Asthma Risk Factors

Asthma now affects about 20 million Americans, nearly half of whom are children and teenagers. Although the etiology of this complex disease is not completely understood, several risk factors have been identified, including environmental, social, and occupational exposures.

**Genetics.** Many different genes contribute to asthma, and gene-environment interactions are important in its development. While some researchers believe that most asthma cases are mediated by immunoglobulin E (IgE), others believe there are both allergic and nonallergic forms. Much current research is focusing on the role of immune responses associated with inflammatory processes, especially those leading to an imbalance between T helper 1 cells (Th1) and T helper 2 cells (Th2) cytokine profiles. Asthma may represent a shift in balance towards Th2 lymphocytes, resulting in airway inflammation.

**Family history.** The risk for asthma is three to six times higher in individuals who have one parent with asthma.

**Gender.** Asthma occurs more often in young boys than young girls, but after puberty it is more common in females. Whether this difference is partly or solely related to sex hormones or other factors is not known. Research to date does not consistently show a relationship between oral contraceptive use after menarche and asthma.

**Preterm birth.** A meta-analysis of 19 studies found a 7 percent increase in asthma risk among preterm infants.

**Allergens.** A genetic propensity to respond to allergen exposure with an IgE reaction (atopy) is a known risk factor for asthma. A recent National Institutes of Health longitudinal study of 10,508 individuals found that 56.3 percent of asthma cases were attributable to atopy, with cat, *Alternaria* fungus, and white oak allergen having the strongest associations. According to a prospective study that followed 2,166 children from birth to age 6, cat allergen exposure from infancy through age 2 contributes to sensitization. To confuse the picture, however, there is evidence that exposure to dogs and cats in young children may protect against asthma development. House-dust mite allergen causes asthma in susceptible children, as does cockroach allergen in preschool children.

**Chemical irritants.** Young children exposed to secondhand tobacco smoke, including children with prenatal exposure due to the mother actively smoking, are at increased risk for developing asthma. Air pollution is also linked to increased
Controller and Reliever Medications
A REVIEW

Scientific consensus now supports the view that persistent asthma is a chronic disease for which the foundation of treatment is daily use of anti-inflammatory medication. Guidelines of both the National Asthma Education and Prevention Program (NAEPP 2007) and the Global Initiative for Asthma (GINA 2006) classify asthma medications as either long-term-control or reliever medications. Controllers manage asthma through their anti-inflammatory effects, while quick-relief medications quickly reverse bronchoconstriction and acute airflow obstruction. The most common therapeutic agents are reviewed here.

LONG-TERM-CONTROL MEDICATIONS
Inhaled glucocorticosteroids (ICS). These are the strongest and most effective controller agents for persistent asthma, with demonstrated efficacy for decreasing airway hyperresponsiveness and inflammation, reducing symptoms, and improving patients’ quality of life.

Long-acting inhaled beta-2 agonists (LABAs). These bronchodilators are not appropriate for monotherapy because they don’t reduce airway inflammation, but they are effective in combination with ICS. According to GINA, adding LABA to ICS is appropriate when medium-dose ICS doesn’t achieve adequate control. Potential benefits of LABA should be weighed against the increased risk for severe exacerbation, an uncommon but serious side effect. According to GINA, when ICS low-dose therapy is insufficient, add-on therapy is recommended. In contrast, NAEPP suggests the options to add LABA or increase the ICS dose be given equal weight.

Leukotriene modifiers. These are mild bronchodilators. They reduce airway inflammation, exacerbations, and symptoms, and improve lung function. They are an alternative to LABAs as add-on therapy with ICS; however, LABAs are preferred.

RELIEVER MEDICATIONS
Short-acting beta-2 agonists (SABA). These medications are the therapy of choice for relieving bronchospasm during acute exacerbations and preventing exercise-induced bronchoconstriction. They should be used at the lowest dose and frequency needed. Increased use or daily use is a sign of poor asthma control and indicates the need to reassess the treatment plan.

Inhaled anticholinergics. These include ipratropium bromide. Although less effective than SABA for treating asthma exacerbations, ipratropium bromide used with SABA modestly improves pulmonary function, has been shown to reduce the risk for hospital admission, and is an alternative for patients who don’t tolerate SABA.

