

Up-to-date asthma care

According to the American Academy of Allergy Asthma & Immunology, it's estimated that the number of people with asthma will grow by more than 100 million by 2025. We provide you with the latest in asthma management.

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Twelve-year-old JL has struggled with shortness of breath, coughing, wheezing, and chest tightness since age 6 when he was diagnosed with asthma. He has missed more than 10 days of school this year due to frequent asthma flare-ups. JL's asthma has been labeled "difficult to treat," leading to monthly appointments with his primary care physician. In addition, he has regular visits with his allergist, pulmonologist, and ear, nose, and throat specialist.

Approximately 23 million Americans have asthma, including almost 7 million children, according to the American Academy of Allergy Asthma & Immunology. Asthma accounts for approximately 500,000 hospitalizations, 217,000 ED visits, 10.5 million physician office visits, 13 million missed school days, and 10.1 million missed work days annually. Asthma costs in the United States

grew from about \$48.6 billion in 2002 to about \$50.1 billion in 2007.

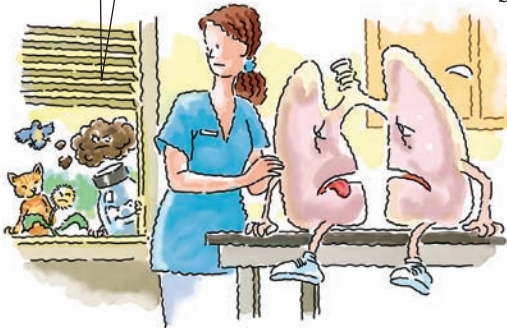
As defined by the National Institutes of Health 2007 National Asthma Education and Prevention Program (NAEPP) Expert Panel Report 3, asthma is a complex, chronic inflammatory disorder of the airways. It's characterized by variable and recurring symptoms due to a combination of underlying inflammation, bronchial hyperresponsiveness, and airflow obstruction.

In this article, we'll examine the causes and triggers of asthma, the purposes of an asthma action plan, and the need for asthma education for patients and their families to help them be as independent and productive as possible.

Itchy trigger finger

People with asthma may be very sensitive to everyday things that don't trouble others.

We're coming to get you!



The factors that cause asthma symptoms and episodes are known as asthma triggers. These triggers differ for each individual; what may trigger asthma in one person may not affect another. Asthma triggers cause symptoms such as coughing, wheezing, and difficulty breathing. Common triggers include allergens, air pollutants, occupational factors, food additives, exercise, changes in weather and temperature, and strong emotions, such as crying, laughing, or yelling. It's

believed that the reflux of acid into the esophagus that occurs with gastroesophageal reflux disease (GERD) may cause bronchoconstriction, leading to an asthma attack, although the exact mechanism of this trigger is unknown.

Respiratory infections and nose and sinus problems are related to inflammation of the mucous membranes and may precipitate an asthma attack.

About 40% of asthma cases are related to an allergic response. These allergens may be seasonal or year round, depending on the exposure. Some common allergens include furred and feathered animals, pollens from various plants, dust mites, and mold.

Common air pollutants and occupational factors include tobacco or wood smoke, vehicle exhaust, scented products, or any strong fumes or odors. Exposure to various agents at work, such as chemicals, can induce an episode. Individuals may arrive at work feeling well, but will become ill as the day progresses.

Additives found in many foods, drinks, and flavorings can cause wheezing in as little as 2 hours. It's important that your patient knows what he's allergic to so he can identify and control his asthma triggers. By knowing and avoiding their triggers, patients with asthma can minimize their symptoms. Through working with their healthcare provider, they can develop an effective action

plan for the management and treatment of their asthma.

Exercise can induce or exacerbate a response, especially during exposure to cold air. Warming up about 10 minutes before exercise, using prescribed medication before exercise, and modifying exercise as necessary can help reduce exacerbations. Breathing through a scarf may help decrease the likelihood of symptoms in cold weather.

