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# Current State of Asthma – 2011

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Although the earliest descriptions of asthma as a medical term date back to Hippocrates and his *Corpus Hippocraticum*,<sup>1</sup> asthma continues to be one of the most common, chronic, and complex disorders. Almost 20 years ago, the National Center for Health Statistics expressed concerns about the increasing trend in asthma prevalence.<sup>2</sup> It is estimated that more than 23 million Americans have asthma, including over 9 million children younger than 18 years.<sup>3,5</sup> The American Lung Association reports that over 4.1 million children experienced at least 1 asthma exacerbation in 2008.<sup>3</sup> This translates into an annual cost of almost \$30 billion in the United States. A significant portion of this cost is the result of emergency department visits and hospitalizations.<sup>3,6</sup> In children younger than 15 years, asthma ranks third in reasons for hospitalization.<sup>7</sup> The Centers for Disease Control and Prevention reports that in 2006 there were over 3600 deaths attrib-



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uted to asthma for all ages.<sup>4,8</sup> Asthma is a manageable disease; however, the management falls short of recommended care based on the national asthma guidelines.<sup>9</sup> According to Akinbami and colleagues,<sup>10</sup> despite the scientific advances made to dramatically improve the mechanisms and treatment, asthma continues to present a challenge to patients/families, healthcare providers, schools, and researchers. A widening, though unexplainable, gap exists with significant socioeconomic and ethnic disparities in asthma morbidity and mortality rates. Increased use of the 2007 National Heart, Lung, and Blood Institute (NHLBI) guidelines and development of a partnership with the child and family increases adherence to management regimens.<sup>9</sup> Légaré and colleagues<sup>11</sup> and Wilson and colleagues<sup>12</sup> reviewed literature addressing shared decision making in which patients/families actively participated and found increased commitment and

adherence to a treatment regimen when compared to a plan of care selected by the healthcare provider alone.

## Make the Diagnosis

Asthma is a chronic disorder characterized by inflammation of the airway mucosa, constriction of the airway smooth muscles, and increased mucous production. This results in recurrent episodes of reversible airflow obstruction presenting as coughing, wheezing, chest tightness, or shortness of breath. In some patients, however, there is irreversible airflow obstruction.<sup>13</sup> There are three diagnostic elements: history, physical examination, and spirometry. A detailed health history is an important first step. Children with asthma will often present with a history of an upper respiratory tract infection that has persisted for weeks or months. There may also be an initial presentation of wheezing, cough, or pneumonia. A history of a dry nighttime cough or cough with exercise is also a frequent presentation. Specific components of the history should include any pattern for the symptoms, precipitating factors (trig-

gers), family history of asthma, allergies, or other atopic conditions.<sup>9</sup> Do the symptoms occur or worsen in the presence of exercise, viral infection, animals with fur or hair, house dust mites (in mattresses, pillows, upholstered furniture, carpets), mold, smoke (tobacco, wood burning), pollen, changes in weather (cold air), strong emotions (laughing or crying), and strong smells or perfumes?

The physical exam, which focuses on the upper respiratory tract, chest, and skin, is often negative. Spirometry is the third component used to make the diagnosis in patients older than 5 years. Some centers are able to obtain reproducible spirometry in children as young as 4 years.<sup>14</sup> According to the NHLBI guidelines, reversibility is determined by a 12% (or greater) increase in FEV<sub>1</sub> (forced expiratory volume in 1 second) after inhalation of a bronchodilator, a short-acting beta agonist (SABA). And, depending on age, an 85% increase in FEV<sub>1</sub>/FVC (ratio of forced expiratory volume in 1 second/forced vital capacity) in children up to age 19 years is normal (80% for 20- to 39-year-

### CONTINUING MEDICAL EDUCATION ACCREDITATION AND DESIGNATION OF CREDIT STATEMENT

#### LEARNING OBJECTIVES

Upon completion of this activity, participants should be able to:

- Understand the epidemiology of asthma in the pediatric patient
- Increase knowledge to assist in making an accurate diagnosis, especially in patients under 5 years of age
- Describe effective management strategies for the asthmatic patient

#### TARGET AUDIENCE

Pediatric nurses, physician assistants, and other interested healthcare professionals, especially those caring for pediatric asthma patients.