For additional information on therapeutic roles and side effects of these pharmacologic agents, as well as the use of theophylline, cromones (cromolyn and nedocromil), systemic glucocorticosteroids, oral SABAs, and allergen-specific immunotherapy, see the complete NAEPP and GINA guidelines.
Most asthma symptoms are preventable with the right treatment and self-management, but helping patients to manage triggers can be challenging. The following common obstacles to trigger management have feasible solutions.

**Problem:** Asthma triggers aren’t clearly identified.

**Solution:** Encourage patients to keep an asthma diary for a month to identify triggers. Have them track peak-flow scores and note their activity and location when asthma symptoms worsen. Common triggers are allergens (such as pollen, mold, pets, dust mites, cockroaches, sulfites, and certain foods); comorbid conditions such as respiratory infections and acid reflux disease; tobacco smoke; strong odors; dust; air pollution; weather; exercise; stress and strong emotions; and exposure to dust and chemicals at work, school, or home. Perform allergy testing when warranted.

**Problem:** Patients often underreport their symptoms, and primary care providers often underestimate the prevalence of asthma symptoms.

**Solution:** Don’t assume that the patient has good control. Use of a peak-flow meter can help both the provider and patient have a better understanding of the patient’s lung status. Formally assess control with an instrument such as the five-question Asthma Control Test, [www.asthmacontrol.com](http://www.asthmacontrol.com), or the seven-item Asthma Control Questionnaire, [http://ajrccm.atsjournals.org/cgi/content/full/162/4/1330#A1](http://ajrccm.atsjournals.org/cgi/content/full/162/4/1330#A1).

**Problem:** Many patients have low expectations for asthma therapy.

**Solution:** The Global Initiative for Asthma defines good control as having no symptoms during the day or night, no physical activity limitations, minimal use of reliever medications (two times a week or less), no asthma attacks, and nearly normal lung function. Emphasize good control and explain the benefits of managing triggers.

**Problem:** The patient is having difficulty reducing exposure to triggers.

**Solution:** Assess the patient’s perspective about trigger avoidance in a nonjudgmental manner. Explore what the patient is and isn’t doing to avoid exposure. Agree on specific steps for reducing exposure. This might include using allergen-proof bedding, staying indoors when pollen levels are high, creating a “safe haven” (such as the bedroom) where pets are not allowed, limiting outdoor exercise in cold weather, and other similar steps, depending on the trigger.

**Problem:** The patient doesn’t understand the importance of daily controller medication and how to promptly manage warning signs of an exacerbation.

**Solution:** Educate the patient about the need for controller medication. Create an individualized written asthma Action Plan and review it with the patient.
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risk, possibly due to allergic sensitization. Occupational risk factors may account for up to 15 percent of asthma cases. Direct irritants linked to development of asthma include hydrochloric acid, sulfur dioxide, and ammonia. Allergic occupational asthma can also develop after continued exposure to powdered medications; castor beans; green coffee beans; insecticides; latex; and airborne particles from plastic, rubber, and resin processing. Others at risk include spray painters, insulation installers, beauticians, janitors, and workers in textile industries.

Respiratory infections. In susceptible individuals, especially during critical points in development, respiratory infections can lead to asthma and be a factor in its persistence. There is evidence that respiratory syncytial virus (RSV), parainfluenza virus, and rhinovirus infections are risk factors. About 40 percent of infants with RSV develop continued wheezing or asthma.

Social environment. Low socioeconomic status is associated with more emergency department visits, hospitalizations, and increased risk for death from asthma. African-Americans die of asthma two to four times more often than do whites. Factors that are undoubtedly involved include access to health care, the physical environment, culture, and genetic predisposition. The Children’s Health Study found that early day care attendance was associated with increased risk for asthma in young children, and this relationship was especially strong for children up to age 4 months.

Obesity. Although obesity and asthma are associated statistically, a causal relationship has not been determined. The possibility that obesity induces an inflammatory state that increases risk for asthma needs to be evaluated with prospective, longitudinal studies.