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# Update on Allergic Rhinitis

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## Author Disclosure

Dr Mahr is a consultant, a member of the Speaker's Bureau, and a research participant with Aventis, AstraZeneca, GlaxoSmithKline, Merck, Pfizer, Inspire, Genentech, Alcon, Schering, and Novartis.

Dr Sheth is a consultant, a member of the Speaker's Bureau, and a research participant with Altana, Aventis, AstraZeneca, GlaxoSmithKline, Merck, Pfizer, and NCB Pharm.

**Objectives** After completing this article, readers should be able to:

1. Recognize the various signs and symptoms of allergic rhinitis (AR) in children.
2. Understand the impact of AR on pediatric patients.
3. Discuss the treatment of AR in children.
4. Describe the systemic effects of antihistamines in infants and young children.
5. Understand the roles of topical and oral corticosteroids in the treatment of AR.

## Introduction

Allergic rhinitis (AR) is the most common chronic disease in children, affecting up to 40%. However, the disease frequently is overlooked and undertreated because it often is mistaken for recurrent upper respiratory tract infections in children who cannot adequately communicate the impact of their symptoms. AR generally is not considered to be a life-threatening disease, yet it is one of the major reasons for visits to pediatricians.

## Definitions

In 1998, the Joint Task Force on Practice Parameters in Allergy, Asthma, and Immunology defined rhinitis as “inflammation of the membrane lining the nose, characterized by nasal congestion, rhinorrhea, sneezing, itching of the nose and/or postnasal drainage.” AR is a hypersensitivity reaction to specific allergens occurring in sensitized patients that is mediated by immunoglobulin (Ig)E antibodies and results in inflammation. Traditionally, AR is classified as seasonal or perennial and as either mild, moderate, or severe. Mild AR involves no sleep interruption, no impairment of daily activities, and no troublesome symptoms. Moderate-to-severe AR involves one or more of those factors. A newer classification system specifies that AR be characterized as intermittent or persistent. Intermittent disease involves symptoms for fewer than 4 days per week or for a duration of fewer than 4 weeks. Persistent disease involves symptoms that occur more than 4 days per week and are present for longer than 4 weeks (Bousquet, 2001).

## Epidemiology

Because approximately 50 million Americans have AR, almost all primary care physicians encounter the disease. In one study, 42% of children were diagnosed as having AR by the age of 6 years. The prevalence of AR has increased dramatically in the past 30 years. Children who have one component of atopy (allergic rhinitis, asthma, eczema) have a threefold greater risk of developing a second component (Wright, 1994).

The financial impact is significant. In 1996, the overall direct costs of treating AR exceeded \$3 billion, with an additional \$4 billion spent to treat related comorbidities triggered or exacerbated by the disease. Not surprisingly, indirect costs are lowest when AR is treated adequately.

## Clinical Impact

### Signs and Symptoms

Patients who have AR may experience a variety of signs and symptoms. Parents usually report mouth breathing, snoring, or a nasal voice in affected children. Other symptoms

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typically include paroxysmal sneezing, nasal itching, sniffing, snorting, nose blowing, congestion or postnasal drainage, and occasionally coughing. Additional symptoms include itchiness of the eyes, throat, and palate. Although it may be easy to dismiss the disease symptoms as trivial, patients often experience headaches, fatigue, impaired concentration, reduced productivity, loss of sleep, and decreased emotional well-being and social functioning. AR typically begins in childhood, persists throughout adolescence and early adulthood, and tends to improve in older adults.

On physical examination, nasal obstruction often can be seen, with pale to bluish nasal mucosa, enlarged or boggy turbinates, clear nasal secretions, and pharyngeal cobblestoning. Because some affected children do not have these classic findings, negative examination findings do not eliminate AR. Other characteristic signs of AR in children include allergic shiners (darkening of the lower eyelids due to nasal congestion and suborbital edema) and the allergic crease (transverse skin line below the bridge of the nose) that is caused by constant rubbing upwards from the palm of the hand (“allergic salute”). Due to the chronic nasal airway obstruction, some children have chronic mouth breathing, which also can lead to craniofacial abnormalities and orthodontic disturbances, such as palatal arching, increased facial length, and a flattened mid-face.

