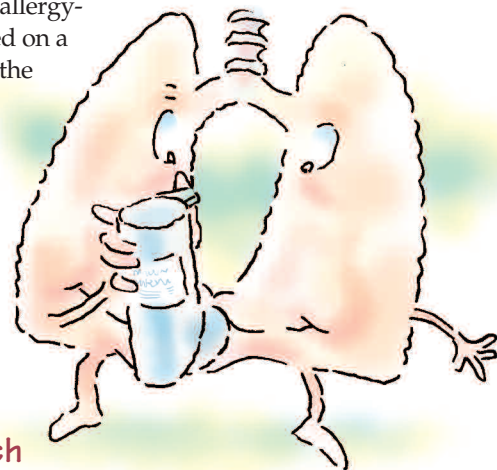
## A stepwise approach to treatment

Treatment for asthma is based on classification and severity of symptoms. As previously described, there are four classifications of asthma: intermittent, mild persistent, moderate persistent, and severe persistent. The National Institutes of Health (NIH) Expert Panel Report recommends that a newly diagnosed patient’s asthma should be classified using the most severe category when prescribing medication, then reevaluated after 4 to 6 weeks. If a patient’s condition is stable or under good control, then the amount of medication can be reduced, as well as visits to the healthcare provider.

Stepping up or stepping down a patient’s classification is useful when determining the proper treatment. The four steps are as follows:

- **step 1.** If a patient is diagnosed as having intermittent asthma, a short-acting  $\beta_2$ -agonist may be used to control symptoms.

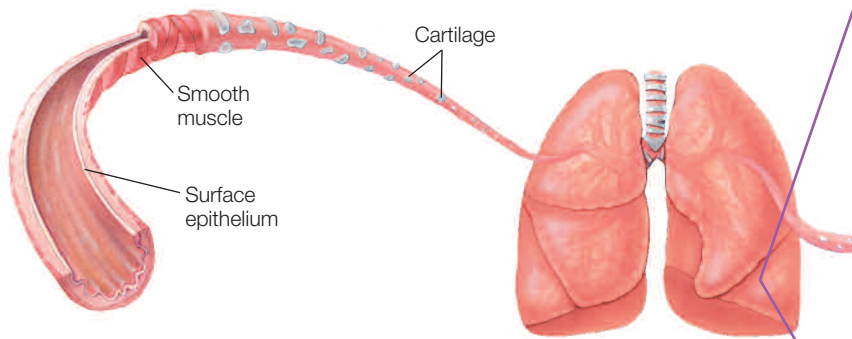
Think step up  
and step  
down when it  
comes to  
treatment.