#### INSTRUCTIONS FOR CREDIT

1. Read the article in its entirety
2. Go to [www.PEDIATRICNPPA.com/CE9](http://www.PEDIATRICNPPA.com/CE9)
3. Select "Continuing Education"
4. Click on this article's title from the list shown
5. Select "Click here to complete the posttest and obtain a CE certificate online"
6. Complete and submit the CE posttest and CE Activity Evaluation
7. Print your Certificate of Completion

#### FACULTY

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#### PROGRAM FORMAT

Learners will participate in this educational activity by reading through article, answering multiple choice questions on the posttest, and completing the evaluation. There is no fee to participate in this CE activity. After reading the article, please log on to [www.PediatricNPPA.com/CE9](http://www.PediatricNPPA.com/CE9) and click on "Click here to complete the posttest and obtain a CE certificate online."

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olds, 75% for 40- to 59-year-olds, 70% for 60- to 80-year-olds). Galant and Nickerson<sup>15</sup> report that the 85% cut point as a normal FEV<sub>1</sub>/FVC may be too high and could lead to unnecessary medications in some children.

Diagnosing children younger than 4 years is challenging and controversial, particularly those unable to perform spirometry. Most children with asthma develop symptoms before age 5 years but are frequently underdiagnosed and receive inadequate therapy.<sup>16</sup> This puts these young children at increased risk for exacerbations.<sup>17</sup> The NHLBI guidelines<sup>9</sup> suggest that a diagnosis of asthma in children younger than 4 years be considered if there has been 2 or more exacerbations in 6 months that required oral systemic corticosteroids or 4 or more episodes of wheezing in the previous 12 months that lasted more than 1 day and affected their sleep, and if there is either a parental history of asthma, healthcare provider–diagnosed atopic dermatitis, or two of the following: evidence of sensitization to foods,  $\geq 4\%$  peripheral blood eosinophilia, or wheezing in the absence of a cold.

Once other conditions have been ruled out (such as aspiration, gastroesophageal reflux, airway anomaly, foreign body, cystic fibrosis, vocal cord dysfunction, and chronic obstructive pulmonary disease) and the diagnosis is made, the next step is to decide the severity. This is determined by considering the symptom frequency over the previous 2 to 4 weeks, current spirometry (FEV<sub>1</sub> and FEV<sub>1</sub>/FVC) values, and the number of exacerbations that required an oral systemic corticosteroid. Deciding if it is intermittent or persistent can be done as demonstrated in Table 1.<sup>9</sup>

Comorbid conditions can make asthma worse. These include allergic bronchopulmonary aspergillosis, gastroesophageal reflux, obesity, obstructive sleep apnea, and chronic rhinitis or sinusitis.

**Management**

The goal of management is to reduce the intensity, frequency, and limitations of asthma symptoms. This involves a preventative approach with regular follow-up visits. At each visit, symptoms should be assessed, spirometry performed (if age appropriate), medications adjusted (either up or down), triggers reviewed, and ongoing education done. Symptom assessment can be accomplished by incorporating a validated self-administered questionnaire such as Asthma Therapy Assessment Questionnaire (ATAQ), Asthma Control Questionnaire (ACQ), or Asthma Control Test (ACT). At The

Children’s Hospital, one ACT is used for children 4 to 11 years and another for children older than 12 years and adults. The questions (7 for the 4- to 11-years-olds and 5 for the older age group) help determine how controlled the asthma is. Patient education is a core recommendation of national and international guidelines<sup>9,19</sup> and should encourage active participation by the patient and family in the management of their asthma. A review of correct inhaled medication device technique is important. An asthma action plan (AAP) that is reviewed and updated at each visit is strongly recommended. The AAP is a tool that includes peak flow values, is symptom based, and provides specific directions for the daily management and adjustment of medica-

tions in response to increasing symptoms or decreasing peak flow values. Children and adults with asthma should be able to play or work, sleep, and learn without asthma symptoms impacting them. Well-controlled symptoms fall into the intermittent category.