### Effects on Quality of Life

AR impairs school performance, and its symptoms interfere with daily life. Schoolchildren who have AR often suffer from both its emotional and behavioral effects. Sedation, irritability, fatigue, and sleeplessness can affect both attentiveness and concentration during school. These place an additional burden on a child’s ability to learn and function in school. It has been shown that children whose allergies are untreated exhibit greater impairment of short-term memory and knowledge acquisition and application compared with children who do not have allergies.

A teenager’s ability to function in school also has been shown to be impaired by AR. A survey of adolescents ages 12 to 17 years demonstrated the impact of seasonal AR on quality of life (Juniper, 1994). The teenagers complained about the lack of a good night’s sleep, difficulty concentrating when doing school work, feeling tired and worn out, accomplishing less, interference with

outdoor activities, irritability, and generally not feeling well. Overall, these youth generally believed that the disease significantly impaired their quality of life.

### Risk Factors

Several risk factors have been noted for the diagnosis of AR by the age of 6 years. These include asthma, maternal smoking (one or more packs per day) in the child’s first postnatal year, parental allergies, and a mother who has asthma. It has been shown recently that the most important factor associated with AR in 6- to 7-year-old children is a family history of rhinitis, personal history of asthma or eczema, and exposure to house dust mites.

Whether exposure to pets during early childhood protects against the development of allergic disease later in life is controversial. Indoor pets can contribute to allergic disease in someone who is known to be allergic to them, but investigators recently have found that expo-

**Sinusitis** often is underdiagnosed in children and can be a complication of allergic rhinitis. Allergic rhinitis also is one of the risk factors associated with otitis media.

sure to two or more dogs or cats in the first postnatal year is associated with a significantly lower risk of developing atopy by age 6 or 7 years (Holsche, 2002).

### Comorbidities

Children who have AR often have coexisting conditions related to their upper and lower airways. Some studies have found that nearly one third of children who have AR also have asthma. Other studies suggest that poorly controlled rhinitis symptoms exacerbate coexisting asthma. Sinusitis often is underdiagnosed in children and can be a complication of AR. Some studies have found that persons who have allergies are more susceptible to viral infections and that the increased mucus and nasal congestion associated with viral infections may expose the patient to the development of sinusitis. AR also is one of the risk factors associated with otitis media. Investigators have reported that about 20% of children who have AR have otitis media with effusion (OME), and 50% of children who have chronic OME have AR. Children who have allergies can become mouth breathers and snore, making them susceptible to disrupted sleep. Some data

**Table 1. Differential Diagnosis of Rhinitis in Pediatric Patients**

Diagnosis	Clinical Presentation
Allergic Rhinitis	Sneezing, rhinorrhea, nasal congestion, pruritus (nasal, ocular, palate, throat), watery eyes, postnasal drip with cough.
Cough-variant Asthma	Nocturnal cough; no history of wheezing; responsive to bronchodilator therapy.
Infectious Rhinitis	<i>Acute viral rhinitis:</i> Rhinorrhea, congestion, fever. <i>Chronic infectious rhinosinusitis:</i> Mucopurulent nasal discharge, postnasal drip with cough, olfactory disturbance.
Foreign Body	Unilateral nasal obstruction and purulent nasal discharge.
Adenoid Hypertrophy	Bilateral nasal obstruction, nasal discharge, and mouth breathing (often severe and unresponsive to therapy).
Structural (deviated septum, nasal turbinate)	Nasal blockage, rhinorrhea, postnasal drip.
Vasomotor Rhinitis	Profuse rhinorrhea, nasal obstruction; symptoms often occur when going from a warm home to frigid outdoor temperatures.
Immune Deficiencies	Recurring upper respiratory tract infections.
Choanal Atresia	Chronic mouth breathing and recurrent infections.
Food-induced (gustatory) Rhinitis	Copious watery rhinorrhea immediately after ingestion of food.
Food Allergy	Nasal, laryngeal, or pulmonary reactions accompanied by gastrointestinal, dermatologic, or systemic manifestations.
Rhinitis Medicamentosa	Nasal congestion and hypertrophy or nasal mucosa (resulting from overuse of topical decongestants).

suggest an association between allergies and snoring, explaining an increased frequency of obstructive sleep apnea syndrome in children who have allergies.