Inflammation situation

Many cells and cellular elements play a role in the inflammation that occurs with asthma, particularly mast cells, eosinophils, neutrophils, T lymphocytes, macrophages, and epithelial cells. Susceptible individuals experience recurrent episodes of coughing (especially at night or early in the morning), wheezing, breathlessness, and chest tightness. These episodes, usually associated with variable airflow obstruction, are often reversible either spontaneously or with treatment.

A variety of changes occur in the airway, all influenced by the underlying inflammation. These changes include:

- **bronchoconstriction**—bronchial smooth muscle contraction that quickly narrows the airways, typically in response to exposure to a variety of stimuli, including allergens or irritants
- **airway hyperresponsiveness** and **exaggerated bronchoconstriction** in response to stimuli
- **airway edema**—in persistent asthma, the inflammation becomes more progressive, resulting in edema, mucus hypersecretion, and the formation of mucus plugs; all of these result in limited airflow.

A definitive cause of the underlying airway inflammation hasn't yet been established, although it appears to involve the interaction between genetic, innate immunity, and environmental factors.

A+ assessment

Asthma severity is classified as intermittent, mild persistent, moderate persistent, or

severe persistent. The classifications are outlined separately for patients ages 0 to 4, 5 to 11, and 12 and older. Specific classification for those age 12 and older is as follows:

- **intermittent**—symptoms twice a week or less; nighttime symptoms twice a month or less; no interference with activity; and use of a short-acting beta₂-agonist (SABA) inhaler twice a week or less to control symptoms
- **mild persistent**—symptoms more than twice a week, but not daily; nighttime symptoms three to four times per month; minor limitation in activity; and SABA use more than two times per week, but not daily and not more than one time on any day
- **moderate persistent**—daily symptoms; nighttime symptoms more than one time per week, but not nightly; some limitation in activity; and daily SABA use
- **severe persistent**—daily symptoms; nighttime symptoms often (seven times per week); extreme limitation in activity; and SABA use several times a day.

The assessment of our patient, JL, reveals a daily, mucus-producing cough, a nighttime cough three to four nights per week, a slight limitation in activity, and daily SABA use for symptoms. He also pretreats physical exertion with a SABA at least once a day, allowing him to continue a fairly active lifestyle. This assessment places JL in the moderate persistent category.

Assessing and monitoring asthma severity and control involves assessing the intrinsic control of the disease process. Severity is measured in patients who aren't receiving long-term control therapy, as well as by the amount of medication required to maintain control in patients who are receiving therapy. Asthma severity and control include the domains of current impairment and future risk:

- **Impairment** is defined by the frequency and intensity of symptoms and functional limitations that the patient is urgently experiencing or has recently experienced.
- **Risk** is defined by the likelihood of asthma exacerbations, progressive decline in lung



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function (or, for children, reduced lung growth), or risk of adverse effects from medication.

The initial assessment must include a detailed history, identifying precipitating factors for episodic symptoms (such as exposure at home, work, daycare, or school to inhalant allergens or irritants) and comorbid conditions that interfere with asthma management (such as sinusitis, rhinitis, GERD, stress, obesity, or depression), and assessing the patient's knowledge and skills for self-management.

Step up, step down

The NAEPP guidelines outline four components of asthma care:

- **component 1**—Assessing and monitoring asthma severity and asthma control
- **component 2**—Education for a partnership in care
- **component 3**—Control of environmental factors and comorbid conditions that affect asthma
- **component 4**—Medications.

Based on the asthma severity classification, a stepwise approach is used in prescribing asthma therapy and typically includes long-term control medications and short-term, quick relief medications (see *The stepwise approach for managing asthma in adults and children age 12 and older*). The goal of asthma therapy is to achieve minimal to no exacerbations.