The mainstay of asthma management is pharmacologic treatment. The NHLBI 2007 guidelines<sup>18</sup> provide a stepwise approach to pharmacologic therapy (Table 2). The guidelines are intended to support the care based on the clinician’s clinical judgment.

Intermittent asthma is typically managed with a SABA (eg, albuterol or levalbuterol) every 4 to 6 hours as needed for cough, wheeze, chest tightness, or shortness of breath and, if needed, 15 to 20 minutes before vigorous activity. SABAs,

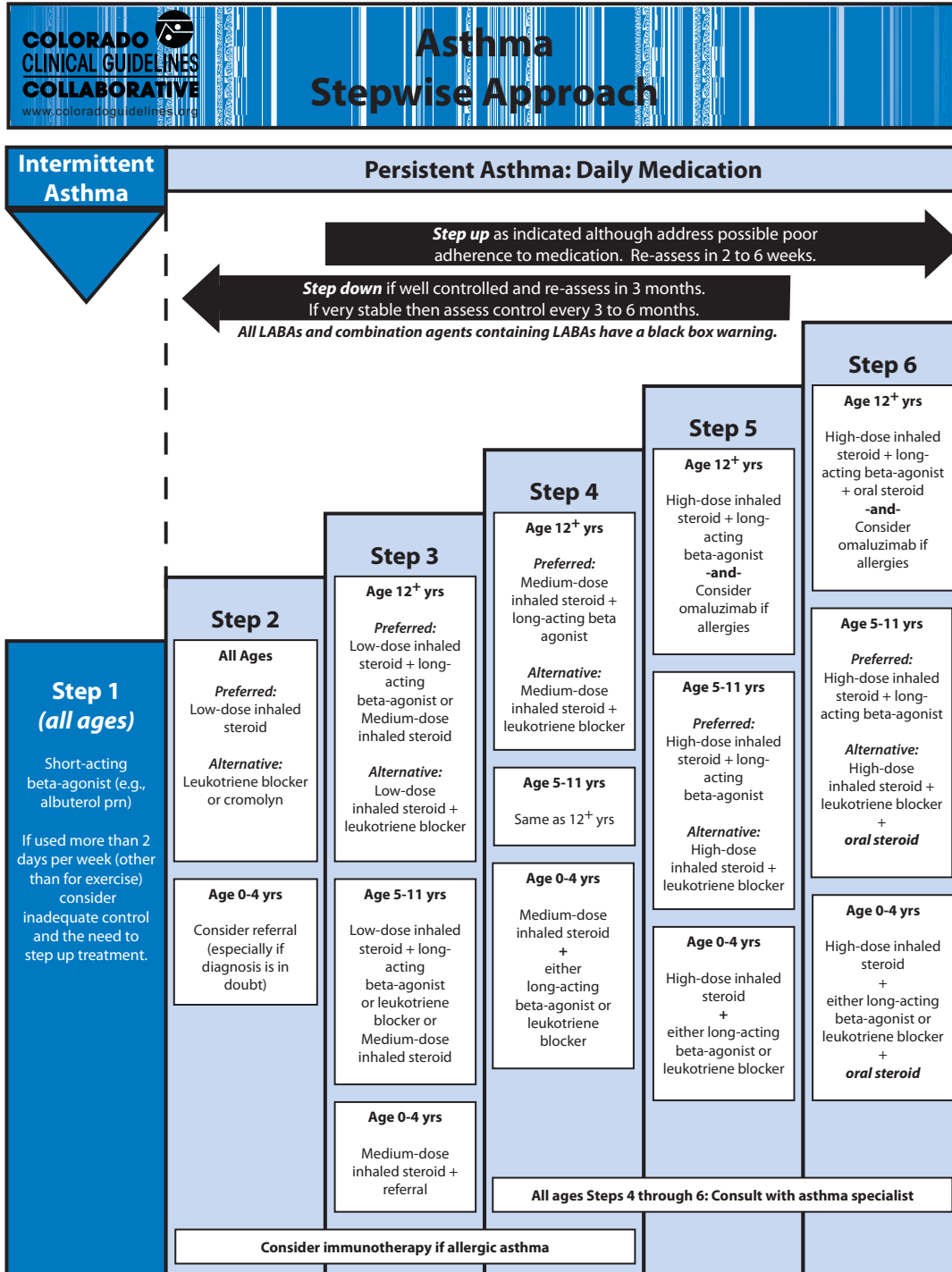
known as quick-acting or reliever medications, relax the airway smooth muscles.<sup>20</sup> Multiple choices are available for inhaled corticosteroids (ICS), the drug of choice for persistent asthma.<sup>9</sup> ICSs suppress airway inflammation and are known as controllers or preventative medications. Some ICSs are combined with a long-acting beta<sub>2</sub> agonist (LABA). LABAs should not be used as monotherapy.<sup>9</sup> Another class of medication used as adjunctive or alternative therapy is a leukotriene-receptor antagonist blocking agent. The final class is omalizumab, an adjunctive therapy for patients older than 12 years. For patients with allergic asthma, omalizumab blocks the inflammatory effects in the airway that are triggered by IgE.