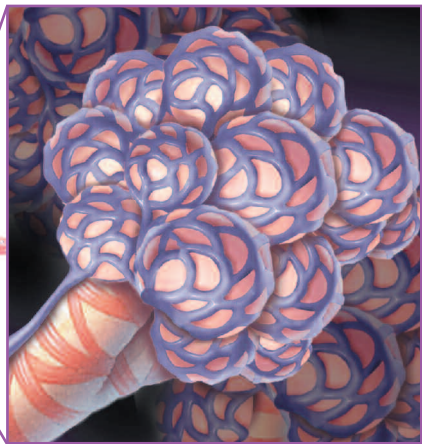


# Picturing an asthmatic bronchus

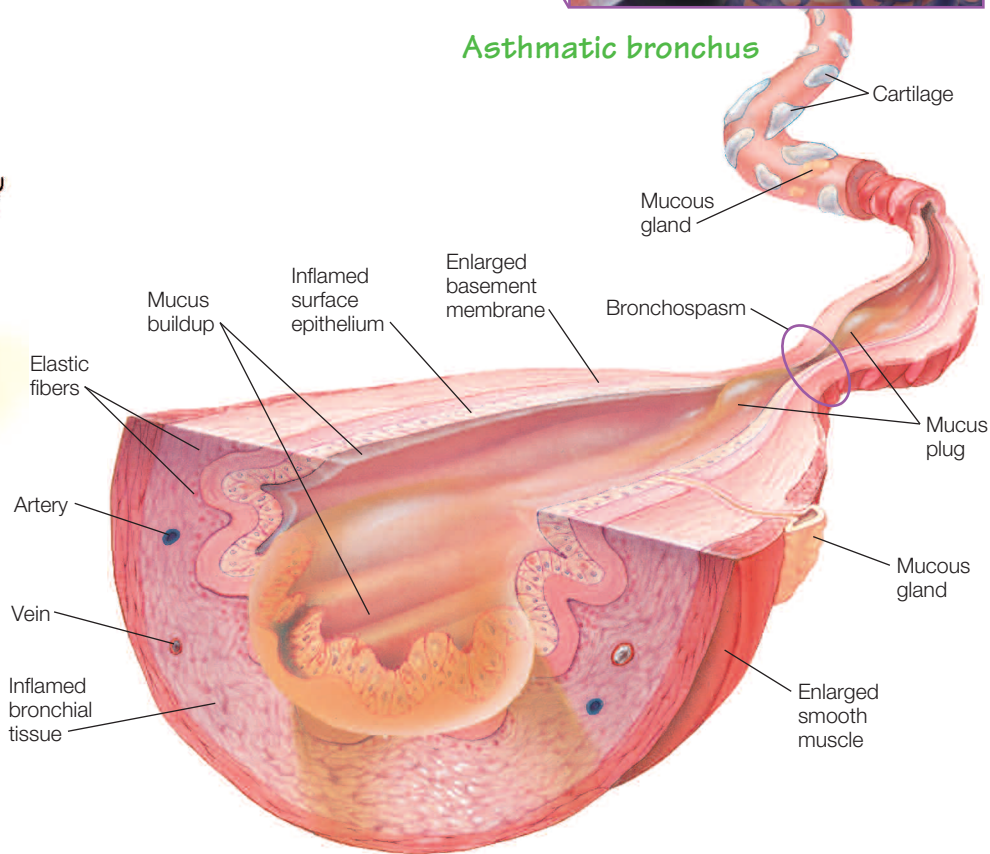
Normal bronchus



Trapped air in alveoli



Asthmatic bronchus



Note the mucus buildup and inflamed tissue.



- **step 2.** If a patient has mild persistent asthma, treatment should include a low- to medium-dose inhaled corticosteroid.
- **step 3.** If a patient has moderate persistent asthma, treatment should include a low- to medium-dose inhaled corticosteroid and a long-acting inhaled  $\beta_2$ -agonist. A leukotriene modifier may be added if the patient is unable to tolerate a  $\beta_2$ -agonist or if she doesn't respond to treatment.
- **step 4.** At this stage, the patient may be given recombinant humanized monoclonal anti-IgE antibody if she meets the criteria of hospitalizations and exacerbations in 1 year. A patient at this stage should be referred to specialty care.

### Quick relief vs. long-term control

Remember that inhaled short-acting  $\beta_2$ -agonists are used during an asthma attack to relieve acute symptoms. The current recommendation to relieve an acute exacerbation is albuterol via nebulizer, 2.5 to 5 mg, or metered-dose inhaler (MDI) with a spacer, four puffs every 20 minutes up to three times. Albuterol has a rapid onset of action (10 to 15 minutes) and its effects last 4 to 6 hours. Adverse reactions include nervousness, tremors, anxiety, headache, and dizziness. It may also cause nausea, vomiting, and tachycardia. If a patient needs to use her rescue inhaler more than two times per week, awakens at night with symptoms more than two times per month, or refills her prescription more than two times per year, she should seek professional help to reevaluate her current treatment regimen. If your patient doesn't respond to treatment within 15 minutes, her symptoms aren't improving, or she experiences an adverse reaction, notify the healthcare provider immediately.

Long-term-control medication is used to control the airway inflammation caused by asthma but isn't used for relief of acute symptoms. Combination therapy with an inhaled steroid and a long-acting  $\beta_2$ -

## Asthma medications

cheat

sheet

Asthma medications may be divided into two categories: quick relief medications and long-term control medications.

### Quick relief medications

Used to treat acute symptoms and exacerbations of asthma.

- Inhaled short-acting  $\beta_2$ -agonist—treatment of choice for acute symptoms.
- Anticholinergics—used in the emergency care setting and may be beneficial when administered concomitantly with an inhaled short-acting  $\beta_2$ -agonist.
- Systemic corticosteroids—used for moderate and severe asthma exacerbations.

### Long-term control medications

Used to achieve and maintain control of persistent asthma symptoms.

- Inhaled corticosteroids (ICSs)—most effective medications for long-term control of asthma.
- Long-acting  $\beta_2$ -agonists—may be used as combined therapy with ICSs for control of moderate or severe persistent symptoms.
- Cromolyn sodium or neocromil—not considered preferred treatment, but may be used as an alternative treatment for mild persistent asthma symptoms.
- Leukotriene modifiers—not considered preferred therapy, but may be used as an alternative treatment for moderate persistent symptoms.
- Immunotherapy—used as an alternative therapy for patients 12 years of age and older with severe persistent symptoms. Requires referral to a specialist.

Source: National Heart, Lung, and Blood Institute. Expert panel report 3: guidelines for the diagnosis and management of asthma (2007). <http://www.nhlbi.nih.gov/guidelines/asthma/asthgdln.pdf>.

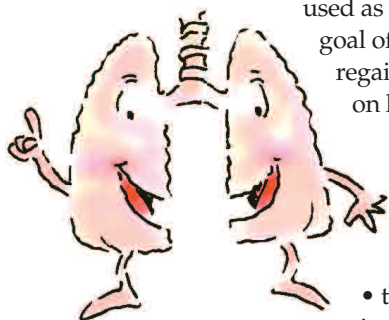
agonist may be prescribed for long-term control. An IgE-blocker or immunotherapy can be used for patients over age 12 whose symptoms aren't adequately controlled by inhaled corticosteroids.

### Take action

Patient teaching should include an asthma action plan, making sure your patient knows how to determine when she should use her inhaler and when to seek emergency medical intervention. The action plan should be a collaboration of the patient, the healthcare provider, and the healthcare team, focusing on teaching the patient to control her asthma. Self-management is the name of the game be-



Teach your patient to control allergens and irritants.



cause asthma is a chronic illness.