Long-term control medications include:

- **corticosteroids**. Inhaled corticosteroids are the most effective medications for the

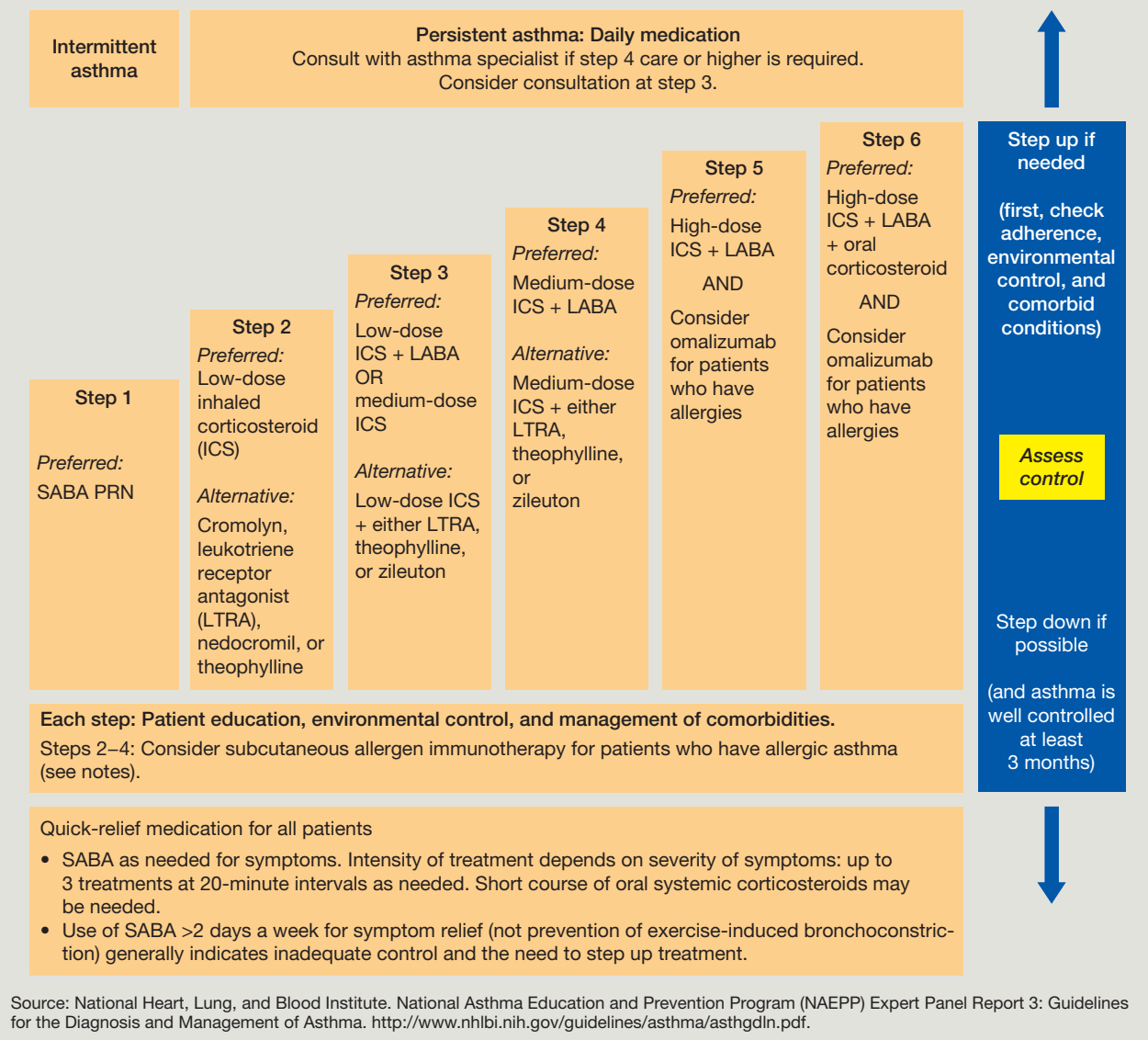
long-term treatment of asthma; they're anti-inflammatory in nature and reduce airway hyperresponsiveness, inhibiting inflammatory cell migration and activation and blocking late phase reactions to allergens.

- *cromolyn sodium* and *nedocromil*. These medications stabilize mast cells and interfere

with chloride channel function; they aren't a preferred medication, but can be used as an alternative in mild persistent asthma.