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	<b>Intermittent</b>	<b>Mild Persistent</b>	<b>Moderate Persistent</b>	<b>Severe Persistent</b>
Daytime symptoms	$\leq 2$ days/week	$>2$ days/week, not daily	Daily	Throughout day
Nighttime awakenings	0-4 years of age: 0  $\geq 5$ years of age: $\leq 2$ $\times$ /month	0-4 years of age: 1-2 $\times$ /month  $\geq 5$ years of age: 3-4 $\times$ /month	0-4 years of age: 3-4 $\times$ /month  $\geq 5$ years of age: $>1$ $\times$ /week, not nightly	0-4 years of age: $>1$ $\times$ /week  $\geq 5$ years of age: Often 7 $\times$ /week
SABA use (not prevention of exercise-induced symptoms)	$\leq 2$ days/week	$>2$ days/week, not daily	Daily	Several times each day
Interference with normal activities	None	Minor limitation	Some limitation	Extreme limitation
FEV <sub>1</sub>	0-4 years of age: N/A  $\geq 5$ years of age: Normal FEV <sub>1</sub> between exacerbations	0-4 years of age: N/A  $\geq 5$ years of age: $>80\%$ predicted	0-4 years of age: N/A  $\geq 5$ years of age: 60%-80% predicted	0-4 years of age: N/A  $\geq 5$ years of age: $<60\%$ predicted
FEV <sub>1</sub> /FVC	0-4 years of age: N/A  $\geq 5$ years of age: Normal between exacerbations	0-4 years of age: N/A  5-11 years of age: $>80\%$ predicted  $\geq 12$ years of age: Normal	0-4 years of age: N/A  5-11 years of age: 75%-80% predicted  $\geq 12$ years of age: Reduced 5%	0-4 years of age: N/A  5-11 years of age: $<75\%$ predicted  $>12$ years of age: Reduced $>5\%$
Exacerbations requiring oral systemic corticosteroids	0-1/year	$\geq 2$ /year	$\geq 2$ /year	$\geq 2$ /year
SABA indicates short-acting beta agonist; FEV <sub>1</sub> , forced expiratory volume in 1 second; FEV <sub>1</sub> /FVC, ratio of forced expiratory volume in 1 second/forced vital capacity. Adapted from National Heart, Lung, and Blood Institute (NHLBI) guidelines. <sup>9</sup>				

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Table 2



Adapted from the NAEPP 3: <http://www.nhlbi.nih.gov/guidelines/asthma/>. This guideline is designed to assist the clinician in the management of asthma. This guideline is not intended to replace the clinician's judgment or establish a protocol for all patients with a particular condition. For references, additional copies of the guideline, or patient documents go to [www.coloradoguidelines.org](http://www.coloradoguidelines.org) or call (720) 297-1681 or 866-401-2092.

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**What Is Next?**

Asthma is a chronic disorder that could be better controlled if clinicians involved in asthma management routinely provided education in the use of inhaled medication devices, offered an AAP, and followed the principles of the NHLBI guidelines. More research is needed to better understand other potential components in asthma pathogenesis, such as the roles that diet and vitamin D play,<sup>21,22</sup> and ways to decrease the disproportionate effect asthma has on minority and low-income groups. ☀

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