Evaluation of Uncontrolled Childhood Asthma

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Introduction

Asthma is the most common chronic disease of childhood and affects more than 300 million people worldwide. Uncontrolled asthma leads to exacerbations that result in unscheduled health care visits, hospitalizations, and even death. In the United States, of the approximately 7 million children with asthma, 4 million suffered an exacerbation during 2009, demonstrating that over half of these children were uncontrolled at some point in the year. The impact in the child and family includes suboptimal quality of life and time lost from school or work, as well as a significant burden on the health care system.

Tools for Asthma Control Assessment

Multiple tools have been used to assess asthma control, that may include different variables such as daytime symptoms, nighttime symptoms, activity limitation, unscheduled medical visits, exacerbations, short-acting bronchodilator use, patient global self-assessment, physician assessment, spirometry, and exhaled nitric oxide measurement. The Global Initiative for Asthma guidelines have been widely accepted by classifying asthma as controlled, partly controlled, and uncontrolled. Assessment of asthma control in children may be more difficult and often relies on different components depending on age -- as outlined by the Expert Panel Report (Table 1). Despite age-appropriate assessment tools, asthma severity is often under-estimated in children. Young children are unable to express their symptoms and older children may deny theirs to avoid more medications, restriction of activity, parental criticism, and clinic or hospital visits.

Causes of Uncontrolled Asthma

The cause(s) of poorly controlled asthma may lie in any of four major areas: diagnosis, medications, provoking agents, and presence of comorbid conditions (Table 2).
I. Diagnosis

Wheezing is a hallmark feature of asthma but merely indicates partial airway obstruction that may occur from external compression, wall thickening, or intraluminal lesion. Therefore, wheezing may be due to a wide variety of causes, including various infections, acid irritation by gastroesophageal reflux, chronic rhinosinusitis,
foreign body aspiration, anatomical airway obstruction, and cystic fibrosis. To reach a definitive diagnosis, the evaluation may include radiologic studies of the lungs or sinuses, allergy evaluation, sweat chloride testing, pH probe study, or bronchoscopy, depending on the clinical features.

II. Medications

Once the diagnosis of asthma is established, the appropriateness of therapy should be ascertained. In this regard, marked variations occur among health care providers. One study of over 1500 children showed that physicians’ adherence to disease-specific quality indicators for asthma was suboptimal (45%), which was even lower than for acne (57%). In a global asthma survey, patients with persistent asthma were found to have received controller therapy in only 41.1% in Europe, 35.4% in the United States, and 14.5% in Asia-Pacific. Even with the prescription of appropriate therapy, there may be poor compliance, that may or may not be admitted by the patient. In a group of 24 children aged 8-12 years, whereas the compliance to inhaled corticosteroids was reported as 95%, electronic monitoring (Chronolog) showed that 59% of expected doses were used, and only 31% were taken at correct times.

The route of administration and frequency of dosing markedly affect the degree of compliance. In a comparison of two treatment modalities for childhood asthma, the compliance with a tablet form was 78% compared to 42% for an inhaled medication. More frequent dosing also leads to poorer compliance, dropping from 71% for twice a day dosing to only 18% for four times a day. Other barriers to compliance can be poor technique, incomplete family support, suboptimal education, and non-availability or prohibitive cost of the medication. Adolescents are especially prone to non-compliance due to a variety of factors such as disease denial, forgetfulness, laziness, fear of side effects, inconvenience, and embarrassment.

III. Provocative Factors

In spite of appropriate a correct diagnosis and appropriate therapy, asthma is poorly controlled in many patients. Environmental factors can be a major problem, including exposure to heavy allergen load or non-specific inhaled irritants. Identification of such factors by a thorough environmental history and allergy evaluation would be most useful in recommending avoidance measures or specific immunotherapy. It is worth noting that immunotherapy should be postponed until asthma is brought under better control.

Tobacco smoke is probably the most significant environmental irritant. In addition to its direct irritation to the airway, tobacco smoke increases lung mast cell numbers and serum IgE level, potentiates production of IgE antibodies to low molecular weight pollutants, and increases alveolar permeability and bronchial hyperreactivity. Maternal tobacco smoke was reported to be associated with asthma development relative risk of 1.53-1.83 and of functionally-impairing asthma of 1.95-2.28. Tobacco is often missed as an offending allergen in asthma, particularly when eaten on a daily basis. It should be especially suspected in young children with poorly controlled asthma, wheezing following eating, and coexistence of atopic dermatitis, especially if food-related. Other factors that may be a culprit are reactions to drugs or additives, such as aspirin, ACE inhibitors, β-adrenergic blockers, and sulfiting agents.
IV. Comorbid Conditions

There are multiple comorbid conditions that may make asthma more difficult to control, with rhinosinusitis being the most common. Nevertheless it is usually missed by the asthma patients or their physicians. Provocation of nasal mucosa in patients with allergic rhinitis has been shown to lead to increased inflammation in the lower airway. In a study of 48 children with asthma, treatment of sinusitis was associated with a decrease in cough, wheeze, and bronchodilator use from 100% of the patients, to 29%, 15%, and 21% respectively, with normalization of spirometry in 67% of subjects. Less common, though of great significance, is the coexistence of pulmonary diseases such as allergic bronchopulmonary aspergillosis, bronchopulmonary dysplasia, cystic fibrosis, and chronic obstructive pulmonary disease. Gastroesophageal reflux, though less common than in adults, should be suspected in children whose asthma exacerbate upon recumbency.

Obesity has been reported to be associated with increased asthma symptoms and use of short-acting β-agonists and inhaled corticosteroids. In addition to the weight burden and extrinsic restriction of lung function, increased leptin levels in obese individuals have been shown to be associated with increased allergy sensitization and increased systemic inflammation. Asthma is more commonly worse in children with atopic dermatitis with both having similar pathogenesis. In certain individuals, the underlying cause can be a humoral immunodeficiency that requires immunoglobulin therapy.

Conclusions

In children with uncontrolled asthma it is important to verify the underlying cause of chronic wheezing. When the diagnosis of asthma is confirmed, the patient should receive appropriate medication commiserate with severity, and attention should be paid to compliance and technique of administration. Provoking environmental allergens, irritants, unrecognized food allergy, and medication that may exacerbate asthma should be identified and controlled. Comorbid conditions that may contribute to poor asthma control include rhinosinusitis, gastroesophageal reflux, pulmonary disease, cardiac disease, obesity, and chronic stress.

References