Remember that an asthma action plan should be culturally sensitive. Ask your patient about what type of home remedies, if any, she uses to treat her asthma. Find out if she has any cultural beliefs about asthma or medication use. Creating an open environment will allow patients to share their beliefs with you. Each hospitalization should be used as a teachable moment because the goal of therapy is to help your patient regain control of her disease and its effect on her life.

Teach your patient the following:

- the nature of asthma as a chronic inflammatory disease
- the definition of inflammation and bronchoconstriction
- the purpose and action of each medication
- triggers to avoid, including information about types of indoor and outdoor allergens that can aggravate her asthma, and how to do so.

Environmental control measures that limit allergens and irritants are imperative. Teach your patient how to control dust mites, pollen and mold, animal dander, and other irritants. To control dust mites:

- Don't use feather or down pillows and comforters; only use synthetic polyester fill. Encase pillows, mattresses, and box springs in zippered dust mite-proof covers.
- Wash sheets and blankets once a week in very hot water to kill dust mites.
- Dust and vacuum weekly. If possible, use a vacuum cleaner with a high-efficiency particulate air filter to collect and trap dust mites; use washable throw rugs and wash them in hot water weekly.
- Reduce the number of dust-collecting houseplants, books, and nonwashable knickknacks.

To control pollens and molds:

- Avoid the use of humidifiers because humidity promotes mold growth. If you must use one, change the water every day and clean the inside two to three times per week

to prevent mold growth. Humidity in the air should stay below 50%.

- Ventilate bathrooms, basements, and other dark, moist places that commonly grow mold. Consider using a dehumidifier in basements to remove air moisture.
- Air conditioning removes excess air moisture, filters out pollens from the outside, and circulates air throughout your home. Filters should be changed once a month.
- Use a weak bleach solution to clean bathrooms, which are notorious for mold growth.
- Keep windows and doors shut during pollen season.

To control animal dander:

- If allergic to a pet, it might be advisable to find a new home for the animal.
- It may help to wash the animal at least once a week to remove excess dander.

To control irritants:

- Don't smoke or allow others to smoke in the house.
- Don't burn wood fires in fireplaces or wood stoves.
- Avoid strong odors from paint, chemical cleaners, disinfectants, perfume, and glues.

## Walking papers

Before discharge, review proper inhaler technique with your patient. For tips on teaching her how to use an MDI, see "Breathe Easier: A Step-By-Step Guide to MDIs" from our November/December 2006 issue. Also teach her how to use a peak flow meter (see *Picturing peak flow monitoring*).

Peak flow monitoring is a simple, inexpensive, and objective way to measure large airway lung functions. Patients are encouraged to perform daily monitoring to detect early airflow changes that may require treatment. Patients can also use peak flow monitoring to evaluate their response to treatment. Short-term monitoring should be done over a 2- to 3-week period when the patient's asthma is under good control. Readings should be taken at

## Picturing peak flow monitoring

Peak flow meters measure the highest volume of airflow during forced expiration. Volume is measured in color-coded zones: The green zone signifies 80% to 100% of personal best; yellow, 60% to 80%; and red, less than 60%. If peak flow falls below the red zone, the patient should take the appropriate actions prescribed by her healthcare provider.



the same time each day so the patient can determine her personal best value. This value can help her identify a relationship between suspected triggers. Keeping a daily diary to track peak flow readings, along with symptom scoring, allows the patient to better manage her disease.

Encourage your patient to avoid smoking and to perform regular aerobic exercises to improve cardiopulmonary and musculoskeletal conditioning. The use of an inhaled short-acting beta<sub>2</sub>-agonist or cromolyn sodium 15 minutes before exercise is recommended if attacks are triggered by exercise. Encourage her to maintain adequate fluid intake and balanced nutrition. Fluids and antioxidants thin bronchial mucus while vitamin B<sub>5</sub> (pantothenic acid) helps to form antibodies. Because patients with lung disease may feel more short of breath when

their stomachs are full, smaller, more frequent meals may be helpful. It's highly recommended that influenza and pneumococcal vaccines be given to asthma patients as well. Stress management and relaxation techniques might be useful to improve well-being and prevent asthma attacks triggered by stress.

Teach your patient the importance of maintaining regular follow-up visits with her healthcare practitioner. Referral to an allergy specialist is recommended for sensitivity testing and monitoring. In more severe cases, referral to a respiratory specialist or pulmonologist should be considered.

### *A case of exposure*

Asthma is a serious and growing problem in the United States, especially for those living in urban areas exposed to multiple

allergens and environmental pollutants. Looking ahead, more research needs to be done in the area of patient outcomes to reduce the number of hospital admissions and ED visits by patients with asthma. By following the step-up and step-down approach to treatment, as outlined by the NIH, you'll have a useful tool that will allow you to improve the care and management of your patient's asthma. When a patient like Karen appears in your unit, you'll be better prepared to effectively and efficiently assess her symptoms, making sure she gets appropriate treatment and teaching her self-management techniques to help her control her asthma symptoms at home to prevent future exacerbations. ■

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