## Diagnosis

### Differential Diagnosis

The differential diagnosis for chronic rhinitis in pediatric patients includes allergies, sinusitis, infectious rhinitis, structural abnormalities, and a foreign body. AR often is misdiagnosed as infectious rhinitis, which is very common in the younger child (Table 1).

### Diagnostic Tools

Although the nasal smear for eosinophils is suggestive but not pathognomonic for AR, in the correct setting, it is helpful. Nasal eosinophilia can be defined by a nasal smear showing an eosinophil count of greater than 4% in children. Eosinophils increase in nasal secretions of patients who have seasonal AR during the pollen season and correlate significantly with the signs and symptoms of AR. Nasal eosinophilia helps distinguish AR from viral infections and nonallergic rhinitis. Nasal secretions can be taken from both nostrils. The specimen may be obtained by swabbing the area with a thin wire swab or by having the patient blow his or her nose on wax paper. Hansel stain is used.

Evidence of hypersensitivity to a specific allergen usu-

ally is necessary to confirm a suspected diagnosis of AR. Techniques used for measuring specific IgE include in vitro assays such as radioallergosorbent testing or skin-prick testing with suspected allergens. The testing can be extremely useful in identifying the allergens that are causing the child's AR, and specific allergen avoidance can be recommended.

## Management

Management of AR is important to prevent both the symptoms and potential complications of the disease, such as sinusitis, otitis, and sleep disturbance. Options for treatment include allergen avoidance, pharmacotherapy, and immunotherapy. In addition, there is a role for prevention of comorbid diseases.

### Allergen Avoidance

Allergy avoidance is the first recommendation for the patient who has AR. Although it may be easy to recommend avoiding pets or pollen, such avoidance is extremely difficult for many patients. A more realistic goal is to decrease allergen exposure as much as possible, keeping in mind that many patients are allergic to multiple allergens. Strategies include staying inside during high pollen times (5 AM to 10 AM), keeping air-conditioning on during spring and fall pollen seasons, and avoiding drying clothes outside during high pollen

**Table 2. Management of Allergic Rhinitis: Assessing Pharmacologic Agents**

Agent	Sneezing	Itching	Congestion	Rhinorrhea	Eye Symptoms
Oral antihistamine	++	++	+/-	++	++
Nasal antihistamine	+	+	+/-	+	-
Intranasal corticosteroid	++	++	++	++	+
Oral decongestant	-	-	+	-	-
Intranasal decongestant	-	-	++	-	-
Intranasal mast cell stabilizer	+	+	+	+	-
Topical anticholinergic	-	-	-	++	-

- provides no benefit, +/- provides little or minimal benefits, + provides modest benefit, ++ provides substantial benefit. This table represents a consensus of the Task Force's opinion.  
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times. To avoid molds, strategies include decreasing humidity in the home, using a dehumidifier, and keeping obvious areas of mold clean with a bleach solution. Patients also should avoid conditions in which mold may be elevated, such as in barns, on hayrides, and outdoors during harvesting.

The ideal solution for pets is to remove them from the home, although this often is not feasible or easy to accomplish. An alternative is to remove pets from the bedroom at night and during the day. Reservoirs for pet dander and allergen also should be avoided, such as pillows and heavy upholstered furniture.

For dust mites, total avoidance is difficult if not impossible. Therefore, strategies to decrease exposure should be used, such as bed and pillow coverings and hypoallergenic pillows and comforters. Feather and down pillows and comforters should be avoided because they may increase dust mite exposure. Clothing should be washed in hot water to denature any remaining mite allergen. The relative humidity of the house should be decreased to prevent dust mite growth. Recent studies have suggested that avoidance alone may not be sufficient to treat AR, especially when the allergen is dust mites. It also has been well documented that passive exposure to cigarette smoke, which is not a true allergen, can exacerbate symptoms for patients who have AR or asthma.

### Pharmacotherapy

Pharmacologic options for treating AR include antihistamines (oral and intranasal), oral leukotriene receptor antagonists (LTRA), and intranasal corticosteroids (INS). Treatment guidelines for AR support the use of INS as first-line therapy. INS are approved for use in patients as young as 2 years of age. The onset of INS action has been shown to be within 12 hours, and in some studies, INS have been shown to work when used

as needed. Oral antihistamines and LTRA improve symptoms of AR when compared with placebo. Decongestants work by vasoconstriction. Because of specific adverse effects of both oral and topical forms, decongestants should be used only intermittently for break-through symptoms of nasal congestion.