- *immunomodulators*. Omalizumab is a monoclonal antibody that prevents binding of immunoglobulin E to the high-affinity receptors on basophils and mast cells;

The stepwise approach for managing asthma in adults and children age 12 and older



clinicians administering this medication must be prepared and equipped to identify and treat anaphylaxis should it occur.

- **leukotriene modifiers.** These medications interfere with the pathway of leukotriene mediators, which are released from mast cells, eosinophils, and basophils; examples include montelukast and zafirlukast, which are an alternative but not preferred treatment for mild persistent asthma. They can also be used as adjunctive therapy with inhaled corticosteroids.

- **long-acting beta₂-agonists (LABAs).** These are inhaled bronchodilators that have a bronchodilation duration of at least 12 hours after a single dose; they aren't to be used as monotherapy for long-term asthma control, but are preferred therapy in conjunction with inhaled corticosteroids in moderate or severe persistent asthma. Examples include salmeterol and formoterol, which do carry a black box warning about asthma-related deaths.

- **methylxanthines.** Sustained-release theophylline is a mild-to-moderate bronchodilator used as an alternative, not as a preferred therapy; monitoring serum theophylline concentration is essential.

Quick relief medications include:

- **anticholinergics.** These medications inhibit muscarinic cholinergic receptors and reduce intrinsic vagal tone of the airway; examples include ipratropium, ipratropium with albuterol, and tiotropium.

- **inhaled SABAs.** These are bronchodilators that relax smooth muscle; they're the treatment of choice for relief of acute symptoms and prevention of exercise-induced bronchospasm. Examples include albuterol, levalbuterol, and pirbuterol.

- **systemic oral corticosteroids.** Although not short-acting, these medications are used for moderate and severe exacerbations in addition to SABAs to speed recovery and prevent recurrence. Examples include methylprednisone and prednisone.

All about education

Education of the patient and his family should start at the onset of diagnosis, encourage self-management, and be integrated throughout his care. Asthma education should be tailored to the patient's needs and culturally sensitive. The desired outcome is for the patient to attain normal lung function, restore his normal activities, and control or eliminate asthma symptoms, exacerbations, and adverse reactions to medications.

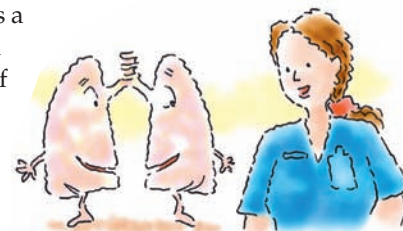
Correct administration of drugs is a major factor in success. Patients and families need education in the use of asthma medications such as inhalers. It's recommended that spacers be used with inhalers; otherwise the medication can end up on the tongue or back of the throat. Spacers must be prescribed by the healthcare provider.

A dry powdered inhaler (DPI) requires less manual dexterity and coordination and is an effective delivery system for asthma medications. A DPI shouldn't be stored in the bathroom because the high humidity can affect the powder. The patient must rinse his mouth with water after DPI use and spit out the water, not swallow it.

A nebulizer is a machine that turns liquid medications into a fine mist that can be inhaled more easily by the patient who's having a severe attack and unable to use an inhaler. Nebulizers are also useful in treating small children.

Some people with asthma use a peak expiratory flow meter (PEFM). A PEFM is an inexpensive and portable handheld device that measures how fast air flows from the lungs. When used properly, peak flow monitoring provides an objective measurement of airflow obstruction and can be used by most adults and children older than age 5. Because patients with asthma frequently don't perceive changes in their breathing, a PEFM can provide information about an impending asthma

When it comes to asthma control, think step up, step down.





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attack before signs and symptoms occur. The peak flow zones are based on the patient's personal best flow number. The zones help check asthma and signal when to take the appropriate actions listed on the patient's action plan to keep his asthma managed and under control.

The colors on the PEFM indicate what action the patient should take. If the indicator falls within the green zone, there are no signs or symptoms of asthma. The yellow zone means caution; the patient may be able to perform some, but not all, of his normal activities. He may show early warning signs and symptoms, such as coughing, wheezing, or difficulty breathing. The red zone means stop; the patient will experience shortness of breath or other symptoms that may be severe. He won't be able to perform normal activities. This is a medical emergency and he must follow his action plan completely and call his physician immediately.