Comparisons between INS and oral antihistamines have shown that INS provide superior efficacy for most AR symptoms. When ocular symptoms occur, oral antihistamines may provide slightly greater efficacy than INS, but several recent studies have shown a similar improvement in ocular symptoms when either INS or an oral antihistamine are used for treatment. INS show greater symptom improvement when compared with LTRA (Table 2).

Sedation often is a problem with first-generation antihistamines and can lead to reduced school and cognitive performance. This effect can be avoided by the use of second-generation antihistamines that have low or no sedation effects. With INS use, parents often raise the concern of potential growth suppression. Several studies of INS have shown no effect on growth over 1 year of treatment in pediatric patients. Other concerns include the use of INS with concomitant therapy for asthma, such as inhaled steroids. One recent study has shown that the use of INS in addition to inhaled asthma therapy does not cause any increase in hypothalamic-pituitary-axis adverse effects.

### Allergy Immunotherapy

Allergy immunotherapy (IT) should be considered as adjunctive therapy for children whose disease is significant. IT has been shown to decrease symptoms of AR when administered appropriately. The exact mechanisms of action of IT remain uncertain. Recent studies have suggested that IT induces the production of Treg cells (T-regulatory) and interleukin-10, which are anti-

inflammatory, thereby downregulating allergic inflammation. Other mechanisms include prevention of the seasonal rise in specific IgE that occurs during exposure and potentially the production of blocking antibodies (IgG).

### Disease Prevention

Treatment of AR improves a patient's quality of life and has been shown to decrease asthma-related emergency department visits and potentially to reduce the development of asthma in pediatric patients. One recent study has shown that treatment of grass pollen or dust mite allergies with an oral antihistamine in children younger than age 2 years reduced the subsequent development of asthma compared with a placebo group. Another study showed that children whose AR was due to grass or birch pollen and who were treated with IT were less likely to develop subsequent asthma (Moller, 2002). Those who were treated with placebo were 2.5 times more likely to develop asthma compared with those treated with allergy IT. These data suggest that treatment of AR also may modify and potentially prevent asthma.

### Conclusion

Symptomatic relief and improved quality of life can be achieved for most patients who have AR by avoiding the inciting allergen and using pharmacotherapy appropriately. For those who do not respond to medical management, further evaluation by an allergy specialist and consideration for allergy IT may be beneficial.

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## PIR Quiz

Quiz also available online at [www.pedsinreview.org](http://www.pedsinreview.org).

5. Allergic rhinitis is *best* characterized by:
  - A. Cold air-induced rhinorrhea.
  - B. Fever.
  - C. Nasal pruritus.
  - D. Nocturnal cough.
  - E. Unilateral nasal discharge.
  
6. Of the following conditions, the one *most* commonly coexisting with allergic rhinitis is:
  - A. Asthma.
  - B. Chronic sinusitis.
  - C. Immunodeficiency.
  - D. Otitis media with effusion.
  - E. Sleep apnea.
  
7. Allergen avoidance, when possible, is the best way to control allergic rhinitis. Of the following, the *most* effective intervention in reducing the symptom burden of allergic rhinitis is to:
  - A. Increase home humidity.
  - B. Keep air-conditioning on during pollen seasons.
  - C. Prevent all exposure to pets in the first postnatal year.
  - D. Restrict outside play to early morning hours.
  - E. Spray pillows and comforters to eliminate dust mites.
  
8. A 6-year-old girl presents in the early spring with a 2-week history of paroxysmal sneezing associated with itching of her nose and eyes. She had similar symptoms last year that lasted for 2 months before abating. You diagnose seasonal allergic rhinitis and review appropriate avoidance measures. Of the following, the *most* effective control of her nasal symptoms would be achieved by proper use of an:
  - A. Intranasal corticosteroid.
  - B. Intranasal decongestant.
  - C. Oral first-generation antihistamine.
  - D. Oral leukotriene receptor antagonist.
  - E. Oral second-generation antihistamine.

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