Five signs of an asthma emergency include:

- difficulty breathing (The patient is hunched over, struggling to breathe, and his chest and neck muscles pull in with breathing.)
- trouble walking or talking
- asthma symptoms that don't improve 15 to 20 minutes after medication is taken
- activity stops and the patient is unable to start again
- lips or fingernails are gray or blue.

A written asthma action plan that's developed between the patient and his

healthcare provider will help the patient manage his asthma (see the sample asthma action plan). The action plan will consist of the specific daily dosage of long-term preventive medication to control the patient's asthma and prevent symptoms. It will tell the patient what triggers to avoid and what to do in case of an asthma episode. It will also include the recommended dosages and frequencies of daily medications, asthma symptoms to watch for, recommended dosages and frequencies of medication to take if symptoms of asthma occur, PEFM numbers and zones, a list of triggers and how to handle them, and emergency phone numbers.

What should you teach your patient's family to do if he's having an asthma episode? Follow his action plan, if available; encourage slow breathing using pursed lips for prolonged expiration; position him comfortably to help relax and limit movement; don't leave him alone; have him use his medication as prescribed; and call 911 if necessary.

Taking control

Back to JL—his asthma assessment and subsequent testing revealed seasonal and environment allergens, as well as sensitivities to irritants such as perfumes and cleaning products. In addition, comorbidities of rhinitis, sinusitis, and GERD make maintaining asthma control challenging. JL's maintenance medications include a combination inhaled corticosteroid/LABA, a leukotriene modifier, a SABA, a combination SABA/anticholinergic, oral and nasal medications, GERD medications, and a mucolytic nebulized medication, which helps loosen mucus that plugs the airways. Despite sinus surgery, he requires 4 to 6 weeks of antibiotic therapy two to three times a year due to sinusitis. Oral systemic steroids are also required two times a year.

Despite the complexity of his medication regimen, JL is very compliant, realizing the

GREEN ZONE: 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% or more of my best peak flow)

My best peak flow is: _____

Before exercise

_____ 2 or 4 puffs 5 to 60 minutes before exercise

Medicine	How much to take	When to take it

YELLOW ZONE: Asthma Is Getting Worse

- 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: _____ to _____
(50% - 80% of my best peak flow)

ADD: Quick-Relief Medicine - and keep taking your GREEN ZONE medicine

FIRST _____
(short-acting beta₂-agonist)

SECOND 2 or 4 puffs, every 20 minutes for up to 1 hour
 Nebulizer, once

If your symptoms (and peak flow, if used) return to GREEN ZONE after 1 hour of above treatment:

- Take the quick-relief medicine every 4 hours for 1 to 2 days.
- Double the dose of your inhaled steroid for _____ (7-10) days.

-Or-

If your symptoms (and peak flow, if used) do not return to GREEN ZONE after 1 hour of above treatment:

Take: _____ 2 or 4 puffs or Nebulizer
(short-acting beta₂-agonist)

Add: _____ mg. per day For _____ (3-10) days
(oral steroid)

Call the doctor before/ within _____ hours after taking the oral steroid.

RED ZONE: Medical Alert!

- 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% of my best peak flow)

Take this medicine:

_____ 4 or 6 puffs or Nebulizer
(short-acting beta₂-agonist)

_____ mg.
(oral steroid)

Then call your doctor NOW. Go to the hospital or call for an ambulance if:

- You are still in the red zone after 15 minutes AND
- You have not reached your doctor.

DANGER SIGNS

- Trouble walking and talking due to shortness of breath
- Lips or fingernails are blue

Take 4 or 6 puffs of your quick-relief medicine AND Go to the hospital or call for an ambulance (_____) NOW!

goal of normal lung function. He completes pulmonary function testing, which has almost always indicated normal lung growth and function. Assisting your patient in the facilitation of his asthma plan will ensure that he'll have better outcomes and the best possible quality of life. ■

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